LIFE-COURSE TRAJECTORIES IN BLACK AND WHITE DIFFERENTIALS IN SELF-RATED HEALTH: USING A HIERARCHICAL AGE-PERIOD-COHORT APPROACH

Seung-Eun Song*
University of Texas at Austin

Direct all correspondence to: Seung-Eun Song, Population Research Center, 1 University Station, G1800, University of Texas at Austin, Austin, TX 78712.
Email: sesong@prc.utexas.edu

ABSTRACT

The present study examines the life-course patterns of black-white disparities in self-rated health, using repeated cross-sectional data of the 1982-2007 National Health Interview Survey. The hierarchical age-period-cohort model is utilized to adequately separate age effects from period and cohort effects. Preliminary results show that black-white differentials in health diverge until about age 62, followed by progressive convergence throughout later old age. We also observe temporal trends toward narrowing racial disparities in health in the context of generally deteriorating health over recent periods, particularly for whites. Cohort patterns substantially differ between blacks and whites, resulting in the inverted U-shaped curve of racial disparities in health across birth cohorts. Ignoring cohort patterns leads to a more rapid rate of increasing and decreasing the race-health relationships over the life-course, while ignoring period patterns makes it flatter. The large portion of age - and cohort-specific racial variations is explained by the compositional differences in education and marital status.

Life-Course Trajectories in Black and White Differentials in Self-Rated Health: Using a Hierarchical Age-Period-Cohort Approach

BACKGROUND

The racial differences in health represent a troubling and challenging issue in the U.S. There is overwhelming evidence that black populations as compared to white populations experience a disadvantage in health and mortality. For instance, recent research shows that black mortality rates were about 1.5 times higher than white rates (Levine et al. 2001; Woolf 2004). Such a difference translates into 5-6 years of differential life expectancy at age 25 across black and white populations. Although the race-health relationship is a strong one and remains robust regardless of how health is measured, there remain large controversies regarding the life-course/age trajectories in black-white disparities in health.

There are several reasons to think that racial differentials in health are not uniform across the life-course and two competing hypotheses have been emerged: the double jeopardy hypothesis and the age-as-leveler hypothesis. The argument of the double jeopardy hypothesis is similar to that of the cumulative advantage/disadvantage hypothesis in that the effect of race is stronger at older ages than at younger age because racial inequalities in socioeconomic status as well as in health risk and protective behaviors continue to increase across the life-course. On the contrary, the age-as-leveler hypothesis postulates that the racial gap in health converges at old age because of the increasing biological frailty and senescence for both racial groups. In other words, health status becomes overwhelmed by biological senescence as individual ages. And such biological differences between black and white populations become smaller at older age so that the racial gap in health gets smaller.

Although existing empirical evidence seems to support more the age-as-leveler hypothesis than the double jeopardy hypothesis, many still suspect that such a convergence may occur because of ignoring cohort and/or period patterns. In general, life-course trajectories in the race-health relationship observed in previous studies are identified based on the cross-sectional data so that cohort and period phenomenon are completely ignored. Some of the most recent studies have begun to identify the life-course pattern in health differentials between blacks and whites populations, based on the pooled repeated cross-sectional data (i.e., National Health Interview Survey and General Social Survey) which may allow for researchers to examine period and cohort effects simultaneously. However, either cohort or period effects are not accounted for because of the identification problem, although both cohort and period phenomenon obscure the age-specific relationship between race and health. Glen (2007) points that "Age, period, and cohort effects must be considered as a package, because the three kinds of effects are so closely interrelated that it is impossible to deal empirically with one without also dealing with the others."

To date, the most challenge facing health researchers is the ability to disentangle the age effect from cohort and period effects. In general, the regression type of the conventional Age-Period-Cohort (APC) model forces researchers to drop either period or cohort effects due to the problem of perfect multicolinearity. The overall goal of the present study is to reexamine the life-course patterns of racial disparities in health among US adults, while taking into account the confounding effects of period and cohorts. To resolve the identification problem, I adopt the hierarchical modeling technique and specify age, period, and cohort as second-level random effects. The pooled repeated cross-sectional data of the 1982-2007 National Health Interview Survey are utilized. I focus on self-rated health (SRH) because it can be assessed reliably over time and across subpopulations, because SRH is the most pervasive measure for health status among health researchers and because SRH has an exceptional predictive validity of objective dimensions of health such as disease, mortality, and health services utilization.

In concert with the above, the specific aims of this research are:

1. To assemble a very large, repeated cross-sectional data set that allows for me to comprehensively document the racial gap in SRH across age, periods, and cohorts more precisely than has therefore been the case.
2. To test whether racial differences in SRH increase, remain the same, or decrease with advancing age. By utilizing the hierarchical Age-Period, and Cohort (HAPC) models, I separate the age effects from cohort and period effects. In addition, this study explores how ignoring period and/or cohort patterns may influence age patterns in racial disparities in SRH.
3. To test whether racial differences in SRH have widened or narrowed across successive cohorts and over time periods.
4. To explore the extent to which racial differences in SRH across ages, periods, and cohorts are mediated by two important dimensions of socioeconomic status – education and martial status.

METHODS

Data

This study uses data from the National Health Interview Survey (NHIS), spanning the period 1982 to 2007. The NHIS is the largest household survey which is representative of the civilian non-institutionalized population of the United States and has been conducted annually since 1957. The data for 2007 were the most recent available for public use at the time of these analyses. The NHIS uses a multistage sampling technique, with probability of inclusion in the sample according to age, sex, race, and region. I include those variables (in addition to education, and marital status) as covariates, rather than use sample weights in the analyses – given the largest sample size (Lynch 2006).

The analysis is limited to the individuals that age ranged from 30 to 79 because those below 30 are less likely to complete their education, while beyond age 79, estimation bias arising from mortality selection is more likely to be salient. Three variables, education, marital status, and self-rated health, have missing cases. This study removes missing from the analysis because I believe that excluding records with missing data does not lead to any serious distortion of results – given the small amount of missing data (2.43%). The initial sample size before considering missing data was 1161646 and the final analytic sample size was 1133330.

Measurements

The outcome used in this study is self-rated health (SRH). Between 1982 and 2007, the NHIS collected information about the self-rated health by asking respondents "would you say your health in general is excellent (1), very good (2), good (3), fair (4) or poor (5)." Lower value indicates that people are in a better health condition.

Race is coded as dummy variables comparing non-Hispanic whites (NHW) to Non-Hispanic blacks (NHB). The education categories include: (1) college graduates (4 or more years of completed college); (2) some college (1-3 years of college); (3) high school graduates; (4) no high school graduates (the reference group). As of 1997, the NHIS adds information on credentials in addition to the number of years of education. I record education in the same fashion to match across all survey years. Gender and marital status are measured as conventional dummy variables, with the man and married as reference groups, respectively. The region of residence is divided into four categories that are comprised of a series of dichotomous measures: (1) Northeast, (2) Midwest, (3) South, and (4) West. The category of "Northeast" serves as the reference group. As noted above, age ranges from 30 to 79.

The period variable indicates survey year, covering from 1982 to 2007. Cohort is the year of the survey minus age and includes members born from 1903 through 1977. Age, period, and cohort are measured in single years.

Model and Analysis

I apply the hierarchical Age-Period-Cohort (HAPC) models to revolve the identification problem created by the linear dependency of age, period, and cohort. According to conventional APC analysis, all three dimensions of change (age, period, and cohort) cannot be considered simultaneously in the same model due to the problem of perfect multicolinearity. In turn, either cohort or period effect is forced to drop, although age effects may be confounded with cohort and/or period effects.

The identification problem, however, is easily solved if the basic idea of hierarchical modeling technique is applied. That is, if one may consider one or more of age, period, or cohort as second-level random effects, it is possible to separately estimate the effects of age, period, and cohort without assigning certain constraints to the coefficients. It is also important to note that the HAPC model tends to generate more efficient estimates than the conventional APC regression model because it takes into account the possibility that sample respondents in the same age, cohort, and/or period groups may be likely to be similar in their responses to an outcome response due to the fact that they share random error components (Yang and Land 2006, 2008). Yang and Land (2006) note that "a failure to assess this potentially more complicated error structure adequately in APC analysis may be serious consequences for statistical inference," – given that the conventional APC model tends to underestimate the standard errors of estimations.

In fact, the HAPC is very flexible in terms of which and how many dimensions of age, period, and cohorts are specified as second-level units. For instance, O'Brien et al. (2008) treat age and period as fixed effects and cohort as a random effect, while Yang and Land (2008) consider age as a fixed effect and period and cohort as second-level random effects. In this analysis, I specify all age, period, and cohort as second-level units and allow for the intercept and coefficient of race to vary randomly across those second-level units because this case does not require specification of a parametric form associated with the age, period, and cohort effects on SRH and the gap between NHW and NHB populations. By allowing age, period, and cohort as random, not only is the identification problem resolved but no such parametric restriction is implied.

The two models are estimated: Model 1 includes the race variable and two background variables of gender and region; and Model 2 adds education and marital status variables to Model 1 to estimate the extent to which these two factors take into account the age, period, and cohort variations in an outcome of interest. For all covariates, the reference category is the one associated with the better status of self-rated health.

Model 1 that I estimate can be expressed in a form as:

<u>Level 1</u>

$$\text{SRH}_{ijkz} = \beta_{0jkz} + \beta_1\text{NHB}_{ijkz} + \beta_2\text{Female}_{ijkz} + \beta_3\text{Midwest}_{ijkz} + \beta_4\text{South}_{jkz} + \beta_5\text{West}_{jkz} + e_{ijkz},$$

$$e_{ijkz} \sim \text{N}(0, \sigma^2) .$$

<u>Level 2</u>

$$\beta_{0jkz} = \gamma_{00} + u_{0j} + v_{0k} + w_{0z}, \qquad u_{0j} \sim \text{N}(0, \tau_u), \; v_{0k} \sim \text{N}(0, \tau_v), \; w_{0z} \sim \text{N}(0, \tau_\text{w}).$$

$$B_{1jkz} = \gamma_{10} + u_{1j} + v_{1k} + w_{1z}, \qquad u_{0j} \sim \text{N}(0, \tau_u), \; v_{0k} \sim \text{N}(0, \tau_v), \; w_{0z} \sim \text{N}(0, \tau_\text{w}).$$

Combined Model of Equations 1 and 2

$\text{SRH}_{ijkz} = \gamma_{00} + \gamma_{10}\text{NHB}_{ijkz} + \beta_2\text{Female}_{ijkz} + \beta_3\text{Midwest}_{ijkz} + \beta_4\text{South}_{jkz} + \beta_5\text{West}_{jkz} + u_{0j} + v_{0k} + w_{0z} + u_{1j}\text{NHB} + v_{1k}\text{ NHB} + w_{1z}\text{ NHB} + e_{ijkz}$

For $i = 1, 2, 3, \ldots n_{jkz}$ individuals within age j, period k, and cohort z; $j = 30,\ldots 79$ years of age, $k = 1982,\ldots 2007$ time periods (survey years), and $z = 1903,\ldots\ldots 1977$ birth cohorts, where within each age j, period k, and cohort z, the respondent i's SRH score is modeled as a function of race, gender, and region.

The Level 2 equation specifies the inter-age, inter-birth, and inter-cohort differences in the intercept and the racial coefficient. β_{0jkz} and B_{1jkz} have means of γ_{00} and γ_{10}, representing the values with respect to the mean SRH score of all individuals and the average SRH score differentials between NHW and NHB for all ages, periods, and cohorts. It follows that the variance of β_{0jkz}, u_{0j}, v_{0k}, and w_{0z}, are measures of the variability of the mean SRH scores for each age j, period k, and cohort z, respectively, while the variance of β_{1jkz}, u_{1j}, v_{1k}, and w_{1z}, are measures of the variability of the mean SRH score differences between NHW and NHB for each age j, period k, and cohort z, respectively. Such residual random values, in turn, indicate the amount of deviations in the intercept and the race coefficient for each age j, period k, and cohort z from the average intercept (γ_{00}) and average slope coefficient of race (γ_{10}) for all ages, periods, and cohorts. In fact, they represent whether and how the mean SRH score and the mean SRH score gap between NHW and NHB vary by age-to-age, period-to-period, and cohort-to-cohort. These random values are obtained from the residual files.

When the Level 2 equation is combined with the Level 1 equation, age-, period-, and cohort-specific patterns of outcomes of interest become clear: $\gamma_{00} + u_{0j}$ is the age-specific SHR score averaged overall all cohorts and periods; $\gamma_{00} + v_{0j}$ is the period-specific SHR score averaged overall all ages and cohorts; $\gamma_{00} + z_{0j}$ is the cohort-specific SHR score averaged overall all ages and periods; $\gamma_{10} + u_{1j}$ is the age-specific SHR score gap between NHW and NHB averaged overall all cohorts and periods; $\gamma_{10} + v_{1j}$ is the period-specific SHR score gap between NHW and NHB averaged overall all ages and cohorts; $\gamma_{10} + z_{1j}$ is the cohort-specific SHR score gap between NHW and NHB averaged overall all ages and periods.

As noted above, I run additional Model that adds variables of education and marital status to Model 1 to explore whether and the extent to which these two factors take into account the age, period, and cohort variations in an outcome of interest.

Model 2 is described as follows:

$$SRH_{ijkz} = \gamma_{00} + \gamma_{10}NHB_{ijkz} + \beta_2 Female_{ijkz} + \beta_3 Midwest_{ijkz} + \beta_4 South_{jkz} + \beta_5 West_{jkz} + \beta_6 No\_High_{jkz} + \beta_7 High_{jkz} + \beta_8 S\_College_{jkz} + u_{0j} + v_{0k} + w_{0z} + u_{1j}NHB + v_{1k}NHB + w_{1z}NHB + e_{ijkz}$$

RESULTS

Table 1 shows the fixed coefficients and random variances obtained from hierarchical linear models. Model 1 contains only race, gender and region variables and Model 2 includes martial status and education variables additionally.

Model 1 displays the NHW-NHB gap in SRH score after controlling gender and region variables. The mean SRH score for NHBs is 0.403 point higher than that for NHWs. It warrants emphasis that 0.403 is the global racial differential in SRH averaged overall all ages, periods, and cohorts. In fact, racial differentials in SRH differ by age-by-age, period-by-period, and cohort-by-cohort – given that Level-2 variance by age, period, and cohort is statistically significant. Consistent with prior studies, being female and living in the Midwest and South regions is positively associated with one's expected score on SRH.

Model 2 of Table 1 adds education and marital status to the equation. Inasmuch as we know that racial disparities in health are mediated by these two social status variables, it is not surprising that the race difference declines substantially from Model 1to Model 2 (from 0.403 to 0.254). Such diminution also occurs for other covariates, gender and region, although health differentials still remain significantly. Education and marital status exert great effects on perceived health.

--- Table 1 about here ---

The variance components show that most of the variance in self-rated health is accounted for by the individual-level regressors. Level-2 variance by age, period, and cohort is statistically significant. It is important to note that in these models, variance in the intercept actually represents variance in NHW populations when all covariates take values of 0. In turn, variance in the intercept by age is substantially larger for variance in the race coefficient by age (as well as variance associated with cohorts and periods) as the former reflects age variations in SRH scores for NHWs, while the latter represents age-based variations in SRH scores for NHB as compared to NHWs. Compositional changes in education and marital status account for the large portion of age and cohort variations in SRH and for cohort variations in NHW-NHB differentials in SRH.

Tables 2-4 present HAPC estimates of random effects for age, period, and cohort, based on Model 2 (random coefficients in Model 1 are not shown, but available on request) and show up in Figure 1-3 with additional information on random coefficients of SRH for NHBs. The random coefficients of SRH for NHBs are calculated by adding random coefficients for the NHWs (or the intercept) to random coefficients for the racial coefficient ($u_{0j} + u_{1j}$ for ages, $v_{0j} + v_{1j}$ for periods, and $z_{0j} + z_{1j}$ for cohorts). Each figure contains three lines, indicating change in SRH scores for NHWs (or the intercept) (yellow line), NHBs (red line), and NHW-NHB differences (blue color), respectively. A positive slope indicates that SRH status for NHWs and

NHBs is deteriorating and the racial gap in SHR is increasing, while a negative slope indicates that SRH status for NHWs and NHBs is improving and the racial gap in SRH is narrowing. I also calculate adjusted SRH scores for NHW and NHB populations across ages, periods, and cohorts and show up in Figure 1a-3a.

--- Table 2-4 about here ---

In terms of the life-course pattern in the race-health relationship, Figure 1 suggests that NHBs as compared to NHWs experience a faster rate of worsening health up to the early 60s, but a slower rate in late old age. As a result, the racial gap in SRH diverges and then converges across the life-course. This convergence occurs around the early 60s. This result is consistent with the age-as-leveler hypothesis.

--- Figure 1 and 1a about here ---

Figure 2 confirms temporal trends toward improving and then deteriorating SRH for both NHW and NHB populations over the period studied. Given that NHWs have improved their SRH to a lesser degree in the earlier years and deteriorated their SRH to a greater degree in the later years, the racial difference has rather consistently narrowed over the entire time period.

--- Figure 2 and 2a about here ---

Examining the random coefficients for cohorts (Figure 3), it can be seen that cohort patterns in SRH substantially differ between NHW and NHB populations. Across NHW birth cohorts, the levels of SRH increased, decreased and then increased again, while, for NHB birth populations, the levels of SRH stabilized, increased, and then decreased. As a result, the racial gap has rather stabilized by the mid-1920s cohorts and diverged by the mid-1940s cohorts followed by progressive convergence throughout the very recent cohorts.

--- Figure 3 and 3a about here ---

To answer the question regarding the confounding effects of period and cohort on age effects in terms of the racial disparities in SRH, I run additional hierarchical models with random effects of (1) age and (2) age and cohort after controlling gender, region, marital status, and education variables and compare them with random coefficients obtained from Model 2 (all age, period, and cohort dimensions as random). Figure 4 presents age-specific SRH differentials between NHW and NBW populations, based on three Models illustrated above.

--- Figure 4 about here ---

Figure 4 suggests that estimating age patterns without taking into account cohort patterns makes diverging and converging slopes steeper. As seen in Figure 2, cohort patterns in the racial gaps take an inverted U-shaped curve. In turn, ignoring cohort patterns leads to a more rapid rate of increase in the racial gap in SRH among young to midlife adults as the cohort effect is decreasing, while leading to patterns toward steeper declines for the old age group as the cohort effect is increasing. On the contrary, age patterns appear flatter if period patterns are ignored. At any rate, this implies that a failure to separate age effects from period and cohort effects results in over-estimates of not only the earlier divergence but the later convergence in the racial gap in SRH over the life-course.

Table 1. HAPC Model Estimates of Fixed Effects for Self-Rated Health

FIXED EFFECTS		MODEL 1	MODEL 2
INTERCEPT		2.244 ***	1.820 ***
RACE [NHW]			
NHB		0.403 ***	0.254 ***
GENDER [Male]			
Female		0.072 ***	0.043 ***
REGION [Northest]			
Miswest		0.078 ***	0.065 ***
South		0.175 ***	0.147 ***
West		-0.004	0.047 ***
MARITAL STATUS [Married]			
Not Married			0.126 ***
EDUCATION [University]			
No High School			0.892 ***
High School			0.451 ***
Some College			0.276 ***
VARIANCE COMPONENTS		**MODEL 1**	**MODEL 2**
AGE (30-79)	Intercept (NHW)	0.109 ***	0.069 ***
	NHB	0.001 ***	0.001 ***
COHORT (1903-1977)	Intercept (NHW)	0.003 ***	0.001 ***
	NHB	0.010 ***	0.006 ***
PERIOD (1982-2007)	Intercept (NHW)	0.001 ***	0.001 ***
	NHB	0.002 ***	0.002 ***
INDIVIDUAL		1.123 ***	1.043 ***

Source: National Health Interview Survey, 1982-2007

Two-Tailed Tests: * $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Table 2a. HAPC Model Estimates of Random Effects of Age for Self-Rated Health

	MODEL 1		MODEL 2	
AGE	NHW	NHB	NHW	NHB
30	-0.542 ***	-0.030 *	-0.446 ***	-0.031 **
31	-0.534 ***	-0.024	-0.440 ***	-0.029 *
32	-0.516 ***	-0.039 **	-0.420 ***	-0.039 **
33	-0.492 ***	-0.012	-0.403 ***	-0.005
34	-0.485 ***	-0.007	-0.392 ***	-0.013
35	-0.475 ***	-0.020	-0.383 ***	-0.022
36	-0.446 ***	-0.024	-0.359 ***	-0.019
37	-0.411 ***	-0.006	-0.328 ***	-0.009
38	-0.399 ***	-0.019	-0.321 ***	-0.015
39	-0.379 ***	-0.016	-0.302 ***	-0.013
40	-0.344 ***	-0.023	-0.271 ***	-0.018
41	-0.328 ***	-0.025	-0.259 ***	-0.021
42	-0.311 ***	-0.020	-0.248 ***	-0.014
43	-0.279 ***	-0.011	-0.220 ***	-0.009
44	-0.264 ***	0.026	-0.207 ***	0.033 **
45	-0.239 ***	0.010	-0.190 ***	0.019
46	-0.197 ***	-0.019	-0.148 ***	-0.012
47	-0.182 ***	-0.013	-0.139 ***	-0.007
48	-0.157 ***	0.030 *	-0.121 ***	0.028 *
49	-0.124 ***	-0.002	-0.092 **	0.002
50	-0.096 **	0.028 *	-0.068 *	0.036 **
51	-0.061	0.037 **	-0.038	0.034 **
52	-0.030	0.005	-0.016	0.004
53	0.006	0.037 **	0.017	0.045 ***
54	0.011	0.027	0.021	0.028
55	0.050	0.005	0.055	0.009
56	0.091 *	0.000	0.091 **	0.006
57	0.120 **	0.009	0.112 ***	0.012
58	0.125 ***	0.058 ***	0.114 ***	0.059 ***
59	0.164 ***	0.018	0.147 ***	0.022
60	0.188 ***	0.032 *	0.167 ***	0.033 *
61	0.213 ***	0.061 ***	0.183 ***	0.067 ***
62	0.241 ***	0.026	0.206 ***	0.025
63	0.255 ***	0.034 *	0.217 ***	0.027
64	0.258 ***	0.010	0.214 ***	0.018
65	0.272 ***	-0.001	0.220 ***	-0.007
66	0.276 ***	0.036 *	0.221 ***	0.030
67	0.291 ***	0.006	0.233 ***	0.000
68	0.323 ***	-0.015	0.258 ***	-0.021
69	0.325 ***	0.004	0.260 ***	0.000
70	0.341 ***	-0.019	0.265 ***	-0.026
71	0.351 ***	-0.016	0.272 ***	-0.019
72	0.358 ***	-0.017	0.273 ***	-0.033
73	0.384 ***	-0.023	0.291 ***	-0.033
74	0.408 ***	0.000	0.311 ***	-0.006
75	0.399 ***	-0.033	0.294 ***	-0.034
76	0.435 ***	-0.044 *	0.329 ***	-0.052 **
77	0.458 ***	0.000	0.345 ***	-0.005
78	0.479 ***	-0.014	0.354 ***	-0.015
79	0.471 ***	-0.009	0.343 ***	-0.011

Source: See Table 1a. Two-Tailed Tests: * $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Table 2b. HAPC Model Estimates of Random Effects of Period for Self-Rated Health

	MODEL 1		MODEL 2	
PERIOD	**NHW**	**NHB**	**NHW**	**NHB**
1982	0.080 ***	0.073 ***	0.003	0.069 ***
1983	0.044 ***	0.076 ***	-0.025 ***	0.071 ***
1984	0.043 ***	0.036 **	-0.019 **	0.034 **
1985	0.034 ***	0.051 ***	-0.024 ***	0.046 ***
1986	0.027 ***	0.026	-0.023 **	0.018
1987	0.012	0.038 **	-0.031 ***	0.029 **
1988	0.000	0.042 ***	-0.036 ***	0.030 **
1989	-0.023 ***	0.023	-0.056 ***	0.021
1990	-0.027 ***	-0.004	-0.050 ***	-0.010
1991	-0.010	-0.020	-0.028 ***	-0.025 *
1992	0.009	0.039 ***	-0.008	0.040 ***
1993	0.007	0.045 ***	-0.003	0.042 ***
1994	0.005	0.023	0.003	0.021
1995	0.019 **	-0.021	0.022 ***	-0.007
1996	0.006	-0.026	0.016 *	-0.013
1997	-0.039 ***	-0.023	-0.025 ***	-0.017
1998	-0.042 ***	0.002	-0.017 **	-0.004
1999	-0.038 ***	-0.057 ***	-0.011	-0.047 ***
2000	-0.030 ***	-0.033 **	0.002	-0.029 *
2001	-0.031 ***	-0.017	0.006	-0.020
2002	-0.008	-0.045 ***	0.037 ***	-0.041 ***
2003	-0.012	-0.053 ***	0.039 ***	-0.046 ***
2004	0.006	-0.060 ***	0.062 ***	-0.051 ***
2005	-0.006	-0.049 ***	0.059 ***	-0.053 ***
2006	-0.011	-0.027	0.047 ***	-0.024
2007	-0.016 *	-0.039 **	0.059 ***	-0.034 **

Source: See Table 1. Two-Tailed Tests: * $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Table 2c. HAPC Model Estimates of Random Effects of Cohort for Self-Rated Health

	MODEL 1		MODEL 2			MODEL 1		MODEL2	
COHORT	**NHW**	**NHB**	**NHW**	**NHB**	**COHORT**	**NHW**	**NHB**	**NHW**	**NHB**
1903	-0.015	-0.027	-0.028	-0.025	**1941**	-0.109 ***	0.145 ***	-0.073 ***	0.131 ***
1904	0.033	0.038	-0.011	0.032	**1942**	-0.089 ***	0.058 **	-0.048 ***	0.051 **
1905	0.052 *	-0.112	-0.005	-0.089	**1943**	-0.087 ***	0.146 ***	-0.037 ***	0.132 ***
1906	0.042	-0.072	-0.013	-0.072	**1944**	-0.081 ***	0.098 ***	-0.036 ***	0.082 ***
1907	0.066 ***	0.066	0.004	0.040	**1945**	-0.066 ***	0.084 ***	-0.012	0.074 ***
1908	0.033	0.082	-0.016	0.071	**1946**	-0.077 ***	0.105 ***	-0.020 **	0.088 ***
1909	0.084 ***	-0.083	0.020	-0.080	**1947**	-0.080 ***	0.078 ***	-0.013 *	0.076 ***
1910	0.116 ***	-0.008	0.049 ***	-0.009	**1948**	-0.075 ***	0.064 ***	-0.007	0.064 ***
1911	0.075 ***	-0.046	0.017	-0.062	**1949**	-0.072 ***	0.086 ***	-0.004	0.091 ***
1912	0.093 ***	-0.034	0.030 **	-0.043	**1950**	-0.065 ***	0.040 *	-0.001	0.045 **
1913	0.073 ***	0.011	0.019	-0.005	**1951**	-0.063 ***	0.036 *	-0.002	0.048 ***
1914	0.107 ***	-0.085 **	0.050 ***	-0.098 ***	**1952**	-0.054 ***	0.042 **	0.004	0.045 **
1915	0.065 ***	-0.009	0.023 *	-0.037	**1953**	-0.040 ***	0.034 *	0.010	0.048 ***
1916	0.087 ***	-0.082 **	0.045 ***	-0.099 ***	**1954**	-0.030 ***	-0.005	0.008	0.018
1917	0.044 ***	0.002	0.009	-0.013	**1955**	-0.021 **	-0.004	0.009	0.019
1918	0.053 ***	0.009	0.028 **	-0.009	**1956**	-0.006	-0.016	0.013 *	0.016
1919	0.070 ***	0.004	0.046 ***	-0.027	**1957**	-0.013	-0.021	0.001	0.012
1920	0.047 ***	0.057 *	0.030 ***	0.019	**1958**	-0.016	-0.030	-0.007	0.004
1921	0.026 **	0.013	0.024 **	-0.027	**1959**	0.011	-0.064 ***	0.015 *	-0.025
1922	0.033 **	0.063 **	0.030 ***	0.022	**1960**	0.001	-0.050 **	-0.005	-0.008
1923	0.020	0.049 *	0.015	0.011	**1961**	0.003	-0.097 ***	-0.003	-0.062 ***
1924	0.020	0.011	0.016 *	-0.028	**1962**	0.018	-0.123 ***	0.010	-0.082 ***
1925	0.038 ***	0.019	0.035 ***	-0.019	**1963**	0.010	-0.114 ***	0.001	-0.073 ***
1926	0.018	0.051 *	0.020 **	0.005	**1964**	0.018	-0.097 ***	0.007	-0.057 **
1927	-0.013	0.078 ***	-0.016 *	0.035	**1965**	0.027	-0.141 ***	0.016	-0.096 ***
1928	-0.018	0.105 ***	-0.018 **	0.082 ***	**1966**	0.022	-0.136 ***	0.012	-0.095 ***
1929	0.005	0.064 **	0.005	0.029	**1967**	0.027 *	-0.117 ***	0.020 *	-0.097 ***
1930	-0.053 ***	0.089 ***	-0.038 ***	0.052 **	**1968**	0.029 *	-0.174 ***	0.020	-0.136 ***
1931	-0.054 ***	0.152 ***	-0.039 ***	0.121 ***	**1969**	0.055 ***	-0.149 ***	0.043 ***	-0.110 ***
1932	-0.059 ***	0.092 ***	-0.038 ***	0.064 ***	**1970**	0.033 *	-0.096 ***	0.029 **	-0.070 **
1933	-0.040 ***	0.109 ***	-0.023 **	0.077 ***	**1971**	0.008	-0.069 **	0.004	-0.038
1934	-0.065 ***	0.123 ***	-0.043 ***	0.096 ***	**1972**	0.038 *	-0.149 ***	0.022	-0.103 ***
1935	-0.083 ***	0.125 ***	-0.057 ***	0.096 ***	**1973**	0.038 *	-0.179 ***	0.020	-0.125 ***
1936	-0.061 ***	0.102 ***	-0.042 ***	0.083 ***	**1974**	0.033	-0.091 **	0.015	-0.057
1937	-0.086 ***	0.119 ***	-0.053 ***	0.087 ***	**1975**	0.068 ***	-0.115 **	0.041 **	-0.080 *
1938	-0.076 ***	0.089 ***	-0.051 ***	0.062 ***	**1976**	0.054 *	-0.227 ***	0.013	-0.150 ***
1939	-0.071 ***	0.086 ***	-0.044 ***	0.069 ***	**1977**	0.026	-0.109	0.002	-0.077
1940	-0.081 ***	0.105 ***	-0.049 ***	0.085 ***					

Source: See Table 1a. Two-Tailed Tests: * $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Figure 1. Random Coefficients for Age

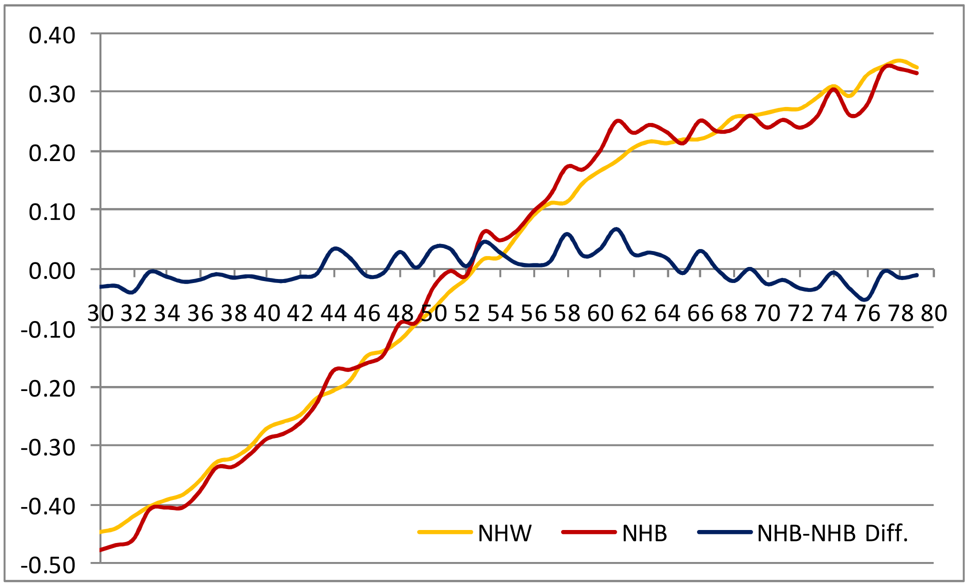

Figure 1a. Adjusted Age-Specific Mean of Self-Rated Health for NHWs and NHBs

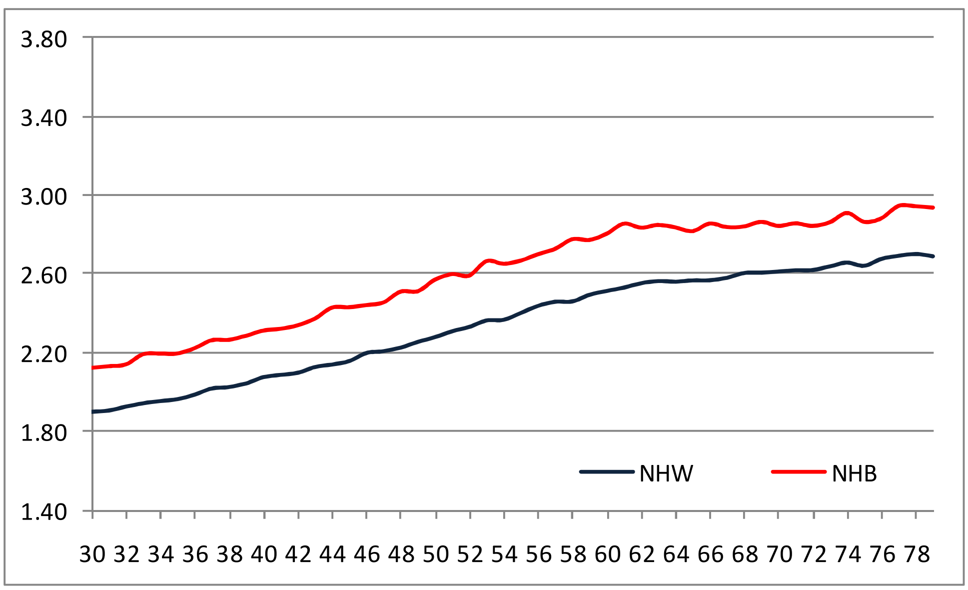

Figure 2. Random Coefficients for Periods

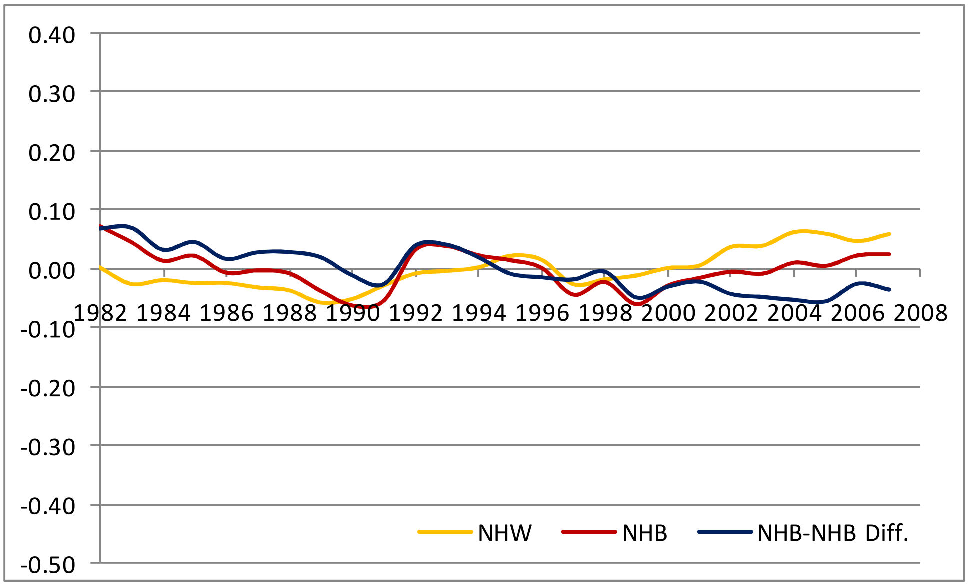

Figure 2a. Adjusted Period-Specific Mean of Self-Rated Health for NHWs and NHBs

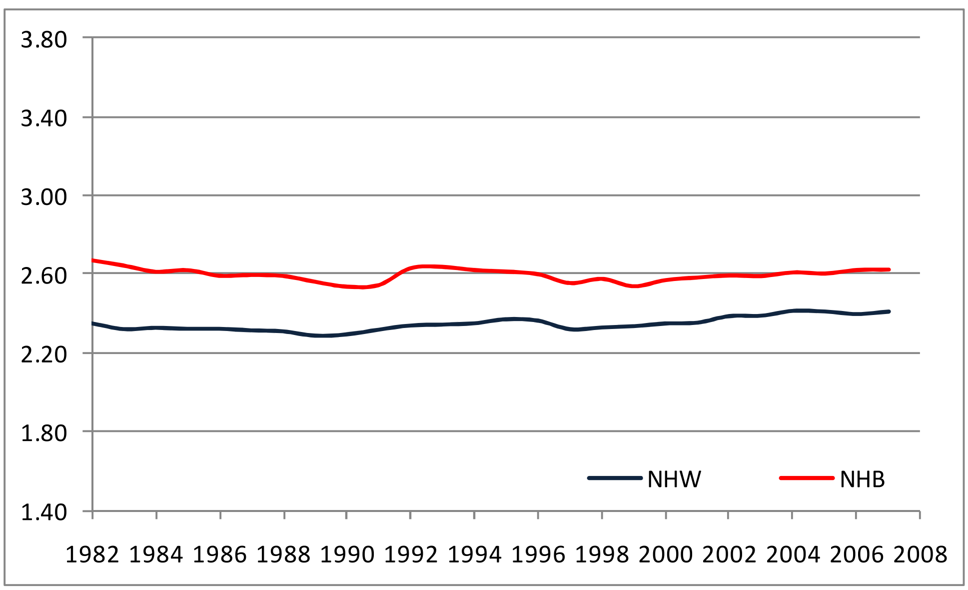

Figure 3. Random Coefficients for Cohorts

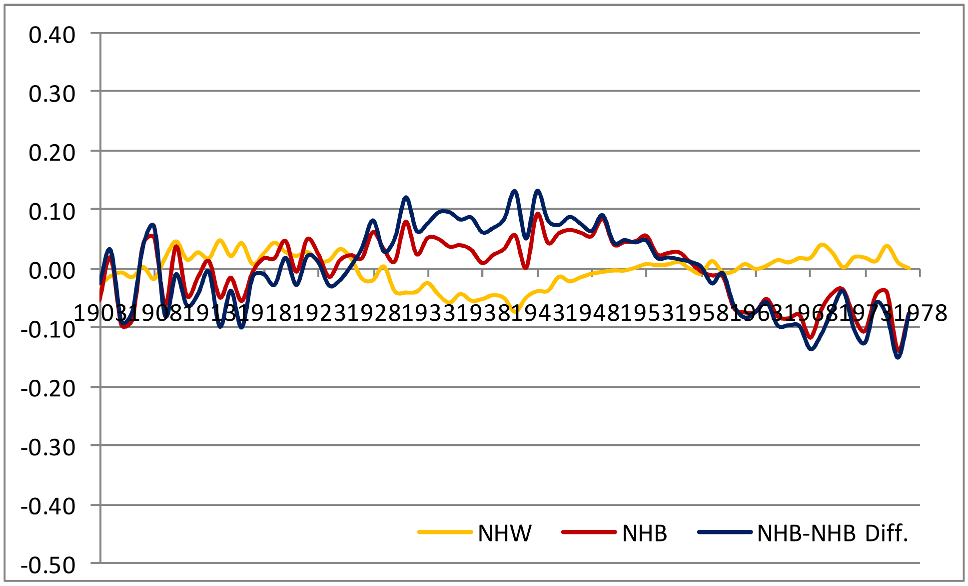

Figure 3a. Adjusted Cohort-Specific Mean of Self-Rated Health for NHWs and NHBs

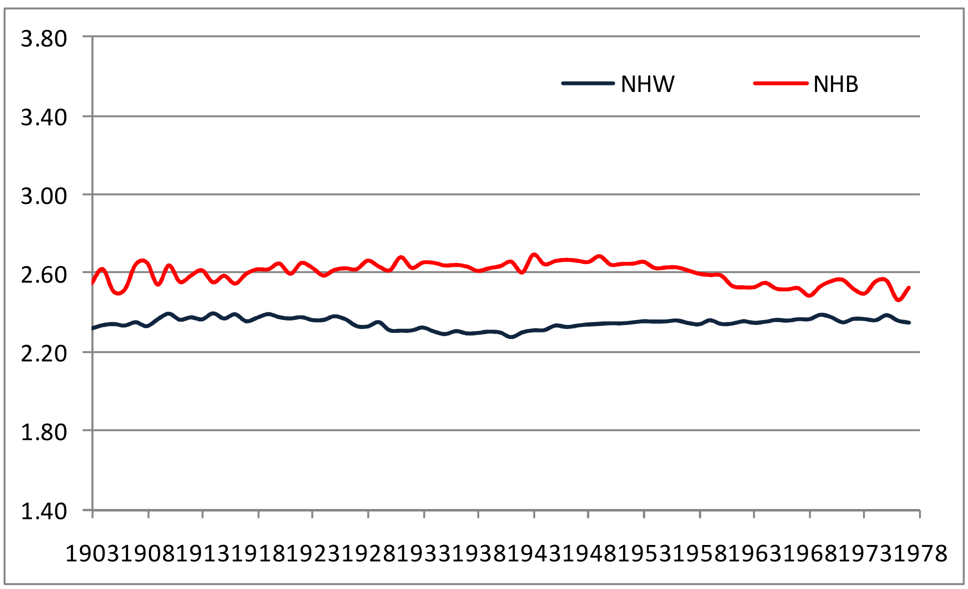

Figure 4. Age Variations in the NHW-NHB Difference in SRH with Random Effects of (1) Age, (2) Age + Cohort, and (3) Age + Cohort + Period