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Rising Inequality in Life Expectancy by Socioeconomic Status

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Why should we care about socioeconomic mortality differentials?

- Equity
- Population average projections of mortality improvements may not apply to specific annuitant and pensioner risk pools, exposing insurers and plan sponsors to an additional source of longevity risk.

Previous research

- Existence of socioeconomic mortality differentials well established (Kitagawa and Hauser, 1973, Brown, Liebman, and Pollet, 2002, and numerous actuarial studies).
- Literature suggests socioeconomic mortality differentials have changed over time – narrowing to maybe 1960 and then widening (Waldron, 2007).
- But a problem arises – how to determine SES.

Assigning socioeconomic status

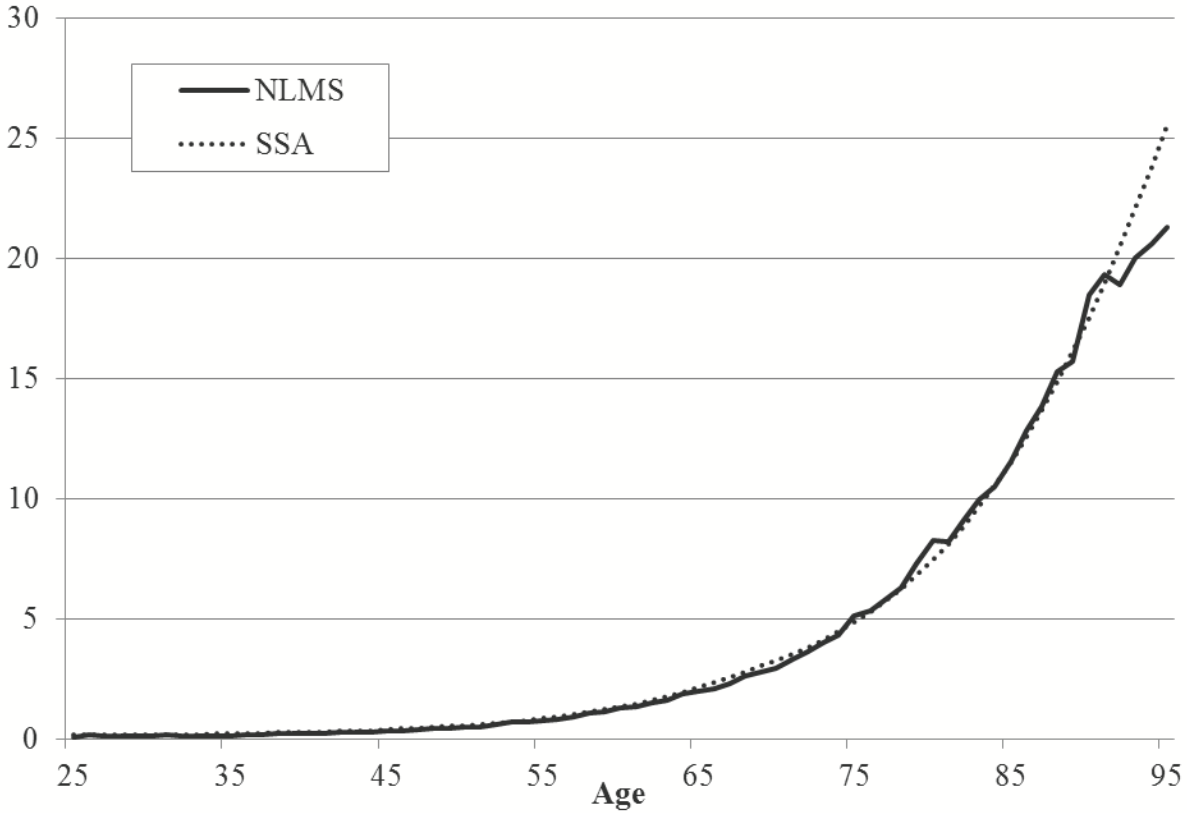
- Waldron (2013) uses lifetime earnings. But earnings are correlated with health status and may overstate socioeconomic mortality differentials.
- Several studies use educational attainment. Advantage is that it is fixed early in life before the onset of ill health.
  - Olshansky (2012) uses absolute measure (failure to complete high school) and finds mortality increasing for low-SES individuals.
  - But high school dropouts have become a more select group – 40% of 1925 birth cohort, 20% of 1945 birth cohort.
  - Difficult to divide into quartiles because education is not a continuous variable.

Data and sample

- National Longevity Mortality Study (NLMS) – individual level data from the 1979-2011 Current Population Survey matched to death certificates obtained from the National Center for Health Statistics.
- Final sample comprises 1.5 million individuals aged 25 or older and born 1877-1959, of whom 108,000 died by 2011.

The NLMS data are consistent with Social Security Administration life tables

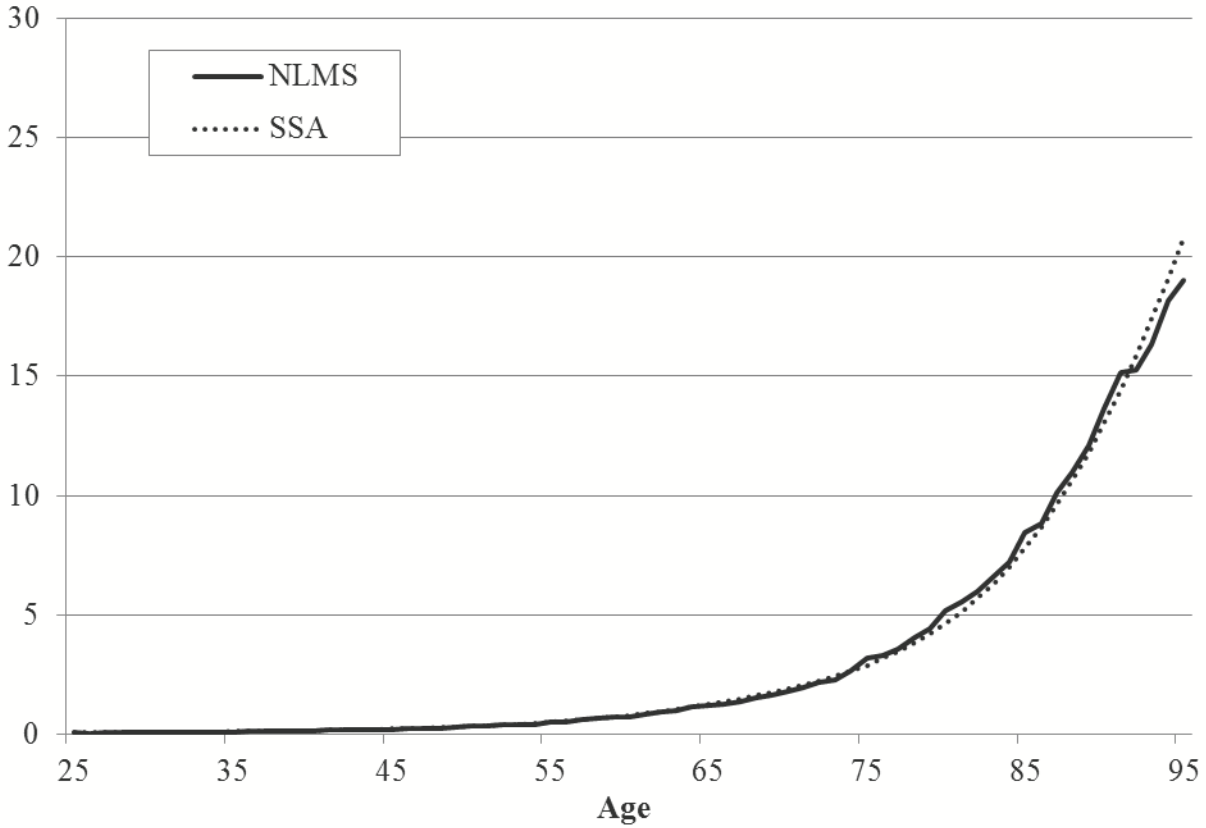
Comparison of NLMS and SSA Mortality Rates (per 100), Men



Source: Authors' calculations using tabulations from restricted NLMS data provided by the U.S. Census Bureau, 1979-2011.

The NLMS data are consistent with Social Security Administration life tables

Comparison of NLMS and SSA Mortality Rates (per 100), Women



Source: Authors' calculations using tabulations from restricted NLMS data provided by the U.S. Census Bureau, 1979-2011.

Reassigning education attainment

- Estimate ordered probit model $y^* = xb + e$ where y denotes educational attainment and x is a vector of correlates of educational attainment.
- Place those with less than a high school education in quartile 1, with a high school education in quartile 2, and so on.
- If more than 25% of individuals in a given birth cohort are college graduates, randomly reassign people from quartile 4 to quartile 3.
- Probability of being moved is based on the probability that someone with vector of characteristics x would not have graduated from college, based on our econometric model.

Constructing period life tables

- Use NMLS data to construct period mortality tables:
- Estimate following weighted equation for 1) whole sample, and 2) each education quartile for men and women separately:

$$\ln(m_{a,t}) = b_0 + b_1(a - 52) + b_2(t - 1979)$$

β_0 - log mortality at age 52 in 1979

b_1 - exponential rate at which mortality increases with age

b_2 - annual percent decline in mortality from 1979

Are model restrictions reasonable?

- Exponentially increasing mortality fits the data (Gompertz 1825). We allow the rate of increase to vary by educational attainment.
- National mortality data do not support restrictions of constant percentage decline in mortality over time and equal decline in mortality at all ages. But we are subject to sample size constraints.

We first benchmark pooled regression results against SSA data

Pooled Regression Results

	Age	Years since 1979	Constant
Men	0.085	-0.020	-0.106
	(0.001)	(0.001)	(0.018)
Women	0.091	-0.007	-0.869
	(0.001)	(0.001)	(0.020)
Overall sample	0.085	-0.011	-0.505
	(0.001)	(0.001)	(0.019)

Source: Authors' calculations using tabulations from restricted NLMS data provided by the U.S. Census Bureau, 1979-2011.

- Overall decline – 1.1% a year – is close to the 1.0% reported by the SSA for 1982-2011.
- Decline for women –is also close to SSA data (0.7% Vs 0.6%), but we get a higher decline for men (2.0% Vs 1.3%).

Results by education quartile-MEN

	Age	Years since 1979	Constant
Lowest quartile	0.077	-0.016	0.201
	(0.001)	(0.001)	(0.016)
Second quartile	0.085	-0.020	-0.005
	(0.001)	(0.001)	(0.018)
Third quartile	0.089	-0.022	-0.106
	(0.001)	(0.001)	(0.019)
Highest quartile	0.099	-0.024	-0.522
	(0.001)	(0.001)	(0.019)

- Mortality increases with age.
- Mortality is lower for men with higher educational attainment.
- Key finding – rate of decline is faster for men with higher educational attainment – 2.4% Vs 1.6% a year.

Results by education quartile-WOMEN

	Age	Years since 1979	Constant
Lowest quartile	0.083	-0.005	-0.547
	(0.001)	(0.001)	(0.017)
Second quartile	0.094	-0.009	-0.849
	(0.001)	(0.001)	(0.019)
Third quartile	0.096	-0.010	-0.961
	(0.001)	(0.001)	(0.020)
Highest quartile	0.104	-0.012	-1.258
	(0.001)	(0.001)	(0.024)

- Similar pattern to men. Annual decline 0.5% in bottom quartile Vs 1.2% in top.

Most of the differences are statistically significant

	Age	Years since 1979	Constant
Men			
Difference second and lowest quartile	0.008***	-0.004***	-0.201***
	(0.001)	(0.001)	(0.024)
Difference third and second quartile	0.004***	-0.002**	-0.106**
	(0.001)	(0.001)	(0.025)
Difference highest and third quartile	0.011***	-0.003***	-0.416***
	(0.001)	(0.001)	(0.027)
Women			
Difference second and lowest quartile	0.010***	-0.004***	-0.302***
	(0.001)	(0.001)	(0.028)
Difference third and second quartile	0.003***	-0.001	-0.111***
	(0.001)	(0.001)	(0.029)
Difference highest and third quartile	0.008***	-0.002**	-0.297***
	(0.001)	(0.001)	(0.030)

Change in life expectancy conditional on surviving to age 65

Conditional on surviving to age 65	1979 period	2011 period	Difference
Men			
Lowest quartile	77.5	81.6	4.1
Second quartile	77.7	82.7	5.0
Third quartile	77.8	83.2	5.4
Highest quartile	79.0	84.9	5.9
Women			
Lowest quartile	82.2	83.5	1.3
Second quartile	82.5	84.9	2.3
Third quartile	82.9	85.4	2.5
Highest quartile	83.5	86.5	3.1

Change in life expectancy conditional on surviving to age 22

Conditional on surviving to age 22	1979 period	2011 period	Difference
Men			
Lowest quartile	68.9	75.2	6.2
Second quartile	70.6	77.8	7.3
Third quartile	71.3	79.0	7.7
Highest quartile	74.4	82.1	7.7
Women			
Lowest quartile	77.0	78.8	1.8
Second quartile	78.6	81.6	3.0
Third quartile	79.3	82.5	3.2
Highest quartile	80.7	84.4	3.7

We do not attempt to construct cohort mortality tables

- Constructing cohort mortality tables requires an extrapolation of current mortality trends.
- Rate of improvement in mortality fluctuates. Unwise to extrapolate.

Relevance to longevity risk market

- Socioeconomic mortality disparities have been observed since data were first collected.
- But differences in rate of mortality improvement are substantial and vary over time.
- Risk pools of insurers and plan sponsors vary substantially.

Conclusions

- Socioeconomic mortality differentials are increasing.
- Goal of future research is to determine why – is it due to changes in labor and marriage markets, greater ability of the educated to access new health technologies. To what extent is the U.S. different from elsewhere.
- Case and Deaton argue that widening mortality differentials in the U.S. are "deaths of despair."
- Policy makers need to address the causes of the problem, and insurance companies should worry that they might succeed.

Thank you

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