Longevity Disparity across Communities in the United States

Lijia Guo*, Ph.D., ASA, MAAA

Government Accountability Office

*The opinions expressed and conclusions reached by the author are her own and do not represent any official position or opinion of the US Government Accountability Office.

Presentation Overview

- Background
- Data
- Method
- Findings
- Discussion
- Summary/Takeaway
- References

Background

- Socioeconomic disparities in longevity have been documented
- SOA (Barbieri, 2021, 2022) work on longevity differences by the socioeconomic index at the state and county level
- Crairns, etc. 2019 looked small area mortality in England and developed a Longevity Index for England that focuses on mortality and uses a range of predictive variables to explain the differences in mortality and life expectancy between small neighborhoods
- Boing, etc. 2020 studied life expectancy disparity across states, counties, and census tracts and found that more than three-fourths of the total variation in life expectancy is attributable to census tracts

Population inequalities in longevity are primarily a local phenomenon

Data – Government Agency Data

- The U.S. Small-area Life Expectancy Estimates Project (USALEEP) from Centers for Disease Control and Prevention (CDC) - estimates of life expectancy at birth for most of the census tracts in the United States, and abridged period life tables for 2010-2015, available from: https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html

- American Community Survey (ACS) from US Census - premier data source for detailed population and housing information, including demographics, education, homeownership, median family income, etc., available from Census: https://www.census.gov/programs-surveys/acs

Publically Available Data – Social Vulnerability Index

- Social Vulnerability Index (SVI) - CDC and Agency for Toxic Substances and Disease Registry (ATSDR) (available from: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html) - a composite score of the following four sub indexes measuring different aspects of social vulnerability
  - Socioeconomic - SVI_THEME1
  - Household Composition & Disability - SVI_THEME2
  - Minority Status & Language - SVI_THEME3, and
  - Housing Type & Transportation theme- SVI_THEME4.
- Most recent release: CDC/ASTDR SVI 2020 update in October 2022
- Widely used by public health professionals in health equity work

Publically Available Measures - National Risk Index

- National Risk Index (NRI) - Federal Emergency Management Agency (FEMA) (available from https://hazards.fema.gov/nri/learn-more)
- Risk assessment for 18 natural disasters such as
  - Flooding (Riverine and coastal); Hurricane; Wildfire; Earthquake
- Expected annual loss based on exposures, annual frequency, and historical loss ratio
- Social vulnerability (SOVI Score)
- Community resilience (Resilience Score)
- Risk Assessment:

$$Risk = Expected\ Annual\ Loss \times Social\ Vulnerability \times \frac{1}{Community\ Resilience}$$

- Risk Scores and Ratings

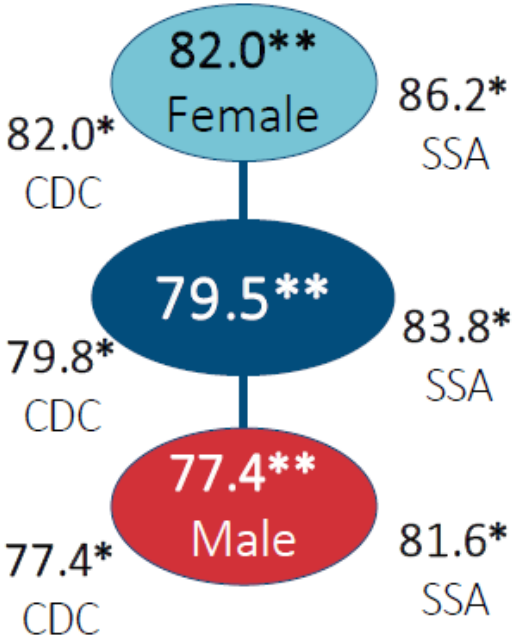
Longevity in the United State

- Life expectancy is one of the key measures of the health status of a population
- Life expectancies reflect the avera experience of the population subs

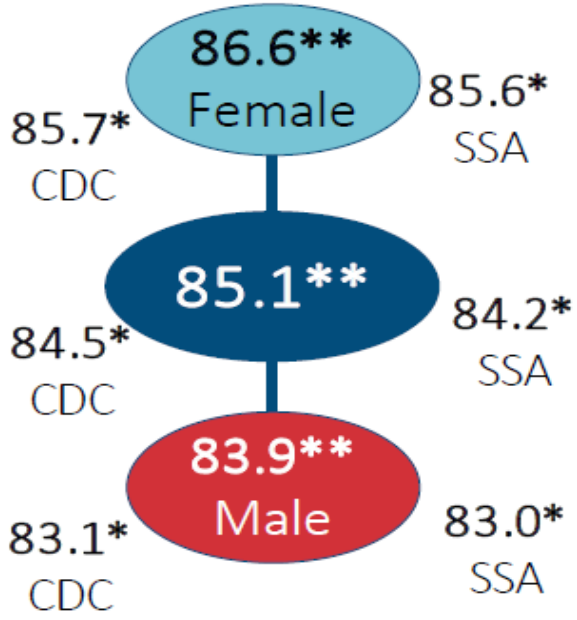
*SOA Research Report, October 2021
- CDC data: Centers for Disease Control and Prevention Period Life Tables, Table A
- SSA data: Social Security Administration Period Life Table
- the impact of COVID-19 not reflected

** Generationally projected to 2021 and beyond with MP-2021;

US Life Expectancy at age 25, 2021*



US Life Expectancy at age 65, 2021*



Methodology/Analysis

- How longevity varies by local communities (census tract) in US?
- What are the socioeconomic and other community characteristics associated with longevity disparity across US communities and how the associations changes as people aging?

Measuring community vulnerability and resilience

- NRI social vulnerability score
- SVI sub-indexes
- Community resilience indicators from ACS

Measuring community natural disaster risk (NRI)

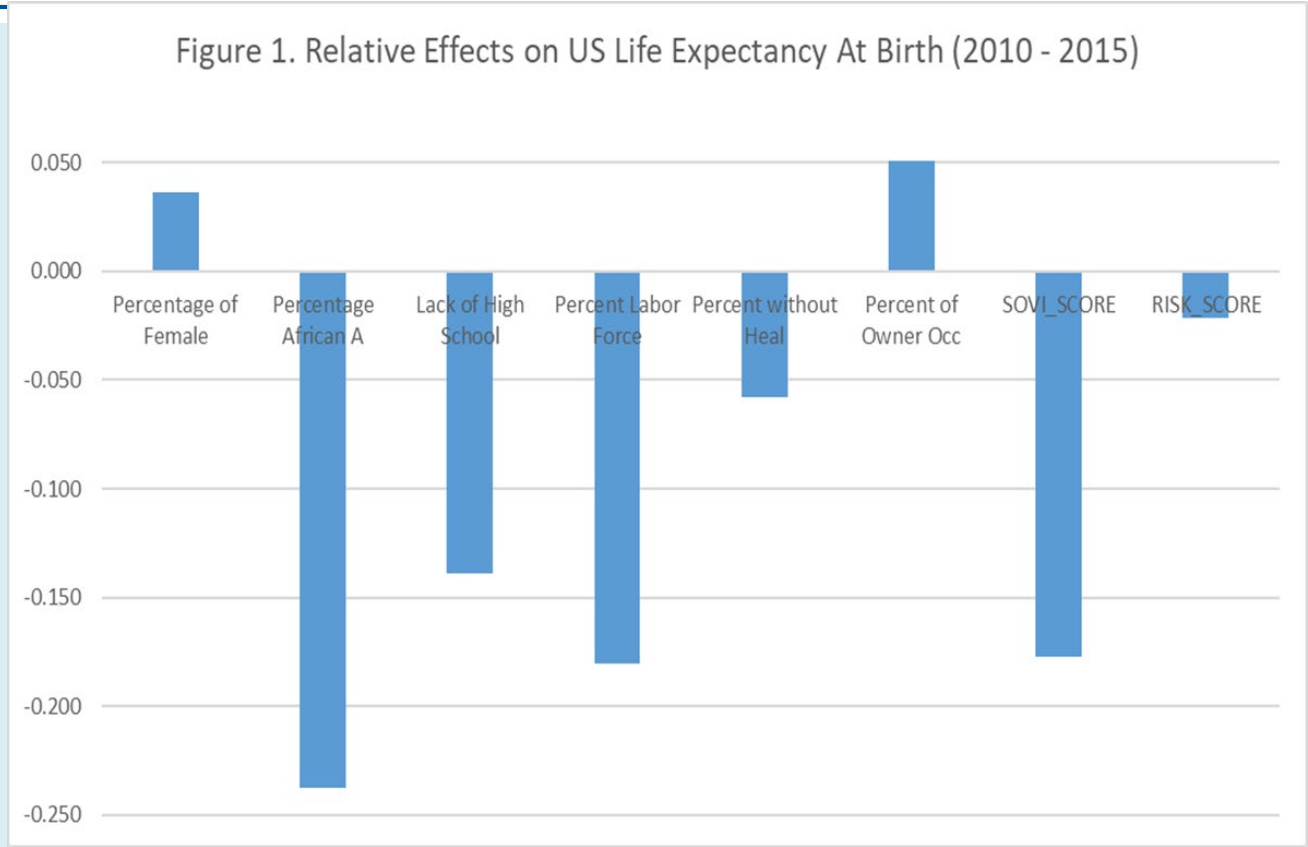
- Risk Score
- Exposure, expected annual loss
- Historical loss ratio
- Resilience score

Methodology/Analysis

- linked life expectancy estimates to the ACS community socioeconomic and demographic data, the CDC SVI data, and FEMA community risk of natural disasters
- Developed generalized linear models that identified associations of community risks, socioeconomic and demographic factors with the life expectancy while accounting for other census tract characteristics.
- The models are developed at the census tract level which reflects the community characteristics more specifically.
- Statistical significance was assessed at the 0.05 level

Findings – Longevity for New Born Varies by Community

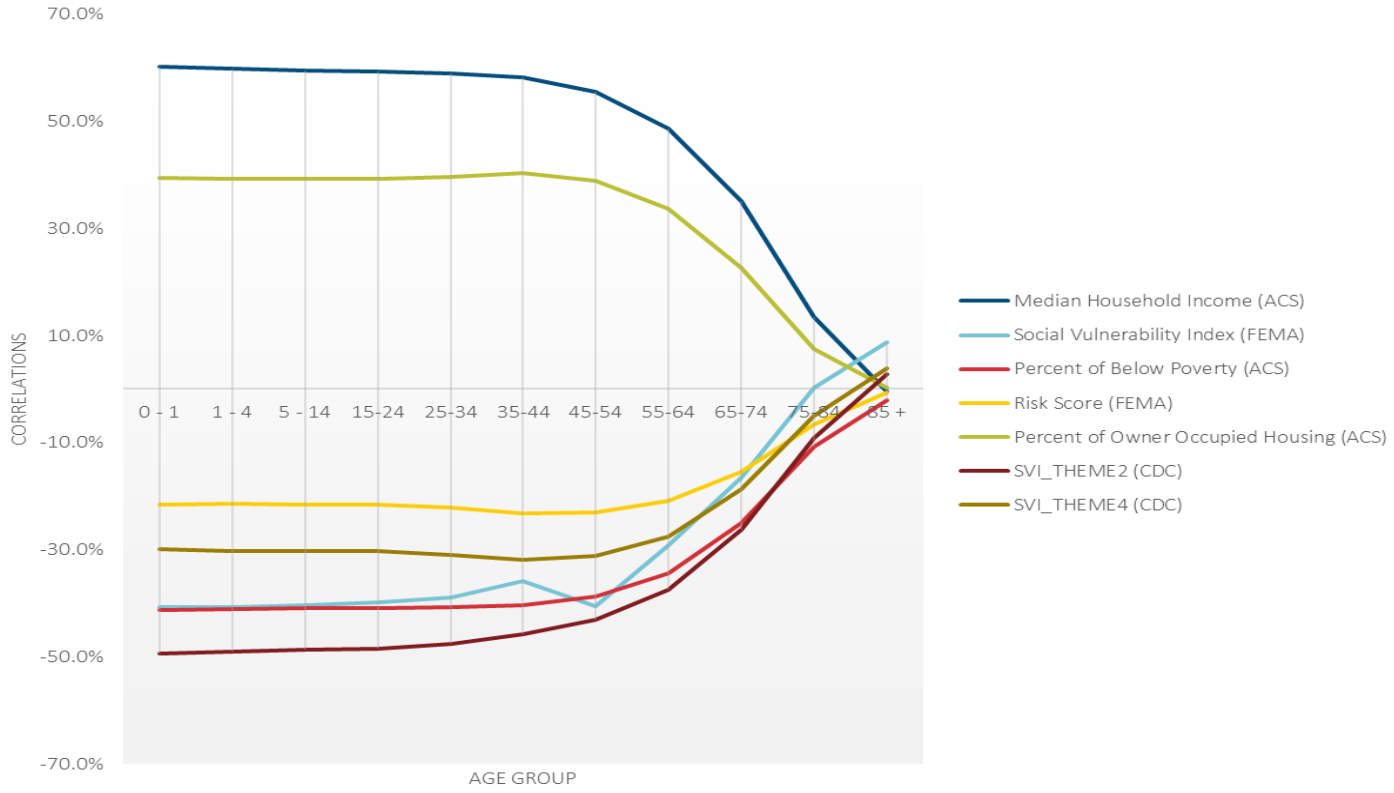
- Areas with higher social vulnerability tend to have lower life expectancy at birth, when control all other factors
- Communities with higher risks of natural disasters had lower life expectancy at birth than communities with lower risks of natural disasters
- The longevity inequality also linked to the community demographic characteristics such as gender and race as well



Findings – Longevity as People Aging

- Higher longevity risks are associated with higher level of social vulnerability before retirement
- The correlations of socioeconomic factors to life expectation decrease as people aging
- longevity for people at advanced age with higher income/wealth is due to cumulated effects of high income/wealth before retirement

Figure 2. Correlations to Life Expectancy by Age (2010-2015)



Findings – Gender and Race Effect

- GLM model analyzed the effects of age, gender, race, and community social vulnerability on longevity
- Communities with higher percentage of women residents had higher life expectancy for all age groups when control all other factors.
- Communities with higher percentage of African Americans residents had lower life expectancy for all ages.

Effects for Estimating Life Expectancy by Age Group (2010 - 2015)

Explanatory Variable	Parameter Estimate	Standard Error	t Value	p Value
Intercept	11.644	0.0628	185.49	<.0001
Age Group 0 - 1	70.949	0.0191	3718.2	<.0001
Age Group 1 - 4	70.580	0.0191	3698.85	<.0001
Age Group 5 - 14	66.704	0.0191	3495.74	<.0001
Age Group 15-24	56.833	0.0191	2978.42	<.0001
Age Group 25-34	47.359	0.0191	2481.92	<.0001
Age Group 35-44	38.007	0.0191	1991.84	<.0001
Age Group 45-54	28.789	0.0191	1508.72	<.0001
Age Group 55-64	20.161	0.0191	1056.55	<.0001
Age Group 65-74	12.259	0.0191	642.45	<.0001
Age Group 75-84	5.306	0.0191	278.05	<.0001
Percent of Female	**0.072**	0.0011	63.93	<.0001
Percent of African American	**-0.046**	0.0002	-251.2	<.0001
Social Vulnerability Score	-0.235	0.0011	-215.92	<.0001

Discussion

- Rural/Urban
  - Longevity risk is higher for communities in the rural area, as indicated by explanatory variable Number of Households.
- Climate Change
  - Associations of the FEMA risk score to the longevity risk indicate the climate change to the longevity inequality across the country.
- COVID-19
  - Socioeconomic disparity in Covid-19 related mortality might have only worsened longevity inequality.
- Limitations

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Summary/Takeaways

- US residents in communities with lower social vulnerability have experienced larger gains in life expectancy than those live in socially vulnerable communities
- Risks to natural disasters had negative impact on longevity for people in the community.
- Socioeconomic factors have stronger association to longevity at younger ages
- Use of publically available data for community characteristics at census tract can provide more insights on longevity disparities

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