The Association Between Income and Life Expectancy in the United States, 2001-2014

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Introduction

- Well known that higher income is associated with longer life

  [e.g., Kitagawa and Hauser 1973, Pappas et al. 1993, Williams and Collins 1995, Meara et al., Olshansky et al. 2012, Waldron 2007, 2013]

- But several aspects of relationship between income and longevity remain unclear

  1. What is the shape of the income–life expectancy gradient?

  2. How are gaps in life expectancy changing over time?

  3. How do the gaps vary across local areas?

  4. What are the sources of the longevity gap?

Part 1: Data and Methodology

Data and Sample Definition

- Income data from de-identified 1999-2014 tax returns

- Mortality data from SSA DM-1 file

  - DM-1 death counts are closely aligned with CDC NCHS counts by year and across age distribution (less than 2% difference)
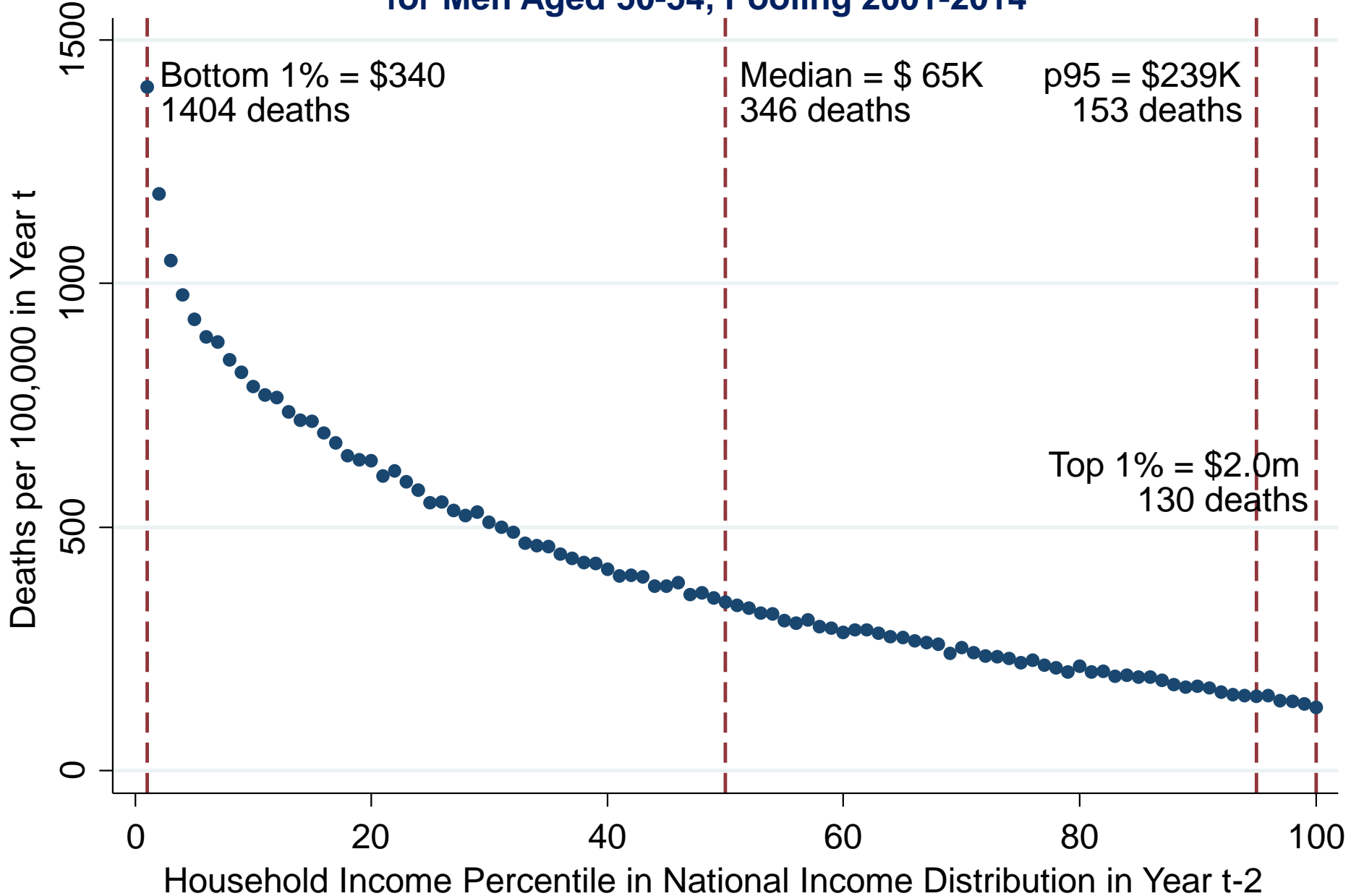
Income Definition

- Baseline income concept: household earnings

    - For tax filers: Adjusted Gross Income minus Social Security and Disability benefits

    - For non-filers: W-2 earnings + UI benefits

- Exclude individuals with zero household income (8% of population at age 40)

    - Mortality rates for individuals with zero income measured imperfectly because deaths of non-residents are not tracked fully in SSA data

- Focus on percentile **ranks** in income distribution

    - Rank individuals in national income distribution within birth cohort, gender, and tax year
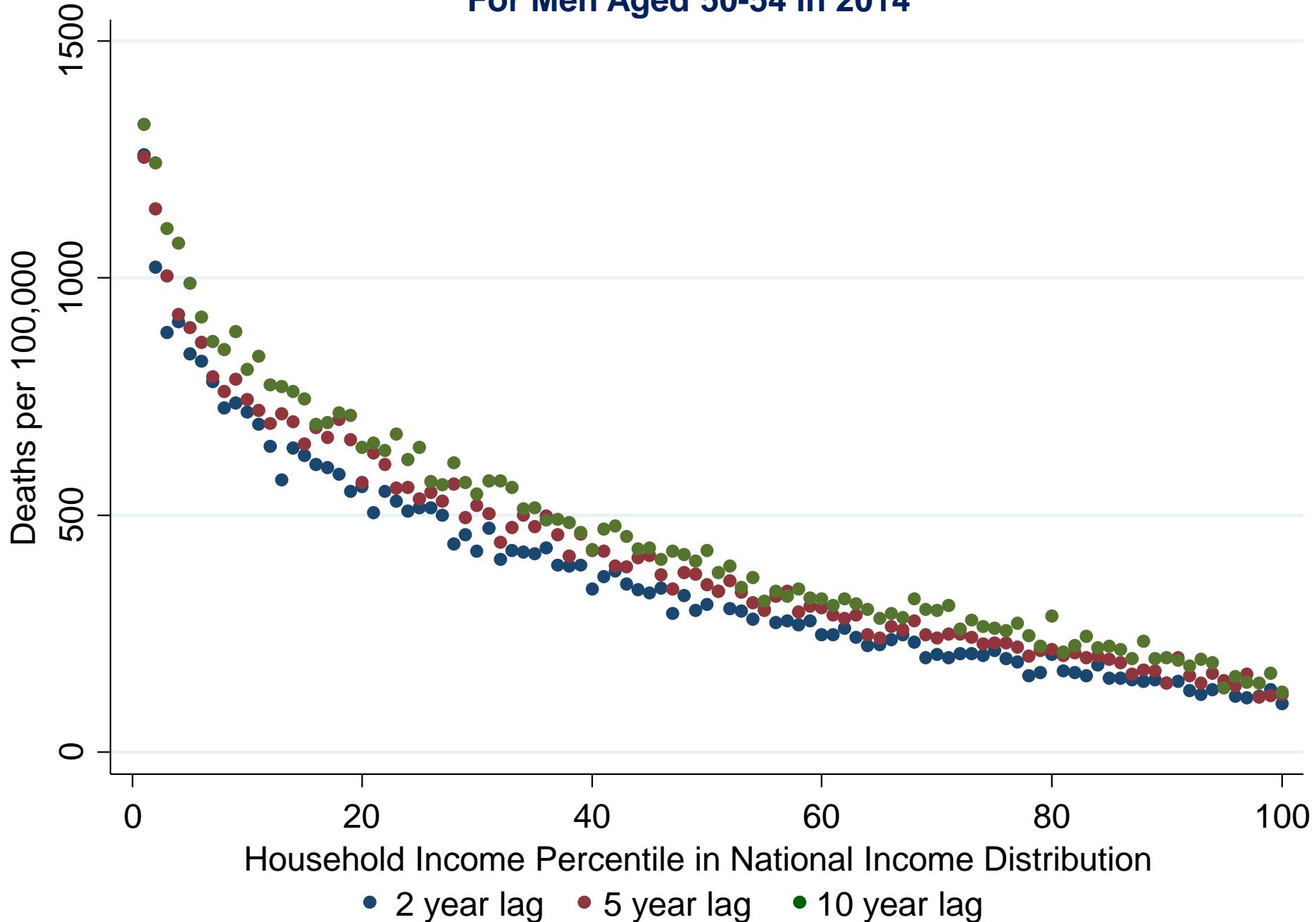
Step 1: Calculating Observed Mortality Rates

- For "working age" sample (below age 63), start by calculating mortality rates as a function of income percentile at age $a - 2$ (two year lag)

    - Then return to original goal of estimating mortality rates as a function of income percentile at age 40

**Annual Mortality Rates vs. Household Income Percentile
for Men Aged 50-54, Pooling 2001-2014**

Bottom 1% = $340
1404 deaths

Median = $ 65K
346 deaths

p95 = $239K
153 deaths

Top 1% = $2.0m
130 deaths

Deaths per 100,000 in Year t

Household Income Percentile in National Income Distribution in Year t-2

Annual Mortality Rates vs. Household Income Percentile
For Men Aged 50-54 in 2014

Deaths per 100,000 (y-axis): 0, 500, 1000, 1500

Household Income Percentile in National Income Distribution (x-axis): 0, 20, 40, 60, 80, 100

Legend: ● 2 year lag ● 5 year lag ● 10 year lag

Survival Curve Using Period Life Table For Men at 5th Percentile
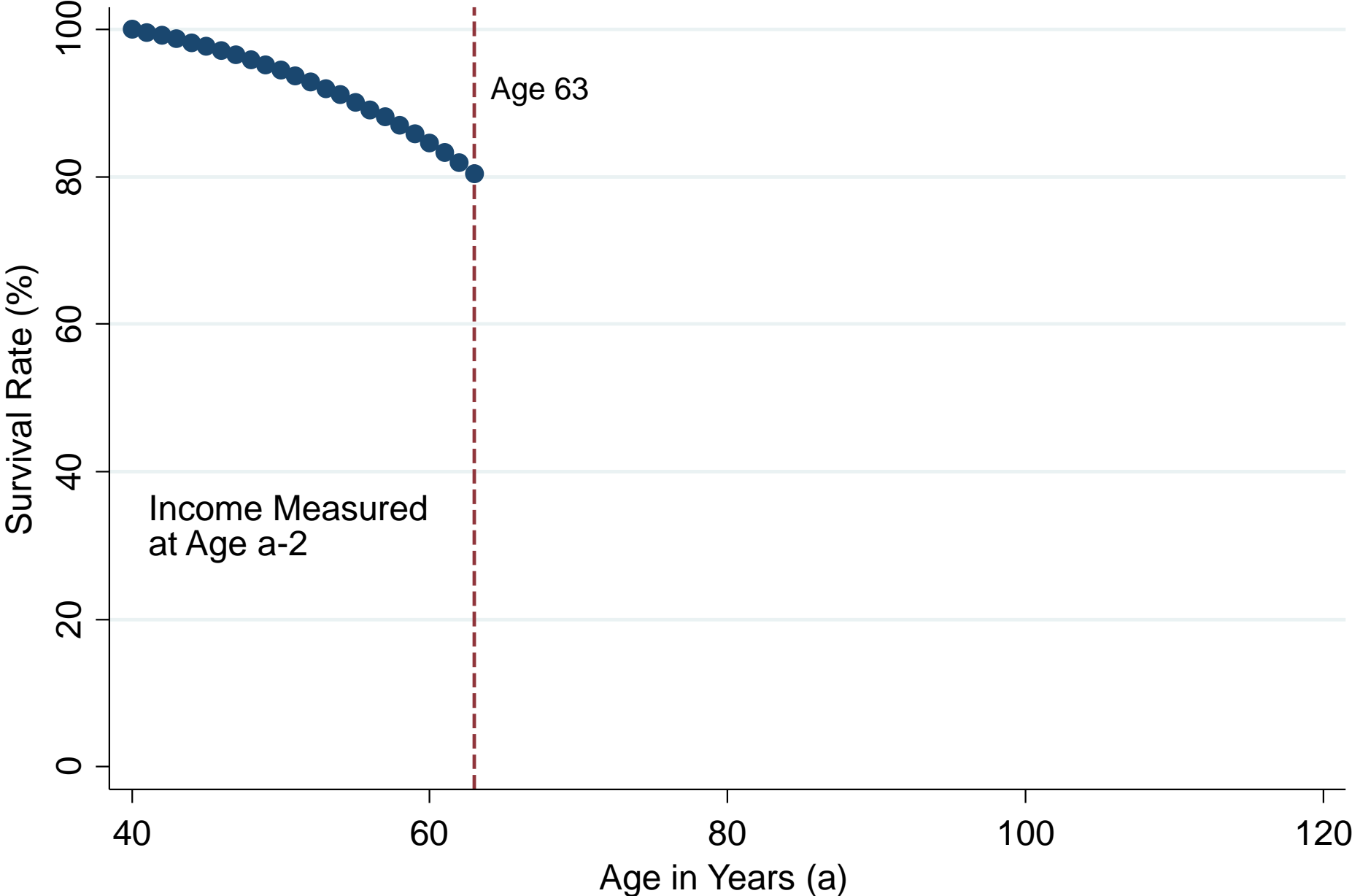
Age 63

Income Measured at Age a-2

Survival Rate (%)

Age in Years (a)

Survival Curves for Men at 5th and 95th Percentiles

Age 63

Age 76

p95 Survival Rate: 83%

p5 Survival Rate: 52%

Income Measured at Age a-2

Income Measured at Age 61

Survival Rate (%)

Age in Years (a)

● Data: p5   ● Data: p95

Survival Curves for Men at 5th and 95th Percentiles

Age 63 | Age 76 | Age 90

Income Measured at Age a-2

Income Measured at Age 61

Gompertz Extrapolation

NCHS and SSA Estimates (constant across income groups)

Survival Rate (%)

Age in Years (a)

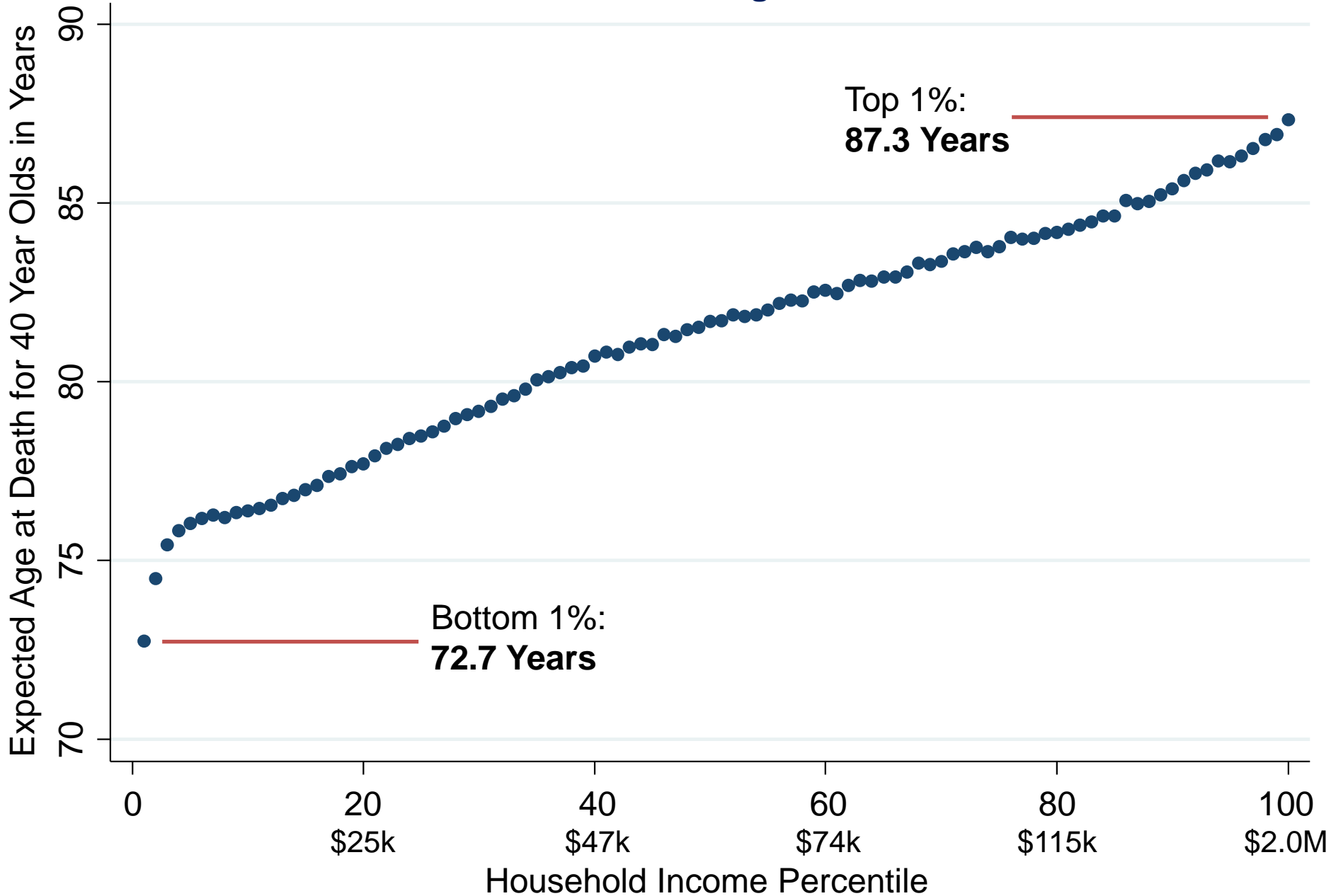● Data: p5 — Gompertz: p5 ● Data: p95 — Gompertz: p95
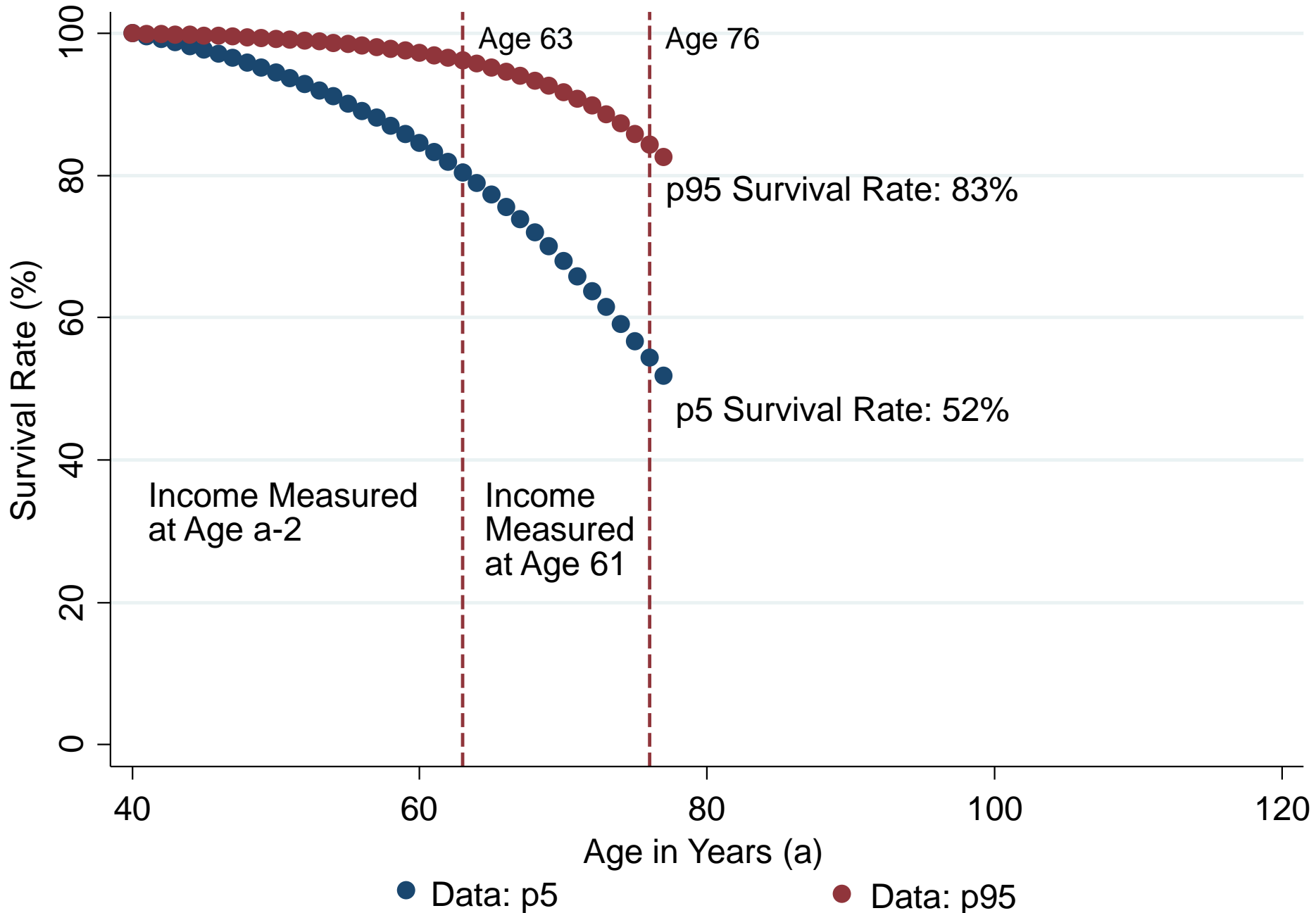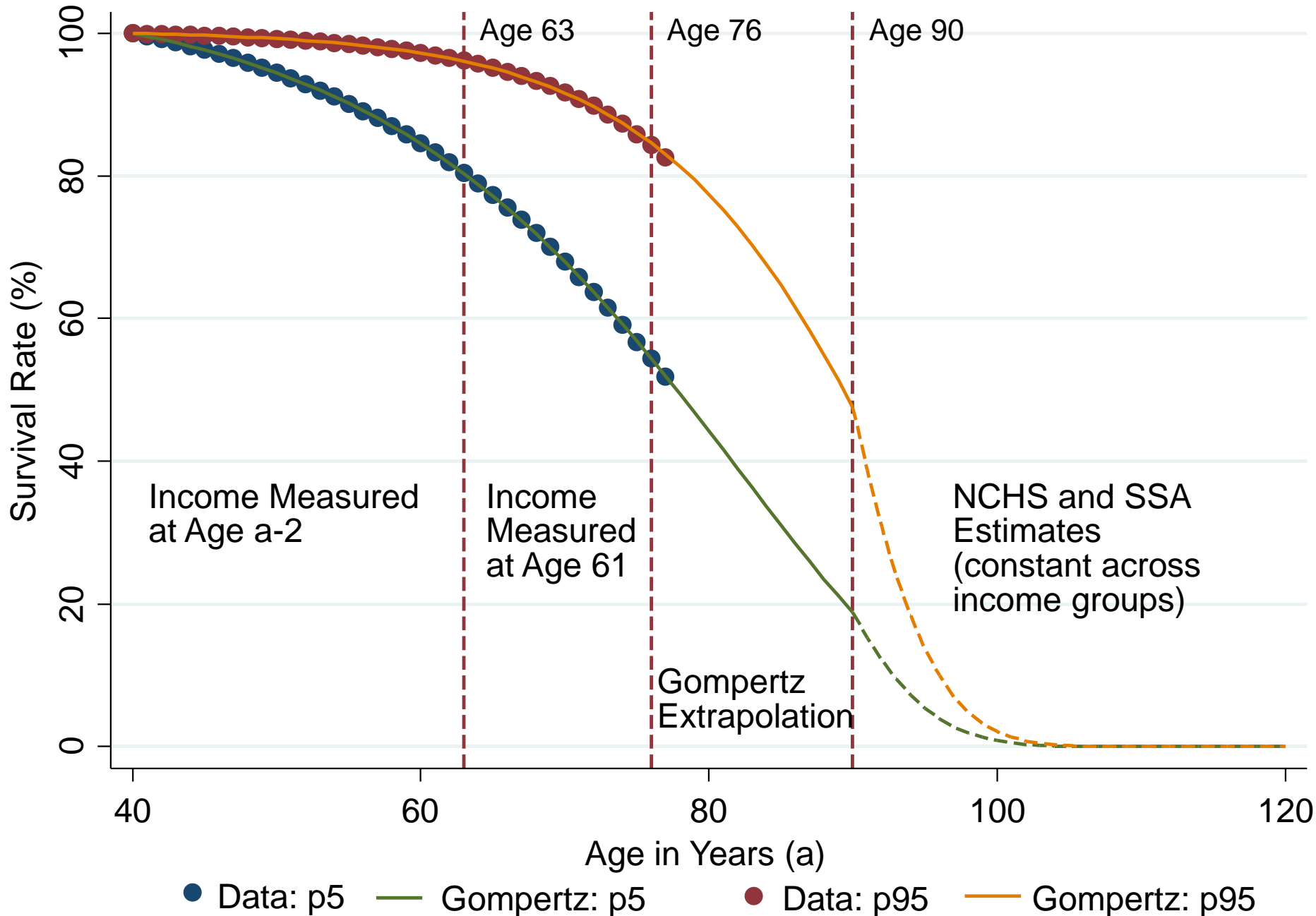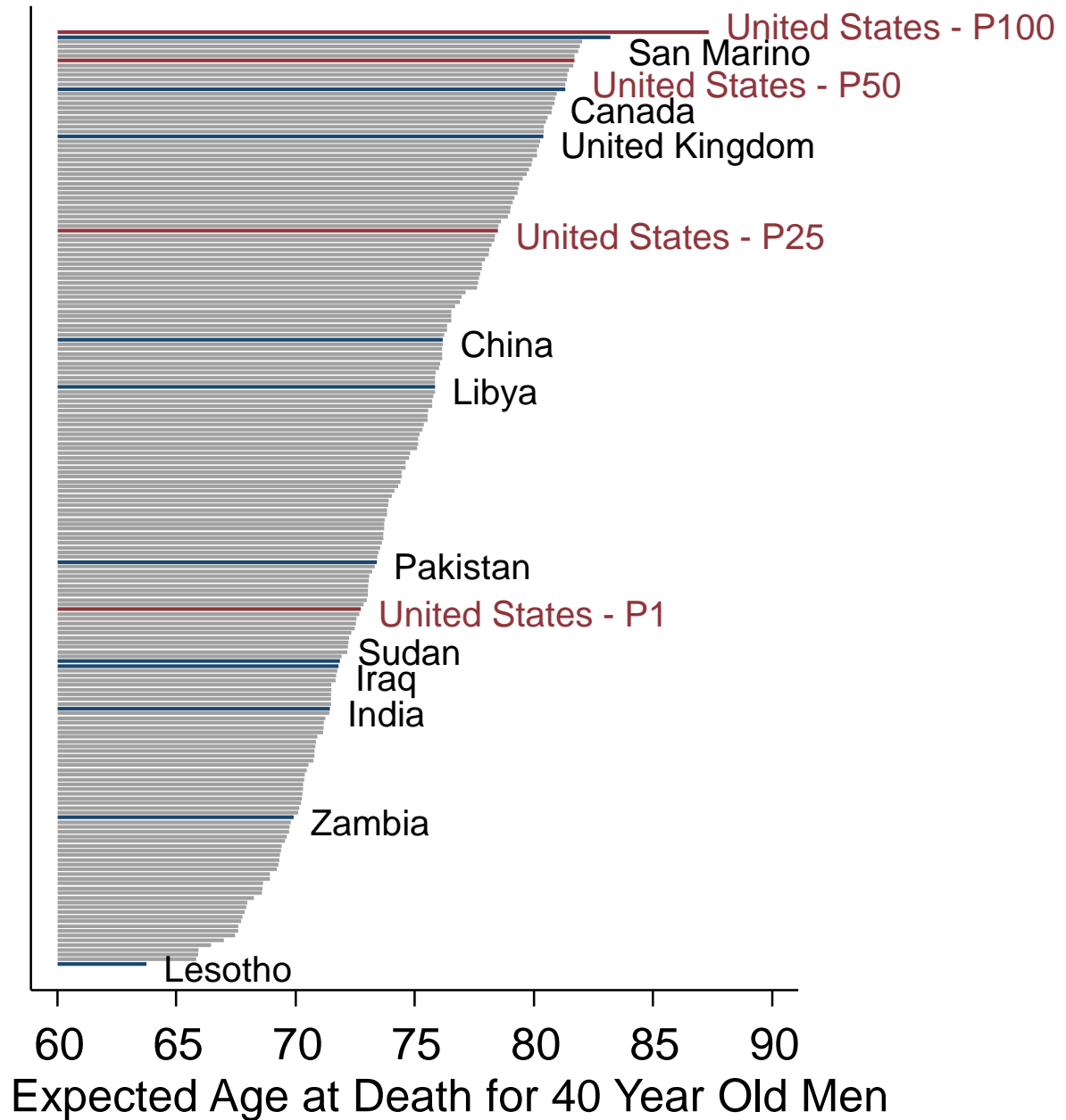
Step 3: Race and Ethnicity Adjustment

- Final step: adjust for racial and ethnic differences in life expectancy

  - CDC statistics show that for males, life exp. of whites is 3.8 years higher than blacks and 2.7 years lower than Hispanics

  - Race shares vary across income groups and especially across areas, potentially biasing raw comparisons

- Perform race (and ethnicity) adjustment to answer the question:

  *"What would life expectancy be if each **income group**
  and **area** had the same black, Hispanic and Asian
  shares as the U.S. population as a whole at age 40?"*

**Expected Age at Death vs. Household Income Percentile
For Men at Age 40**

Top 1%:
87.3 Years

Bottom 1%:
72.7 Years

Expected Age at Death for 40 Year Olds in Years

Household Income Percentile

$25k $47k $74k $115k $2.0M

U.S. Life Expectancies by Percentile in Comparison to Mean Life Expectancies Across Countries

United States - P100

San Marino

United States - P50

Canada

United Kingdom

United States - P25

China

Libya

Pakistan

United States - P1

Sudan

Iraq

India

Zambia

Lesotho

Expected Age at Death for 40 Year Old Men

60   65   70   75   80   85   90

Expected Age at Death vs. Household Income Percentile
By Gender at Age 40

Top 1% Gender Gap
1.6 years

Bottom 1% Gender Gap
6.1 years

Women, Bottom 1%: 78.8
Women, Top 1%: 88.9

Men, Bottom 1%: 72.7
Men, Top 1%: 87.3

Expected Age at Death for 40 Year Olds in Years

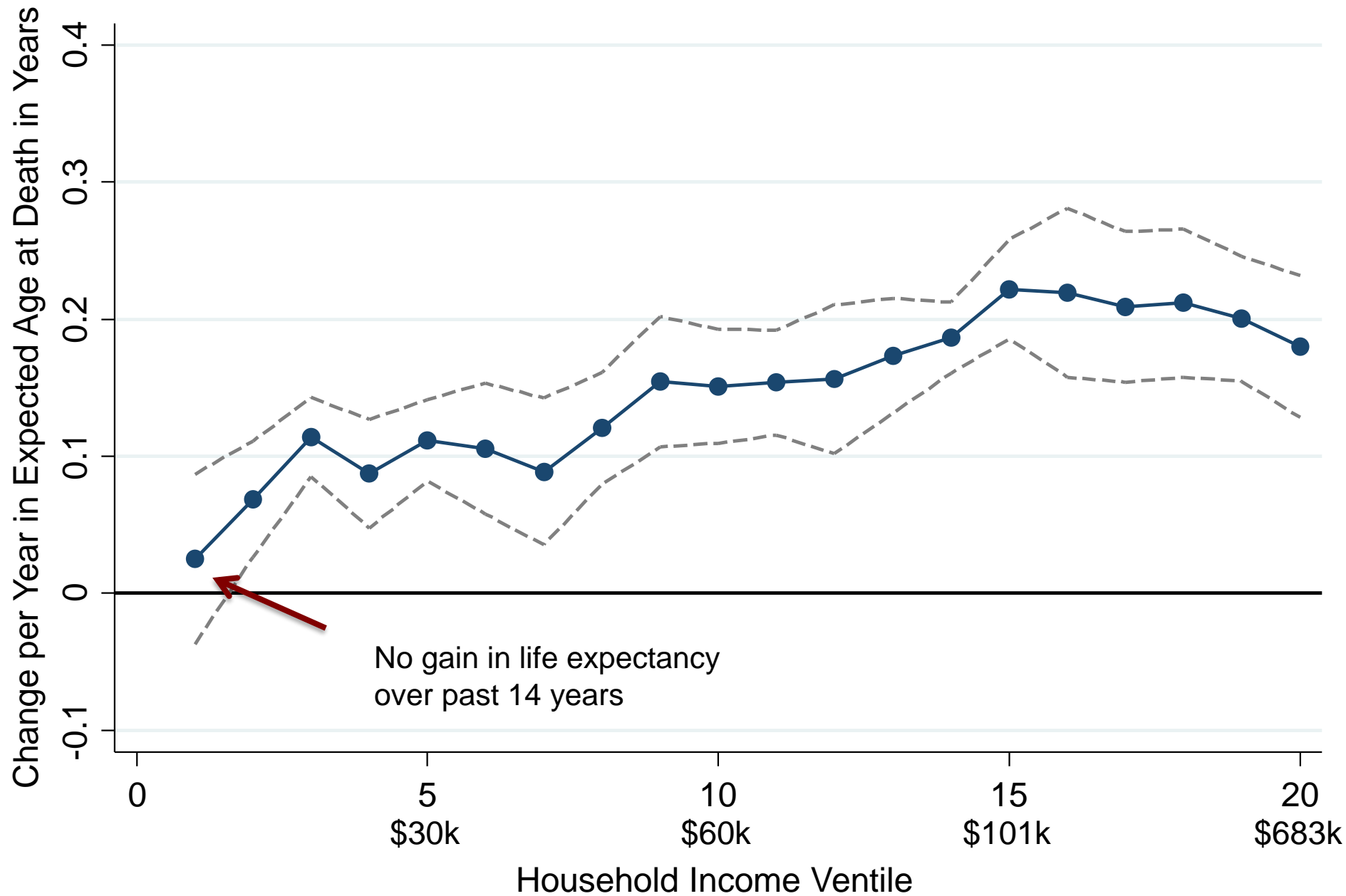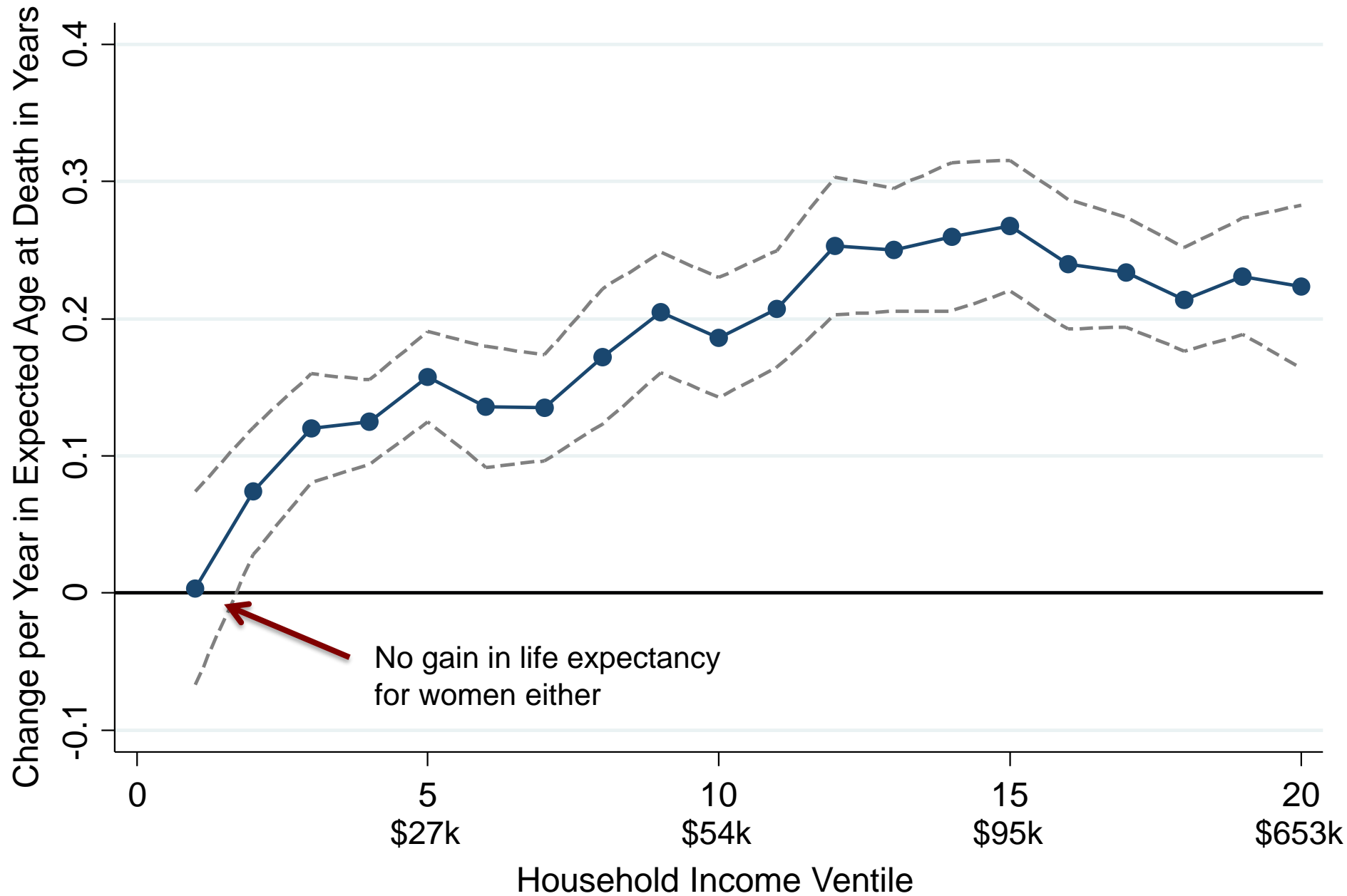Household Income Percentile

● Men   ● Women
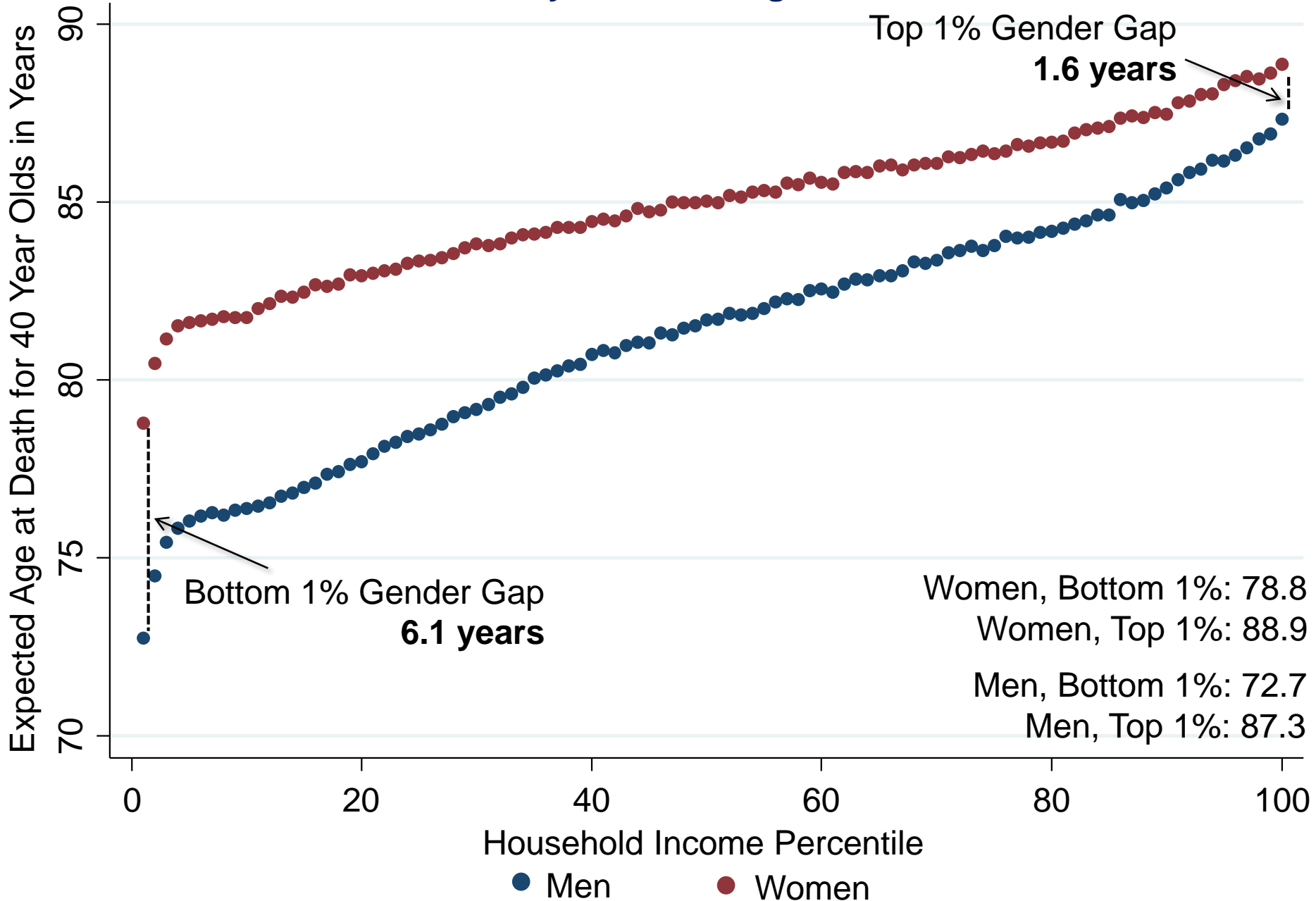
Time Trends

- How are gaps in life expectancy changing over time?

    - Relevant for understanding distributional consequences of various policies, e.g. increasing age of eligibility for social security

- Some studies have found that gap between low- and high-SES groups has grown [Waldron 2007, Meara et al. 2008, Goldring et al. 2015]

    - Some evidence of *declining* life expectancy for low-SES subgroups, but results debated [Olshansky et al. 2012, Bound et al 2015]

Change in Life Expectancy Per Year by Income Ventile, Men

Y-axis: Change per Year in Expected Age at Death in Years

X-axis: Household Income Ventile

No gain in life expectancy
over past 14 years

$30k $60k $101k $683k

Change in Life Expectancy Per Year by Income Ventile, Women

Y-axis: Change per Year in Expected Age at Death in Years

X-axis: Household Income Ventile

No gain in life expectancy
for women either

$27k $54k $95k $653k

Race-Adjusted Expected Age at Death for 40 Year Old Women
Pooling All Income Groups

Expected Age at Death in Years

- >85.2
- >84.6 – ≤85.2
- >84.2 – ≤84.6
- >83.9 – ≤84.2
- >83.5 – ≤83.9
- >83.2 – ≤83.5
- >82.8 – ≤83.2
- >82.4 – ≤82.8
- >81.9 – ≤82.4
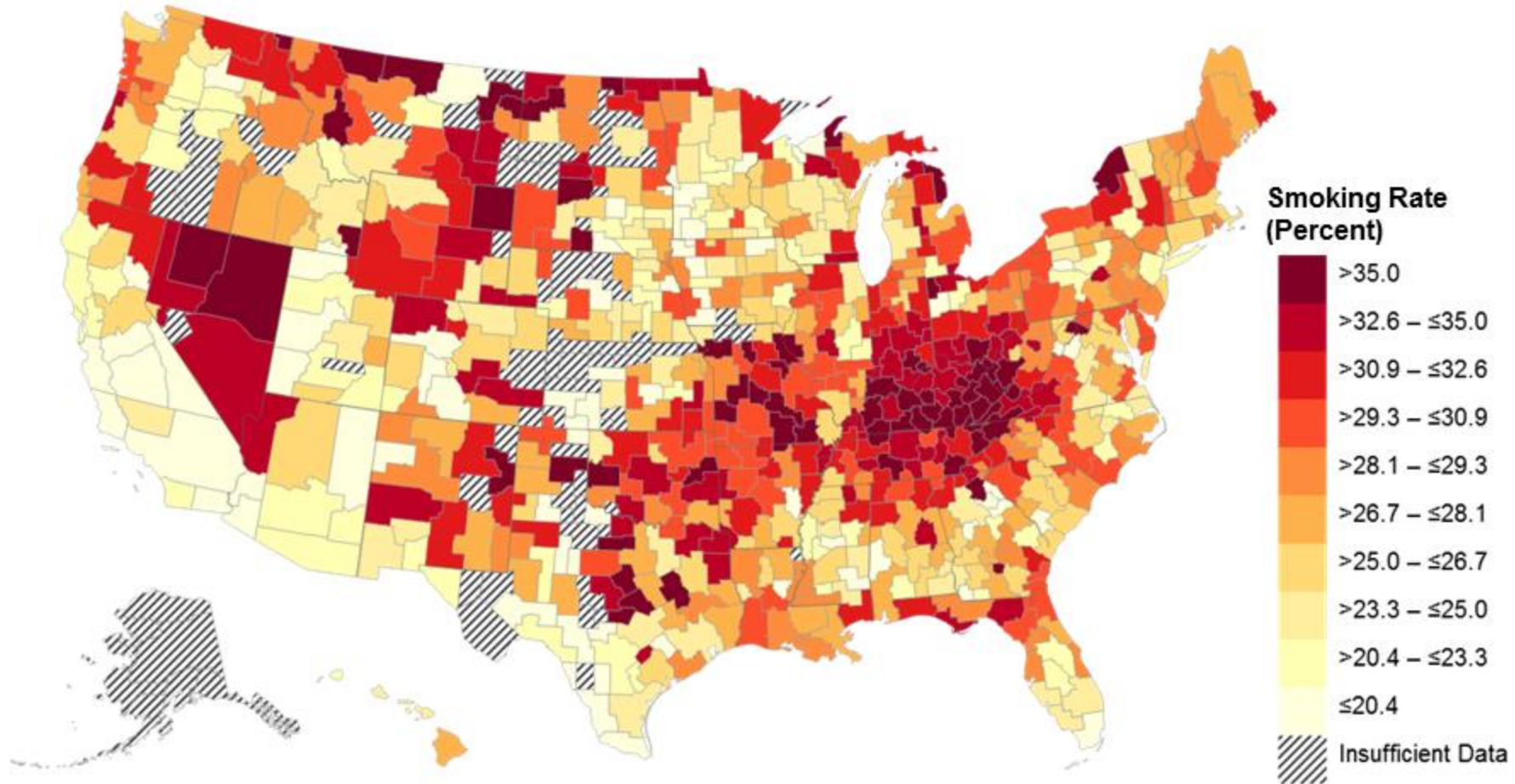- ≤81.9
- Insufficient Data
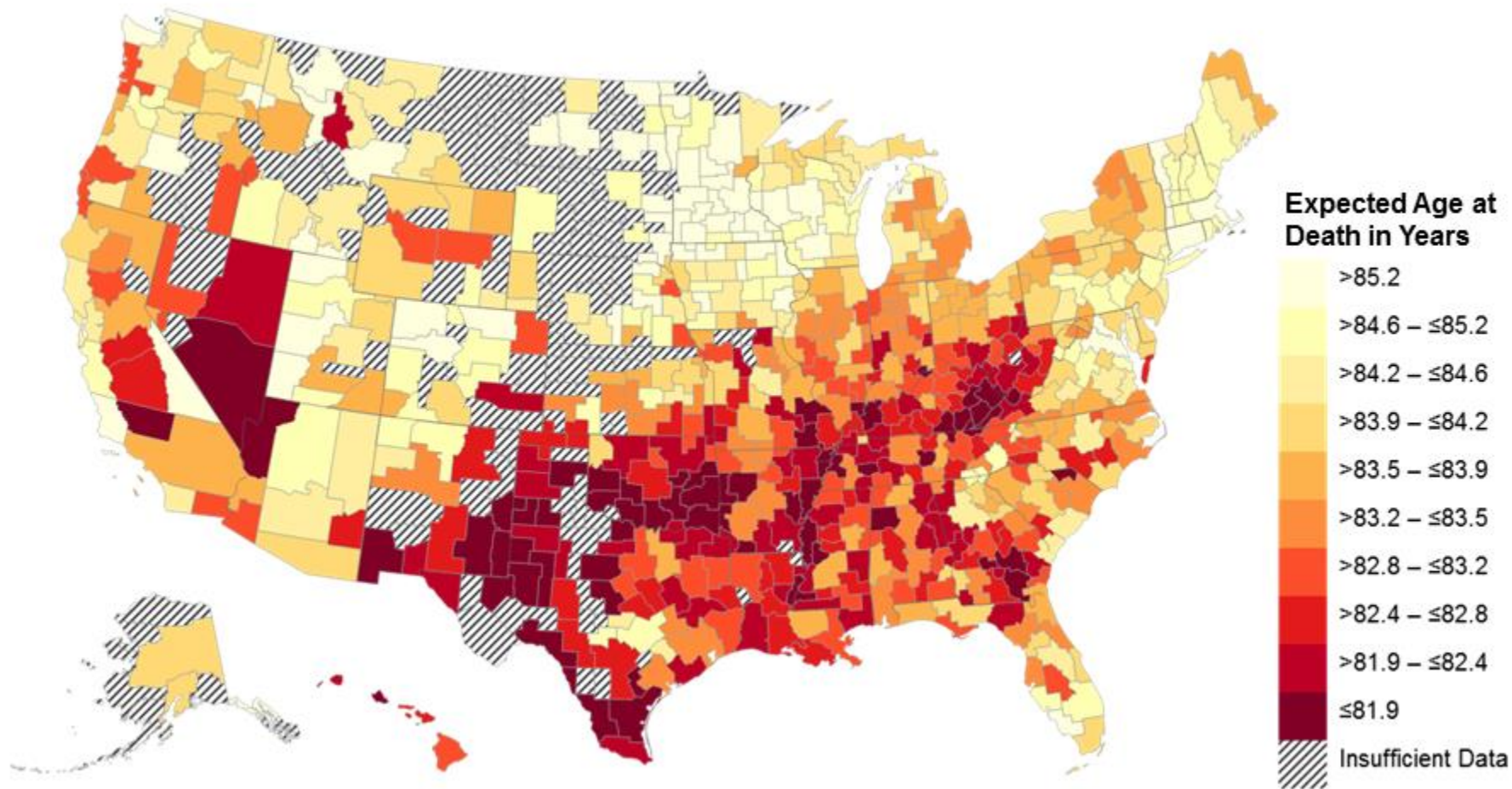
Note: Lighter Colors Represent Areas with Higher Life Expectancy

Why Does Life Expectancy Vary Across Areas?

- Finally, we characterize the features of areas with high vs. low life expectancy conditional on income

  - Analysis is purely correlational: does not directly identify causal pathways that can be manipulated to change mortality

- Begin by assessing measures of health behavior using data from the BRFSS [Fuchs 1974]

Smoking Rates by Commuting Zone
in Bottom Quartile

Smoking Rate (Percent)

- >35.0
- >32.6 – ≤35.0
- >30.9 – ≤32.6
- >29.3 – ≤30.9
- >28.1 – ≤29.3
- >26.7 – ≤28.1
- >25.0 – ≤26.7
- >23.3 – ≤25.0
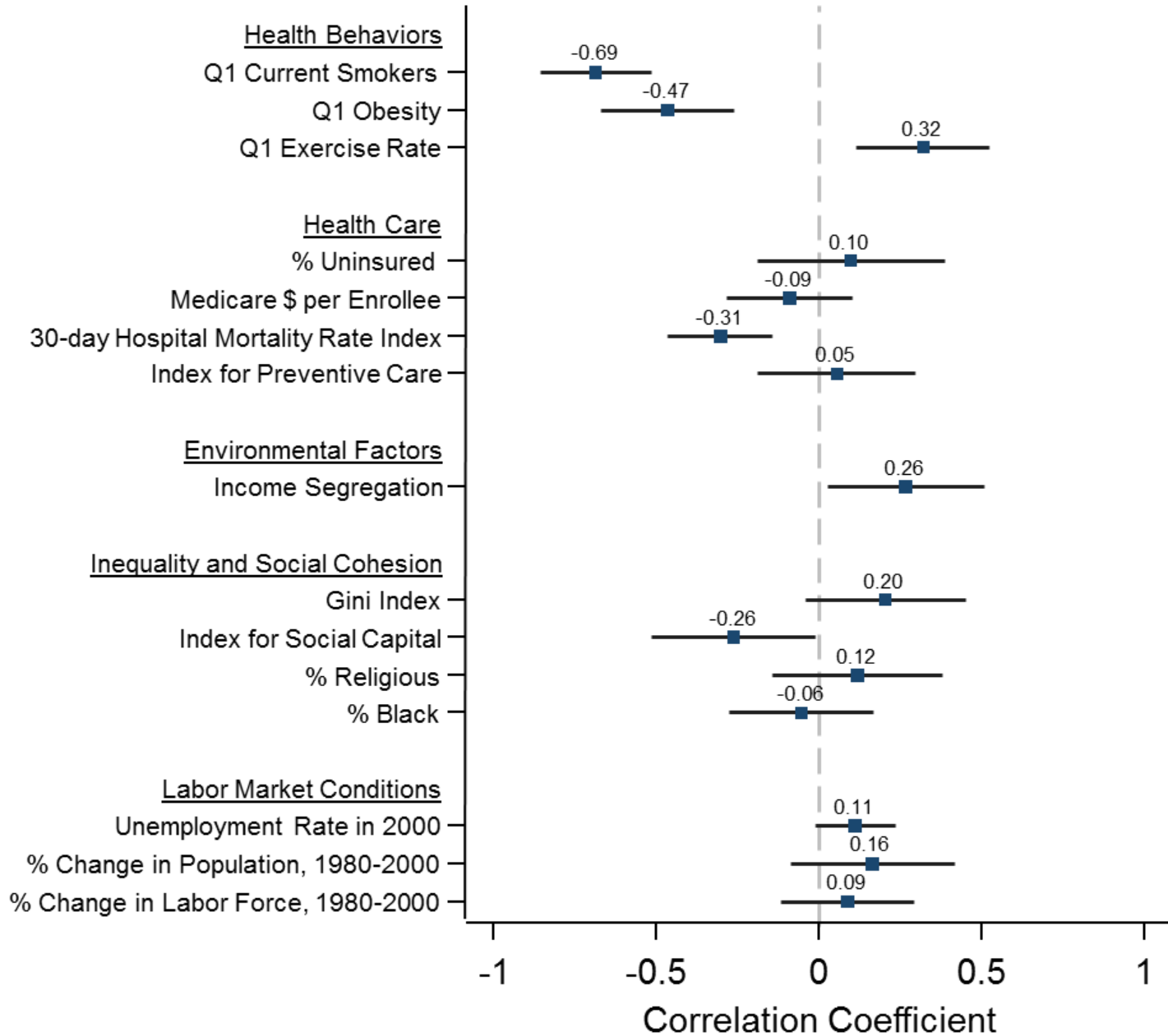- >20.4 – ≤23.3
- ≤20.4
- Insufficient Data

*Note: Lighter Colors Represent Areas Lower Smoking Rates*

Why Does Life Expectancy Vary Across Areas?

- Variation in life expectancy among low income individuals is strongly related to variation in health behaviors

- What generates spatial variation in health behaviors and outcomes?

- We focus here on four theories discussed widely in literature:

  1. Health care [Fisher et al. 1993, Almond et al. 2010, Doyle et al. 2015]

  2. Environmental factors [Dockery et al. 1993, Currie and Neidell 2005]

  3. Income inequality [Lynch et al.1998, Deaton and Lubotsky 2001, Wilkinson 2005]

  4. Economic decline [Ruhm 2000, Sullivan and von Wachter 2009]

Correlations of Expected Age at Death with Health and Social Factors
For Individuals in Bottom Quartile of Income Distribution

Health Behaviors
Q1 Current Smokers — -0.69
Q1 Obesity — -0.47
Q1 Exercise Rate — 0.32

Health Care
% Uninsured — 0.10
Medicare $ per Enrollee — -0.09
30-day Hospital Mortality Rate Index — -0.31
Index for Preventive Care — 0.05

Environmental Factors
Income Segregation — 0.26

Inequality and Social Cohesion
Gini Index — 0.20
Index for Social Capital — -0.26
% Religious — 0.12
% Black — -0.06

Labor Market Conditions
Unemployment Rate in 2000 — 0.11
% Change in Population, 1980-2000 — 0.16
% Change in Labor Force, 1980-2000 — 0.09

Correlation Coefficient

Correlations of Expected Age at Death with Other Factors
For Individuals in Bottom Quartile of Income Distribution
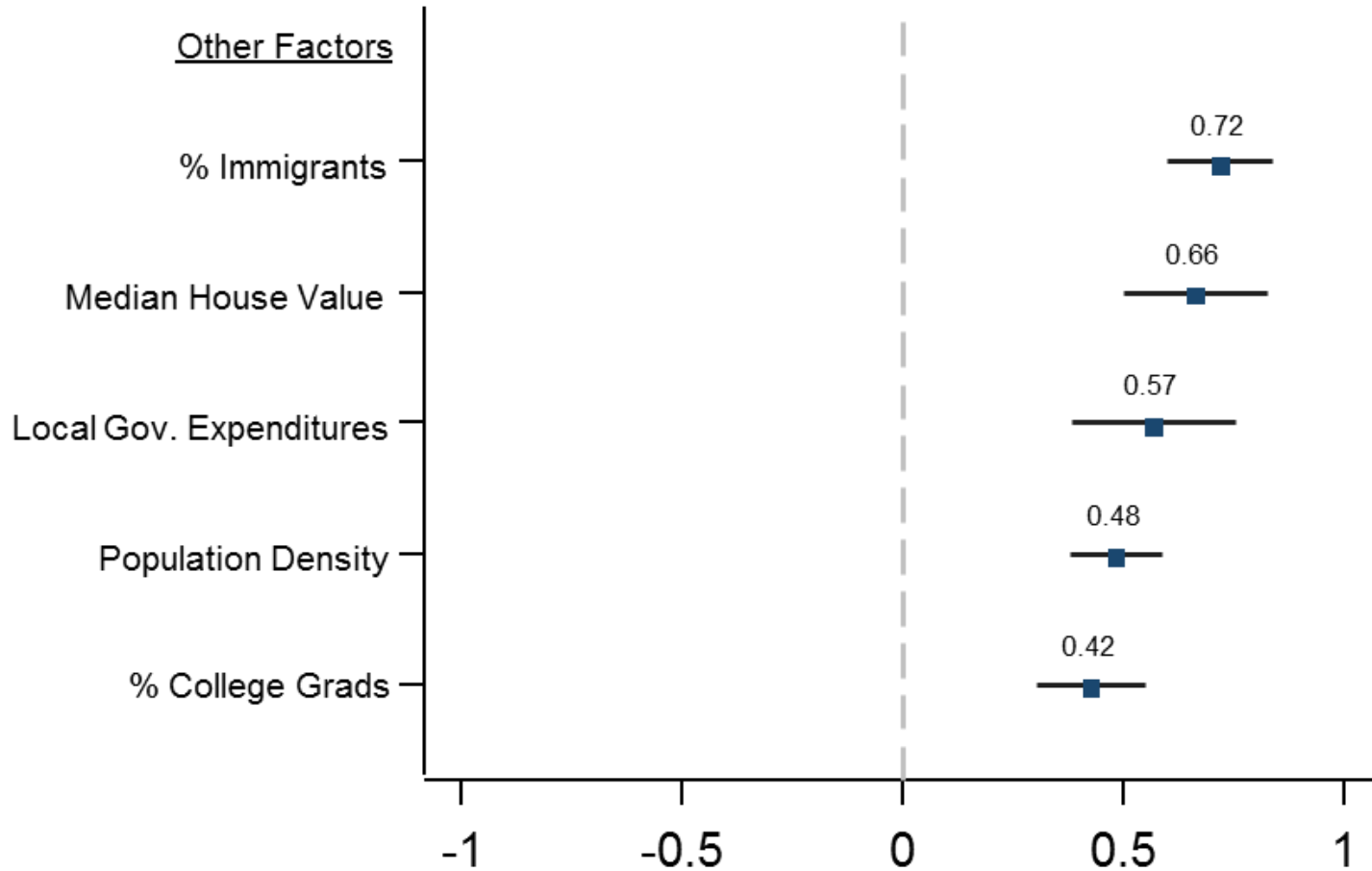
Correlations: Summary

- General pattern: Low-income people in affluent, educated cities live longer (and have healthier behaviors)

- Why is this the case?

  - Spillovers from rich to poor: regulation, public revenues/transfers

  - Exposure to people with healthier behaviors

  - Sorting: low-income people who live in expensive cities are a selected group with different characteristics

  - Ongoing work by other researchers will shed light on these alternative mechanisms

Conclusion

- Inequality in life expectancy is large and growing, but not immutable: some areas in the U.S. have relatively small and shrinking gaps

- Differential trends imply that indexing eligibility for Social Security and Medicare to mean life expectancy will affect progressivity

- Reducing health disparities likely to require local policy interventions

  - Ex: targeted efforts to improve health among low-income individuals in Las Vegas, Tulsa, and Oklahoma City

  - Changing health behaviors at local level likely to be important

- Statistics constructed here (available at www.healthinequality.org) provide a tool to monitor local progress and identify solutions