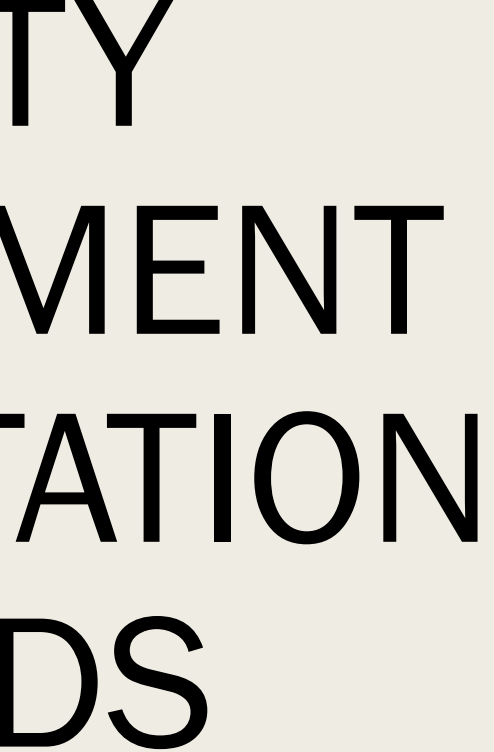




Mentee:
Kreslyn Hinds
Mentor: Rita
Zejnullahi

POVERTY MEASUREMENT AND IMPUTATION METHODS



Quick summary

How do we measure poverty?

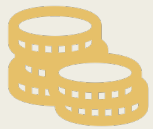
How can we use existing data and surveys to get accurate information about poverty in a population?

What is a poverty line?

What does the poverty line tell us/how can we use the poverty line to calculate poverty in a population?

How do we use the poverty line to alleviate poverty?

Poverty measurement



Wealth index



Sanitation
and health



Nutrition



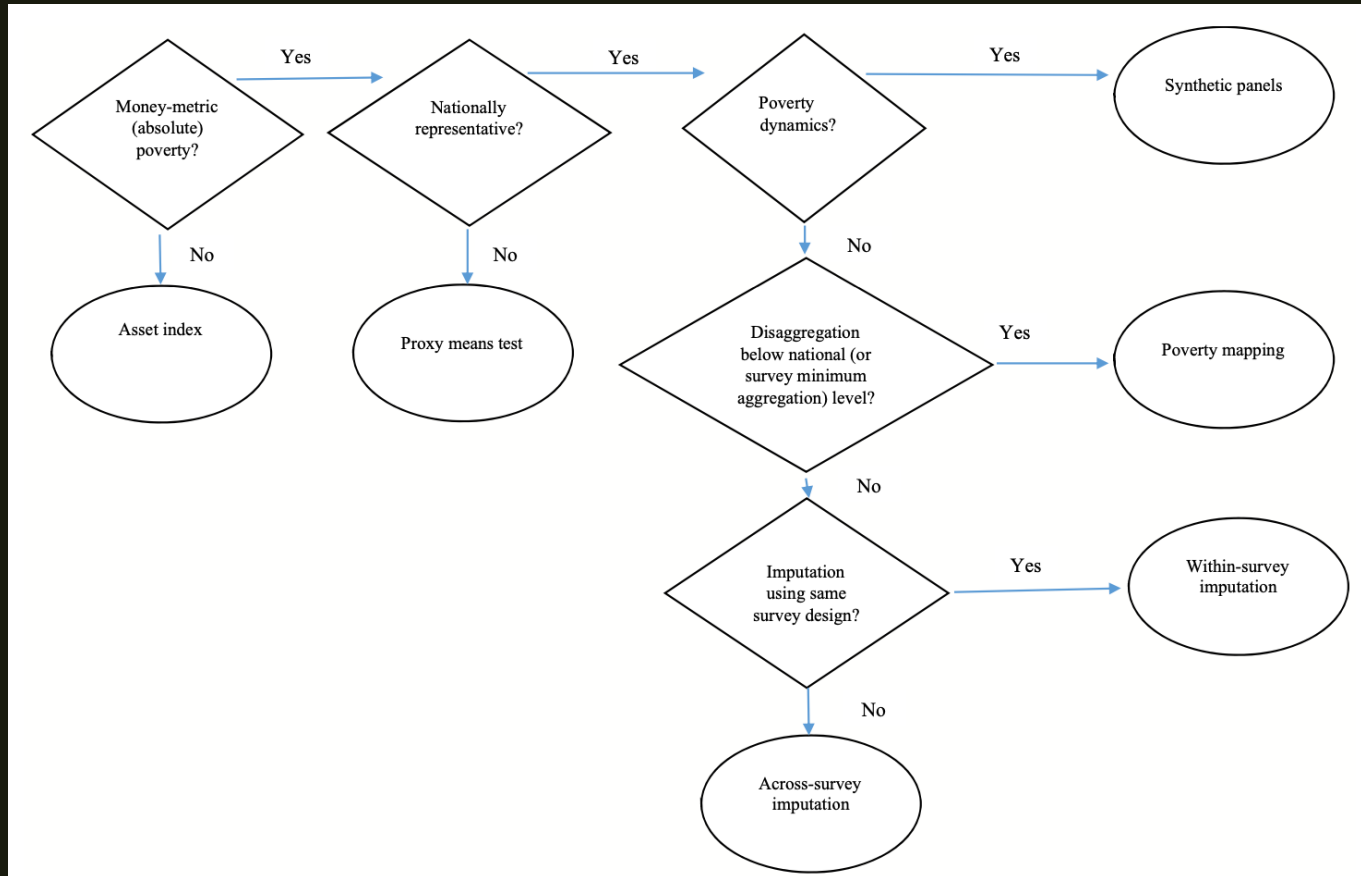
Education



income

What is imputation?

- In statistics, imputation is the process of replacing missing data with substituted values



Where
imputation
may be
necessary in
the US

The Census Bureau is responsible for over
130 surveys

Decennial Census

- *Conducted every 10 years, records very basic information*

Where the Census uses poverty mapping

- Census Small Area Income and Poverty Estimates (SAIPE)
- “The main objective of this program is to provide estimates of income and poverty for the administration of federal programs and the allocation of federal funds to local jurisdictions”
 - *About the SAIPE Census.gov*
 - <https://www.census.gov/programs-surveys/saipe/about.html>



POVERTY LINES

▶ \$ 2.15 per day international poverty line (world bank)

▶ 2100 calories per day as a universal nutrition requirement

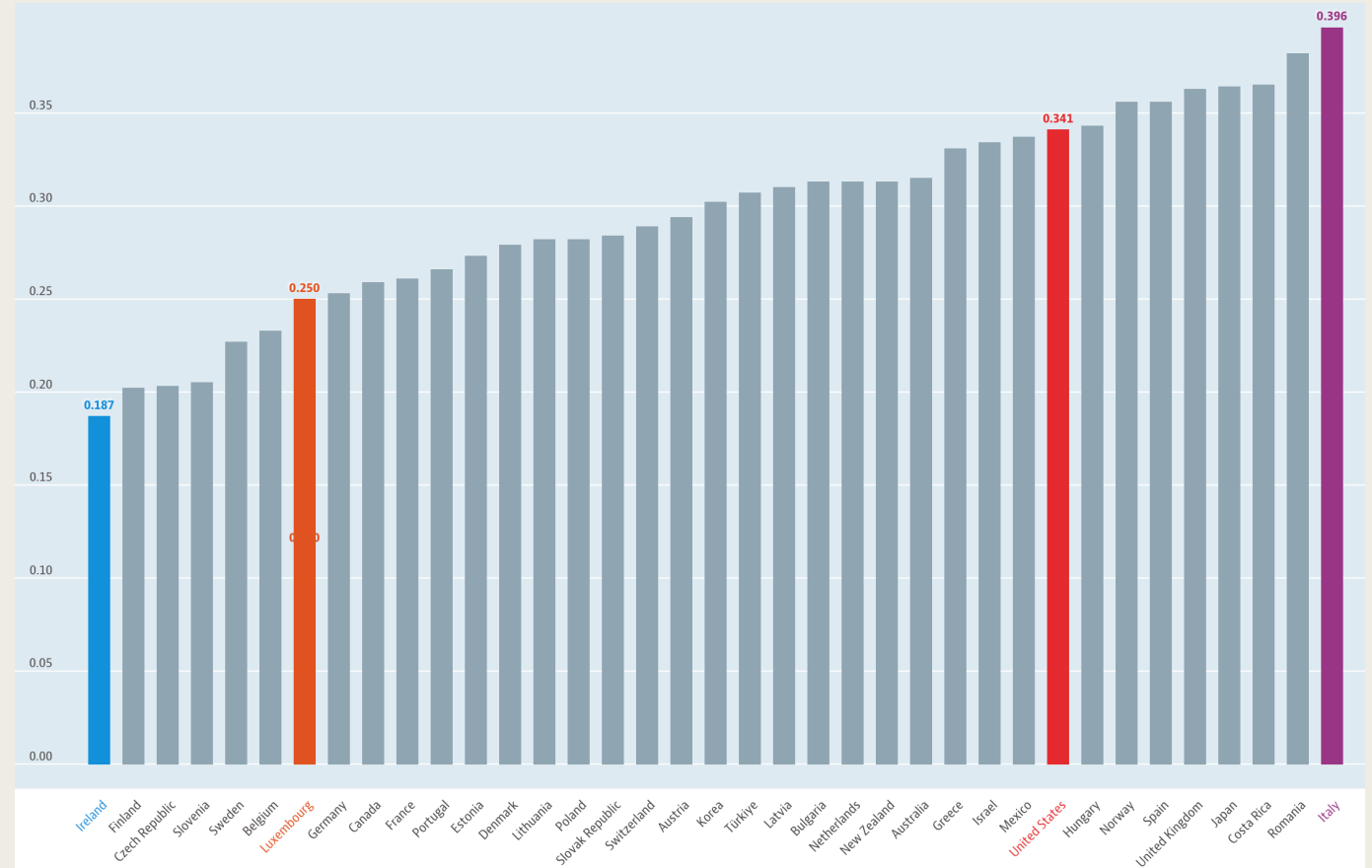
Poverty Thresholds for 2022 by Size of Family and Number of Related Children Under 18 Years
(In dollars)

| Size of family unit | Related children under 18 years | | | | | | | | |
|---|---------------------------------|--------|--------|--------|--------|--------|--------|--------|---------------|
| | None | One | Two | Three | Four | Five | Six | Seven | Eight or more |
| One person (unrelated individual): | | | | | | | | | |
| Under 65 years..... | 15,225 | | | | | | | | |
| 65 years and over..... | 14,036 | | | | | | | | |
| Two people: | | | | | | | | | |
| Householder under 65 years..... | 19,597 | 20,172 | | | | | | | |
| Householder 65 years and over..... | 17,689 | 20,095 | | | | | | | |
| Three people..... | 22,892 | 23,556 | 23,578 | | | | | | |
| Four people..... | 30,186 | 30,679 | 29,678 | 29,782 | | | | | |
| Five people..... | 36,402 | 36,932 | 35,801 | 34,926 | 34,391 | | | | |
| Six people..... | 41,869 | 42,035 | 41,169 | 40,339 | 39,104 | 38,373 | | | |
| Seven people..... | 48,176 | 48,477 | 47,440 | 46,717 | 45,371 | 43,800 | 42,076 | | |
| Eight people..... | 53,881 | 54,357 | 53,378 | 52,521 | 51,304 | 49,760 | 48,153 | 47,745 | |
| Nine people or more..... | 64,815 | 65,129 | 64,263 | 63,536 | 62,342 | 60,699 | 59,213 | 58,845 | 56,578 |

Source: U.S. Census Bureau, 2023.
Note: The source of the weighted average thresholds is the 2023 Current Population Survey Annual Social and Economic Supplement (CPS ASEC).

Headcount ratio, poverty gap and poverty gap squared

- Official poverty rate in 2021
 - 11.9% below the poverty line in 2021 (39.7 million)
- Poverty gap computed by the OECD Library is 34.1%
 - The average gap is ~ \$ 4701.70



https://www.oecd-ilibrary.org/social-issues-migration-health/poverty-gap/indicator/english_349eb41b-en

How do we compute these poverty measures?

- α = Defines the poverty measure
- $F(y)$ = Cumulative distribution function of income y
- $f(y)$ = Probability density function of income y
- z = Poverty line (dollar amount)
- If $\alpha = 0$: Head count ratio
- Collapses the equation to:
 - $P_0 = F(z)$
 - If $\alpha = 1$: Poverty gap
 - If $\alpha = 2$: Poverty gap squared

$$P_{\alpha} = \int_{\underline{y}}^z \left(\frac{z-y}{z}\right)^{\alpha} f(y) dy ; \quad \alpha \geq 0$$

$$P_{\alpha}(B_1, B) = x_1 P_{1, \alpha} \left(\frac{B_1}{x_1} \right) + x_2 P_{2, \alpha} \left(\frac{B - B_1}{x_2} \right)$$

Differentiating this with respect to B_1 , we get

$$\frac{\partial P_{\alpha}}{\partial B_1} = - \frac{\alpha}{z} [P_{1, \alpha-1} - P_{2, \alpha-1}]$$

$$\frac{\partial P_{\alpha}}{\partial B_1} \geq 0 \iff P_{1, \alpha-1} \leq P_{2, \alpha-1}$$

| Ecuador (rural) | |
|--|------|
| Uniform transfer | 100 |
| Optimal targeting (1st administrative level) | 76.0 |
| Optimal targeting (2nd administrative level) | 66.7 |
| Optimal targeting (3rd administrative level) | 58.4 |

| Ecuador | |
|------------------------------|--|
| Household survey | |
| Year | 1994 |
| Source | Encuesta de Condiciones de Vida (ECV) |
| Sample Size | 4500 households |
| Population census | |
| Year | 1990 |
| Coverage | About 10 million individuals in 2 million households |
| Geographic units of Analysis | |
| 1st administrative level | |
| Name | Provincia |
| Number of localities | 21 |
| Average number of households | 45 783 |
| Average number of persons | 223 026 |
| 2nd administrative level | |
| Name | Canton |
| Number of localities | 195 |
| Average number of households | 4930 |
| Average number of persons | 24 018 |
| 3rd administrative level | |
| Name | Parroquia |
| Number of localities | 915 |
| Average number of households | 1051 |
| Average number of persons | 5119 |

HOW DO WE USE THESE POVERTY MEASURES?

- Should more money be given to groups with higher poverty rates, poverty gaps or squared poverty gaps?
- Does optimizing budget allocations save a significant amount of money?

Articles and links

- Budgetary Rules For Poverty Alleviation by S.M. Ravi Kanbur, seminar paper No. 363, Institute For International Economic Studies, University of Stockholm
- Appendix 1 Poverty Definition, Measurement, and Analysis, Asian Development Bank
- To impute or not to impute, and how? A review of poverty-estimation methods in the absence of consumption data, Hai-Anh H. Dang
- Poverty alleviation through geographic targeting: How much does disaggregation help? Chris Elbers, Tomoki Fujii, Peter Lanjouw, Berk Özler, and Wesley Yin
- <https://www.census.gov/library/publications/2022/demo/p60-277.html>
- <https://www.census.gov/programs-surveys/acs/about/acs-and-census.html>
- <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html>
- <https://www.census.gov/topics/income-poverty/poverty/guidance/poverty-measures.html>
- <https://www.census.gov/programs-surveys/surveys-programs.html>
- <https://www.census.gov/programs-surveys/acs/about/acs-and-census.html>
- <https://www.census.gov/programs-surveys/saipe/about.html>
- <https://www.census.gov/programs-surveys/saipe/technical-documentation/methodology.html>
- <https://www.bls.gov/lau/acsqa.htm>