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Inequality in Length of Life

By Victor R. Fuchs and Hal Ersner-Hershfield

This policy brief focuses on the intersection of two subjects of enduring interest to both policymakers and the public: longevity and inequality. Throughout history a long life has been among the most prized goals of humankind. In every age and every land, postponement of death has been sought through sacred dance and song, the imbibing of magic potions, or in recent times the application of modern medicine. The last few centuries in the West have also witnessed widespread pursuit of another goal: reduction in inequality. Through changes in laws and institutions, western societies have sought and to some extent achieved greater political, social, and economic equality for their citizens. Length of life, however,

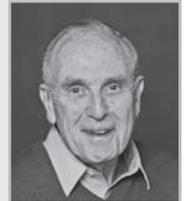
remains one area where inequality is still very large and thus far has mostly defied agreed-upon explanation.

Consider a cohort of Americans born in 2004 (the latest year with life tables available). If during the course of life, this cohort experiences the age-specific mortality that prevailed in 2004, one-fourth of the cohort will die before the age of 70.6 and one-fourth will live beyond the age of 89.1. Thus, the inter-quartile range, a useful measure of inequality,¹ is 18.5 years. A small part of this inequality can be “explained” by the fact that white Americans, on average, live more than five years longer than blacks, but the black-white differential itself has not been adequately explained.

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About The Authors

Victor R. Fuchs is the Henry J. Kaiser Jr. Professor Emeritus at Stanford University, where he applies economic analysis to social problems of national concern. He was Professor of Economics in the Economics Department and the School of Medicine's Department of Health Research and Policy from 1974 to 1995. He is author of nine books, the editor of six others, and about two hundred papers and shorter pieces. Professor Fuchs was elected president of the American Economic Association in 1995. His contributions have also been recognized by his election to the American Philosophical Society, the American Academy of Arts and Sciences, and the Institute of Medicine of the National Academy of Sciences. He has received the John R. Commons Award, Emily Mumford Medal for Distinguished Contributions to Social Science in Medicine, Distinguished Investigator Award (Association for Health Services Research), Baxter Foundation Health Services Research Prize, and Madden Distinguished Alumni Award (New York University).



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1 John R. Wilmoth and Shiro Horiuchi, “Rectangularization revisited: Variability of age at death within human populations,” *Demography*, 36(4), November 1999, pp. 475-495.

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To appreciate the size and complexity of the black-white gap, consider the gap in average length of life between white college graduates and white high school dropouts, which is estimated to be less than four years.² Other factors such as cigarette smoking, obesity, income, and access to medical care are believed to contribute to inequality in length of life, but consideration of known risk factors would leave most of the overall inequality unexplained.³

In this brief we focus on

inequality in length of life among whites, which had an inter-quartile range of 18.0 years in 2004. Because the United States has a large, heterogeneous population, we calculate inequality separately for whites in each of the 50 states.⁴ We treat each state as if it were a separate demographic entity to facilitate comparison with foreign countries, many of which also have relatively small populations. We limit the comparison to whites because of the large black-white differential in length

of life and the large variation across states in the percentage of the population that is black.

Some inequality in length of life is undoubtedly inevitable, but our first major finding is that within-states inequality is significantly greater among U.S. whites than within the 21 “Western”⁵ countries examined for this brief.⁶ Table 1 compares mean intra-state inequality (50 states) with the mean intra-country inequality (21 countries) in 1970, 1980, and 1990 (latest year for which state life tables are available).

Inequality is consistently greater in the states; the difference between the means is statistically significant at a high level of confidence ($p < .001$). The gap between inequality in the states and in the countries is considerably greater (2.1 versus 1.2 years) for females than for males. The level of inequality is much lower for females than for males in both the states and the countries. Between 1990 and

Table 1

Inequality In Length of Life^a, Intra-State (whites only) and Intra-Country^b, 1970, 1980, 1990 (years)

		50 States (white)		21 Countries		States minus Countries	
		Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
1970	Both sexes	19.7	(0.12)	17.5	(0.18)	+2.2	(0.22)
1980	Both sexes	19.0	(0.08)	17.0	(0.17)	+2.0	(0.19)
1990	Both sexes	18.3	(0.08)	16.6	(0.15)	+1.7	(0.17)
	Males	18.3	(0.12)	17.2	(0.22)	+1.2	(0.25)
	Females	16.7	(0.07)	14.6	(0.24)	+2.1	(0.25)

a Measured by the inter-quartile range (75th minus 25th percentile) of survivorship distributions from period life tables.

b “Western” countries are: Australia, Austria, Belgium, Canada, Denmark, England, Finland, France, Germany (West), Iceland, Italy, Japan, Luxembourg, Netherlands, New Zealand (non-Maori), Norway, Portugal, Spain, Sweden, Switzerland, Taiwan.

2 David M. Cutler and Ariana Lleras-Muney, “Education and Health: Evaluating Theories and Evidence,” NBER Working Paper 12352, December 2006, p. 20.

3 Ryan D. Edwards & Shripad Tuljapurkar, “Inequality in Life Spans and a New Perspective on Mortality Convergence Across Industrialized Countries,” Population and Development Review, 31(4), January 2006, pp. 645-674.

4 National Center for Health Statistics. U.S. decennial life tables for 1969-91, vol. II, State life tables. Rockville, Maryland. 1975-98.

5 “Western” countries are Australia, Austria, Belgium, Canada, Denmark, England, Finland, France, Germany (West), Iceland, Italy, Japan, Luxembourg, Netherlands, New Zealand (non-Maori), Norway, Portugal, Spain, Sweden, Switzerland, and Taiwan.

6 Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.mortality.org or www.humanmortality.de (data downloaded on July 7, 2008).

Table 2

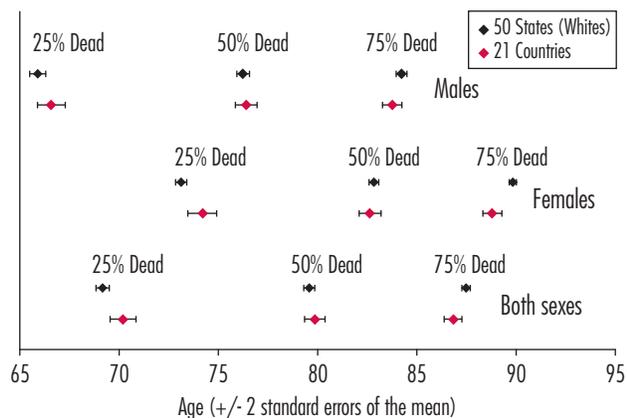
Age At Which Selected Percent of Cohort Are Dead, 50 States (whites only) and 21 “Western” countries^a, 1970, 1980, 1990

	50 States (whites)		21 Countries		States minus Countries	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
1970 – Both Sexes						
25% are dead	64.0	(0.18)	65.6	(0.39)	-1.6	(0.43)
50% are dead	75.4	(0.14)	75.7	(0.32)	-0.3	(0.35)
75% are dead	83.8	(0.11)	83.2	(0.29)	+0.6	(0.31)
1980 – Both Sexes						
25% are dead	67.3	(0.14)	68.1	(0.32)	-0.8	(0.35)
50% are dead	78.2	(0.13)	77.9	(0.28)	+0.3	(0.31)
75% are dead	86.3	(0.10)	85.0	(0.26)	+1.3	(0.28)
1990 – Both Sexes						
25% are dead	69.2	(0.17)	70.2	(0.32)	-1.0	(0.36)
50% are dead	79.6	(0.14)	79.9	(0.26)	-0.3	(0.29)
75% are dead	87.5	(0.11)	86.8	(0.22)	+0.7	(0.25)
1990 – Males						
25% are dead	65.9	(0.20)	66.6	(0.35)	-0.7	(0.40)
50% are dead	76.2	(0.16)	76.4	(0.27)	-0.2	(0.31)
75% are dead	84.2	(0.14)	83.8	(0.24)	+0.4	(0.28)
1990 – Females						
25% are dead	73.1	(0.14)	74.2	(0.36)	-1.1	(0.39)
50% are dead	82.8	(0.12)	82.6	(0.27)	+0.2	(0.30)
75% are dead	89.8	(0.09)	88.8	(0.24)	+1.0	(0.26)

^a “Western” countries are: Australia, Austria, Belgium, Canada, Denmark, England, Finland, France, Germany (West), Iceland, Italy, Japan, Luxembourg, Netherlands, New Zealand (non-Maori), Norway, Portugal, Spain, Sweden, Switzerland, Taiwan.

Figure 1

Ages at which 25%, 50%, and 75% of Cohorts are Dead, 1990



2000, the mean inter-quartile range for the 21 countries fell by 0.8 years. State data are not available for 2000, but for U.S. whites as a whole, the decrease from 1990 to 2000 was 0.9 years. This suggests that the gap between the states and other countries was probably about the same in 2000 as in 1990.

Table 2 and Figure 1 provide more information about the greater inequality in the United States by showing the age at which 25 percent, 50 percent, and 75 percent of the cohort are dead, according to period life tables. By comparing the 50 states with the 21 countries at different levels of survivorship, we see that the greater inequality in the United States is the result of two disparate phenomena. The age at which 25 percent of the cohort is dead is substantially lower in the states than in other countries, indicating higher mortality rates in the states at younger ages. By contrast, the age at which 75 percent of the cohort is dead is higher in the states than in the countries, indicating lower mortality rates in the states at older ages. Both the higher U.S. mortality rates at younger ages and the lower rates at older ages explain the greater inequality in length of life in the states. It should also be noted that the age at which 50 percent of cohort is dead is similar in the states as

in the countries. That is, white median life expectancy in the average state is about the same as median life expectancy in the average “Western” country. Figure 1 shows the mean values for all these variables as the midpoint of bars that extend by two standard errors in each direction. Thus, statistically significant differences, especially between states and countries, are readily discernible. For both sexes and especially for females, the states experience 25 percent dead at significantly lower ages than the countries, but at higher ages when 75 percent is dead.

Why do Americans experience higher mortality than citizens of other countries at younger ages but lower mortality at older ages? If poorer quality of care in the United States were the explanation, the deleterious impact should be evident at all ages. Similarly, if Americans have more unhealthy behaviors with respect to diet, exercise, and the like, the adverse consequences should appear at older ages as well as younger ages unless Americans were more sharply divided into two groups—those

with very unhealthy lifestyles (who die young) and those with very healthy lifestyles (who live a long time). One attempt to compare the association between socioeconomic status and body size in the United States and in 35 developed countries did not provide any support for this hypothesis.⁷

Obesity is more prevalent in the United States than in other “Western” countries. That could help explain below average length of life in the United States⁸ but would not, in itself, explain greater inequality in length of life in the United States or why the age at which 75 percent of a cohort is dead is higher, on average, in the 50 states than in the 21 countries. Furthermore, the discrepant pattern evident in Table 2 was just as evident in 1970 when obesity was not the major risk factor that it is currently.

Greater income inequality in the states than in the 21 countries could possibly contribute to the inequality in length of life. In most populations there is a positive correlation between income and length of life. If the

gradient between income and length of life were the same in all populations, the fact that income inequality is greater in the United States could result in greater inequality in length of life.⁹

The reversal in the U.S. relative position from younger to older ages might result from the presence of universal health insurance for Americans 65 and above through Medicare, whereas almost one in five Americans under age 65 does not have health insurance.¹⁰

Another possible explanation is the pattern of cause of death under 65, which differs considerably from the pattern after 65. Accidents account for almost 13 percent of all white deaths under age 65, but only 2 percent at age 65 and above. Most of the accidental deaths under age 65 are caused by motor vehicles. This may help explain the relatively higher mortality in the United States at younger ages. Homicides are more prevalent in the United States than in most other countries, but because they

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7 Lindsay McLaren (University of Calgary), personal communication, July 18, 2008.

8 June E. O'Neill and Dave M. O'Neill, “Health Status, Health Care and Inequality: Canada vs. the U.S.,” Forum for Health Economics and Policy, Vol. 10, Issue 1, 2007, Article 3 (Frontiers in Health Policy Research)

9 This phenomenon is discussed in O'Neill and O'Neill, op.cit.

10 David Card, Carlos Dobkin, and Nicole Maetas provide some evidence of this effect in “Does Medicare Save Lives?” NBER Working Paper #13668.

account for less than 2 percent of white deaths under age 65, they cannot be an important explanation for the relatively higher mortality in the United States under age 65.

The importance of mortality at younger ages, as indicated by the age at which 25 percent of a cohort is dead, is evident in Figure 2 and Table 3. In comparison with the age at which 75 percent of a cohort is

dead, the inter-quartile range is much more highly correlated with the age at which 25 percent is dead. This is true for the 50 states and also true for the 21 countries. Also, as compared with the age at which 75 percent is dead, there is much more variability across the states and the countries in the age at which 25 percent is dead as evident in the coefficients of variation (the standard deviation divided by the mean).

Conclusions

Inequality in length of life is, on average, significantly greater within the white population in each of the 50 states than within 21 “Western” countries.

Greater inequality in the states is directly linked to the fact that the age at which 25 percent of a cohort is dead is significantly lower in the states than in the countries.

Deaths at younger ages drive inequality in general and the states-countries inequality gap in particular.

Mean age at which 50 percent of a cohort is dead (median life expectancy) is about the same in the 50 states (whites) as in the 21 countries. Mean age at which 75 percent of a cohort is dead is actually higher in the states (whites) than in the countries.

The lower age at which 25 percent of the U.S. cohort is dead may be the result of high accident mortality in the United States; almost 13 percent of all U.S. white deaths under age 25 are the result of accidents, mostly related to motor vehicles. A more thorough investigation of higher U.S. white mortality at ages below 65 would throw light on the greater inequality in length of life in the United States and increase understanding of international comparisons more generally.

Figure 2
Scatter Diagrams of Relationship Between Interquartile Range and Age at which 25% are Dead and 75% are Dead, 1990

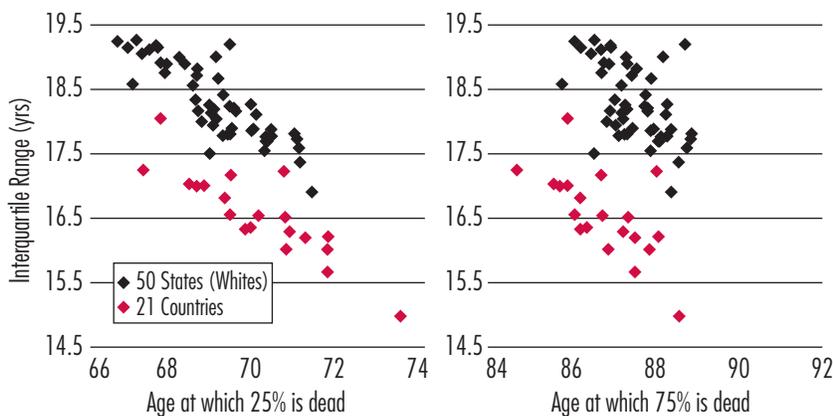


Table 3
Differences Between Age At Which 25% and 75% of Cohort Are Dead, 1990

	(1)	(2)	(3)
	Age at which 25% dead	Age at which 75% dead	(1) / (2)
Coefficient of correlation with inter-quartile range			
50 states (whites)	-0.84	-0.52	1.62
21 countries	-0.80	-0.49	1.63
Coefficient of variation (%)			
50 states (whites)	1.7	0.8	2.12
21 countries	2.1	1.2	1.75

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