

Medicare, Hospital Utilization and Mortality: Evidence from the Program's Origins

Abstract:

We examine changes in hospital utilization and mortality rates occurring after the original introduction of Medicare in July of 1966 with the most comprehensive data ever used. The analysis utilizes the “age discontinuity” design of recent studies, while accounting for pre-existing trends as done in another set of more aggregated research.

We find: i) clear evidence that Medicare increased hospital care utilization and costs among the elderly, but at a lower rate than previously found; ii) significant reductions in the mortality of the eligible population that exhibit an age discontinuity only after the introduction of Medicare – patterns not found in nations that did not introduce a Medicare-style program in the 1960's; and iii) the sharpest mortality reductions in acute causes of death (heart disease), with no change in cancer deaths. We estimate that Medicare's introduction had a cost-per-life year ratio below \$200 (in 1982-84 dollars), with an even lower cost ratio for quality-adjusted life years. In an analysis of changes over time in the characteristics of the “marginal” person who benefited from Medicare coverage, we find that the 65-and-over discontinuity in insurance coverage fell over time, and that the rate of decline was highest among blacks, the less-educated, and poor. We also find a sharp increase during the 1980s in the use of coronary artery bypass graft (CABG) surgery on the Medicare eligible, which coincided with an increase in the *relative* Medicare reimbursement rate for this procedure.

Kenneth Y. Chay
Department of Economics
Brown University
Box B
Providence, RI 02912
and NBER
kenneth_chay@brown.edu

Shailender Swaminathan
Center for Gerontology and Health Care Research
Department of Community Health
Brown University
121 South Main Street
Providence, RI 02912
shailender_swaminathan@brown.edu

Daeho Kim
Department of Economics
Brown University
Box B
Providence, RI 02912
daeho_kim@brown.edu

Table 1: Discontinuity in hospital insurance rates at ages 65-and-over, among individuals aged 45 to 80
[absolute value of t-ratio]

	Discontinuity in hospital insurance rate (per 100) by age group (deviated from fifth-order polynomial in age)					
	Unadjusted for individual characteristics			Adjusted for individual characteristics		
	FY 1963 (1a)	Growth after FY 1963 by		FY 1963 (2a)	Growth after FY 1963 by	
		FY 1968 (1b)	CY 1974 (1c)		FY 1968 (2b)	CY 1974 (2c)
A. All races						
Ages 65 to 69	-1.88 [1.20]	23.68*** [19.18]	18.79*** [16.10]	-0.14 [0.10]	24.79*** [21.57]	17.80*** [16.08]
Ages 70 to 74	0.46 [0.15]	30.38*** [19.70]	24.61*** [16.86]	2.44 [0.86]	30.91*** [21.53]	23.90*** [17.28]
Ages 75 to 80	-1.94 [0.42]	38.79*** [20.12]	34.21*** [18.89]	0.83 [0.19]	39.61*** [22.08]	33.05*** [19.25]
Year effect	---	4.98 [1.49]	-3.34 [1.03]	---	3.11 [1.03]	-2.55 [0.84]
Year-age trend ($\div 10$)	---	-0.01 [0.01]	2.71*** [4.47]	---	-0.37 [0.65]	1.42*** [2.53]
R-squared	0.042	0.058	0.097	0.212	0.207	0.217
Sample Size	39,164	78,298	73,445	39,164	78,298	73,445
B. Whites only						
Ages 65 to 69	-1.97 [1.22]	22.56*** [17.96]	17.87*** [15.07]	-0.57 [0.38]	23.68*** [20.00]	16.68*** [14.74]
Ages 70 to 74	1.47 [0.47]	28.48*** [18.12]	23.61*** [15.97]	2.53 [0.85]	29.16*** [19.69]	22.61*** [16.02]
Ages 75 to 80	0.04 [0.01]	38.23*** [19.54]	33.71*** [18.29]	1.44 [0.32]	38.84*** [21.01]	32.42*** [18.41]
Sample Size	35,545	71,099	66,755	35,545	71,099	66,755
C. Blacks only						
Ages 65 to 69	-2.36 [0.42]	36.01*** [7.54]	30.66*** [6.67]	1.23 [0.24]	37.14*** [8.20]	30.84*** [6.94]
Ages 70 to 74	-15.96 [1.57]	54.47*** [9.28]	44.40*** [7.83]	-5.60 [0.57]	53.06*** [9.45]	42.39*** [7.58]
Ages 75 to 80	-27.36* [1.82]	48.45*** [6.43]	46.65*** [6.71]	-13.66 [0.94]	49.84*** [7.02]	45.84*** [6.83]
Sample Size	3,358	6,678	6,183	3,358	6,678	6,183

Notes: Samples based on forty-five to eighty year-olds in the *National Health Interview Surveys*. Outcome variable is percent with hospital insurance. FY 1963 and FY 1968 are for fiscal years (July 1 to June 30); CY 1974 is for calendar year (January 1 to December 31). All analyses are weighted by *NHIS* annual sampling weights and adjust for a fifth-order polynomial in age, year effects, and year effects interacted with age. Individual characteristics in columns (2a) to (2c) include indicators for gender, race, region of residence, education and income category fixed effects, unemployment status, married/separated/divorced/widowed status, and (peace-time/wartime) veteran status. Estimated standard errors are corrected for heteroskedasticity.

*** significant at 1-percent level, ** significant at 5-percent level, * significant at 10-percent level

Table 2: Discontinuity in hospital discharge rates at ages 65-and-over, among individuals aged 45 to 80
[absolute value of t-ratio]

	Discontinuity in discharge rates from short-stay hospital in past 12 months (per 1,000) (deviated from fifth-order polynomial in age)					
	Unadjusted for individual characteristics			Adjusted for individual characteristics		
	1964-1966 (1a)	Growth after 1964-66 by		1964-1966 (2a)	Growth after 1964-66 by	
		1968-1969 (1b)	1970-1972 (1c)		1968-1969 (2b)	1970-1972 (2c)
A. All races						
Ages 65 to 69	3.11 [0.29]	27.74** [2.50]	35.32*** [3.13]	-5.06 [0.43]	26.60** [2.39]	35.44*** [2.94]
Ages 70 to 74	-23.25 [1.21]	46.35*** [3.69]	31.46*** [2.81]	-30.08 [1.38]	45.74*** [3.61]	33.42*** [2.93]
Ages 75 to 80	-83.97*** [3.21]	75.98*** [3.89]	83.10*** [6.45]	-87.19*** [2.95]	73.68*** [3.75]	82.33*** [6.25]
Year effect	---	14.99 [0.53]	8.03 [0.36]	---	16.79 [0.59]	8.84 [0.38]
Year-age trend ($\div 10$)	---	-3.92 [0.72]	-0.03 [0.01]	---	-4.15 [0.75]	-0.69 [0.16]
Sample Size	114,846	228,944	225,884	114,846	228,944	225,884
B. Whites only						
Ages 65 to 69	2.62 [0.23]	27.74** [2.00]	37.10*** [2.99]	-4.97 [0.41]	26.20* [1.89]	36.99*** [2.79]
Ages 70 to 74	-23.66 [1.27]	46.27*** [3.14]	31.38** [2.63]	-29.58 [1.43]	45.49*** [3.07]	32.40*** [2.69]
Ages 75 to 80	-74.33*** [2.70]	68.92*** [3.35]	87.39*** [6.32]	-77.24** [2.58]	66.10*** [3.18]	85.70*** [6.08]
Year effect	---	9.27 [0.28]	2.87 [0.12]	---	11.29 [0.34]	2.56 [0.10]
Year-age trend ($\div 10$)	---	-2.92 [0.46]	0.48 [0.11]	---	-3.11 [0.48]	0.03 [0.01]
Sample Size	104,688	208,204	205,323	104,688	208,204	205,323

Notes: See notes to Table 1. Samples based on forty-five to eighty year-olds in the *National Health Interview Surveys*. Outcome variable is number of discharges from short-stay hospital in past twelve months per 1,000 individuals. For 1964 to 1966, discharges are for fiscal years; for 1968 they are for both fiscal and calendar year; 1969 and 1970 to 1972 are for calendar years. Estimated standard errors are corrected for heteroskedasticity and clustering at the age-level over time.
*** significant at 1-percent level, ** significant at 5-percent level, * significant at 10-percent level

Table 3A: Hospital insurance rates for South and North regions, before and after Medicare
(estimated standard error)

	Hospital insurance rates (per 100) by region and age group									
	July 1, 1962 to June 30, 1963					<i>Growth</i> by 1974 Calendar Year				
	age 5-14 (1a)	age 35-44 (1b)	age 45-54 (1c)	age 55-64 (1d)	age 65-74 (1e)	age 5-14 (2a)	age 35-44 (2b)	age 45-54 (2c)	age 55-64 (2d)	age 65-74 (2e)
A. All races										
South	56.94	68.99	68.93	63.02	53.71	20.93*** (0.73)	14.52*** (0.89)	14.11*** (0.90)	17.62*** (1.09)	42.23*** (1.10)
North	78.79	83.26	82.62	79.49	66.25	10.01*** (0.45)	7.06*** (0.54)	8.25*** (0.54)	10.23*** (0.65)	31.89*** (0.73)
South – North	-21.86*** (0.62)	-14.28*** (0.76)	-13.69*** (0.79)	-16.47*** (0.97)	-12.54*** (1.23)	10.92*** (0.86)	7.46*** (1.04)	5.86*** (1.05)	7.39*** (1.27)	10.34*** (1.32)
B. Whites only										
South	63.97	72.21	72.52	66.64	58.52	17.87*** (0.79)	13.83*** (0.92)	13.25*** (0.93)	16.66*** (1.14)	38.14*** (1.18)
North	81.82	84.73	83.83	80.90	67.55	8.27*** (0.45)	6.56*** (0.53)	8.02*** (0.54)	9.60*** (0.65)	30.75*** (0.73)
South – North	-17.86*** (0.67)	-12.51*** (0.80)	-11.31*** (0.82)	-14.26*** (1.03)	-9.03*** (1.31)	9.59*** (0.91)	7.28*** (1.06)	5.22*** (1.07)	7.06*** (1.31)	7.39*** (1.39)

Notes: Estimated standard errors corrected for heteroskedasticity.

*** significant at 1-percent level, ** significant at 5-percent level, * significant at 10-percent level

Comparison of difference in insurance rates for 55-64 and 65-74 year-olds in the South versus North.

1. All races
 - i) July 1962 to June 1963 = 3.93 (per 100), [t-ratio = 2.51]
 - ii) *Growth* by 1974 Calendar year = 2.95 [1.62]
2. Whites only
 - i) July 1962 to June 1963 = 5.23 (per 100), [t-ratio = 3.14]
 - ii) *Growth* by 1974 Calendar year = 0.33 [0.17]

Table 3B: Growth in hospital discharge rates after Medicare for South and North regions
(estimated standard error)

	<i>Growth</i> in hospital discharge rates (per 1,000) between 1964-1966 and 1970-1972				
	age 5-14 (1)	age 35-44 (2)	age 45-54 (3)	age 55-64 (4)	age 65-74 (5)
A. All races					
South	3.26 (2.74)	-9.31 (9.97)	15.08 (10.44)	2.55 (9.06)	42.95 ^{***} (13.63)
North	2.51 (2.56)	4.14 (4.27)	9.83 ^{**} (4.33)	8.12 (5.42)	30.66 ^{***} (9.77)
South – North	0.75 (3.59)	-13.45 (8.47)	5.25 (11.93)	-5.57 (8.12)	12.29 (16.24)
B. Whites only					
South	0.83 (2.71)	-15.62 [*] (9.27)	8.34 (12.61)	-5.34 (9.80)	38.65 ^{***} (13.67)
North	1.31 (2.85)	0.48 (5.13)	8.86 (5.32)	7.42 (5.21)	31.37 ^{***} (10.23)
South – North	-0.48 (3.16)	-16.10 [*] (8.30)	-0.52 (13.76)	-12.76 (10.02)	7.28 (13.91)

Notes: Estimated standard errors corrected for heteroskedasticity and clustering at the age-level over time.
^{***} significant at 1-percent level, ^{**} significant at 5-percent level, ^{*} significant at 10-percent level

Comparison of difference in discharge rates for 55-64 and 65-74 year-olds in the South versus North.

3. All races, *Growth* between 1964-66 and 1970-72 = 17.86 [0.97]
4. Whites only, *Growth* between 1964-66 and 1970-72 = 20.04 [1.15]

Table 4: Discontinuity in activity limitation at ages 65-and-over, among individuals aged 45 to 80
[absolute value of t-ratio]

	Discontinuity in activity limitation rate (per 1,000), deviated from fifth-order polynomial in age							
	Unadjusted for individual characteristics				Adjusted for individual characteristics			
	1965-1966 (1a)	Change after 1965-1966 by			1965-1966 (2a)	Change after 1965-1966 by		
		1969-1970 (1b)	1971-1972 (1c)	1973-1974 (1d)		1969-1970 (2b)	1971-1972 (2c)	1973-1974 (2d)
A. All races								
Ages 65 to 69	13.64 [1.13]	-34.98*** [4.09]	-32.10*** [4.77]	-53.69*** [3.79]	-8.89 [0.80]	-32.33*** [3.71]	-33.28*** [4.81]	-45.20*** [3.24]
Ages 70 to 74	15.66 [0.99]	-57.89*** [5.23]	-45.24*** [4.53]	-83.89*** [6.02]	-5.99 [0.34]	-60.61*** [5.64]	-43.71*** [5.03]	-69.27*** [4.85]
Ages 75 to 80	-5.89 [0.26]	-51.66*** [3.96]	-45.00*** [3.51]	-112.15*** [6.46]	-19.04 [0.80]	-60.38*** [4.67]	-51.48*** [4.00]	-102.56*** [5.59]
Year effect	---	-2.75 [0.14]	34.43 [1.38]	-34.67 [1.13]	---	-3.03 [0.15]	33.18 [1.35]	-2.35 [0.07]
Year-age trend ($\div 10$)	---	0.70 [0.18]	-3.84 [0.87]	14.21** [2.44]	---	3.97 [1.03]	0.60 [0.13]	14.01** [2.27]
R-squared	0.080	0.070	0.067	0.066	0.157	0.148	0.149	0.149
Sample Size	77,994	148,629	155,797	147,154	77,994	148,629	155,797	147,154
B. Whites only								
Ages 65 to 69	9.83 [0.69]	-39.66*** [4.50]	-36.95*** [4.60]	-59.50*** [3.85]	-9.33 [0.74]	-37.36*** [4.28]	-40.10*** [5.22]	-51.20*** [3.39]
Ages 70 to 74	8.50 [0.44]	-59.65*** [5.04]	-50.05*** [4.68]	-85.59*** [5.62]	-8.21 [0.41]	-63.03*** [5.47]	-49.98*** [5.27]	-70.61*** [4.51]
Ages 75 to 80	-13.09 [0.48]	-56.23*** [4.15]	-44.24*** [3.24]	-115.87*** [6.24]	-20.22 [0.73]	-63.58*** [4.65]	-53.97*** [4.02]	-108.18*** [5.51]
Sample Size	71,243	135,198	141,787	134,120	71,243	135,198	141,787	134,120

Notes: See notes to Table 1. Samples based on forty-five to eighty year-olds in the *National Health Interview Surveys*. Outcome variable is indicator for activity limitation due to chronic conditions (per 1,000 individuals). Fiscal years are used for 1965 to 1966; calendar years for every other year. Estimated standard errors are corrected for heteroskedasticity and clustering at the age-level over time.

*** significant at 1-percent level, ** significant at 5-percent level, * significant at 10-percent level

Table 5: Discontinuity in mortality rates at ages 65-and-over, among those aged 45 to 80
[absolute value of t-ratio]

	Discontinuity in mortality rate (per 10,000) by age group and cause (deviated from fifth-order polynomial in age)					
	All races			Whites only		
	Change after 1965-1966 by			Change after 1965-1966 by		
	1969-1970 (1a)	1971-1972 (1b)	1973-1974 (1c)	1969-1970 (2a)	1971-1972 (2b)	1973-1974 (2c)
A. All-cause mortality						
Ages 65 to 69	-13.08*** [4.53]	-17.02*** [6.99]	-20.30*** [5.93]	-9.90*** [4.52]	-11.67*** [4.62]	-14.09*** [4.78]
Ages 70 to 74	-6.07 [0.77]	-8.26 [1.50]	-8.64* [1.92]	-10.56* [1.70]	-14.41*** [2.70]	-16.97*** [6.19]
Ages 75 to 80	-17.75*** [2.93]	-10.60** [2.23]	-24.03*** [4.52]	-19.67*** [3.52]	-15.51*** [3.46]	-27.77*** [6.80]
B. Heart disease mortality						
Ages 65 to 69	-5.93*** [4.92]	-8.67*** [8.29]	-10.27*** [6.18]	-5.03*** [4.65]	-6.74*** [5.49]	-8.19*** [5.04]
Ages 70 to 74	-1.31 [0.37]	-4.29 [1.50]	-4.92** [2.64]	-3.48 [1.21]	-6.94** [2.51]	-8.76*** [6.45]
Ages 75 to 80	-7.64*** [2.79]	-5.31* [1.98]	-13.58*** [5.11]	-8.70*** [3.30]	-7.57*** [2.85]	-15.22*** [7.76]
C. Stroke mortality						
Ages 65 to 69	-1.89** [2.62]	-2.97*** [6.44]	-3.51*** [6.21]	-1.44*** [5.35]	-2.03*** [6.50]	-2.42*** [6.39]
Ages 70 to 74	-1.24 [1.51]	-2.63*** [2.72]	-3.41*** [4.06]	-1.74*** [3.68]	-3.53*** [4.44]	-4.49*** [7.34]
Ages 75 to 80	-5.34*** [3.61]	-5.50*** [4.58]	-7.83*** [5.29]	-5.99*** [4.21]	-6.49*** [5.64]	-8.69*** [6.09]
D. Cancer mortality						
Ages 65 to 69	-2.36*** [3.74]	-1.71*** [2.92]	-2.88*** [3.61]	-1.61*** [2.76]	-0.60 [0.90]	-1.53*** [2.01]
Ages 70 to 74	-1.20 [0.68]	0.39 [0.36]	0.92 [0.99]	-1.89 [1.24]	-0.49 [0.43]	-0.36 [0.48]
Ages 75 to 80	0.51 [0.51]	3.65*** [3.92]	2.64*** [2.90]	0.52 [0.58]	3.13*** [3.37]	2.51*** [3.04]

Notes: Data consist of mortality rates for forty-five to eighty year-olds calculated at the year-by-age level from the *National Mortality Detail Files* (see text for further details). The outcome variable is the mortality rate (per 10,000 individuals) in each calendar year. All analyses use cell population counts as frequency weights and adjust for a fifth-order polynomial in age, year effects, and year effects interacted with age. Estimated standard errors are corrected for heteroskedasticity and clustering at the age-level over time.

*** significant at 1-percent level, ** significant at 5-percent level, * significant at 10-percent level

Table 6: Cost-per-life year ratios (for whites)

	Birth year		
	1896 (1)	1899 (2)	1904 (3)
Age at end of 1966	70	67	62
Ages eligible for Medicare	70+	67+	65+
Ages of added Medicare relative to 1896 cohort	---	67 to 69	65 to 69
Added discharges (implied) relative to 1896 cohort	---	146.5 (per 1,000)	184.2 (per 1,000)
Median life expectancy (for survivors to age 64)	79.28	80.26	80.73
Percent surviving to			
Age 71	80.2	81.2	81.7
Age 76	62.3	64.6	66.3
Age 81	43.7	47.2	49.0
Age 85	30.0	33.0	34.2
Cost-per-life year (\$1982-84)		\$187.30	\$159.45
Cost-per-QALY (\$1982-84)			

Notes: Additional discharges calculated from regression similar to that used in Table 2, column (1c) for whites, except using sample of 45 to 69 year-olds and allowing for different indicators for each age between 65 and 69. Use the age-specific survival rates for each birth cohort as weights when summing up the additional discharges. Average cost-per-discharge \$1,250 in 1982-84 dollars. See text for more details.

Table 7: Discontinuity in hospital insurance rate at age-65 across time, individuals aged 45 to 69
[absolute value of t-ratio]

	Insurance rate at age 65 (per 100), deviated from fourth-order polynomial in age				
	1963 FY (1)	1968 CY (2)	1974 CY (3)	1978 CY (4)	1986 CY (5)
All races	-2.98 [1.72]	17.84*** [14.36]	15.89*** [14.05]	10.71*** [11.33]	7.27*** [5.63]
{ages 60-64 rate}	{71.7}	{78.9}	{83.5}	{89.3}	{89.4}
Sample Size	32,875	31,459	28,613	26,502	14,193
Whites	-3.24 [1.81]	16.39*** [13.24]	15.13*** [13.50]	9.58*** [10.07]	7.65*** [5.99]
	{74.3}	{81.1}	{85.2}	{90.2}	{90.3}
Blacks	0.54 [0.09]	30.14*** [5.46]	20.39*** [3.93]	18.81*** [4.63]	0.58 [0.10]
	{46.3}	{57.5}	{68.1}	{81.7}	{81.6}
<u>Whites only</u>					
HS dropout	---	[]	[]	[]	[]
		{}	{}	{}	{}
HS graduate or less	-3.46 [1.75]	18.42*** [13.21]	16.39*** [12.81]	9.97*** [8.97]	9.08*** [6.01]
	{72.6}	{79.2}	{84.0}	{89.4}	{89.4}
Some college or more	-6.39 [1.61]	6.88*** [2.95]	9.39*** [4.24]	6.25*** [3.71]	3.41 [1.72]
	{86.0}	{90.7}	{91.1}	{94.6}	{95.0}
College graduate	---	[]	[]	[]	[]
		{}	{}	{}	{}
Below 150% of poverty line	-0.73 [0.22]	30.09*** [8.45]	28.52*** [9.49]	15.81*** [5.88]	16.08*** [3.00]
	{52.8}	{58.6}	{70.3}	{80.7}	{72.8}
Above 150% of poverty line	-2.21 [1.19]	16.39*** [13.24]	15.13*** [13.50]	8.76*** [8.88]	7.65*** [5.99]
	{74.3}	{81.1}	{85.2}	{90.9}	{90.3}

Notes: See notes to Table 1. Samples based on forty-five to sixty-nine year-olds in the *National Health Interview Surveys*. Entries are the estimated coefficient on an indicator equal to one if the individual is aged 65 to 69 from year-specific regressions that adjust for a fourth-order polynomial in age. Estimated standard errors are corrected for heteroskedasticity. For a two-person household, 150 percent of the poverty line (median income) is \$2,982 (\$4,868) in 1963, \$3,393 (\$6,809) in 1968, \$4,817 (\$10,406) in 1974, \$6,374 (\$14,165) in 1978, and \$10,707 (\$24,565) in 1986. The income cutoffs used in the *NHIS* for 150 percent of the poverty line are below \$3,000 in 1963 and 1968, below \$5,000 in 1974, below \$7,000 in 1978, and below \$10,000 in 1986.

*** significant at 1-percent level, ** significant at 5-percent level

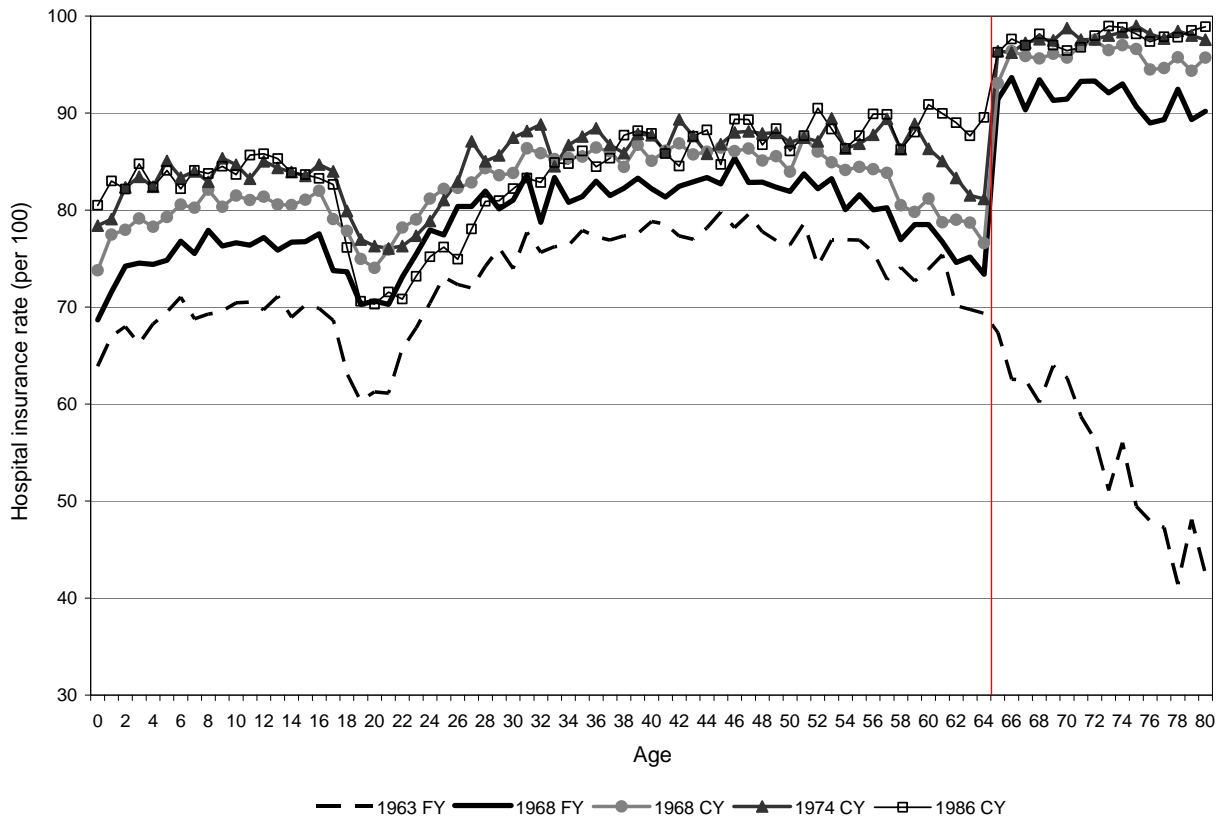
Table A1: Discontinuity in hospital discharge rates at ages 65-and-over, among individuals aged 45 to 80
[absolute value of t-ratio]

	Discontinuity in discharge rates from short-stay hospital in past 12 months (per 1,000) (deviated from fifth-order polynomial in age)					
	Unadjusted for individual characteristics			Adjusted for individual characteristics		
	<i>Growth after 1964-66 by</i>			<i>Growth after 1964-66 by</i>		
	1968-1969	1970-1972	1973-1974	1968-1969	1970-1972	1973-1974
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
A. All races						
Ages 65 to 69	22.55*** [3.27]	35.28*** [3.91]	25.37*** [3.24]	21.12*** [2.94]	34.55*** [3.52]	19.28** [2.44]
Ages 70 to 74	39.19*** [6.31]	31.40*** [3.92]	25.23*** [5.07]	38.18*** [6.20]	32.18*** [3.77]	20.48*** [4.14]
Ages 75 to 80	66.73*** [4.93]	83.03*** [11.80]	72.51*** [5.32]	63.92*** [4.73]	80.72*** [11.54]	64.71*** [4.77]
Year effect	-6.06* [1.94]	7.87** [2.30]	22.82*** [6.66]	-5.48* [1.75]	5.16 [1.43]	23.58*** [5.93]
Sample Size	228,944	225,884	184,006	228,944	225,884	184,006
B. Whites only						
Ages 65 to 69	23.88** [2.59]	37.74*** [3.53]	25.82** [2.37]	22.11** [2.33]	37.02*** [3.18]	19.50* [1.78]
Ages 70 to 74	40.96*** [5.85]	32.26*** [3.49]	30.50*** [6.43]	39.83*** [5.80]	32.45*** [3.36]	25.00*** [5.06]
Ages 75 to 80	62.05*** [4.98]	88.53*** [9.78]	67.43*** [4.22]	58.78*** [4.67]	85.76*** [9.58]	59.60*** [3.78]
Year effect	-6.38* [1.84]	5.47 [1.46]	20.97*** [6.48]	-5.40 [1.51]	2.71 [0.67]	21.83*** [5.36]
Sample Size	208,204	205,323	167,565	208,204	205,323	167,565

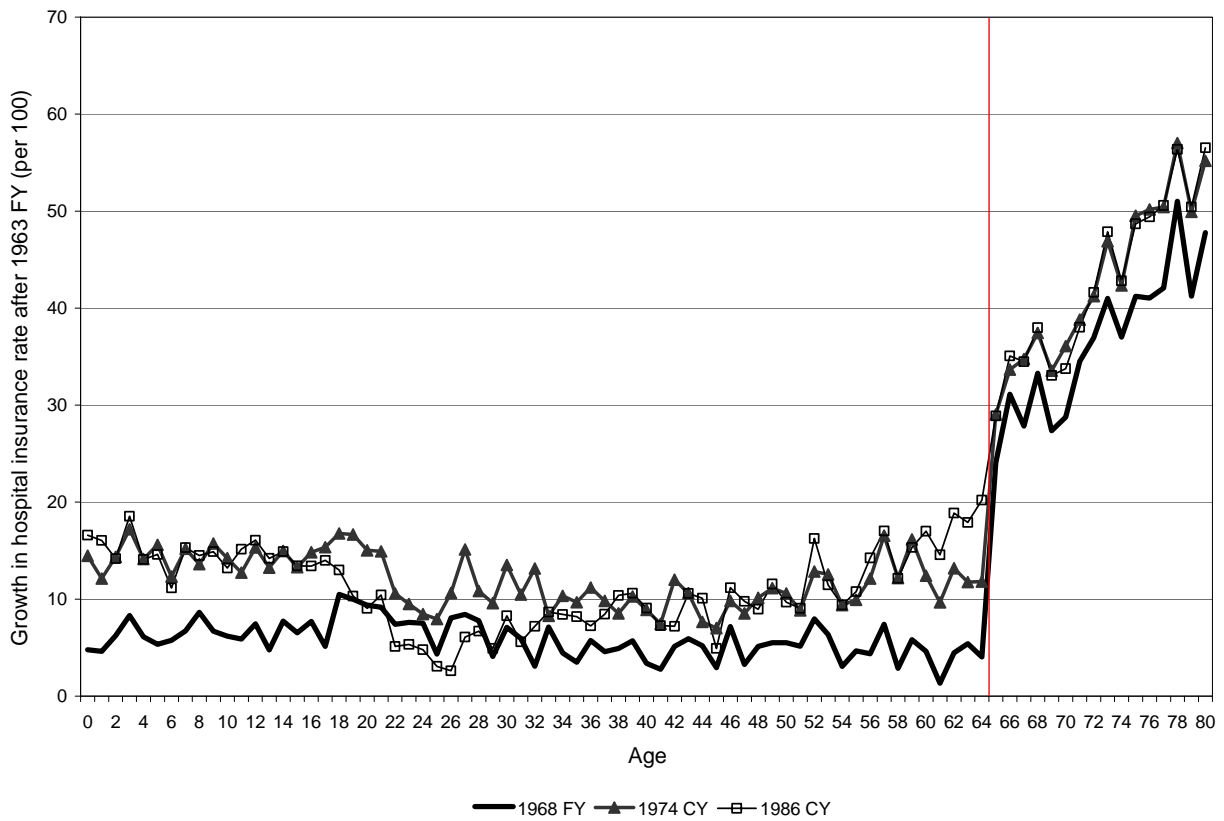
Notes: See notes to Table 2. Samples based on forty-five to eighty year-olds in the *National Health Interview Surveys*.
*** significant at 1-percent level, ** significant at 5-percent level, * significant at 10-percent level

Figure 1: Hospital Insurance rates in the United States, by age and year

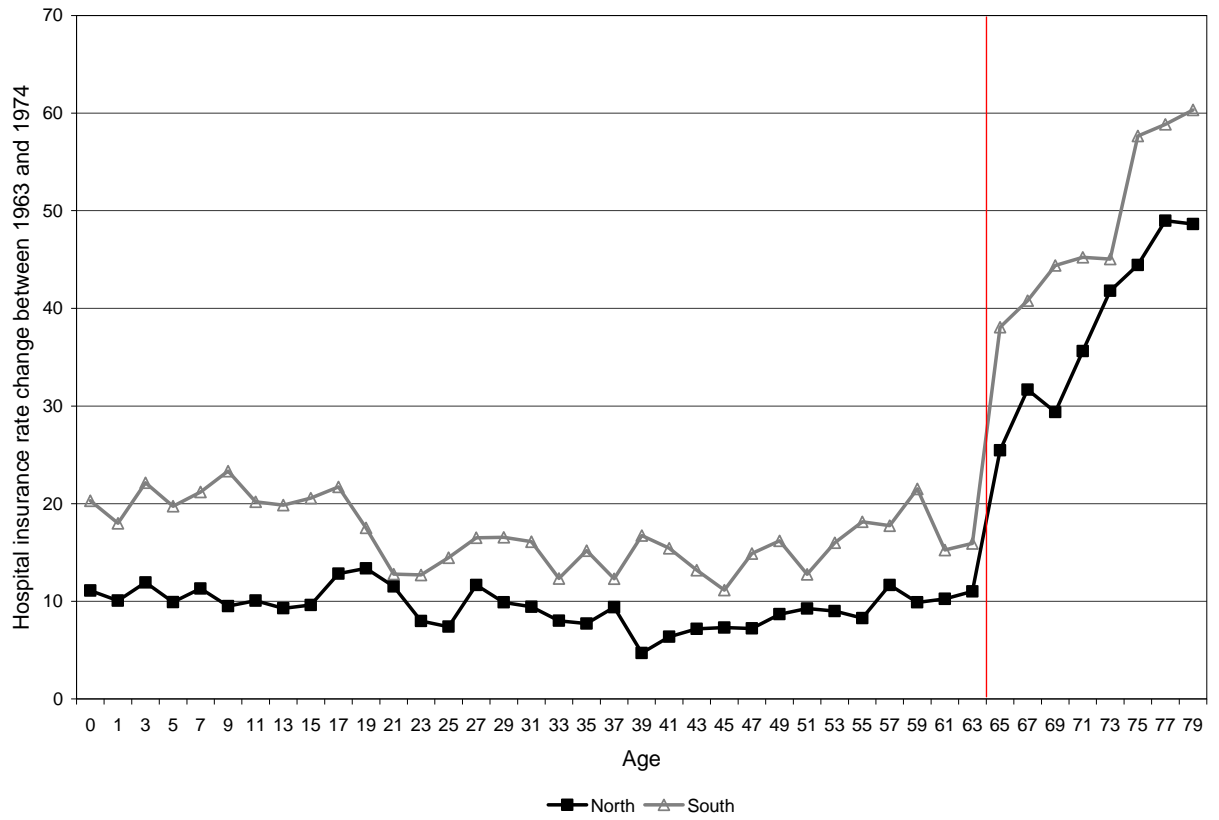
A. Percent with hospital insurance



B. Growth in percent with hospital insurance after 1963 fiscal year



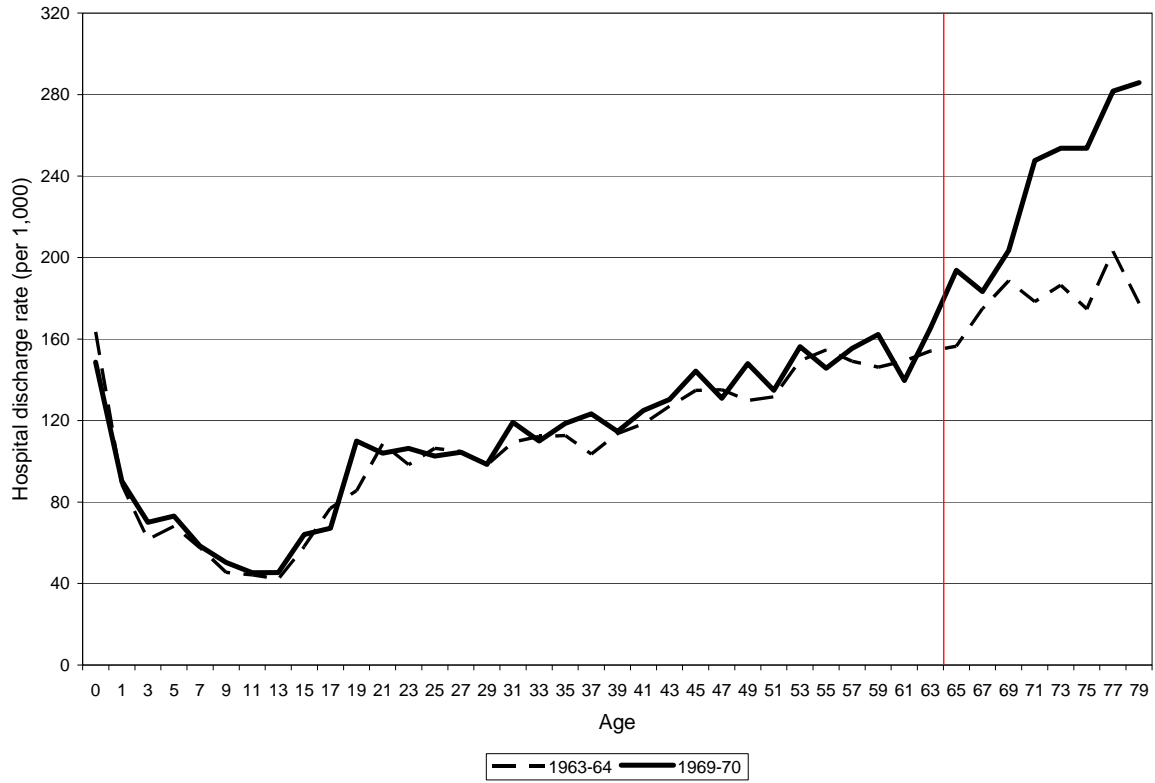
C. Growth in hospital insurance for whites between 1963 and 1974, North and South



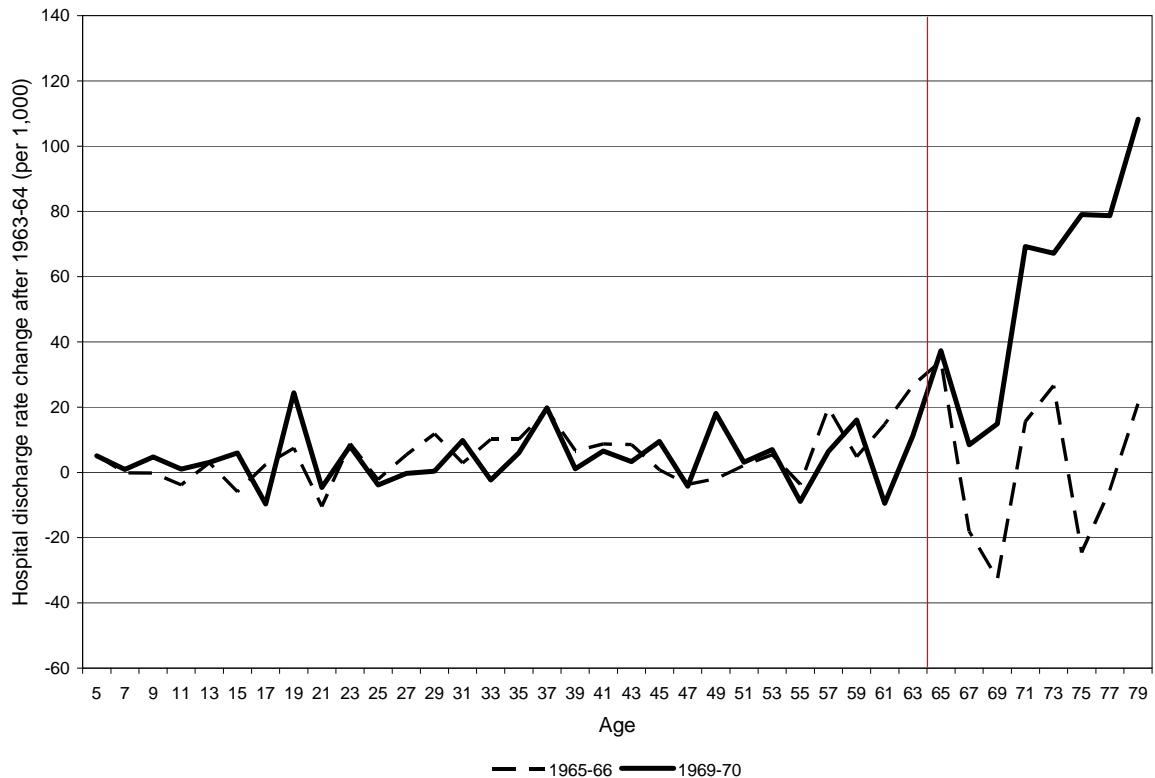
Notes: Data come from the *National Health Interview Surveys*.

Figure 2: Hospital Discharge rates from the *National Health Interview Survey*,
For all races by age and year

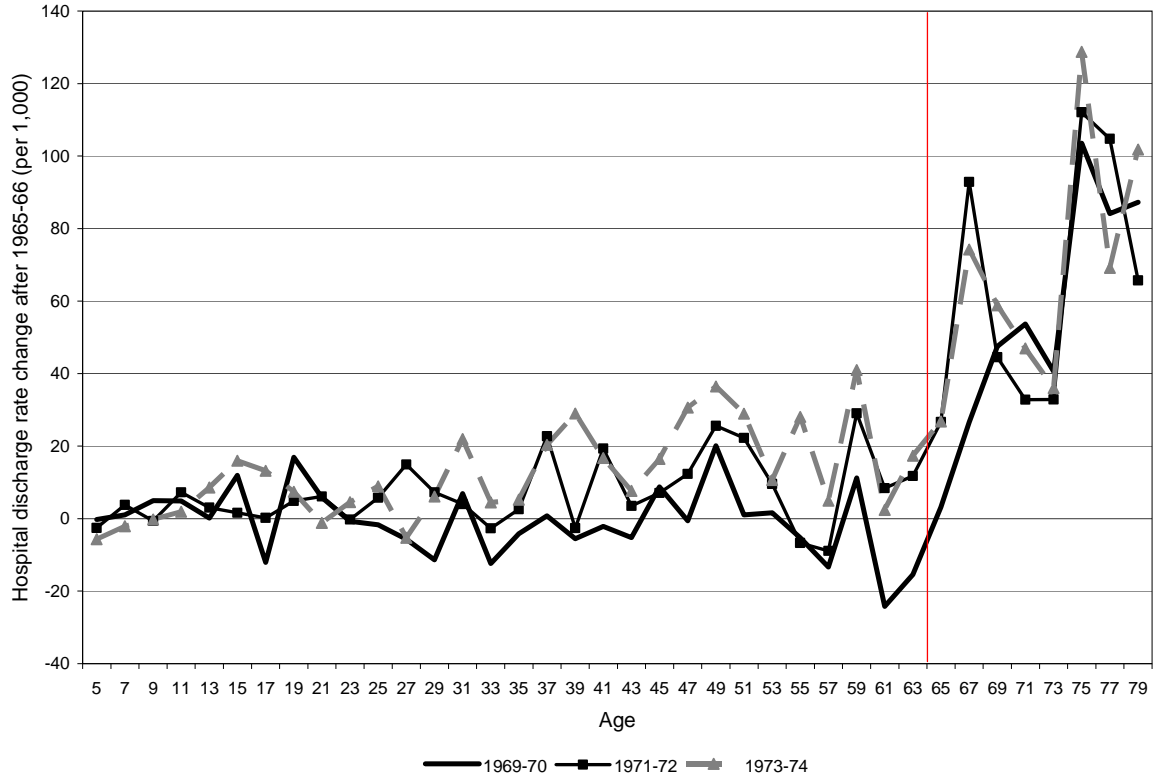
A. Hospital discharge rate per 1,000 individuals



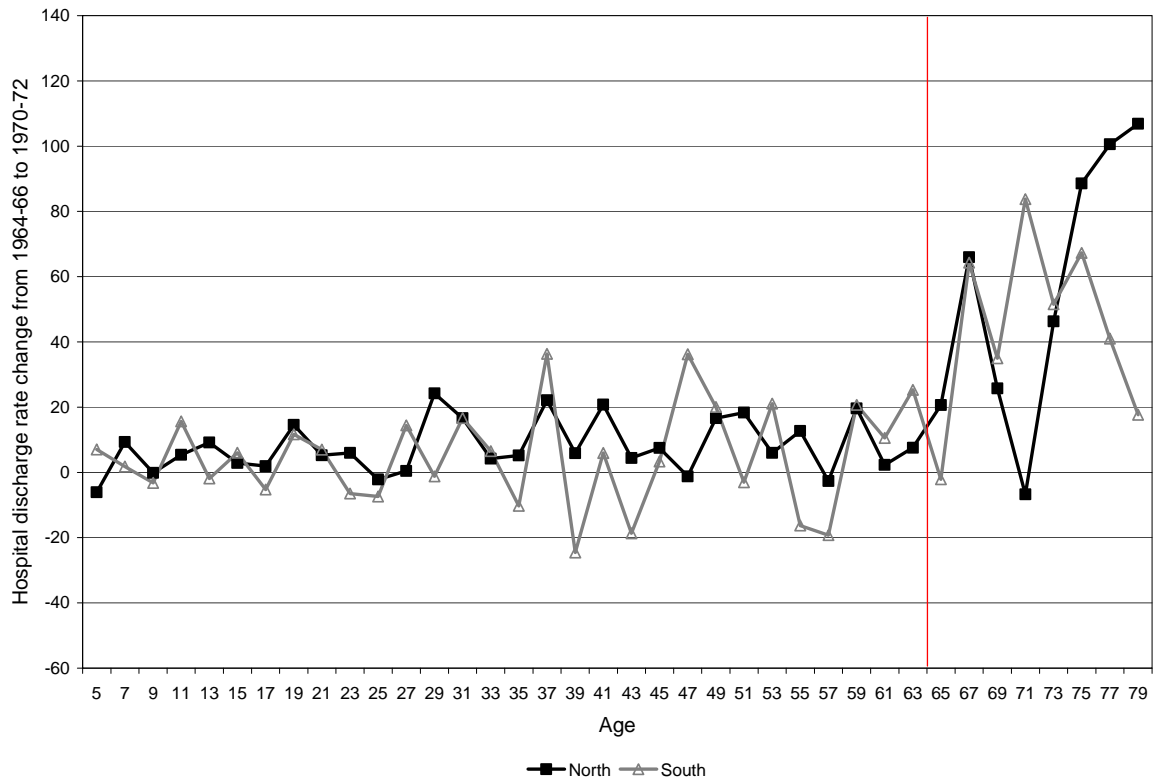
B. Growth in hospital discharge rate after 1963 to 1964



C. Growth in hospital discharge rate after 1965 to 1966



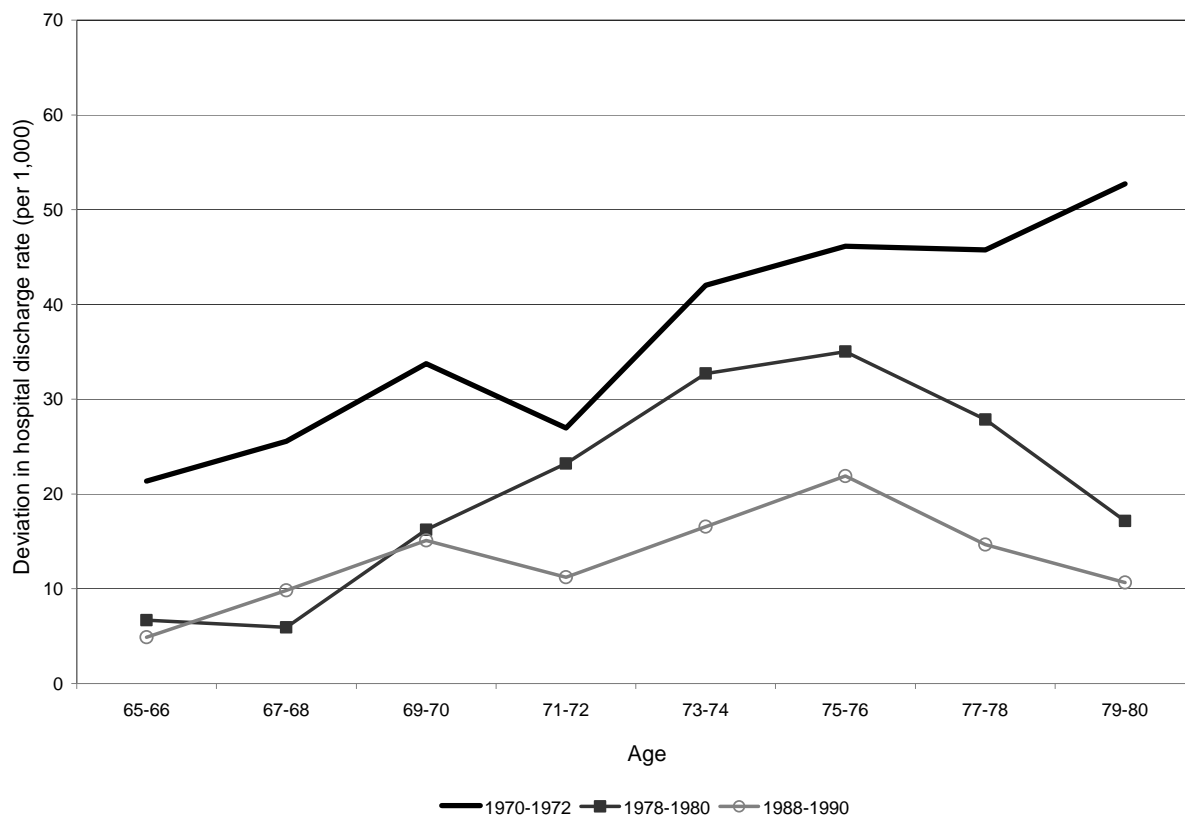
D. Growth in hospital discharge rate between 1964-1966 and 1970-1972, North and South



Notes: Data come from the *National Health Interview Surveys*. Discharges due to delivery of infant are excluded from the hospital discharge rate.

Figure 3: Hospital discharge rates from the *National Hospital Discharge Survey*

A. All hospital discharges for whites 65-and-older, deviated from quadratic polynomial in age

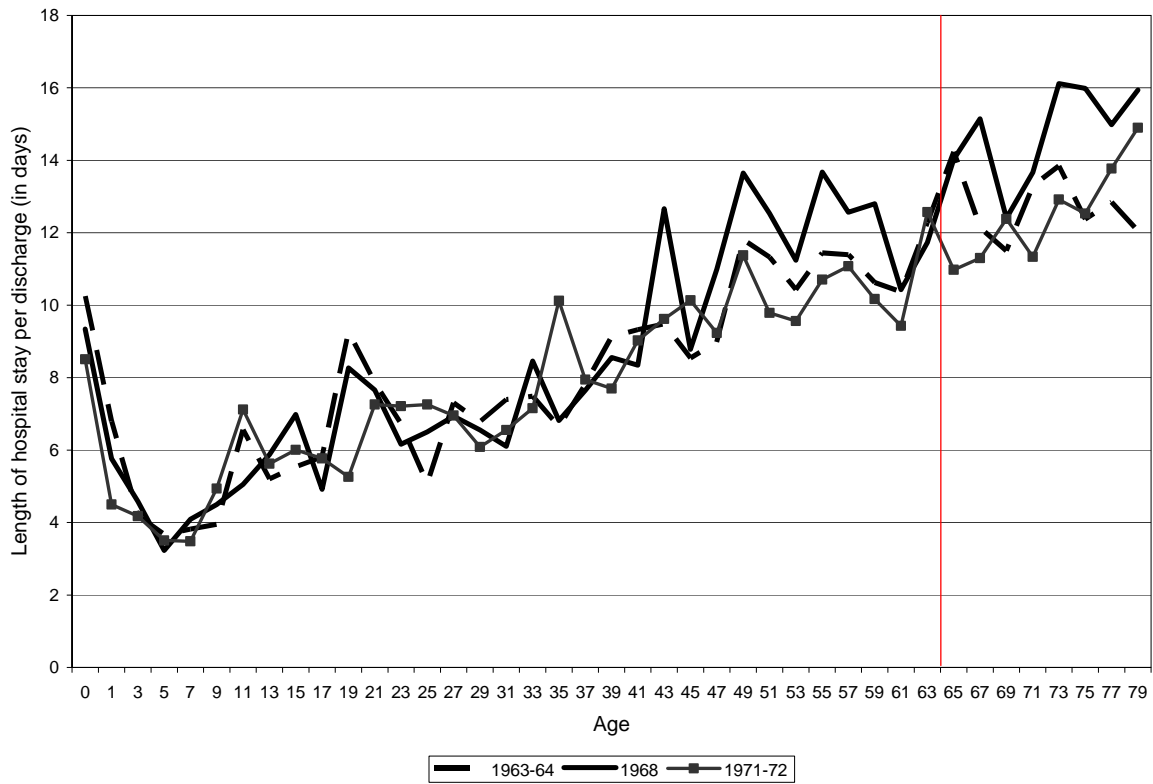


B. Heart disease hospital discharges deviated from quadratic polynomial in age

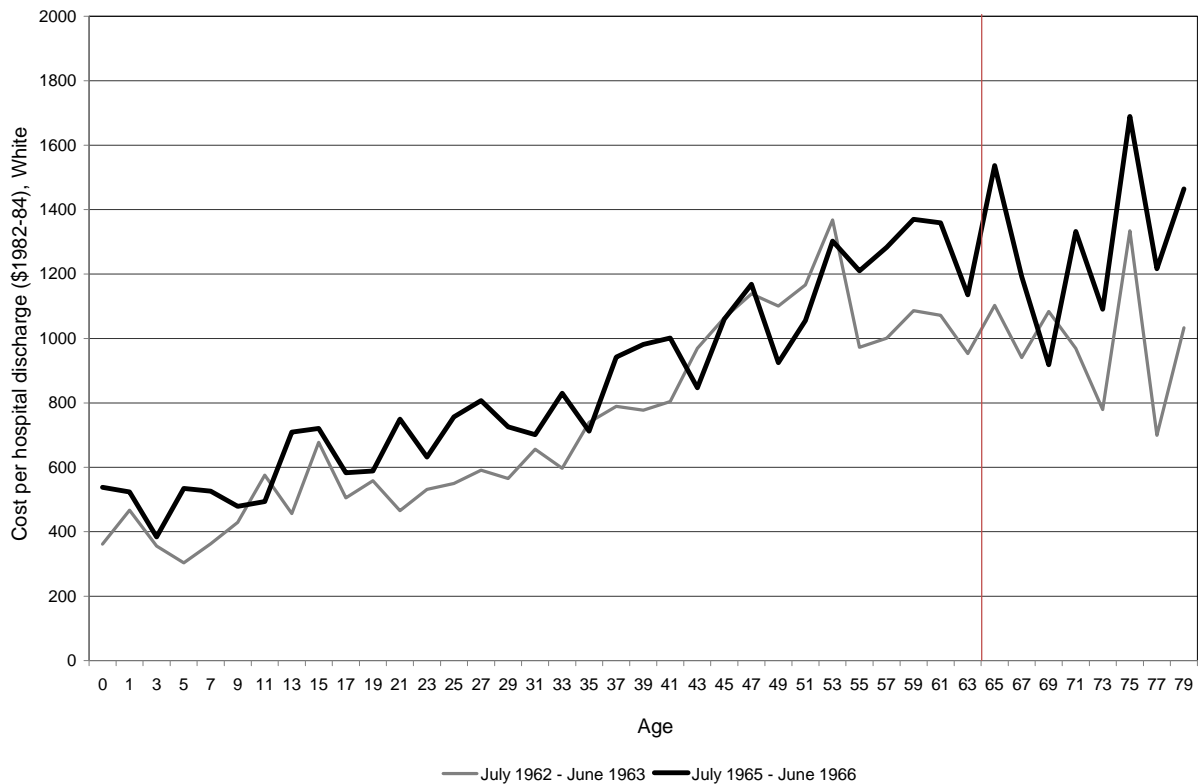
Notes: Data are from the *National Hospital Discharge Surveys*. Estimates come from period-specific regressions that include quadratic polynomials in age. In future, will use exact year-by-age cells and will use population size of cell as frequency weights (also experiment with higher-order polynomial).

Figure 4: Length-of-stay and Costs per hospital discharge for whites, by year and age

A. Average length-of-stay (in days) per hospital discharge



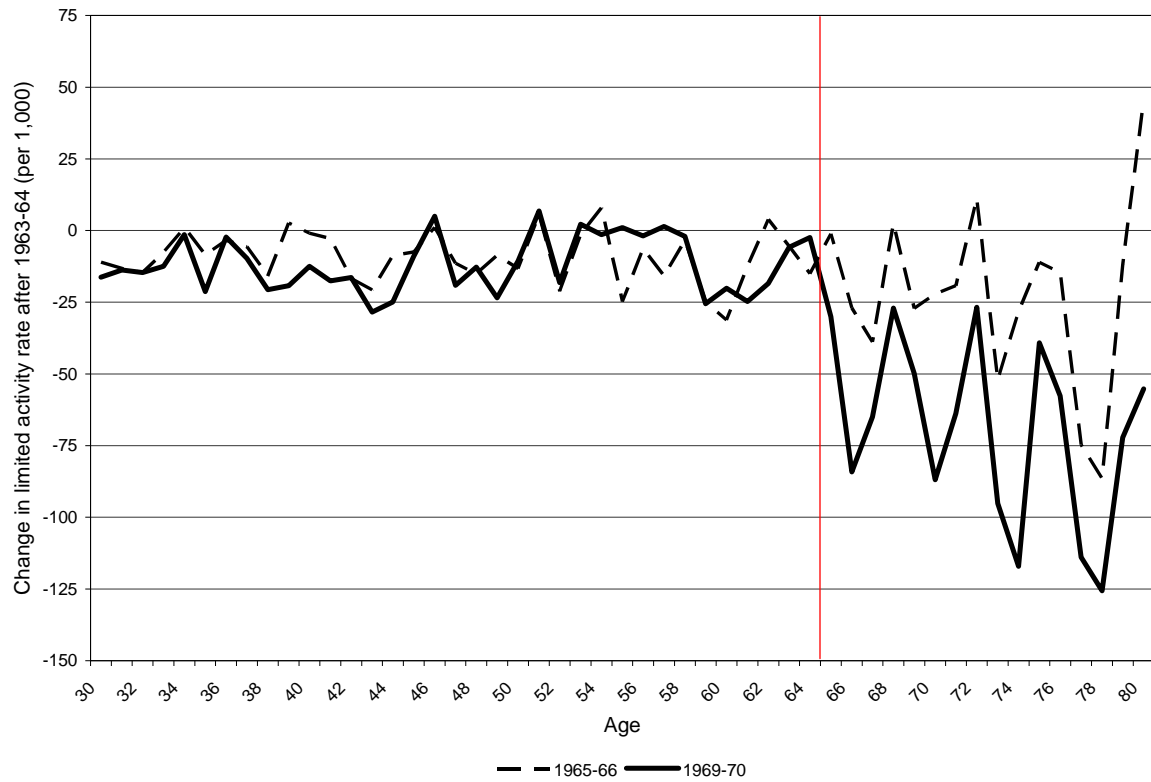
B. Average costs (in 1982-1984 dollars) per hospital discharge (change to all races)



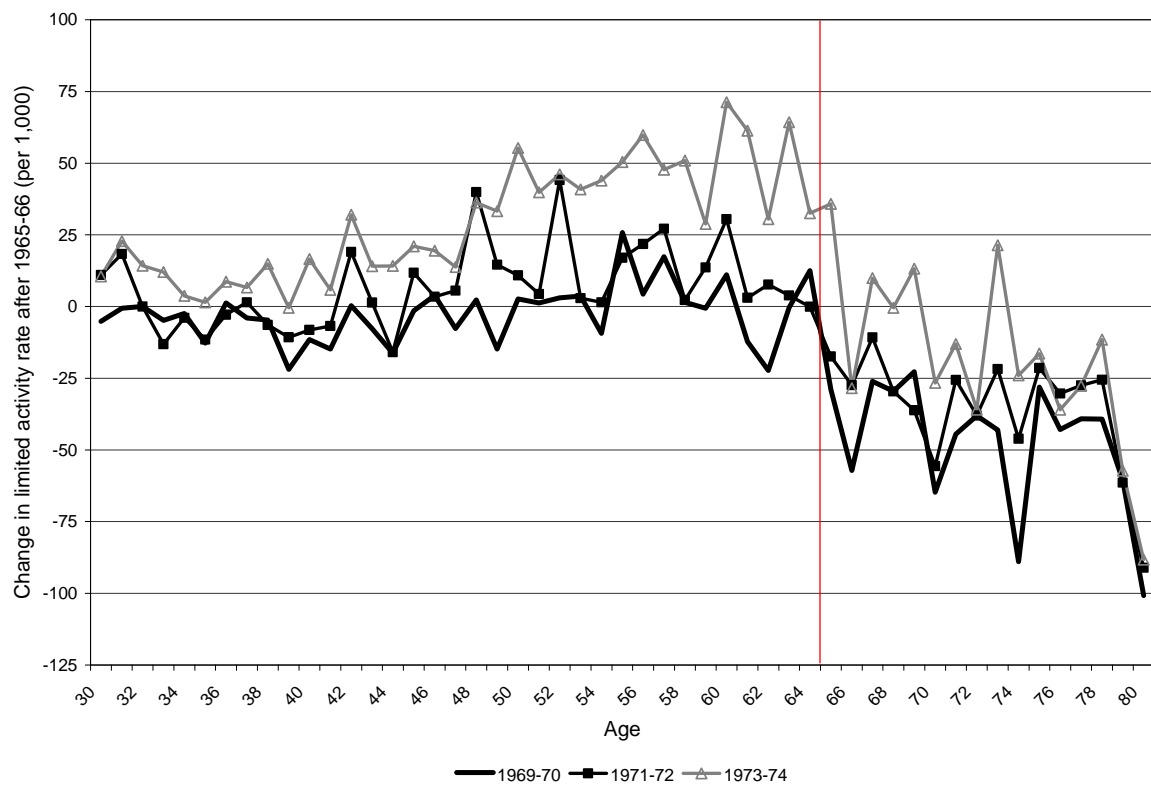
Notes: Data come from the *National Health Interview Surveys*.

Figure 5: Limited Activity Rates (due to chronic conditions), per 1,000 individuals

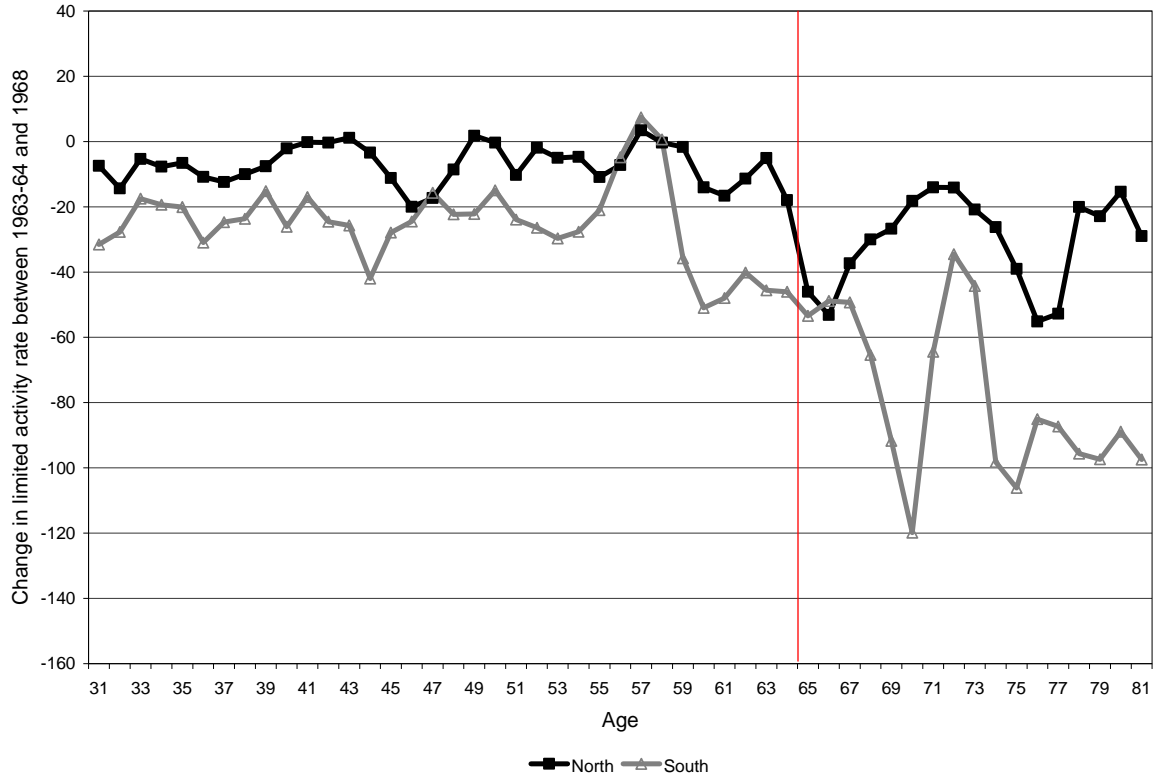
A. Change in limited activity rate relative to 1963-1964



B. Change in limited activity rate relative to 1965-1966

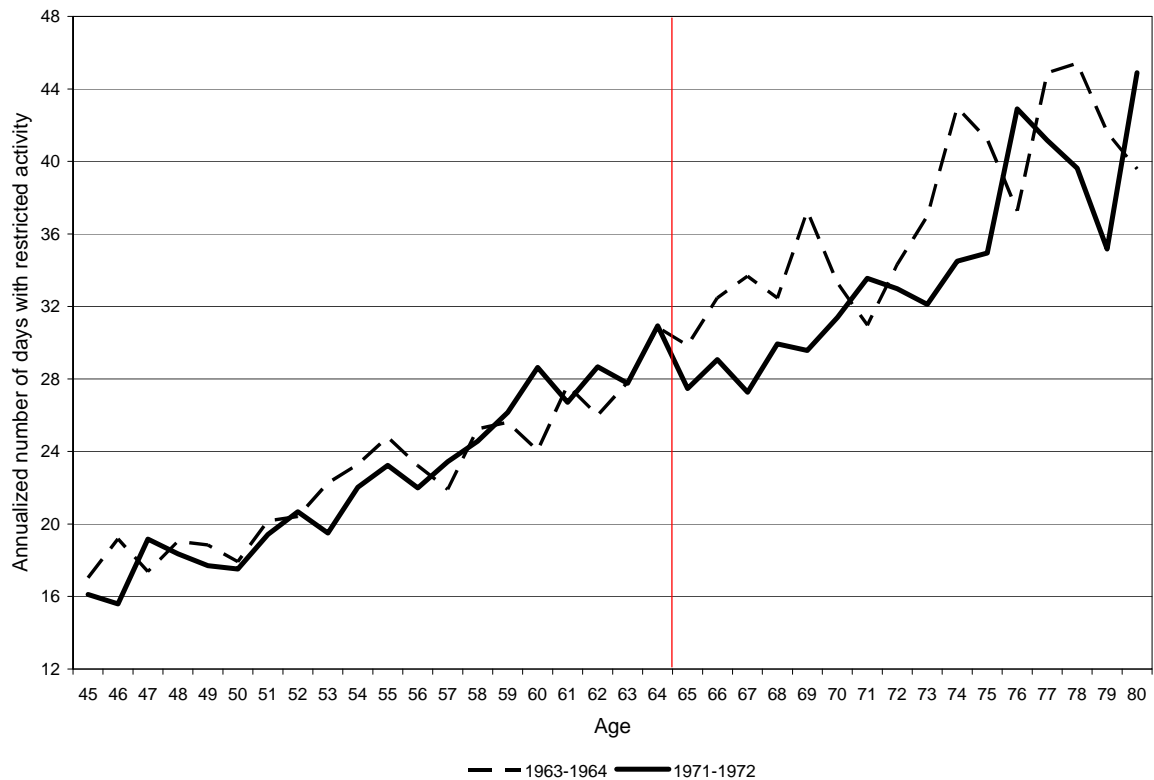


C. Change in limited activity rate between 1963-64 and 1968, North and South



Notes: Plots three-year moving averages. Fiscal years used for 1963 and 1964; fiscal and calendar year for 1968. Regressions similar to those in Table 2 applied to sample of 30 to 82 year-olds leads to coefficient estimates [absolute t-ratios] on an dummy for age 65-and over of -26.3 [3.33], -27.9 [2.99] and -39.2 [2.40] for the entire U.S., North and South, respectively.

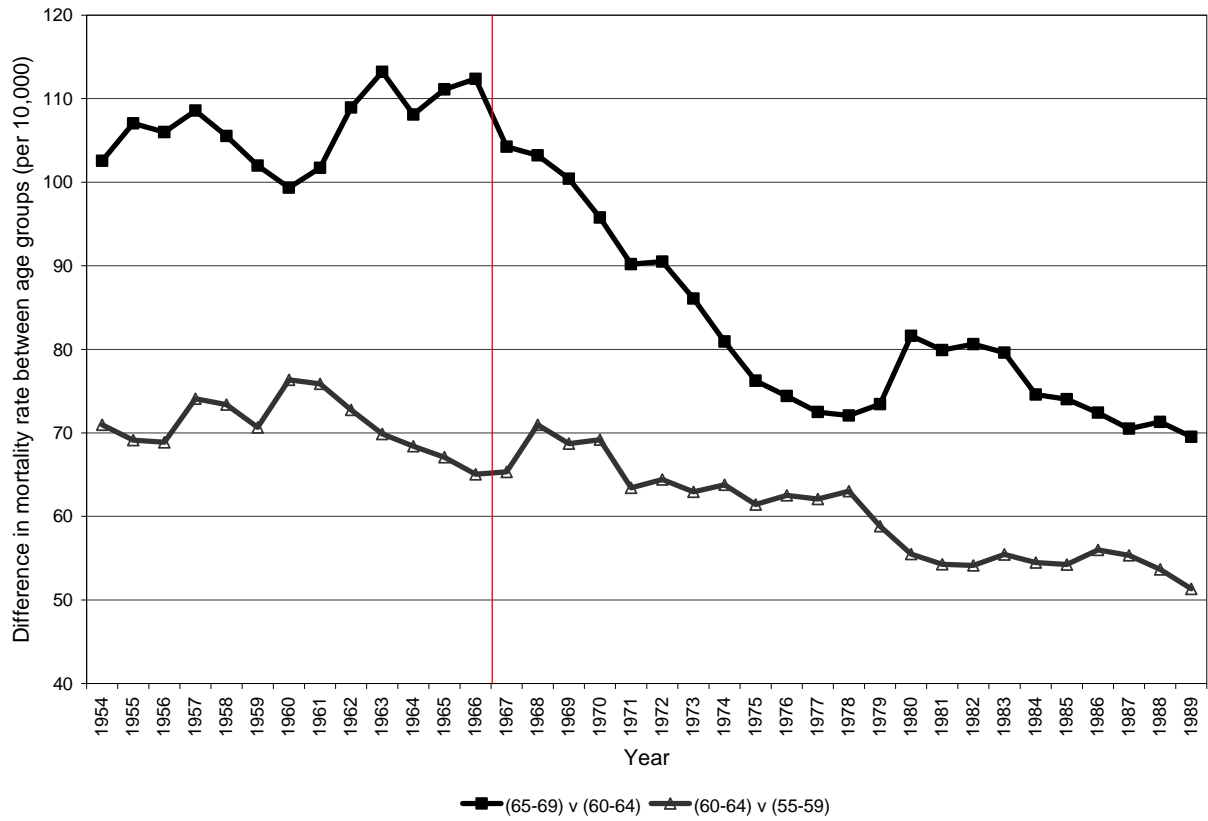
D. Annualized number of days with restricted activity



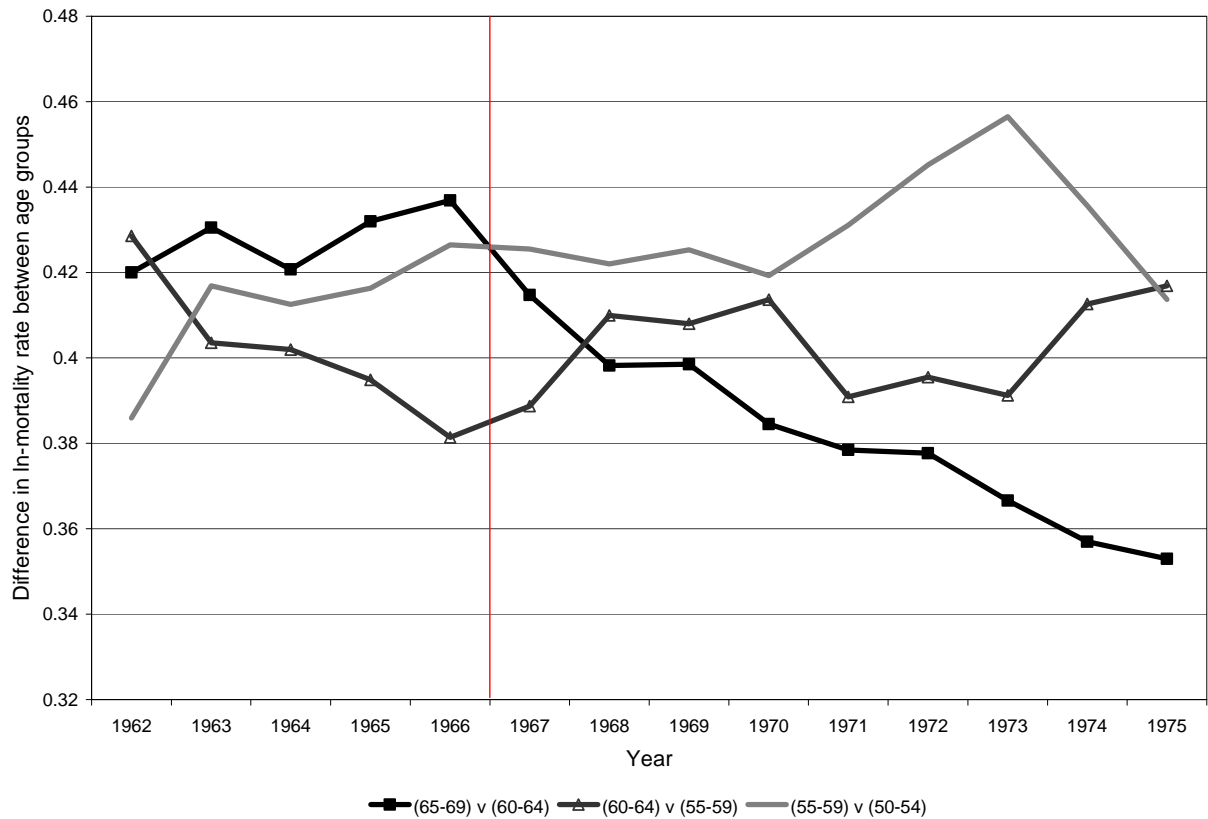
Notes: Estimated discontinuity effects [absolute value of t-ratio] for ages 45-80 deviated from 5th-order polynomial, year and year-age effects: age 65-69 = -5.46 [3.92]; age 70-74 = -4.16 [2.06]; age 75-79 = 4.35 [1.59]

Figure 6: Mortality rates over time in the United States, differences across age groups

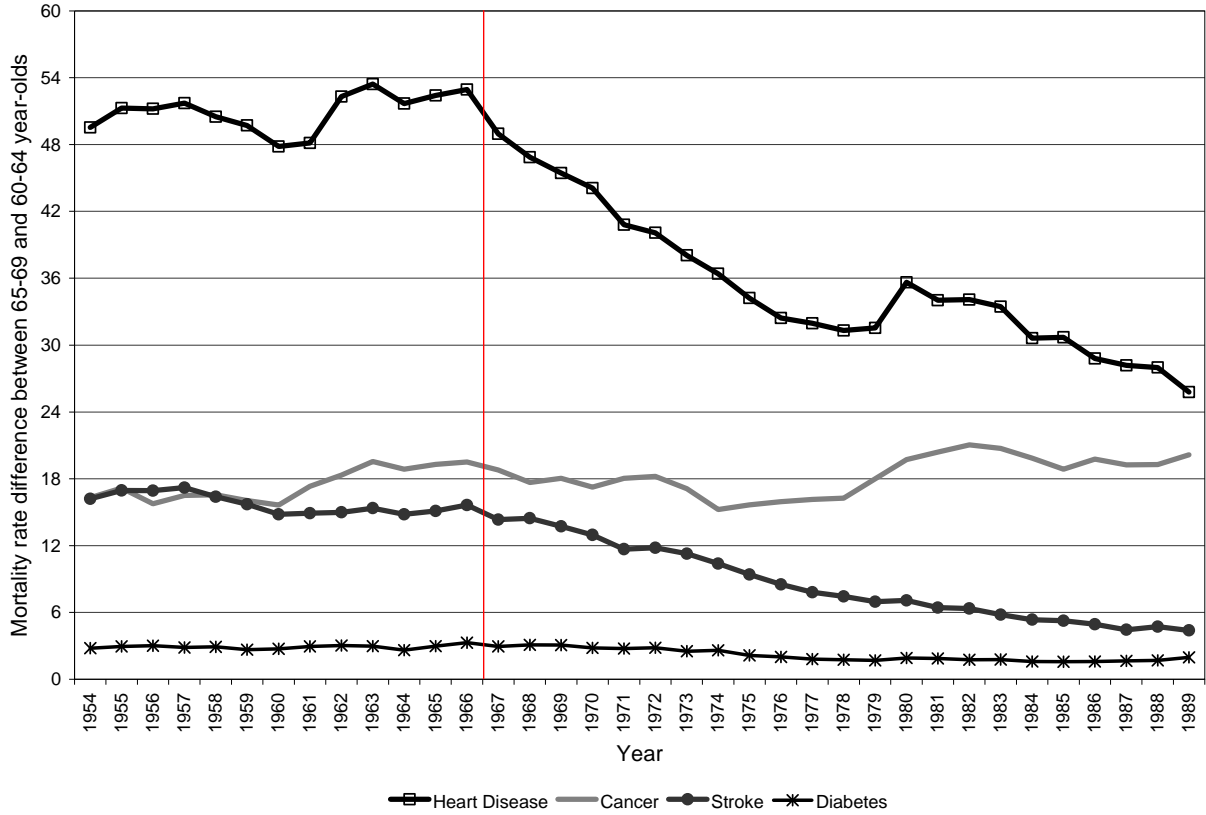
A. Age group differences in all-cause mortality rates (per 10,000 individuals)



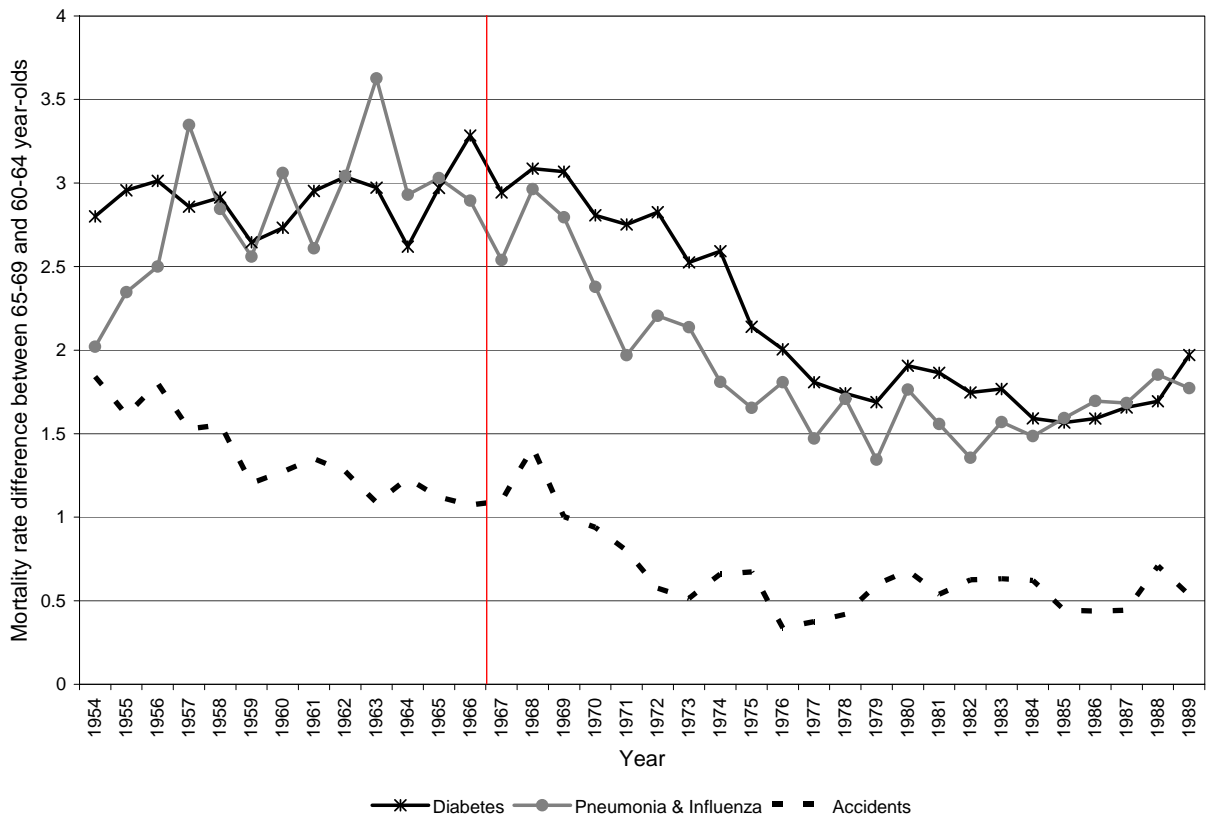
B. Age group differences in natural logarithm of all-cause mortality rate



C. Mortality rate differences between 65-69 and 60-64 year olds, by cause of death



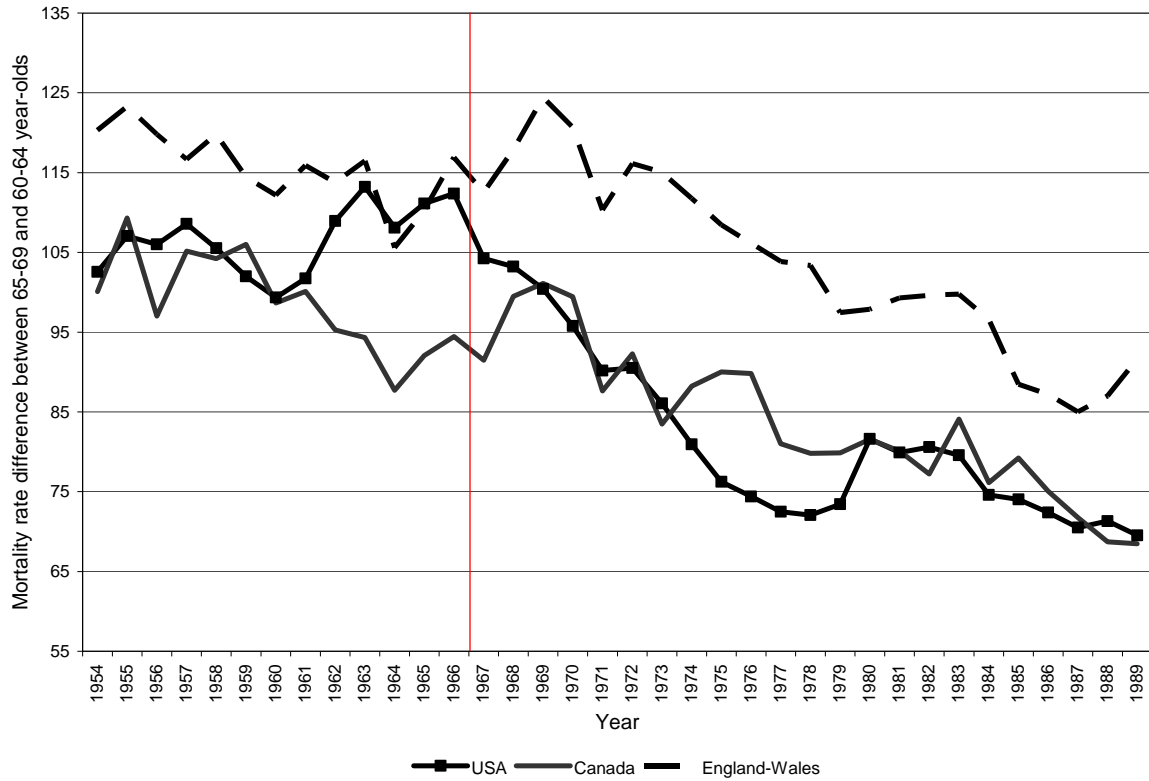
D. Mortality rate differences between 65-69 and 60-64 year olds, by cause of death



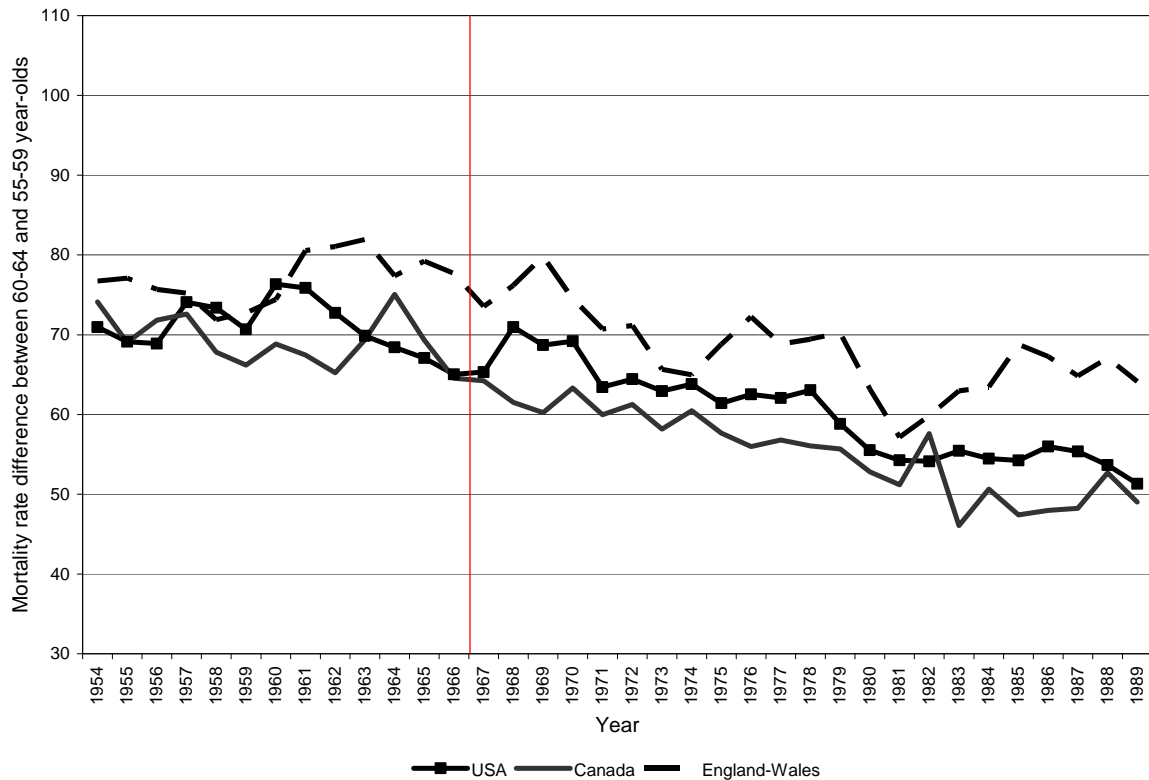
Notes: Data come from the *World Health Organization Mortality Files*. The mortality rates are for the entire United States population – that is, it includes blacks and whites, as well as other races.

Figure 7: Between age-group differences in all-cause mortality rates (per 10,000), United States, Canada, United Kingdom, France

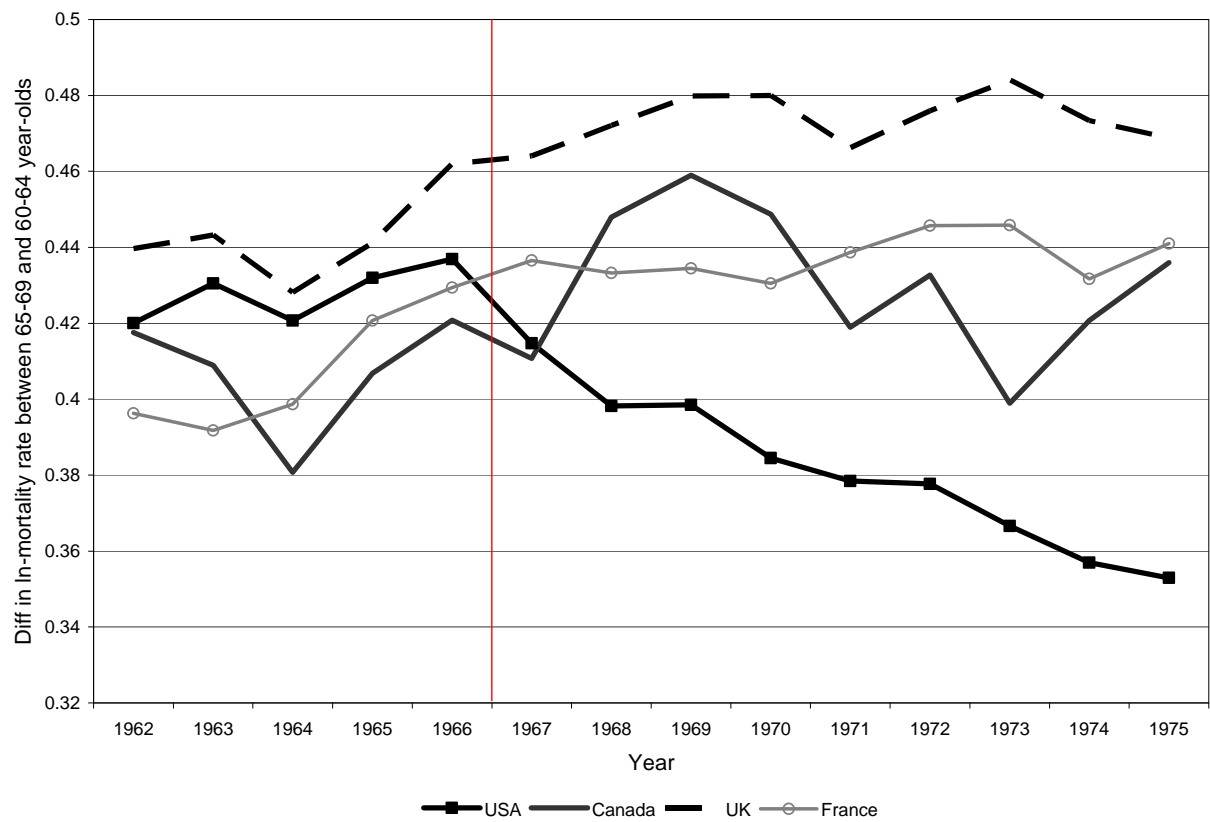
A. Difference in mortality levels between 65-to-69 and 60-to-64 year olds



B. Difference in mortality levels between 60-to-64 and 55-to-59 year olds



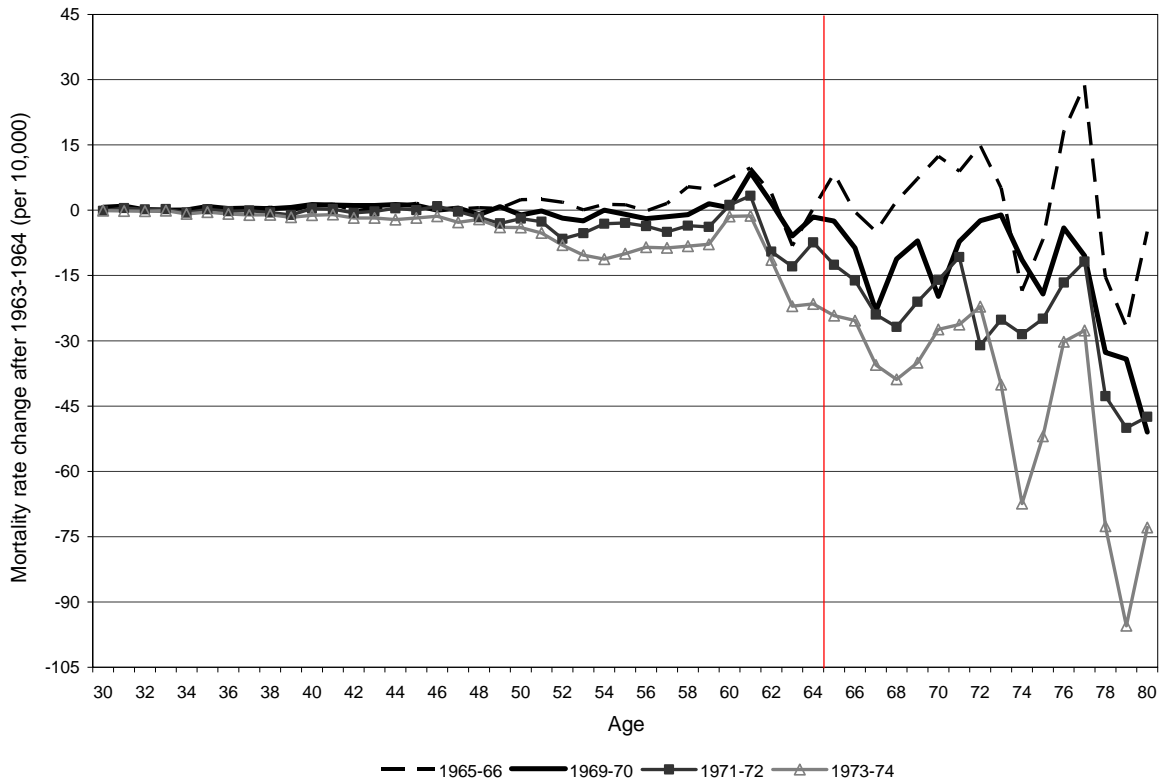
C. Difference in log-mortality between 65-to-69 and 60-to-64 year olds



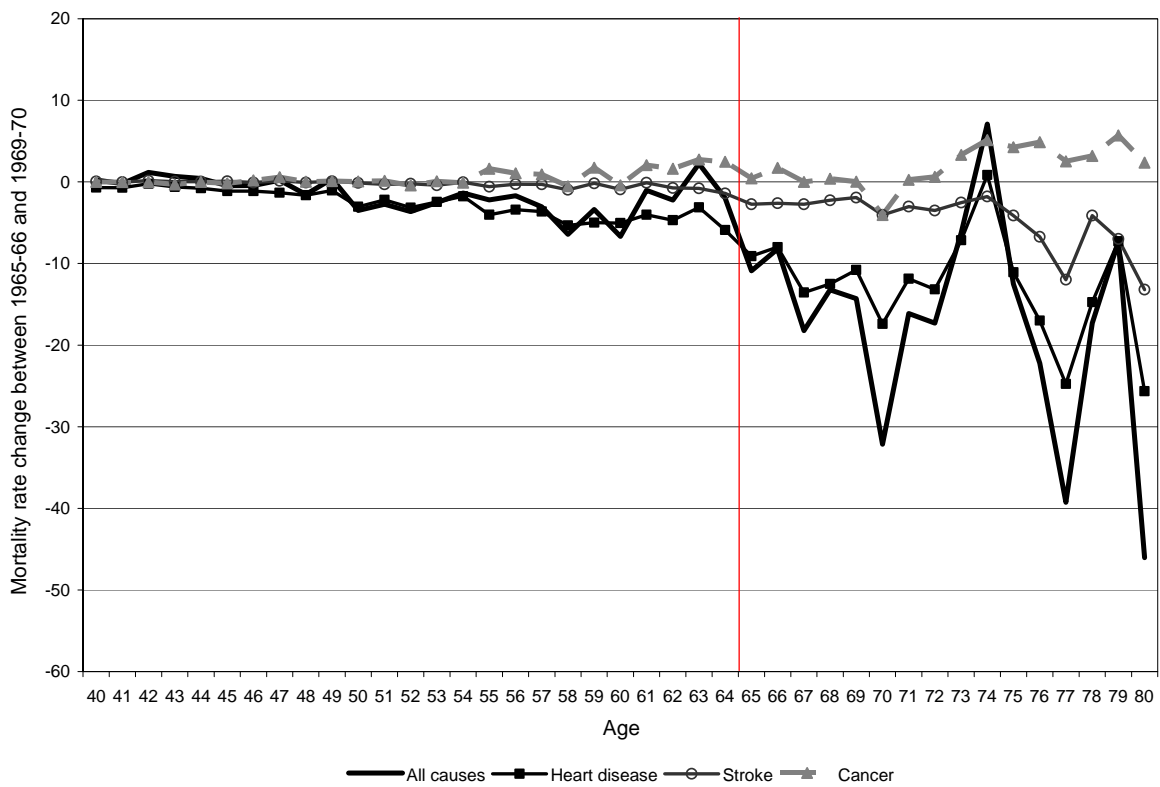
Notes: Data come from the *World Health Organization Mortality Files*.

Figure 8: Mortality rate changes by age and year, Whites only

A. Change in all-causes mortality rates relative to 1963-1964



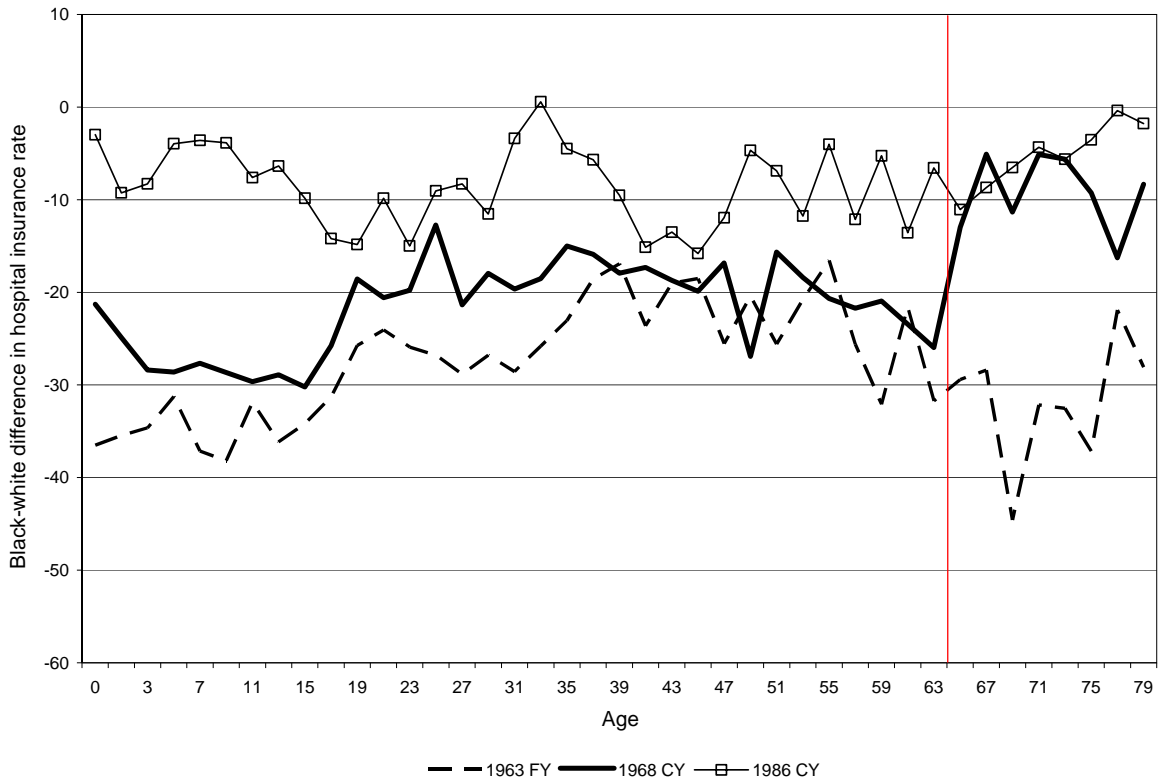
B. Change in mortality rate between 1965-1966 and 1969-1970, by cause of death



Notes: Mortality counts come from the *Mortality Detail Files* and age-specific, population sizes come from the (unrevised) *Census* counts.

Figure 9: Differentials in hospital insurance rates across time

A. Black-white difference in percent with hospital insurance



B. Insurance rate gap between persons with and without activity limitations (due to chronic conditions)

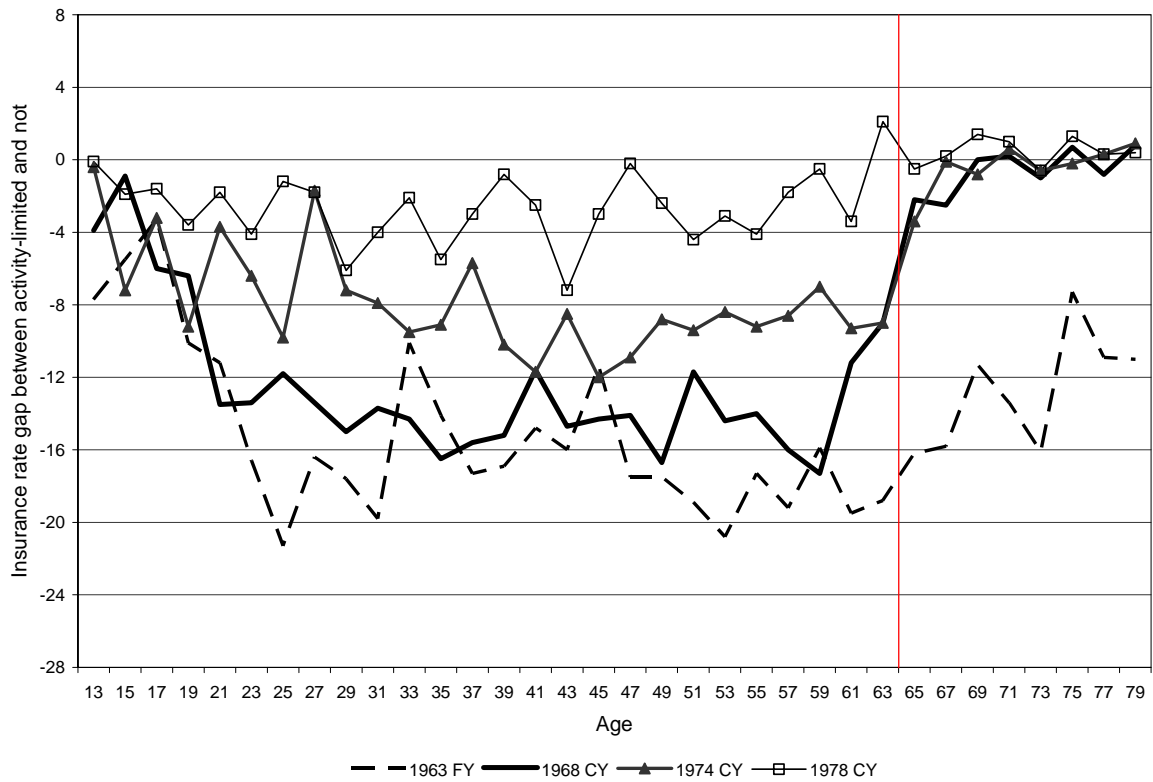
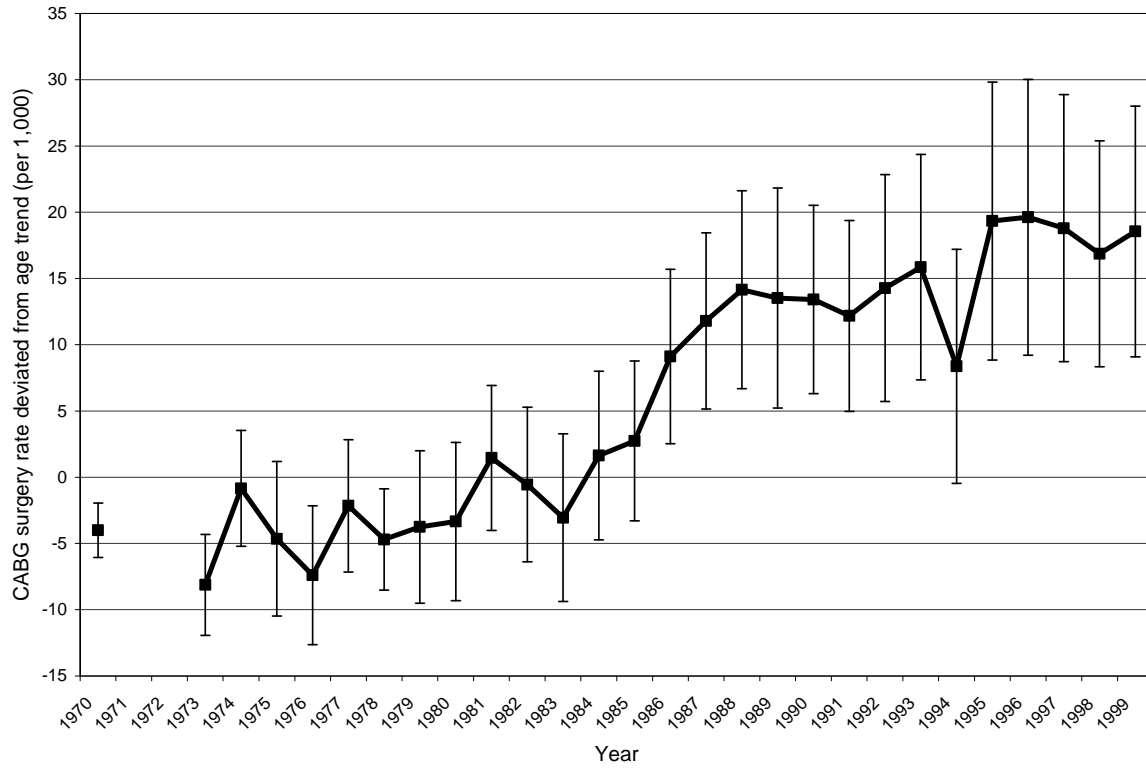
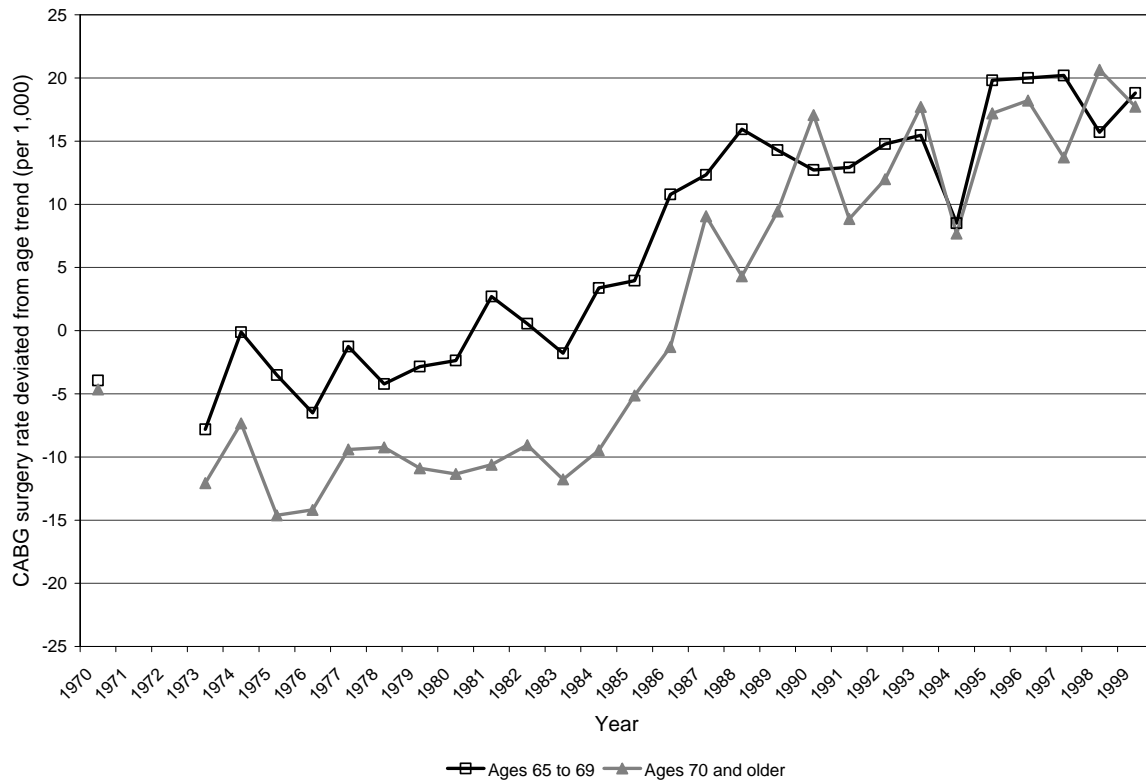


Figure 10: Age 65-and-over discontinuity in coronary artery bypass graft (CABG) surgery rate, Among hospital discharges over time (add angioplasty, consistent CABG 1979-on, black v. white?)

A. Age 65-and-over CABG discontinuity deviated from age trend (ages 50-and-over)



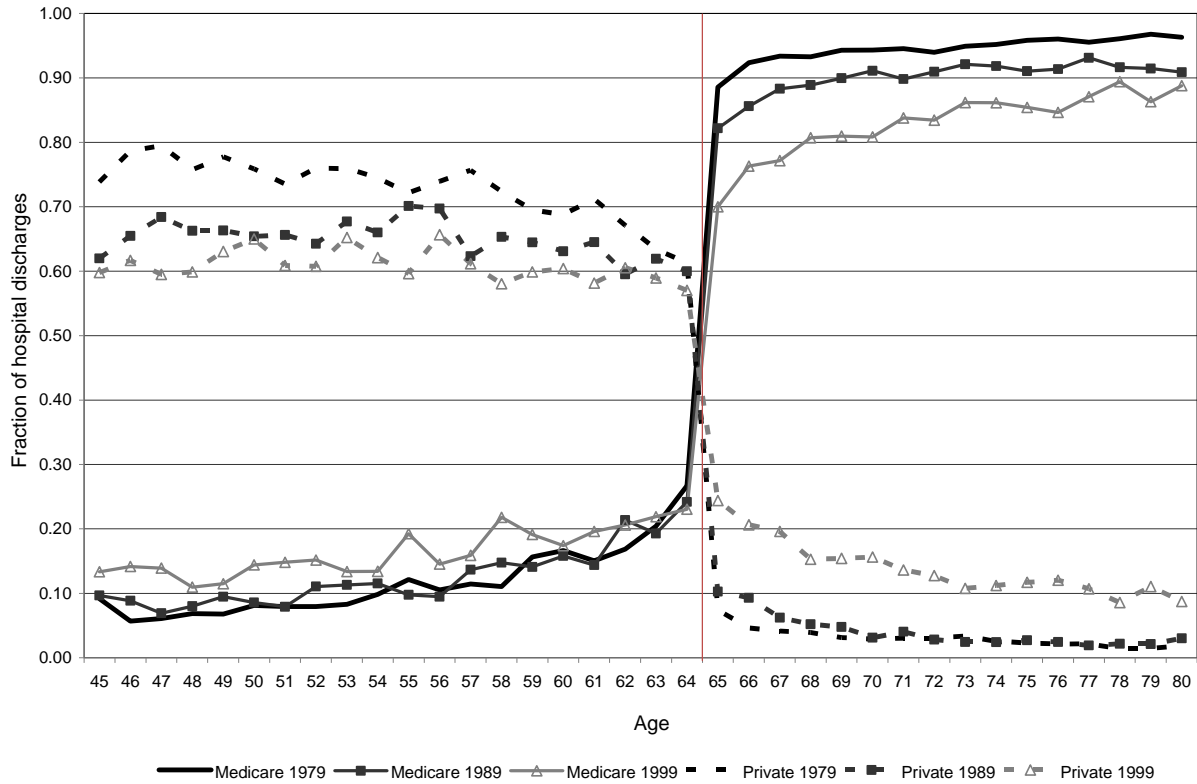
B. Ages 65-to-69 versus 70-and-over CABG discontinuity



Notes: Data come from the *National Hospital Discharge Surveys*. Results are from year-specific, linear probability regressions that include age trends and use samples of discharges aged 50 and over. Vertical lines in Panel A represent (\pm) twice the standard error of the estimate, corrected for heteroskedasticity.

Figure 11: Fractions of hospital discharges for whom primary source of coverage is Medicare or private insurance

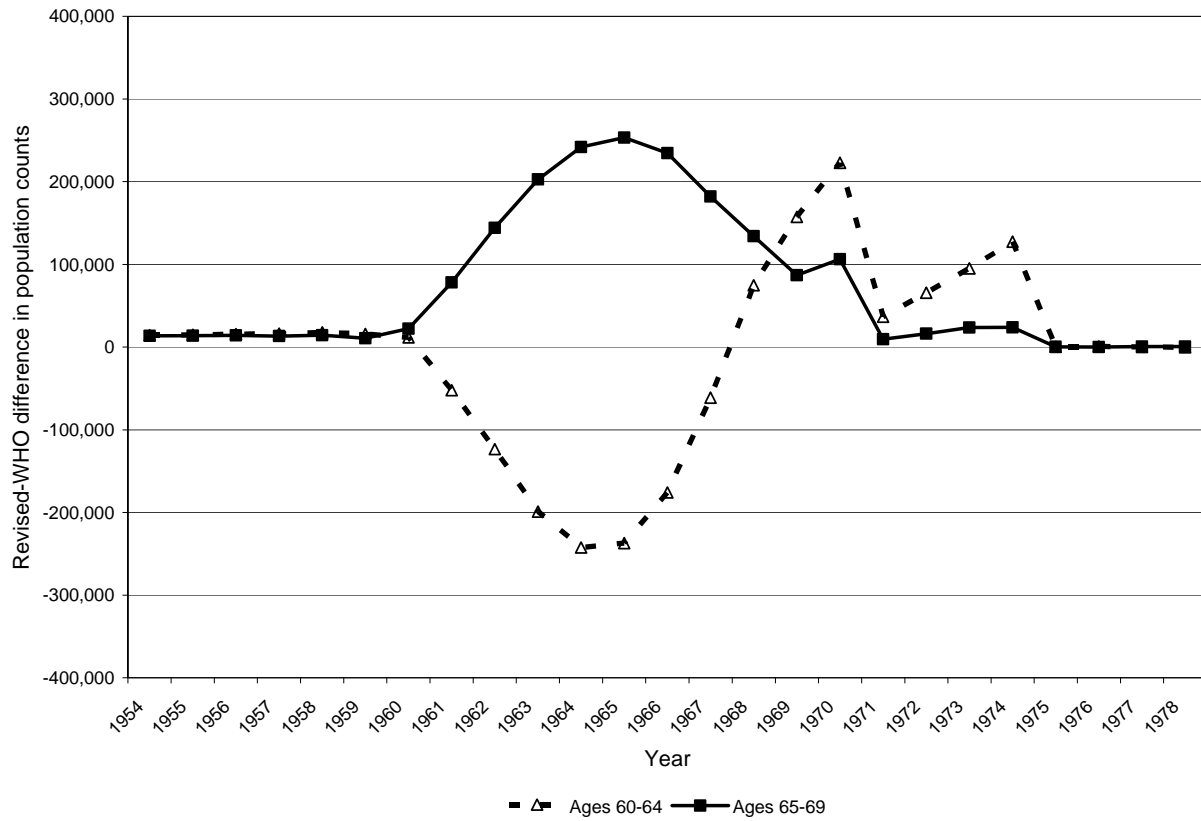
A.



B. Dual coverage, separately for blacks and whites

Notes: Data come from the *National Hospital Discharge Surveys*.

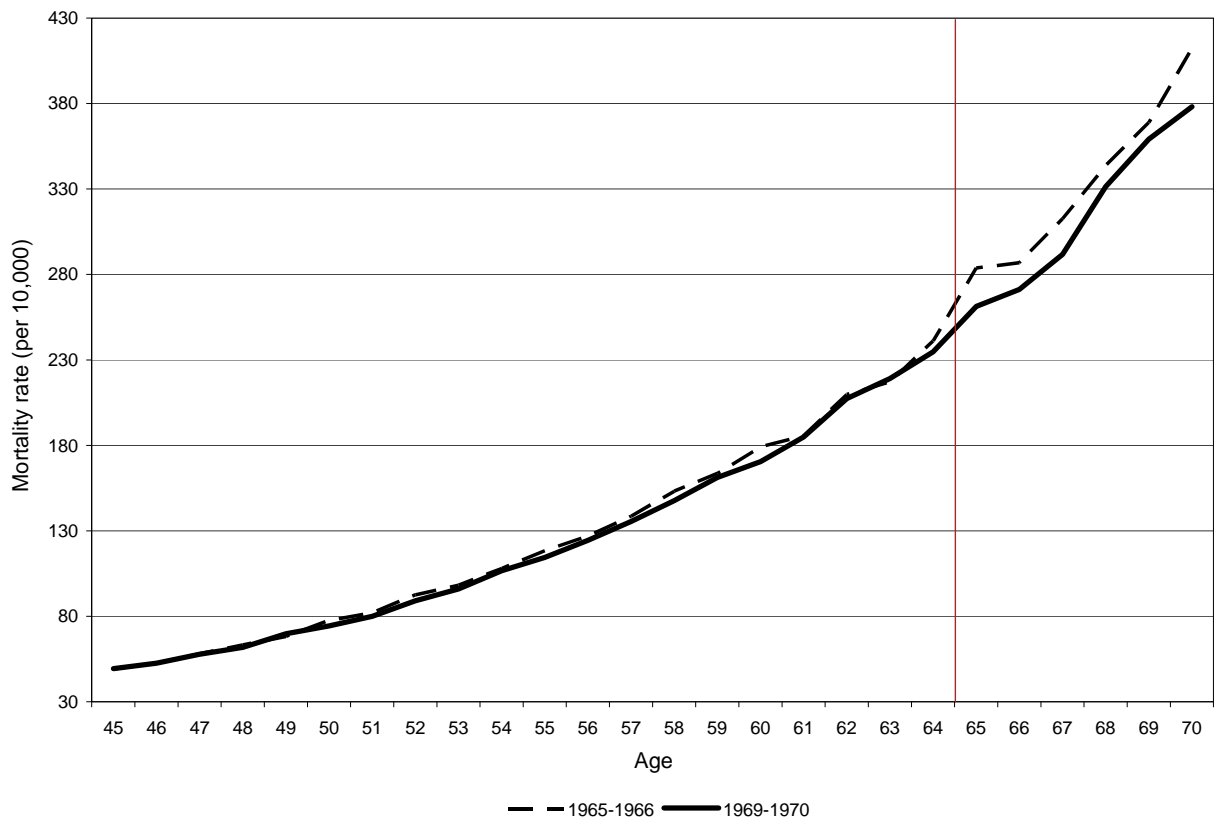
Figure A1: Difference between Intercensal (Revised) and WHO population counts



Notes: Data come from U.S. Census Bureau (Intercensal counts) and World Health Organization (WHO) mortality database.

Figure A2: All-cause mortality rates by age, 1965-1966 and 1969-1970

A. All races



B. Whites only

