Socio-Economic Status and Life Expectancy in California, 1970-1990

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Abstract

This paper examines the relationship between socio-economic status (SES) and life expectancy in California during the period 1970 to 1990. SES is of interest because along with race and gender, it is one of the three cornerstones of social stratification in the United States and it has been found to have a strong association with various health outcome measures, including life expectancy. The period 1970 to 1990 is of interest because social welfare programs that were at a peak in 1970 had been significantly reduced by 1990. The analysis shows that in 1970 high SES populations in California had over one additional year in life expectancy over low SES populations. By 1990, the gap had not been closed and had, in fact, increased slightly, to about 1.3 years. This result supports earlier findings that SES plays a role in differential life expectancy. It also has implications for current national health policy in that one of the two key goals of the U. S. Department of Health and Human Services is the elimination of health disparities by 2010.

Keywords: Social Stratification, Health Outcomes, Mortality Differentials

Introduction

Using regression analysis, Swanson and Stockwell (1986) examined life expectancy in 1930 and 1980 in Ohio and found that while differences narrowed between 1930 and 1980, significant variations in life expectancy persisted among the state's suburban, urban, and rural areas. They noted that the geographical areas of suburb, city, and rural county are themselves associated with socio-economic status (SES) differentials (Darroch and Marston 1971, Duncan and Duncan 1955). Extending the sub-state geographic analysis of Stockwell and Swanson (1986) to sub-state SES differentials, Swanson (1992) found that SES had substantive and statistically significant effects on changes in life expectancy at birth in Arkansas between 1970 and 1990: During this period, high SES populations in Arkansas experienced both absolute and relative gains in life expectancy over low SES populations such that by 1990 the differential was over two years. Using Swanson's (1992) findings as a point of departure, this paper examines the effect of SES on life expectancy in California between 1970 and 1990.

SES is of substantive interest because along with race and gender, it is one of the three cornerstones of social stratification in the United States (Massey 2007) and it has been linked in many studies to mortality differentials (Gortmaker and Wise 1997, James and Cossman 2006, Hummer 2005, Kitagawa and Hauser 1973, McGehee 1994, Stockwell 1961, Stockwell 1963, Stockwell and Laidlaw 1977, Stockwell and Wicks 1984, Stockwell Swanson and Wicks 1987, Stockwell Swanson and Wicks 1988a, Stockwell Swanson and Wicks 1988b, Stockwell Goza and Balisteri 2005, and Stockwell Bedard Swanson and Wicks 1987). Because of the pervasiveness of these findings, Hummer (2006) postulated that socioeconomic differences are fundamental causes of health disparities in the United States, a point also made by Link and Phelan (1995).

Life Expectancy (at birth) is of substantive interest because it is arguably the single most important indicator of the general health of a population (Lamb and Siegel 2004) and it has long been documented that variations in life expectancy at birth exist among the broad geographic divisions within the United States (US), as well as among individual states (Dublin and others 1949, Glover 1921). However, until the work of Stockwell and Swanson (1986), virtually nothing was known about sub-state variations.

As was the case for Arkansas, the years 1970 and 1990 are selected for this study in California because they represent what may be regarded as the "bookends" of a pivotal social policy period in the U.S., where social welfare programs were at a high point in 1970 (via the New Deal under Roosevelt and the War on Poverty under Johnson), but by 1990 (shortly after the end of the Reagan era) were significantly smaller (Stockwell Goza, and Balisteri 2005). There exists a great deal of documentation that this change has contributed to a significant and continuing increase in social inequality – the relative increase of those at the lower end of the SES scale coupled with significantly higher incomes and other forms of wealth by relatively few, those at the high end of the SES scale (Massey 2007: 158-210). Moreover, there is evidence that this increase in social inequality is associated with increased infant mortality rates among those at the low end of the SES scale (Stockwell Goza and Balisteri 2005). Thus, it is natural to examine this question using what is perhaps the ultimate indicator of overall health, life expectancy at birth.

Materials and Methods

For the same reasons described by Swanson (1992), and Swanson and McGehee (1996), a regression-based technique is used to estimate life expectancy (Swanson, 1989), an earlier version of which was used by Swanson and Stockwell (1986). Until the advent of this method for estimating life expectancy at the sub-state level, there was no reliable way to examine life expectancy across either a set of sub-state areas such as counties or a set of populations in these sub-state areas sorted by SES (or other characteristics). This was due to the fact that the usual way to calculate life expectancy is through the construction of a life table, which has rigorous data requirements that are difficult to meet for specific sub-state areas (Kintner 2004).

The model used here was tested by Swanson (1989) and found to be sufficiently accurate for estimating life expectancy at birth for county populations in the United States. The model is defined as:

$$e_o = \{82.276 - (4.24*CDR) + (3.02*\ln(P65+)) + (.0267*CDR^2) + (.1773*Ln(P65+)^2) + (.8707*[(CDR)*(Ln(P65+))]\}$$

where

e_o is life expectancy at birth

CDR is the Crude Death Rate (expressed as deaths per 1000 population)

Ln(P65+) is the natural base logarithm of the percent of the population aged 65 years and over

While this model was found to work well for small populations, it has two conditions under which it can produce unreliable estimates: (1) a “special” population, such as is found in a 55+ retirement community; and (2) a small population with very few deaths, such that the crude birth rate can fluctuate substantially from year to year. In terms of the former condition, a very high difference between the percent aged 65 and over at the state level and a given county warrants further examination. In terms of the second, it is advisable to not use the model if the number of deaths is less than 50. None of the counties in this study was found to be severely impacted by the presence of large retirement populations. However, one county, Sierra, was found to have less than 50 deaths both in 1970 and 1990. This county was excluded.

As was the case in the study in Arkansas (Swanson 1992), the analytical unit is a county population in California (N=58, 57 with the exclusion of Sierra County). Data needed to estimate life expectancy by county were taken from vital statistics reports provided by the California Department of Health (1971 and 1991) and reports for the 1970 and 1990 censuses (U.S. Bureau of the Census 1973, 1991), respectively. County populations are grouped into two sets for 1970 and 1990: (1) low SES, the 1st quintile, the (approximately) 20% (N= 12) of the state's 58 counties with the lowest median household income; and (2) high SES, the 5th quintile, the (approximately) 20% (N =12) of the state's counties with the highest median household income. The county that was excluded, Sierra, fell into the low SES group. Consequently, it has only 11 members instead of 12 for purposes of the analysis.

Median household income data are taken from a special report compiled by the U.S. Census Bureau (no date). Because the 1970 and 1990 censuses asked for income in the preceding year, the median income data are actually for 1969 and 1989, respectively. All amounts are expressed in 1989 dollars.

To measure change in life expectancy between 1970 and 1990, a dummy variable regression model was constructed for each of the two SES populations:

$$e_o = a + b(Yr)$$

where

e_o is life expectancy in and 1970 and 1990 for a given SES population as found from the equation shown above

a is the intercept (the mean life expectancy for the same SES population in 1970)

b is the change in mean life expectancy between 1970 and 1990 for the SES population in question

YR is a dummy variable for year (YR=0, in 1970; YR=1, in 1990)

The one-tailed test ($p=.05$) is applied to the slope coefficient, b, in each of the two equations to determine if there is a statistically significant change in life expectancy for the SES population in question between 1970 and 1990. Because there is a positive correlation between life expectancy for each SES population in 1970 and 1990, the standard error is diminished. However, this effect is mediated by the extremely small sample sizes and the net result is that a given t-test is not highly subject to a Type I error (rejecting a true hull hypothesis). The null hypothesis is that there is no change (i.e., $b=0$); the alternative hypothesis is that there is positive change (i.e., $b>0$). This test structure is appropriate because there is evidence to indicate that, on average, life expectancy increased between 1970 and 1990. If a given slope coefficient is found to be statistically significant then we reject the null hypothesis that $b=0$ and assume the value of b found in the equation represents the amount of change in life expectancy that occurred for the SES population in question between 1970 and 1990. If a given slope coefficient is not found to be statistically significant, then we do not reject the null hypothesis and assume that the value of b is zero - there was no change in life expectancy for the SES population in question between 1970 and 1990.

Results

The estimated life expectancy values for each of the two SES populations in 1970 and 1990, by county, are given in Tables 1 and 2, respectively. In 1970, the mean life expectancy at birth for the low SES population is 72.18, while that for the high SES population is 73.18, a difference of 1.0 years. In 1990, the mean life expectancy at birth for the low SES population is 75.15, while that for the high SES population is 76.44, a difference of 1.29 years. To examine this change, two dummy variable regression equations were constructed using the life expectancy values. These equations are found in tables 1 and 2. The slope coefficient (3.3) in the dummy variable regression equation for the high SES population is statistically significant ($p< .001$), as can be seen in Table 3. This suggests that the high SES population did experience gains in life expectancy between 1970 and 1990 – over three years. The slope coefficient (3.1) in the dummy variable regression equation for the low SES population also is statistically significant ($p < .001$), which suggests that while this population also gained slightly over three years in additional life expectancy between 1970 and 1990, the gap of over one year in 1970 persisted and, in fact, increased slightly This result confirms what is seen from the data in tables 1 and 2. These results are also supported by two (unequal means) t-tests, between high and low SES populations in 1970 and between high and low SES populations in 1990, respectively. In both these tests, the null hypothesis that they had equal average life expectancies is rejected ($p < .05$).

(TABLES 1, 2, and 3 ABOUT HERE)

Discussion

The results found for California show persistence in the initial gap in life expectancy of one year that widened only slightly. This is unlike the situation in Arkansas, where high SES population gained over two additional years of life expectancy over the low SES populations between 1970 and 1990(Swanson 1992). The reason for a persistence of the same differential in California rather than a substantial increase in the life expectancy gap may be due to the fact that its medical and other social support programs were better preserved by the state of California than was the case in Arkansas.

The effects of SES on life expectancy are of substantive interest because SES is one of three primary mechanisms of social stratification in the United States (Massey 2007) and it has been found to have a broad range of health access and health outcomes in the United States (Gortmaker and Wise 1997, James and Cossman 2006, Hummer 2005, McGehee 1994, Stockwell Goza and Balistreri 2005). These effects also are of practical interest because in its "Healthy America 2010" report, the U. S. Department of Health and Human Services (2000: 1) cites the elimination of health disparities by the end of this decade as one of its two key goals. Clearly, the finding that these disparities increased between 1970 and 1990 in Arkansas and persisted over this same period in California do not bode well for meeting this goal by 2010. The findings also provide support for the argument by Stockwell, Swanson, and Wicks (1988a, 1988b) that declining relative standards in living for the low and lower middle SES populations along with the imposition of national policies that limited their health care were likely to be factors contributing to a lack of narrowing of mortality differentials between them and high SES populations subsequent to 1970.

One of the next steps in this research effort will be to examine how race moderates the effects of SES on life expectancy at birth in California. Swanson and Stockwell (1988) found, for example, that while race moderated the geographic association with life expectancy in Ohio, the association was not spurious. Swanson and McGehee (1996) found similar results in regard to race and SES in Arkansas, where between 1970 and 1990: (1) High SES Black populations gained more than three additional years of life expectancy over Low SES Black populations; and (2) High SES White populations gained more than 0.5 years of life expectancy over Low SES White populations. I expect that similar moderating effects of race on SES will be found in California, but this is a working hypothesis to be tested, one made more interesting by the fact that California has both more racial and ethnic diversity than Arkansas.

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Table 1. 1970 and 1990 Life Expectancy at Birth for Low SES Populations*

COUNTY	1969 INCOME QUINTILE	1970 Life Expectancy at Birth	COUNTY	1989 INCOME QUINTILE	1990 Life Expectancy at Birth
Butte	1	72.72	Butte	1	75.91
Calaveras	1	73.96	Del Norte	1	74.21
Kings	1	71.36	Glenn	1	75.91
Lake	1	73.64	Humboldt	1	74.29
Madera	1	70.32	Imperial	1	74.77
Mariposa	1	72.42	Lake	1	76.43
Merced	1	71.46	Modoc	1	74.60
Nevada	1	73.64	Siskiyou	1	75.56
Santa Cruz	1	72.74	Tehama	1	75.34
Tulare	1	71.35	Trinity	1	74.93
Yuba	1	70.39	Yuba	1	74.68
	mean	**72.18**		**mean**	**75.15**

*Sierra County is excluded because it has less than 50 deaths in both 1970 and 1990.

Table 2. 1970 and 1990 Life Expectancy at Birth for High SES Populations

COUNTY	**1969 INCOME QUINTILE**	**1970 Life Expectancy at Birth**	**COUNTY**	**1989 INCOME QUINTILE**	**1990 Life Expectancy at Birth**
Alameda	5	72.00	Alameda	5	75.26
Contra Costa	5	72.56	Contra Costa	5	76.44
Los Angeles	5	71.60	Marin	5	76.97
Marin	5	73.31	Napa	5	76.01
Mono	5	74.01	Orange	5	76.68
Napa	5	76.33	Placer	5	76.33
Orange	5	74.22	San Benito	5	75.69
Sacramento	5	70.74	San Mateo	5	76.96
San Mateo	5	72.90	Santa Clara	5	77.43
Santa Clara	5	74.06	Santa Cruz	5	76.41
Solano	5	72.37	Solano	5	75.89
Ventura	5	74.08	Ventura	5	77.21
	mean	**73.18**		**mean**	**76.44**

Table 3. Dummy Regression and Statistical Test Results: Changes in Life Expectancy by SES Population in California between 1970 and 1990.

	a	b	standard error of b	t	P(b=0)	Ho: b=0
High SES R^2= .69	73.18	3.3	0.47	6.96	<.001	reject Ho
Low SES R^2=.70	72.18	3.1	0.44	6.97	<.001	reject Ho