Predictors of Mortality Among Newly Retired Workers

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Data for this analysis were obtained from a cohort of newly retired workers in the New Beneficiary Survey (NBS) who received their initial benefits between mid-1980 and mid-1981. Results of a logistic regression analysis on the health and personal background characteristics of these retired workers show that selected health, demographic, and socioeconomic characteristics measured shortly after retirement are significant predictors of mortality in later years. The most reliable health predictor was functional capacity limitation. Other predictors included the number of disorders reported and the incidence of circulatory and respiratory disorders. Withdrawal from the labor force because of poor health was a predictor of mortality. An analysis of demographics (age, gender, and marital status) show that men, the unmarried, and older beneficiaries were more likely to die. Race had no significant effect after health and socioeconomic status were controlled. Those beneficiaries in the lowest income quartile had higher mortality, but having additional private health insurance coverage had no significant influence on mortality. Beneficiaries with 9-11 years of education were more likely to die than those with more education. More likely to survive were those with a musculoskeletal condition or those who worked in operator, fabricator, and laborer occupations.

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This article examines the health and survival status of a group of new retired-worker beneficiaries—beneficiaries who received their first Social Security benefits between mid-1980 and mid-1981. The analysis focuses on the differential mortality of a cohort observed over an approximate 8-year period following receipt of initial benefits. Previous studies have generally relied on cross-sectional analyses of beneficiary populations and on similar studies of older age groups in the general population. The present investigation departs from these in that it is concerned with the health and functional status of a retired-worker cohort measured near the age of retirement and with the effects of health status and personal background characteristics on the subsequent survival of its members—two aspects not covered in earlier studies.

Each year, a new cohort of eligible workers retires. These cohorts change in composition and diminish in size as individual members face declining health and die.

The dynamics of a cohort, particularly diminishing health and survival status, directly affect costs to the Old-Age and Survivors Insurance Trust Funds of Title II (Social Security) and to the Health Insurance Trust Funds of Title XVIII (Medicare). The Medicare program pays for a large share of medical costs for individuals aged 65 or older, including acute hospital care. Over the life course, expenditures from the Hospital Insurance Trust Fund rise as failing health and diminished functional status increase. The Social Security Trust Funds are also affected when, for example, longevity increases expenditures through benefits paid. In contrast, if members of a cohort die soon after retirement, then benefits are reduced over what they would have been had mortality been delayed.

Overview of Analysis Procedures

The survival status (dead or alive) of cohort members was analyzed as an outcome over the 1982-88 period. In the analysis, the logistic regression procedure was used to identify independent predictor variables grouped conceptually to represent health, sociodemographic, economic, and contextual characteristics of retired-worker beneficiaries.

The logit analysis is a maximum likelihood procedure appropriate for making estimates when, as in this case, the dependent variable is dichotomous. Previous investigations have found it a robust procedure when the distribution of independent variables is not multivariate normal (Halperin, Blackwelder, and Verter, 1971; Cleary and Angel, 1984). The equation was estimated using the normalized weighting procedure found in the LOGIST software program of the Statistical Analysis System (SAS).

Data Sources

The data are from the 1982 New Beneficiary Survey (NBS). Included in the interviewed sample were 9,103 men and women who first received retired-worker benefits between June 1980 and June 1981. The retired-worker sample represents a cohort of approximately 1.2 million "new" beneficiaries, most of whom were aged 62-64 at first benefit receipt (76 percent of the men and 84 percent of the women were younger than age 65 at retirement). The NBS collected information on income, assets, work history, and current health status. Linkage of the survey to the Social Security Administration's (SSA's) Master Beneficiary Record (MBR) provided information on survival status through 1988.

Comparative Analysis of Mortality

From late 1982 to December 1988, approximately 157,000 (12.9 percent) of the 1.2 million newly retired workers died. The 1982-88 death rate per 1,000 persons was 165.6 for men, compared with 81.0 for women (table 1). This 2 to 1 ratio

of male to female deaths was maintained over most of the 1982-88 period. The gender difference in survival explains in large part why the female proportion of the Social Security beneficiary population increases over time.

How closely does mortality in the NBS cohort match mortality for comparable gender and age groups in the general population? The National Center for Health Statistics (1987) reported the proportion of the general population dying in a 5-year interval at ages 65-70 was 14 percent for men [1] and 8 percent for women. According to data from the MBR, the proportions of the retired-worker cohort who died in the 5-year interval 1984-88 was 14 percent for men and 7 percent for women. (Most of the cohort were aged 65-70 in 1984.) Thus, mortality rates for retired-worker new beneficiaries are very similar to the rates for their general population counterparts.

However, the NBS retired-worker sample excluded certain segments of the population that would intuitively have made it appear to be a healthier population and thus have lower rates of mortality. For example, not represented were disabled-worker beneficiaries converted at age 65 to "retired-worker" status and persons ineligible for Social Security benefits because they lacked a history of covered earnings, which in many cases may have resulted from protracted periods of poor health or severe functional impairment. Thus, the retired-worker sample excluded many low-income persons who may have been eligible for, or who were receiving, only Supplemental Security Income (SSI) payments. These groups represent a significant minority in which poor health and mortality are concentrated. Women who were receiving wife or widow benefits were also excluded, and their health status has not been examined.

Other studies found higher mortality rates in certain subgroups, for example, men, racial minorities, and, as previously mentioned, persons of lower income level. These and other characteristics are tested as independent variables in the logistic regression model discussed below (outcome is dead or alive in 1982-88). Hypothesized predictors included health status, census region, Standard Metropolitan Statistical Area (SMSA), demographic characteristics (race, gender, age), socioeconomic status (income, education, health insurance status), and characteristics of the last job (occupation, self-employment). All logit coefficients represent effects of the 1982 NBS characteristics on survival outcome, independent of the effects of other characteristics specified.

Table 1.—Death rates of NBS retired-worker beneficiaries during the 1982-88 period, by gender

[Numbers in thousands]

Beneficiary	Total	1982-83	1984	1985	1986	1987	1988
	Men						
Alive at beginning of period	689.7	689.7	670.2	655.0	638.0	618.7	599.3
Died during period	114.2	19.5	15.2	17.0	19.2	21.5	21.8
Death rate per 1,000 [1]	165.6	28.2	22.7	26.0	30.1	34.7	36.5
	Women						
Alive at beginning of period	524.4	524.4	518.5	512.3	504.8	498.7	488.9
Died during period	42.4	5.9	6.2	7.5	6.0	9.8	6.9
Death rate per 1,000 [1]	81.0	11.2	11.9	14.8	12.0	19.7	14.2

[1] Death rates per 1,000 at beginning of period. Deaths in 1982 represent deaths occuring after the October-December interview.

Source: SSA's Master Beneficiary Record for the 1982 New Beneficiary Survey retired-worker cohort.

Health Indicators

In general, health indicators were significant predictors of survival status. The three types of health measures represented are: (1) Number of health disorders (included as a measure of co-morbidity); [2] (2) degree of functional capacity limitation (included as an indicator of level of impairment (Haber, 1970));[3] and (3) incidence of respiratory, circulatory, musculoskeletal, or digestive disorders. In addition, an

[1] The proportion of men dying increases strikingly in the older age groups; for example, the rate for those in the group aged 60-65 was 9.5 percent, compared with 20.6 percent for those aged 70-75.

[2] The number of health disorders was determined by the number of positive responses to a list of conditions ranging from visual difficulties to heart or circulatory problems. Circulatory problems represented a positive response to either of the following questions: (1) Have you ever had a heart attack or stroke? or (2) Do you now have any heart problem, such as hardening of the arteries, high blood pressure, or chest pain?

[3] The Index of Functional Capacity Limitation is designed to determine the level of impairment in physical functioning associated with abililty to walk, carry loads of varying weights, stoop, bend, kneel, reach or grasp, and use the fingers. Haber developed a rational scaling procedure for ranking persons on the index. Persons classified as having severe functional limitations were limited in both walking and manual activities or were unable to go outside.

indicator of having left the last job for a health reason was analyzed to further assess a beneficiary's state of health near the time of labor-force withdrawal.

Reports of poor health in 1982 proved significantly associated with death prior to 1989. Compared with survivors, decedents averaged more disease conditions, and proportionately more decendents reported moderate or severe functional limitations (table 2). Decedents also had more circulatory, respiratory, digestive, and musculoskeletal disorders and were more likely to say that health was a major reason for leaving their last job.

The health measures most strongly linked to mortality were those of functional capacity limitation (table 2 and table 3). Beneficiaries who were moderately or severely limited were more likely to die than those who were less impaired. The number of disorders reported and the incidence of circulatory and respiratory disorders were also significant mortality predictors. Having left the last job because of poor health was also a significant predictor of death, independent of the other 1982 health indicators, which supports the argument made by Boaz and Muller (1990) that health is a viable

Table 2.—Survival status of new retired-worker beneficiaries to 1989, by selected characteristics for men and women

Characteristic	Total		Men		Women	
	Alive	Dead	Alive	Dead	Alive	Dead
Number of beneficiaries (in thousands)	1,057.4	156.7	575.5	114.3	482.0	42.5
Average number of health disorders	2.45	3.01	2.52	3.02	2.36	2.9
	Percent					
Health indicators:						
One or more disorders	78.1	87.4	79.3	86.7	76.6	89.4
Two or more disorders	52.4	67.2	54.0	66.6	50.5	68.8
Functional limitation—						
Severe	14.8	25.2	12.5	22.9	17.4	31.5
Moderate	15.4	23.1	15.0	22.4	16.0	24.9
Minor or none	69.8	51.7	72.4	54.7	66.6	43.6
Diagnostic group—						
Musculoskeletal	53.1	57.2	51.9	55.0	54.5	62.9
Circulatory	40.1	53.1	40.7	53.1	39.5	53.1
Digestive	17.8	25.5	18.6	24.0	16.9	29.7
Respiratory	12.4	22.3	14.7	23.5	9.7	19.3
Left job for health reasons	19.5	29.4	19.8	29.0	19.1	30.3
Sociodemographic factor:						
Professional, technical	19.5	19.2	22.5	19.1	16.0	19.4
Sales, administrative	28.0	21.5	18.1	16.4	39.8	35.2
Precision, craft, and repair	13.8	17.5	22.7	22.7	3.2	3.7
Operator, fabricator, and laborer	18.8	18.7	20.3	20.5	16.9	13.9
Services	13.3	14.9	9.1	12.6	18.3	21.3
Self-employment	12.9	13.8	18.5	17.0	6.2	5.4
Black	7.9	11.4	7.9	11.2	7.9	11.9
White	89.7	86.5	89.6	86.4	89.8	86.8
Other	1.7	1.5	1.8	1.8	1.7	.7
Married	78.5	72.7	85.4	77.1	70.4	60.9
Not married	21.5	27.3	14.6	22.9	29.6	39.1
Men	54.4	72.9	100.0	100.0	(1)	(1)
Women	45.6	27.1	(1)	(1)	100.0	100.0

See footnotes at end of table.

Table 2.—Survival status of new retired-worker beneficiaries to 1989, by selected characteristics for men and women—**Continued**

Characteristic	Total		Men		Women	
	Alive	Dead	Alive	Dead	Alive	Dead
	Percent—**Continued**					
Year of birth:						
Before 1914	3.9	7.8	5.3	9.0	2.3	4.7
1914	3.0	3.7	3.8	4.1	2.0	2.8
1915	14.3	15.9	16.6	16.8	11.6	13.6
1916	13.3	14.5	15.3	15.8	10.9	11.1
1917	9.6	8.6	10.4	8.5	8.6	8.8
1918	36.5	35.3	31.4	32.8	42.6	41.9
1919	19.3	14.2	17.1	13.1	22.0	17.2
Income:						
Lowest quartile	29.3	39.0	28.8	37.6	30.0	42.6
2nd quartile	26.3	24.2	26.5	25.3	26.0	21.1
3rd quartile	23.5	19.0	22.7	18.8	24.5	19.6
Highest quartile	20.8	17.8	22.0	18.3	19.5	16.6
Education:						
Elementary or less	23.1	28.2	26.4	31.3	19.1	20.0
Some high school	19.7	22.6	19.3	21.3	20.2	26.1
High school	32.2	28.8	28.5	27.1	36.6	33.3
College	24.4	19.7	25.0	19.7	23.6	19.5
Other	.5	.5	.6	.2	.4	1.2
Other health insurance:						
Yes	78.2	69.1	76.3	67.0	80.5	74.6
No	21.5	30.2	23.4	32.4	19.2	24.1
Geographic region:						
South—						
SMSA [2]	21.9	23.0	21.7	24.0	22.0	20.4
Non-SMSA [2]	11.3	12.4	11.7	11.8	10.9	13.9
East—						
SMSA [2]	19.9	19.0	18.5	18.3	21.5	20.8
Non-SMSA [2]	2.2	2.2	2.4	2.3	2.0	2.0
Central—						
SMSA [2]	18.9	17.4	18.7	17.8	19.2	16.3
Non-SMSA [2]	9.4	11.4	9.9	12.4	8.7	8.6
West—						
SMSA [2]	12.1	12.0	12.3	10.9	11.8	15.1
Non-SMSA [2]	4.4	2.7	4.8	2.5	3.9	3.0

[1] Data not available.
[2] Standard Metropolitan Statistical Area (SMSA).
Source: 1982 New Beneficiary Survey.

reason, not a rationalization, for retirement.

In the logistic regression analysis, the presence of a musculoskeletal condition was associated with survival rather than death. It is not clear why this relationship occurred. One reason could be that musculoskeletal conditions that may be negatively associated with other health conditions are not represented in the logistic regression equation. However, some studies have found that arthritic and related muscular conditions, which are more pervasive among older women, are generally less lethal. Verbrugge (1985) notes that women have higher prevalence rates for numerous nonfatal conditions such as arthritis, chronic sinusitis, and certain digestive conditions.

Geographic Location

To analyze urban/rural differences in mortality, a distinction was made between persons living inside or outside a SMSA and among those living in the Northeastern, Midwestern, Southern, and Western census regions at the time of the 1982 survey. It was reasoned that geographic location reflects morbidity and survival pattern differences resulting from variations

in climatic conditions, demographic patterns in age, and differences in the distribution of and access to inpatient and outpatient services.

As shown in table 2, region and urban/rural status proved to have little association with death. Furthermore, most of the logit coefficients were not significant (table 3). The only coefficient that was statistically significant represented a greater likelihood of death among non-SMSA residents in the Midwest. Without further analysis, it is not possible to say why this particular result occurred.

Sociodemographic Variables

Gender, marital status, and year of birth (age) were all important predictors of survival status. Earlier studies have consistently demonstrated higher mortality rates for men and unmarried persons (Verbrugge, 1989; Gove, 1973; Hu and Goldman, 1990). Consistent with this research, male beneficiaries were more likely to die. As noted earlier, the death rates of NBS men were about double those of women, and, as expected, married beneficiaries were significantly less likely to die than those who were unmarried (table 3).

Age Effects

The most consistent finding, as anticipated, was the influence of increasing age on mortality. As table 2 shows, a disproportionate percentage of decedents was born in earlier years. As the logistic regression analysis confirms, younger cohort members were significantly less likely to die (table 3). Age had a robust effect on the prediction of survival status, despite the relatively constrained

Table 3.—Characteristics related to the likelihood of death in 1982-88, for retired-worker beneficiaries [1]

Characteristic	Final logit coefficient	Standard error of estimate	Chi Square	Significance level
Health:				
Number of disorders	0.114	0.032	12.51	0.001
Moderate limitation	.524	.088	35.39	.01
Severe limitation	.647	.091	50.06	.01
Respiratory disorder	.234	.093	6.36	.05
Circulatory disorder	.188	.081	5.43	.05
Musculoskeletal disorder	−.330	.086	14.9	.001
Digestive disorder	.087	.089	.94	...
Left last job for health reasons	.172	.083	4.36	.05
Geographic region:				
South—				
SMSA [2]	−.063	.117	.29	...
East—				
SMSA [2]	.051	.123	.17	...
Non-SMSA [2]	−.034	.239	.02	...
Central—				
SMSA [2]	−.006	.125	.00	...
Non-SMSA [2]	.328	.138	5.66	.01
West—				
SMSA [2]	.078	.137	.33	...
Non-SMSA [2]	−.372	.214	3.01	...
Sociodemographic factors:				
Race, black	.031	.115	.07	...
Married	−.382	.079	23.15	.01
Sex, male	.871	.079	121.94	.001
Birth year (age)	−.106	.015	48.15	.001
Income:				
Lowest quartile	.352	.107	10.78	.01
2nd quartile	.088	.106	.72	...
3rd quartile	−.007	.107	.00	...
Health insurance	−.132	.081	2.65	...
Education:				
0–8 years	−.041	.091	.20	...
9–11 years	.180	.088	4.16	.05
Occupation:				
Foreman, craftsman, precision production	−.060	.098	.32	...
Operator, fabricator, and laborer	−.230	.099	5.44	.05
Service	.041	.105	.15	...
Self-employed	−.191	.104	3.40	...

−2 log likelihood of intercept only 6,948.28
−2 log likelihood of model, 6,411.39
Model Chi square, 536.90
Model degrees of freedom, 29

[1] Deletion variables are minor, no limitation; South, non-SMSA; highest income quartile; 12 years or more of education; and white collar, agricultural, or military occupation.

[2] Standard Metropolitan Statistical Area (SMSA).

Source: 1982 New Beneficiary Survey.

age range (approximately 5 years) in the retired-worker sample.[4]

Race Effects

In general, black cohort members were more likely to die than whites. Approximately 11 percent of the decedents, compared with 8 percent of the survivors, were black (table 2), which is consistent with other findings. This very likely reflects differences in other health, socioeconomic, and demographic background characteristics. When race was tested in the logistic regression analysis, it had no significant independent effect on survival outcome.

The black/white differential in mortality and morbidity has been widely documented. Keith and Smith (1988) examined 1980 data from the National Center for Health Statistics and found that whites aged 65 or older had higher life expectancies than blacks (although this differential was reduced over that among people of working ages and for infants of less than a year old). They also found that medical causes of death accounted for this differential rather than nonmedical causes (such as accidents, homicides, and suicides). Consistent with their analysis, a higher proportion of black men and women than of whites aged 65-70 in the general population died. These studies did not control for the effects of income in their analyses.

[4] At first benefit receipt in mid-1980 to mid-1981, the 1982 NBS cohort's average age was 63.7 years for men and 63.1 years for women. The majority were under age 65, although 7 percent of the men and 4 percent of the women were aged 66 or older. The average cohort age in 1984 was 67 years.

Socioeconomic Factors

In addition to age, gender, race, and marital status, mortality differentials may also reflect differences in income, education, occupation, access to medical care, personal habits, nutrition, and diet (Kitagawa and Hauser, 1973; Kitagawa, 1977). Kitagawa noted that many of these variables are closely interrelated so that estimation of their separate effects from individual characteristics would be difficult. Her research in the Chicago SMSA in 1960, for example, found that the highest socioeconomic status (SES) group had a much greater life expectancy than the lowest SES group. It is believed that persons of higher SES engage in better health-maintenance behavior and have greater access to adequate medical care than their lower SES counterparts.

The SES measures included in the logistic regression model are quarterly family income, years of education, and private health insurance coverage.[5] Results were generally in the expected direction. A higher percentage of decedents had income in the lowest quartile, and low income was a significant predictor of death.

As expected, a larger percentage of survivors had private health insurance, but having such additional coverage proved not to be a significant predictor of survival status in the logistic regression analysis, possibly because of its association with SES factors. We had expected that the insurance coverage variable would have a significant effect on survival either directly or through its association with other variables (such as income and occupational work history). Because private insurance is available from employment in large firms and from private purchase through insurance companies, such coverage can be interpreted as an indicator of higher financial status and better access to health care. When the association with income is controlled, the remaining effects are not significant.

Lower educational level was associated with mortality. A higher percentage of decedents had fewer than 8 years of education, and proportionately fewer decedents had 12 years or more of education (table 2). In the logistic regression analysis, beneficiaries with a moderate level of education (9-11 years of formal education) were significantly more likely to die than those who were more educated.

[5] To estimate quarterly income per person, quarterly income of married persons was divided by two. Private health insurance includes any insurance coverage other than Medicare, Medicaid, CHAMPUS, and health care provided by the Department of Veterans Affairs.

Effects of Occupation

Earlier research suggests that characteristics of the last job should influence mortality because of working conditions, job requirements, and earnings differences. A higher percentage of decedents had been employed in precision production, craft, and repair occupations; otherwise there were very few differences among the occupational groups represented.

As a means of testing for the effects of occupation and work history independent of health and other characteristics, the logistic regression model included characteristics of the last job before the 1982 interview. The results were generally not what the percentage distributions would suggest. Overall, variables representing precision production, craft, and repair and service occupations failed to be

significant, as was the case for variables representing the self-employed. Those who were in operator, fabricator, and laborer occupations were more likely to survive than those in other occupations. The apparent contradiction with the percentage frequencies (table 2) probably reflects the combined effects of other characteristics.

Conclusion

This study has examined the effectiveness of using health and personal background information obtained in personal interviews with retired-worker beneficiaries shortly after retirement to predict survival status. Survival was a dichotomous variable indicating whether the beneficiary died between the interview date (October-December 1982) and December 1988, as determined from the date of death contained in the Master Beneficiary Record. A logistic regression analysis was used as the statistical analysis technique.

The logistic regression analysis has demonstrated that, overall, deaths occurring before 1989 could be predicted by health and personal background characteristics assessed shortly after receipt of benefits. In a more general sense, the model of survival status confirms many of the relationships reported in the literature pertaining to survival. The analysis has demonstrated that survey measures can be effectively used to identify a certain set of predictor variables, including demographic characteristics, indicators of poor health in 1982, low income, education, and major occupation in the last job.

The logistic regression was successful in identifying characteristics that predicted survival to 1989. Self-reported health status measured in late 1982 was significantly associated with the probability of subsequent death, suggesting that self-assessed health at retirement accurately identifies those in poorest health who have a greater likelihood of mortality within a specified interval. In addition to health status, certain demographic and socioeconomic variables proved to be significant predictors. Men, the unmarried, and older beneficiaries were more likely to die before 1989. Race, however, was not significantly associated with survival status after health and socioeconomic status were controlled. Measures of socioeconomic status—for example, being poor (lowest quartile of income) and having some high school education (9-11 years)—were significant predictors.

The findings uphold the argument that "health" is indeed a reason, not just a rationalization, for many retired workers' withdrawal from the labor force. All of the health variables tested—except one—were significant predictors of survival status. Perhaps the most convincing finding is that reports of leaving the last job for health reasons was a significant predictor of mortality. The overall logistic results tend to contradict the argument advanced that self-assessed health may be unreliable because it is more socially acceptable to stop working for presumed health reasons (Myers, 1985; Ruhm, 1989) than for other reasons.

Assessments of the health status of new retired-worker beneficiaries could be useful in more reliably forecasting the expected mortality and the "active life expectancies" of retired workers. This procedure could be extended to recipients of other benefits (such as disabled workers) as well. The results have shown that items such as those represented in the NBS can function as valid indicators of health and can be effectively used as quick measures of predicted outcomes. An assessment of health status shortly after labor-force withdrawal might be especially useful in developing reliable estimates of the functional status and life expectancies of future cohorts of retired workers, disabled workers, and other SSA program populations.

The death rates of newly retired workers (as findings from this study indicate) were very similar to those of all persons of comparable age in the general population. It is reasonable to assume that death rates for other groups (such as recipients of disabled-worker benefits and SSI payments) may be higher than the rates for those with similar age characteristics in the general population. Projections of beneficiary mortality are useful in estimating costs not only to the OASI Trust Funds but also for Medicare costs. Health status assessment has the potential of being a very useful tool in projecting the future health status needs and mortality of emerging cohorts of beneficiaries. A program to routinely survey emerging cohorts of retirees and other program-specific subgroups might prove to be a reliable means to project beneficiary mortality and its associated costs.

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