Antecedents of Mortality Among the Old-Age Assistance Population

by John L. McCoy*

This research is concerned with patterns of mortality and related risk conditions among noninstitutionalized recipients of old-age assistance. Survival status was determined by followup interviews in the 1974 Survey of the Low Income Aged and Disabled. Data obtained in initial interviews a year earlier were used as antecedent variables in the analysis. The general hypothesis that the overall death rate of recipients would be higher than the rate of persons aged 65 or older in the general population was not supported. Older white men had a significantly lower death rate than their population contemporaries. The opposite pattern was observed for older men other than white who had higher rates than their population contemporaries. Factors with significant association with mortality that were suggested by logit analysis included previous employment in construction industries, advanced age, greater household density, male sex, cancer, and heart trouble. Recipients who had lost the capacity to dress and were isolated from local support were also more likely to die. Survival factors included previous occupation as a farm operator, functional activity, and the ability to bathe and to care for self when ill.

The 1973 Survey of the Low-Income Aged and Disabled (SLIAD) was designed to provide demographic and socioeconomic information on the population the supplemental security income program was intended to cover—before the actual implementation of the program.[1] Followup interviews with the survey's "aged welfare sample," conducted in 1974, reveal patterns of mortality and risk-related conditions for old-age assistance recipients—the subject of the present analysis.

Previous research has shown that the poor, regardless of age, have higher mortality rates than the nonpoor. Several reasons have been suggested to explain the difference. Low-income persons, particularly the aged, have a higher incidence of morbidity, including a wider prevalence of chronic disease. Some investigators have reasoned that the poor make less use of health services because low income limits their access to health professionals and that inadequate health care results in an inferior health status. Other investigators have suggested that the poor are more likely to work and reside in generally inferior environments; and that their relatively greater exposure to unhealthy and hazardous conditions contributes to their poor health and may provide a greater risk of accidental death.

Yet another—perhaps less subtle—explanation has been suggested: Many differences between the mortality rates of the poor and nonpoor can be accounted for by differences in the demographic composition of the two populations. Perhaps the most comprehensive study of sociodemographic correlates of mortality—in particular characteristics associated with socioeconomic status—is the recent work of Kitagawa and Hauser.[2] Of special interest is the representation of blacks and other minorities, women, and the very old among the poor. Whatever the reasons for these differences in mortality rates—whether they are behavioral, financial, environmental, or demographic—they reflect a complex interacting set of associated conditions and preexisting causal circumstances.

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[1] For a description of the purposes and survey design, see Thomas Tissue, "The Survey of the Low-Income Aged and Disabled: An Introduction," **Social Security Bulletin,** February 1977.

[2] Evelyn M. Kitagawa and Philip M. Hauser, **Differential Mortality in the United States: A Study in Socioeconomic Epidemiology,** Harvard University Press, 1973.

Background and Purposes

This investigation is primarily concerned with testing the differential death rate hypothesis. It calls for an analysis of mortality rates among a subgroup of the poor—specifically, recipients of old-age assistance (OAA). A previous analysis of this population revealed that they suffered from a wide prevalence of health disorders. When compared with other low-income elderly persons who had not received assistance, they were much more likely to evaluate their health as "poor," to average more health disorders, and to experience more circulatory, mental, and musculoskeletal disorders.[3] In brief, the welfare subpopulation not only experienced worse health than the nonpoor, but—even when compared with low-income nonrecipients—they continued to experience greater health problems.

Given their established low-income status and correspondingly inferior health profile, it is anticipated that the welfare subpopulation will have a higher death rate than persons of similar age in the general population. To test this assumption and explain its consequences, this research attempts to demonstrate how recipient death rates may differ demographically from rates in the general population. Subsequent research objectives include a more focused multivariate analysis of how various personal, residential, and health characteristics of the aged welfare population are associated with mortality.

Data and Methods

Sample Characteristics

Data were gathered from a national sample of OAA recipients represented in the 1973 and the 1974 followup Survey of the Low-Income Aged and Disabled. The initial 1973 sample contained 5,192 household interviews weighted to represent a national caseload of 1,665,200 recipients. The uniform requirement for inclusion in the study population was that the sample person had to have received OAA sometime during the initial survey year. Since OAA eligibility was restricted to persons who had reached age 65, persons represented were at least that old but many were much older. The mean age was 75.5, and 13 percent of the weighted population was aged 85 or older.

The sample was distinguished by its age homogeneity or a small variation in age (the standard deviation was 7.07 years) and history of income deprivation, particularly its public assistance experience. About 6 recipients in 10 (64 percent) had received aid for more than 5 years, and 35 percent had received aid for as long as 10 years. Hence, the analysis of mortality was conducted among a population doubly burdened with the consequences of old age and poverty.

[3]John L. McCoy and David L. Brown, "Health Status Among Low-Income Elderly Persons: Rural-Urban Differences," **Social Security Bulletin,** June 1978.

Methods of Analysis

The first phase of analysis tests the general hypothesis that the observed death rate for recipients will be higher than that of their age contemporaries in the population. To understand what may have influenced the overall death rate, specific rates were calculated for eight subgroups defined by race (white/black, other), sex, and age (65–74 and 75 and older) within the recipient and the general population. These race-sex-age-specific rates were used to make comparisons within and between the two target populations. Subsequently, expected deaths among recipients were determined by a substitution of the corresponding population subgroup rates. Observed and expected recipient deaths are compared to show which subgroups had the greatest differential influences on overall mortality.

In the second phase of analysis, sex-specific rates are compared for selected sociodemographic, residential, and health characteristics among recipients. This part of the analysis is limited to recipients and uses information collected in phase one initial interviews. For both men and women, death rates are presented by occupational, industrial, and residential classifications. Further death rates are presented for selected chronic conditions, physical incapacities, and personal activities.

The final phase of the research is a multivariate analysis of survival status. Death and survival are examined as alternative outcomes that result from combinations of potential explainer variables. The technique used was multinomial logistic discrimination, or logit analysis.[4] A total of 104 data elements were subclassified into three separate logit models that were systematically analyzed for significant explanatory effects. The composition of each model and the application of logit are further discussed in the final section of the article.

Data Limitations

In addition to its use of the logistic approach to mortality, the present study differs from other studies of mortality in some ways. The data represent a "snap-shot" view of death occurring within a designated interval of 1 year—between October 1973 when initial interviews began and October-December 1974 when attempts were made to complete followup interviews. To the extent possible, elapsed time between interviews was standardized for all sample persons. Eighty-six percent of the 1974 followup interviews were completed within 50–54 weeks after the first year interview. Unlike data obtained from death certificates that contain information certified by a physician, medical examiner, or coroner, the death of the sample person was recorded along with other noninterview reasons by Bureau

[4]Richard H. Jones, "Probability Estimation Using a Multinomial Logistic Function," **Journal of Statistical Computation and Simulation,** No. 4, 1975, and S. H. Walker and D. B. Duncan, "Estimation of the Probability of an Event as a Function of Several Independent Variables," **Biometrika,** Nos. 1 and 2, 1967.

of the Census interviewers at followup. No attempt was made by followup interviewers to establish a probable cause of death.

Reliance on earlier self-reported information has an important methodological limitation that applies to the second and third phases of analysis in which initial survey responses were treated as "independent" variables. If the sample person was at home but unable to be interviewed because of poor health, the initial interview was conducted with a proxy respondent who was intimately familiar with the sample person's situation and circumstances. Proxy respondents represented 7 percent of the study population.

In the second and third phase of the analysis, a number of demographic, social, residential, and health characteristics are treated as antecedents of mortality. Such possible causes as accidents and drownings, poisonings, suicides, and homicide were excluded. How much these events influenced the death rates cannot be determined. Other investigators have observed that the elderly have above-average accident rates.[5] The recipient demographic profile suggests that their impact was probably minimal. Recipients were predominantly rural residents, with 56 percent residing in small towns and more rural places, and were primarily women (75 percent). For the most part, they led a retired, sedentary life.

Findings

Findings of the followup attempt are shown in table 1. Death was the major reason for failure to obtain an interview: 308 persons or 5.8 percent of the total weighted population (97,100) had died. The second most important reason for noninterview (4.1 percent) was institutionalization of sample persons. The indirect influence of the second reason on mortality should be kept in mind. The welfare aged population, as noted above, included household residents only. Residents of nursing homes, congregate-care facilities, and similar institutions were excluded from sample selection. Deaths among the institutionalized were thus excluded from the interval of observation, unlike deaths within the larger population. It is possible, however, that some sample persons reported as institutionalized at followup subsequently died within the survey period. The chance of this type of misclassification was minimized by the instructions to interviewers emphasizing the "current status" of the sample person at the time of recontact.

Race-Sex-Age Composition

Table 2 presents overall death rates and race-sex-age specific rates for recipients and for the general population. Contrary to what was expected, the overall death rates did not differ (5.8 percent for recipients and 5.7 percent for the general population). Confidence intervals for the 95-percent level were calculated for recipient rates, and these were compared with corresponding population rates. If the population rate, which was assumed to be a point estimate, was within the recipient confidence interval, the two rates were considered not to be significantly different.[6] A significantly higher mortality rate had been anticipated among the welfare aged because of extensive evidence relating to poverty, health, and mortality—and given the recipient population's demonstrated burden of poverty.[7]

Subgroup results (also shown in table 2) provide a gen-

Table 1.—Number and percentage distribution of 1973 interviews and 1974 followup results among OAA recipients

Items	Number (in thousands)	Percent
1973 interviews	1,665.2	100.0
1974 followup results:		
Complete interviews	1,474.7	88.6
Deceased	97.1	5.8
Institutionalized	68.7	4.1
Other[1]	24.7	1.5

[1]Includes those who refused to be interviewed, and those who were out of the country or could not be contacted after repeated attempts.

Table 2.—OAA recipients and aged U.S. population and percent of deaths, by sex and age, 1974

Sex and race	OAA recipients, by age			U.S. population, by age[1]		
	Total	65–74	75 and older	Total	65–74	75 and older
Number (in thousands):						
All persons	1,665.2	863.9	801.3	21,816.0	13,537.0	8,279.0
Deceased	97.1	29.0	68.1	1,239.0	450.5	788.6
Death rate (percent)	5.8	3.4	8.5	5.7	3.3	9.5
Percent deceased:						
Men	7.0	5.0	10.0	7.0	4.6	11.5
Women	5.3	2.5	8.0	4.8	2.4	8.4
White	5.5	3.1	7.8	5.7	3.2	9.7
Men	6.0	4.4	[2]8.2	7.0	4.5	[2]11.7
Women	5.2	2.4	7.7	4.8	2.3	8.5
Other	6.8	3.9	10.5	5.6	4.3	8.0
Men	9.6	6.3	[2]14.8	6.6	5.3	[2]9.4
Women	5.5	2.7	8.8	4.8	3.4	7.1

[1] Death rates computed from data from National Center for Health Statistics, Vital Statistics of the United States, 1974: Mortality Part A, vol. II, tables 1-26 and 6-2. Population estimates as of July 1, 1974.

[2] Rate significantly different from U.S. population rate when tested at the 95-percent confidence level.

[5] See Manuel Rodstein, "Accidents among the Aged: Incidence, Causes and Prevention," **Journal of Chronic Diseases,** No. 6, 1967. Elderly white males are reported to be especially susceptible to suicide. See Robert N. Butler, **Why Survive? Being Old in America,** Harper, 1975, and H. Resnick and J. Cantor, "Suicide and Aging," **Journal of American Geriatric Society,** 1970, page 152.

[6] For standard errors used in the calculations see Erma Barron, **Survey of Low-Income Aged and Disabled: Survey Design, Estimation Procedures and Sampling Variability,** Office of Research and Statistics, Social Security Administration, September 1978.

[7] Aaron Antonovsky, "Social Class, Life Expectancy and Overall Mortality," **Milbank Memorial Fund Quarterly,** April 1962; the author observes that class differentials by age begin to disappear beyond age 65. See also Evelyn M. Kitagawa and Philip M. Hauser (**op. cit.**) who concluded that such differentials were much greater among persons under age 65 than among persons aged 65 or older.

eral pattern of effects. Only two of the groups, however, had rates that differed significantly from those for their corresponding population group. The relative impact of the rates for each of these groups—both made up of men recipients aged 75 or older—is considered later. In general, subgroup differences represented countervailing effects tending to produce overall similar results. Yet the overall recipient rate was not only influenced by each subgroup's specific rate but also by that group's proportionate representation—that is, by its composition.

Overall differences in composition for the three demographic characteristics used in the derivation of subgroup rates are shown in chart 1, which compares the sample distribution of each characteristic with its population distribution. Among recipients, men—who generally have higher death rates than women—were underrepresented in comparison with their proportion in the general population (30 percent, compared with 41 percent). Persons other than white, who also tend to have higher death rates, were excessively overrepresented (28 percent, compared with 9 percent). Persons of more advanced age were also overrepresented among recipients: Forty-eight percent of the recipients were aged 75 or older, compared with 37 percent in the general population.

Separate effects for each subgroup are graphically demonstrated in chart 2. Bars on the left compare race-sex-age-specific rates for the recipient and general populations, the bars on the right compare the representation of the subgroups in the populations. The overall patterns for these comparisons demonstrate clearly the relative effects of these two conditions. The chart shows specifically that (1) although some recipient groups had high relative rates, their corresponding compositional influence was negligible and (2) other groups with low relative rates had greater compositional influence.

In general, white recipients exhibited lower mortality rates, but blacks and members of other minorities showed higher rates. Older men who were not white were not only overrepresented but had the highest recipient death rate. Younger men of similar background also had an augmentative influence, but the combined effect for this group was not as great because of a lower death rate and a smaller representation.

In contrast, older white men were underrepresented among recipients and had significantly lower rates than their population contemporaries. Since white men manifest a much lower risk of poverty than others, it is reasonable to assume that they would be minimally represented among welfare recipients. Younger white men were underrepresented to an even greater extent (13 percent compared with 24 percent in the population).

Patterns of mortality among women recipients were somewhat similar to those of men, yet with notable differences. The most salient differences were compositional. Unlike older men, older women recipients had death rates more closely comparable with those of their general population contemporaries.

A comparison of observed recipient deaths with those expected, if population subgroup rates had prevailed, presents another perspective for assessing compositional effects. Table 3 indicates that recipient deaths would have risen from 97,100 to 100,400, or a net increase of about 3,300 deaths. This relatively small increase is reflected in the fact that the expected overall rate of 6.0 was not significantly different from the observed rate of 5.8. The two significant group effects noted previously are further demonstrated by their observed/expected ratios (older nonwhite men—1.57; older white men—0.70). If older nonwhite men recipients had died at the same rate as their population contemporaries, total deaths would have declined by about 3,000. If the population rate for older white men had prevailed, total deaths would have increased by about 5,200. Similar patterns were demonstrated for older women: Ratios were higher for those that were not white and lower for white women.

The following generalizations emerge from the analysis of subgroup mortality. The overall findings conform with the general observations of Antonovsky and others that differences in mortality rates according to socioeconomic levels become obscured beyond age 65. Specific results point to compensating subgroup differences: Older white men recipients had substantially lower mortality rates and older men other than white had rates higher than their contemporaries in the general population.

The study did not show directly why older white men exhibited significantly lower mortality rates among recipients than they did in the general population. These men have one of the lowest risks of poverty and, although their rate of institutionalization is not known, they may have entered nursing homes or similar institutions as a result of declining health and accompanying changes in living arrangements. The older men who are not white, in contrast, have a much greater risk of poverty and are far less likely to enter institutions.

Chart 1.—Percentage distribution of OAA population and of U.S. population aged 65 and older, by sex, race and age

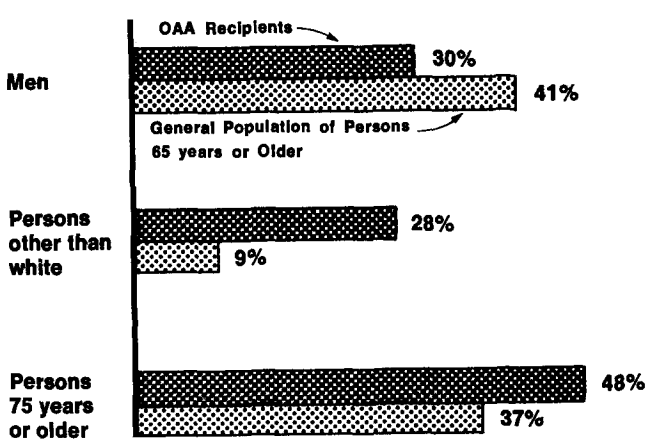
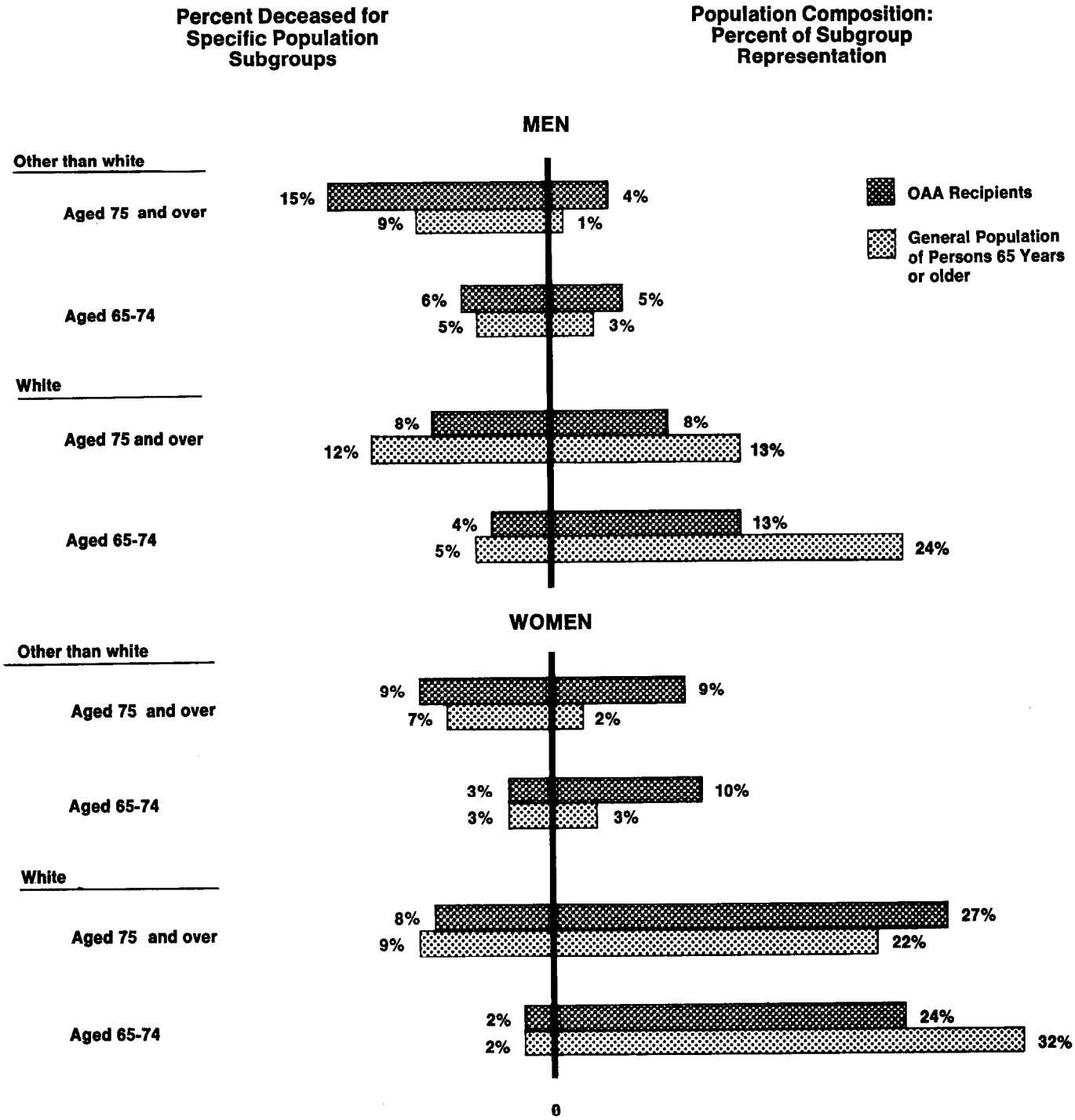


Chart 2.—Specific death rates for 1974 and compositional differences in OAA population and U.S. population aged 65 and older, by sex, race, and age



Although a "cross-over" effect by race was observed among the general population aged 75 and older, no such effect occurred among recipients.[8] Among men recipients, whites consistently had lower mortality rates yet in the general population white men had a higher rate. One interpretation of this effect is that race and socioeconomic status are concomitantly related to mortality but other antecedent and intervening conditions may also be important. Many of these intervening conditions are more clear-cut in a welfare aged population where socioeconomic status is uniformly low and income is "controlled." If it is assumed that whites

[8]See Russel G. Thornton and Charles B. Nam, "The Lower Mortality Rates of Nonwhites at the Older Ages: An Enigma in Demographic Analysis," **Research Reports in Social Science** (Institute for Social Research, Florida State University), No. 1, 1968, and Charles B. Nam, N.L. Weatherby, and K.A. Ockay, "Causes of Death Which Contribute to the Mortality Crossover Effect," **Social Biology,** No. 4, 1979.

Table 3.—Number of OAA recipients, observed and expected number of deaths, and ratio of observed to expected deaths, by sex, race, and age, 1974

[Number in thousands]

Sex, race, and age	All persons	Deaths		Ratio of observed to expected
		Observed[1]	Expected[2]	
Total number	1,665.2	97.1	100.4	0.97
Men:				
White:				
65–74	88.0	5.6	4.7	1.19
75 and older	56.2	8.3	5.3	1.57
Other:				
65–74	209.3	9.3	9.4	.99
75 and older	149.4	12.3	17.5	.70
Women:				
White:				
65–74	171.2	4.6	5.8	.79
75 and older	144.9	12.7	10.3	1.23
Other:				
65–74	395.5	9.5	9.1	1.04
75 and older	450.9	34.8	38.3	.91
Death rate (percent)	.....	5.8	6.0	.....

[1] Weighted number of deaths.

[2] Computed by multiplying the sex, race, and age death rates in U.S. population by the number of OAA recipients with these characteristics.

have experienced higher socioeconomic status, then a theory mentioned by Kitagawa and Hauser serves as a partial explanation for the cross-over and leveling effects associated with race in the general population. Kitagawa and Hauser have suggested that higher minority death rates among younger age groups result in a residual elderly population of robust and relatively hardy survivors.

A "survival of the fittest" theory presents a dilemma that may obscure the relationship of other factors associated with mortality. Elderly welfare recipients can be viewed as hardy, though not necessarily healthy, remnants of a stressful past that has eliminated many weaker associates. One need not necessarily assume that welfare survivors have been survivors on welfare for an extended period of time. The study population may also be thought of as a special group experiencing different stresses of varying exposure and intensity.

Profile of Mortality: Sex-Specific Comparisons

The second phase of analysis included systematic comparisons of sex-specific death rates for the total recipient population unadjusted for age. Rates were calculated to represent a range of characteristics indicative of the sociodemographic epidemiology of the aged welfare population. Comparisons of death rates presented in tables 4–10 serve as an introduction to the multivariate analysis presented later. All of the items for which death rates were calculated were included in the logistic survival models.

In addition to age, sex, and race, other sociodemographic characteristics included region of residence, size of residential location, housing type and quality, household composition, marital status, and Hispanic origin.[9] Rates were also compared for major occupation and industry classes. Health-status measures included physical functioning capacity and prevalence of 38 chronic conditions and impairments. Other items in this group included measures of ability to carry out daily activities of living.[10] Health "outcome" and related behavior were represented by the number of days ill in bed at home, days hospitalized, last physician contact, and last time spent as an overnight patient in a hospital.

Sociodemographic Characteristics

A lower death rate for married persons has been a consistent finding reported in official death statistics.[11] The pattern for the aged welfare population, however, does not completely parallel the national findings. Mortality rates for the overall recipient population ranged from a low of 4.3 percent for married persons to a high of 7.0 percent for the widowed (table 4). For those who were married and for those who were separated or divorced, the rates were equally low (4.5 percent and 4.7 percent). Major differences between the mortality rates for men and women were observed. For men the highest rate was for those who were widowed (11.2 percent) and the lowest for those who had never married (4.7 percent). For women the highest rate was also for the widowed (6.4 percent), but, unlike the men, their lowest rate was for the married (2.1 percent).

Two of the geographic regions had mortality rates above the average—the West (6.4 percent) and the South (6.2 percent). The North Central region, with a 4-percent mortality rate, was below the overall rate. Mortality rates for men ranged from a high of 8.1 percent in the Northeast to a low of 4.1 percent in the North Central region. For women the rates ranged from a high of 6.0 percent in the West to a low of 3.9 percent in the North Central region. It is likely that that demographic patterns account for the low rates for men and women in the North Central region—that is, proportionately fewer black and Hispanic recipients were represented in that region. Higher rates among women in the West may also reflect the presence of proportionately more blacks and persons of Mexican-American origin.

Rural-urban residence resulted in no observable differences in mortality for the population as a whole. Differences between rates for men and women were observed, however,

[9] For definitions used, see John L. McCoy and David L. Brown, **op. cit.**

[10] See Sidney Katz et. al., "Studies in Illness in the Aged: The Index of ADL—A Standardized Measure of Biological and Psychological Function," **Journal of American Medical Association,** No. 12, 1963; M. Powell Lawton and Elaine M. Brody, "Assessment of Older People; Self-Maintaining and Instrumental Activities of Daily Living," **Gerontologist,** September 1969.

[11] National Center for Health Statistics, **Mortality from Selected Causes by Marital Status** (Vital and Health Statistics, Series 20, Nos. 8A and 8B), December 1970.

for residents of intermediate-size cities (25,000 to 100,000 population). Here sex patterns similar to the patterns observed in the regional comparisons were exhibited. Men had the highest mortality rates (8.1 percent) and women the lowest (4.2 percent).

Housing quality, a composite measure of basic minimal household comforts,[12] produced no observable differences—that is, the mortality rate of those who were living in substandard structures (6.2 percent) was similar to the rate of persons whose structures met or exceeded the standard (5.7 percent). Mitigating demographic circumstances intervene between housing quality and death. The recipient population was represented by a strong rural and a strong Southern background. Southern rural welfare recipients have been shown in an earlier analysis to reside in detached units that have tended to be below standard in quality.[13] In addition, recipients who were occupants of single-family units were more likely to have been married and younger than the single women—more often than not widows—who lived in apartments.

Household composition was represented in the analysis by four types of living arrangement: (1) Alone, (2) only a spouse present, (3) others in addition to a spouse present, and (4) persons other than a spouse present. As table 4 shows, the highest mortality rate was found for both men and women who had lived with persons other than a spouse (9.3 percent and 8.6 percent). Their highly comparable and substantially greater mortality rates suggest that common circumstances such as declining health and loss of function may have been antecedents to their living arrangements. On the other hand, the presence of persons other than a spouse may represent nothing more than a demographic artifact—that is, unmarried recipients who had lived with others had higher rates because proportionately more minorities were represented who have been shown to rely on extended-family support systems.

The negative influence of the presence of a spouse on mortality was also demonstrated in household composition effects. Its impact, however, was more apparent for women. The presence of others in addition to a spouse appeared to have no effect: The rates were 1.8 percent for those with spouse and others and 2.1 percent for those with spouse only.

Lifetime occupations of deceased recipients are compared in table 5. Differences in mortality rates among the nine major categories represented were relatively small, ranging from a low of 5 percent for service and household workers to a high of 8 percent for craftsmen. The reason for such small differences is partly explained by the plurality of lower blue-collar and farm-related occupations. Since white-collar and professional occupations were substantially excluded in the sample-selection procedure, their pattern of mortality could not be observed.

Table 4.—Demographic characteristics of OAA recipients and percent of deaths, by sex, 1974

Characteristics	Total	Men	Women
Number (in thousands):			
All persons	1,665.2	502.9	1,162.3
Deceased	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased reported:			
Region of residence:			
West	6.4	7.2	6.0
North Central	4.0	4.1	3.9
East	5.3	8.1	4.3
South	6.2	7.5	5.7
Size of place:			
Population less than 25,000	6.0	6.6	5.7
25,000-100,000	5.2	8.1	4.2
100,000 or more	5.7	7.6	5.0
Housing quality:			
Meets standard	5.7	6.6	5.3
Below standard	6.2	7.6	5.3
Living quarters:			
Apartment	5.5	11.1	4.0
Rented room[1]	7.1	4.3	10.4
Detached house	6.1	6.5	5.9
Row house	4.7	8.9	3.4
Trailer or mobile home	4.2	3.9	4.3
Household composition:			
Alone	4.5	7.1	3.8
With spouse only	4.3	6.1	2.1
With spouse and others	4.9	6.4	1.8
With others only	8.7	9.3	8.6
Marital status:			
Married	4.5	6.2	2.1
Widowed	7.0	11.2	6.4
Separated, divorced	4.7	5.0	4.6
Never married	4.3	4.7	4.0
Hispanic origin:			
Mexican American[2]	6.9	7.0	6.8
All others of Spanish heritage	4.3	5.5	3.7

[1]Includes rented rooms in hotels and in rooming and boarding houses.
[2]Respondents identified themselves as Chicanos or Mexicanos.

Table 5.—Lifetime occupation of OAA recipients and percent of deaths, by sex, 1974

Occupation	Total	Men	Women
Number (in thousands):			
All persons	1,665.2	502.9	1,162.3
Deceased	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased in:			
Professional and managerial	6.2	6.6	6.0
Clerical and sales	5.4	7.0	5.1
Craftsmen	7.6	7.5	[1]
Operatives	5.7	9.7	3.7
Laborers:			
Nonfarm	7.1	7.7	[1]
Farm	6.6	6.5	6.2
Farm operators	5.3	5.9	3.2
Service	5.0	4.8	5.0
Household worker	5.2	[1]	5.2
Never worked	5.7	[1]	5.8

[1]Less than 1 percent reporting on occupation.

[12]See Thomas Tissue, "A Last Look at Adult Welfare Recipients Prior to SSI," (Survey of Low-Income Aged and Disabled Report No. 3), March 1978.

[13]See Sylvester Schieber, "Aged Welfare Recipients' Housing and Public Housing Policy" (paper presented at the Annual Meeting of the Eastern Economics Association, April 1978, Office of Research and Statistics, Social Security Administration), June 1978.

Table 6.—Lifetime industry of OAA recipients and percent of deaths, by sex, 1974

Industry[1]	Total	Men	Women
Number (in thousands):			
All persons	1,665.2	502.9	1,162.3
Deceased	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased in:			
Agriculture, forestry, and fishery	6.4	6.4	6.3
Mining	10.0	10.3	(2)
Construction	11.4	10.9	(2)
Manufacturing	5.3	7.9	3.8
Transportation	7.5	5.9	(2)
Wholesale and retail trade	5.6	7.3	5.1
Services	4.2	3.2	4.3
Entertainment and recreation	3.9	3.6	3.9

[1]Communication and utilities, finance and business, and public administration not shown; less than 1 percent reported.
[2]Less than 1 percent.

Mortality rates for occupation of men ranged from a low of 5 percent for service workers to a high of 10 percent for operatives. The rates in women's occupations ranged from a low of 3 percent for farm operators to a high of 6 percent for farm laborers and professional/managerial employees. Women operatives also had low mortality rates. The opposite trend in sex-related mortality for operatives is explained in part by sex differences in job requirements. Men were more likely than women to have been employed as truck drivers, for example.

Farm operators, regardless of sex, tended to have lower mortality rates than those in other occupations, but these rates were even lower for women. In contrast, women who had worked as farm laborers had relatively high mortality rates. These differences suggest that race, Hispanic background, and other demographic characteristics may be closely associated with the residential and regional characteristics of recipients.

In comparison with the small occupational differences noted above, the distribution by industry showed a wider range of mortality rates (table 6). Mortality rates ranged from a low of 4 percent for persons in services to a high of 11 percent for those in construction. The highest rates for men were in mining and construction, both almost entirely male-dominated. For women, the highest rate was found for those in agriculture, forestry, and fishing industries.

Mortality rates for men were higher than those for women in manufacturing industries (7.9 percent, compared with 3.8 percent). As noted earlier, such differences may reflect differences in sex-role requirements. Greater numbers of men were involved in heavy industries, with relatively greater exposure to hazardous working conditions.

Health Indicators

Selected chronic health conditions are in descending order of mortality rates in table 7. The range was from a low of 5.8 percent for gallbladder or liver conditions to a high of 18.6 percent for cancer. Other leading conditions include chronic lung trouble, mental illness, stroke, hardening of arteries, and heart trouble. Since the sample person could have had more than one of these conditions, the conditions are probably more realistically accounted for as part of various health syndromes with a combined effect greater than any single occurrence—that is, cancer may have occurred with chronic lung trouble, a tumor, cyst, or growth (regardless of malignancy), or with a gallbladder or liver condition. All of these conditions together may have had a far greater combined influence on mortality. The present analysis does not address such issues. The multivariate analysis presented later partly considers such collective influences.

Table 7.—Chronic health conditions of OAA recipients and percent of deaths, by sex, 1974

Chronic condition	Total	Men	Women
Number (in thousands):			
All persons	1,665.2	502.9	1,162.3
Deceased[1]	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased with:			
Cancer	18.6	12.1	22.0
Chronic lung trouble	10.4	10.1	10.6
Mental illness	10.1	12.5	9.2
Stroke	9.2	10.0	8.8
Hardening of arteries	8.0	8.3	7.9
Heart trouble	8.0	8.2	8.0
Deformed extremities	7.7	9.5	6.8
Coronary heart attacks	7.6	5.6	8.8
Spinal deformities	7.5	8.2	7.2
Blindness, total or partial	7.2	9.5	6.2
Stomach ulcers	7.2	9.0	5.9
Deafness, total or partial	6.9	8.4	6.2
Chronic bronchitis	6.4	8.6	5.6
Emphysema	6.4	6.6	6.2
Chronic stomach trouble	6.3	5.9	6.5
Hypertension	6.2	7.8	5.7
Tumor, cyst, growth	6.1	8.8	5.4
Hernia or rupture	6.1	6.5	5.8
Chronic kidney trouble	5.9	7.5	5.1
Gallbladder or liver trouble	5.7	8.5	5.0

[1]Excludes conditions with prevalence rates of 1.0 percent or less or mortality rates of less than 5.0 percent.

Cancer exhibited the greatest sex differences in death rates (table 7). For women, the rate was almost twice that of men (22 percent, compared with 12 percent). Otherwise, except for heart attacks and chronic stomach conditions, death rates for specific conditions were generally higher among men. Women's higher death rate for heart attacks is puzzling in light of other national evidence. One explanation is that these deaths of women may have been influenced by advancing age effects. Thus, sex would appear to have a conditional influence because of women's larger representation. A similar age-related mechanism may be associated with cancer deaths among women.

The ability to perform basic activities of living has been shown to be a reliable indicator of health status. Performance decrements in such activities, particularly among the aged, usually indicate serious, underlying chronic disease. It

Table 8.—Limitation in selected living activities of OAA recipients and percent of deaths, by sex, 1974

Limitation	Total	Men	Women
Number deceased (in thousands)	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased with limitation in:			
Dressing	20.7	18.8	21.3
Bathing	18.1	16.4	18.7
Do light housework	12.3	12.7	12.0
Preparing meals	12.9	11.1	12.8
Washing clothes	9.8	10.7	9.3
Shopping for groceries	9.1	11.7	8.3
Caring for self when ill	8.7	9.4	8.3
Doing heavy housework	6.8	8.2	6.2

is therefore reasonable to assume that these performance decrements should be reliable indicators of mortality.

Two groups of performance measures were represented in the analysis. One focused on individual behavior associated with personal hygiene and household activities such as dressing, bathing, caring for self when ill, preparing meals, and doing household chores. The other focused on individual capacities to control major muscle systems of the body. That set was adapted from items developed by Haber and included personal incapacities for the following functions: Walking, grasping, sitting, climbing, reaching, standing, stooping, and lifting.[14]

Mortality rates, by limitations in activity ranged from a low of 6.8 percent for recipients who could not do heavy housework to a high of 20.7 percent for those who could not dress (table 8). Although prevalence rates are not shown, they were an important consideration in the analysis. Prevalence was generally inversely associated with mortality: About 1 recipient in 10 (8 percent) could not dress, a slightly larger proportion could not bathe (12 percent), and 73 percent were unable to do heavy housework.

As table 8 indicates, inability to bathe or dress had the highest associated mortality. When these strikingly higher death rates are considered in terms of the study population's poor health profile, they suggest that serious health syndromes were associated with them. The marked absence of sex differences underscores a basic observation that, for both men and women, such activities were vital to the maintenance of routine living.

Among the nine physical capacities assessed, an inability to walk was the most serious for both men and women (table 9). That incapacity produced the highest mortality rates (25.3 percent for men, 18.4 percent for women). The lowest rate was for the inability to lift heavy weights. A loss of function in grasping or handling also produced high mortality rates for both men and women (18.5 percent for men and 13.3 percent for women). These high mortality rates emphasize the importance of a loss in functional capacity and its probable health consequences.

[14]See Lawrence Haber, "The Epidemiology of Disability: II. The Measurement of Functional Capacity Limitations" (Social Security Survey of the Disabled, Report No. 10), Office of Research and Statistics, Social Security Administration, 1970.

Health Behavior

Four measures of health behavior and health-service utilization are compared in table 10. Mortality rates associated with the number of days ill in bed ranged from a low of 3.8 percent for those who reported illness of less than a week to a high of 11.3 percent for those who reported illness in bed for 30 days or longer. Mortality rates for the number of days of hospitalization were similar, but the pattern did not suggest a linear relationship. For men, the highest mortality rate was for hospitalization of 21–29 days (19.1 percent), for example, but the rate was much lower for longer periods.

Mortality rates associated with the last period of hospitalization for women ranged from a low of 4.7 percent for those whose last confinement was 7–12 months ago to a high of 14 percent for hospitalization in the past month. Mortality rates among men were equally high whether they had been hospitalized in the past 6 months or past month (11.6 percent and 10.5 percent). Contact with a physician had only a minimal relationship with mortality rates, ranging from a low of 3.8 percent for women whose last contact was 7–12 months ago to a high of 9.2 percent for men who had visited a physician in the past month. Overall, illness at home in bed and hospitalization appear to be more associated with male mortality. Recency of physician contact was also a more discriminating indicator of mortality for men.

Logistic Analysis

Introduction and Methods

The final phase of the study of mortality departs conceptually and methodologically from the analysis presented in the preceding sections. In the analysis that follows, death is

Table 9.—Selected physical incapacity of OAA recipients and percent of deaths, by sex, 1974

Physical incapacity	Total	Men	Women
Number deceased (in thousands)	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased with incapacity in:			
Walking	20.2	25.3	18.4
Grasping or handling	14.9	18.5	13.3
Sitting for long periods	11.1	11.1	11.1
Climbing stairs	10.8	11.3	10.7
Reaching	10.2	11.1	9.9
Standing for long periods	9.0	10.6	8.5
Stooping, crouching, kneeling	8.7	11.1	8.1
Lifting light weights, up to 10 pounds	8.3	11.2	7.5
Lifting heavy weights, over 10 pounds	7.1	9.0	6.4

Table 10.—Health care utilization of OAA recipients and percent of deaths, by sex, 1974

Utilization	Total	Men	Women
Number deceased (in thousands)	97.1	35.4	61.7
Death rate (percent)	5.8	7.0	5.3
Percent deceased reported:			
Days ill in bed:			
None	4.7	5.5	4.3
1–6	3.8	8.2	1.7
7–20	5.4	4.7	5.7
21–29	6.1	11.0	4.4
30 or longer	11.3	13.6	10.4
Days hospitalized:			
None	5.0	6.1	4.5
1–6	3.5	8.0	1.3
7–20	7.4	7.6	7.3
21–29	14.6	19.1	12.1
30 or longer	12.5	12.6	12.4
Last contact with physician:			
Past month	6.5	9.2	5.6
Past 6 months	5.9	5.5	6.1
Past year	4.2	5.1	3.8
Last time hospitalized:			
Past month	12.9	10.5	14.1
Past 6 months	9.3	11.6	8.1
Past year	5.2	6.6	4.7

considered as an alternative outcome condition to survival. The research emphasis is on the multivariate nature of survival status, and the major objective is to identify variables that reliably explain survival status. The technique used for this purpose was multinomial logistic discrimination, or logit analysis. Briefly, the logit analysis used here is a maximum likelihood procedure that initially derives standard discriminant coefficients as starting estimates and applies iterative procedures to maximize the likelihood functions.[15]

Compared with standard regression procedures, logit is considered more appropriate for making reliable estimates when the dependent variable is dichotomous and its distribution is extremely skewed. Previous methodological investigations of logit have found it to be a robust procedure when the distribution of X independent variables is not multivariate normal. It has also been found to be acceptable for mixtures of Gaussian and Bernoulli types of independent variables following a loglinear model. A recent study[16] of the behavior of the multiple logistic function concluded that, if the multivariate distribution is nonnormal and if the true coefficient is zero ($\omega_i = 0$), the logit analysis will estimate the coefficient to be zero.

Logit results presented here contain four types of information: (1) Values of chi square based on one degree of freedom, (2) final logit coefficients that represent the direction and magnitude of association of explainer variables with the dependent variable (positive if dead, negative if alive), (3) standard errors of the estimates, and (4) the relative risk associated with the explainer variable. Relative risk provides an additional index indicating the increase in risk that a particular variable may induce. It was calculated by treating the logit coefficient as an exponential function of the base e (2.718). Since chi square is a function of the squared ratio of a logit coefficient to its standard error, its appearance in the tables is intended primarily for additional information.

Three logit models were specified to represent different conceptual aggregates of variables. A model consisting of chronic conditions, physical function, and other related health behaviors included all 48 of the variables discussed in the preceding analysis. Data elements for activities of living were further specified to distinguish effects of personal isolation when a particular activity could not be performed independently.

Two sociodemographic characteristics were added to the 24 variables represented earlier—the highest level of education and the poverty ratio level. Additional specifications in the residential/household logit model (30 variables) included accessibility of a telephone, flush toilet, and hot water in the dwelling unit. Rural/urban location was further specified to test farm and open-country classifications.

In all cases, if the health condition, the capacity to perform an activity or function, or a specific attribute were present, the variable was coded 1, otherwise 0. Variables that assumed continuous values were introduced into the logit models as continuous variables. In the health model, continuous variables included days ill in bed and hospital days. In the sociodemographic model—age, income, and education were coded continuously. No continuous variables were represented in the residential/household characteristics model. Physical functions were coded hierarchically and assigned a higher score if the function could be accomplished completely without assistance. Distinctions were made among activities of living to show the type of help received when a performance decrement was present. Occupations and industries were represented only at the broadest levels of generalization and conformed with the general classification developed by the Bureau of the Census—operatives, farm operators, agriculture, manufacturing, for example. Residence was represented according to size of place and by Census region.

Overall Logit Model Results

Overall logit results for the three models are shown in table 11. The relative effectiveness of model specifications was judged on the basis of two criteria: (1) Number of explanatory variables (logit coefficients) with chi square values statistically significant at the 0.05 or level or better

[15]The logistic analysis used was adapted with modifications from the computer program initiated by Richard H. Jones, **op. cit.**

[16]Max Halperin, William C. Blackwelder, and Joel Verter, "Estimation of the Multivariate Logistic Risk Function: A Comparison of the Discriminant Function and Maximum Likelihood Approaches," **Journal of Chronic Diseases,** 1971. See also John McCoy and Robert Manicke, "A Comparison of Cp Regression and Logit Analysis for Deriving Optimal Models of Mortality," **Proceedings of Social Statistics Section,** American Statistical Association, 1978; and David R. Cox, "Some Procedures Associated with the Logistic Response Curve" in Florence N. David (ed.), **Research Papers in Statistics: Festschrift for John Neyman,** John Wiley, New York, 1966.

Table 11.—Overall results of logistic analysis showing relative efficiency of aggregated models for OAA recipients

Item	Total	Health/ physical function	Socio-demographic	Contextual
Variates:				
Analyzed	104	48	26	30
With significant χ^2 (≥ 3.84)	17	9	5	3
Overall x^2 (df=number of variates)	659.88	389.5	183.2	87.2
Normalized x^2 for df x 2 table	.....	0.274	0.187	0.129

and (2) comparative overall chi square values for each model as a whole.

Summary findings (based on normalized chi square values calculated to adjust for rows and columns) show that the health logit model was the most effective; the sociodemographic model was relatively less effective; and the residential/household characteristics model was the least effective. This relative ordering of the variable classifications may conform with most a priori views that health indicators should be more effective than demographic characteristics, but it is also evident that some other model specification could have reversed their order of importance. Whether or not the residential/household model could have been more efficiently specified with other survey data is doubtful. Its lack of explanatory power is an issue only in a relative sense. The data elements included in the model were conceptualized as environmental. Such effects are both indirect and cumulative, as noted earlier. Moreover, some elements with environmental implications are represented in the sociodemographic and health logit models. Indeed, as the following analysis of health characteristics demonstrates, one of the most important risk conditions to emerge stresses the important supporting role of the social environment.

Health and Physical Function

The profound impact of cancer on mortality was confirmed in the logit analysis by its reliable and relatively large coefficient (table 12). Relative risk for recipients with cancer (3.26) was three times that of other elderly recipients without cancer. Another chronic condition, heart trouble, was also a reliable mortality predictor, but its relative risk (1.49) was only about half that of cancer. None of the other chronic health conditions with high mortality rates shown in table 7 proved to have significant logit coefficients. Chronic back trouble, however, which had an extremely low rate, had a negative association with mortality (relative risk, 0.56); the reason for this was not directly evident. Back trouble may represent other disorders that do not have as steep a trajectory of terminal decline as cancer and heart conditions or may represent arthritic types of conditions pervasive among the surviving population.

Selected measures of activity limitation and personal function proved to be reliable explainers of survival status, but their association points to a complex conditional relationship. This relationship was demonstrated in each logit analysis but was most evident in the health logit model. The results indicate a three-way association representing declining personal function, need for assistance, and mortality. If, for example, a recipient was unable to dress, it was further determined whether help was received and, if so, whether it was received at no cost. As the logit results in table 12 show, recipients who could not dress and could not get help had a relative risk of death (9.83) almost 10 times that of other elderly recipients. This evidence, when compared with the relative risk (1.39) for recipients who could not dress but had received free household help, stresses the significance of the household unit as a support system.

Table 12.—Probability of 1974 death/survival using multinomial logistic analysis of health and physical characteristics among OAA recipients, 1973

Characteristics	Chi square[1]	Final logit coefficient	Standard error of estimate	Relative risk
Variates analyzed	48	.....	.....	.....
Initial log likelihood[2]	2,396.9	.....	.....	.....
Final log likelihood	2,171.2	.....	.....	.....
Cancer	22.40	1.1815	0.2469	3.26
Back/spine trouble	10.14	-.5776	.1814	.56
Heart trouble	7.68	.3978	.1436	1.49
Able to bathe	5.60	-.8351	.3527	.43
Unable to climb stairs	4.79	.2739	.1251	1.31
Requires help to dress, none available	4.53	2.2860	1.0742	9.83
Days ill in bed	4.42	.0635	.0302	1.07
Free household help when ill	4.05	.3274	.1627	1.39
Able to care for self when ill	3.94	-.2994	.1508	.74

[1] $\chi^2 \geq 10.837 = \chi^2(.001)$; $\chi^2 \geq 6.635 = \chi^2(.01)$; and $\chi^2 \geq 3.841 = \chi^2(.05)$.

[2] To ensure accuracy the iteration procedure minimized -2 log likelihood, which is numerically equivalent to maximizing the log likelihood.

Coping capacity was further demonstrated by two other logit findings, both of which focus on survival rather than on mortality. Recipients who could bathe without assistance and those who could care for themselves when ill had significantly lower relative risks of mortality. These findings suggest that personal isolation is relatively unimportant for persons who have functional capacity but that, when isolation occurs in the absence of function, the risk of death significantly increases.

Among the remaining physical functions examined, only inability to climb stairs had a significant relative risk of death (1.31). A feasible explanation is that inability to climb may indicate underlying musculoskeletal, neurologic, or cardiovascular conditions representing greater stress than is associated with inability to walk.

Among the health behaviors examined, the number of days hospitalized was not a significant predictor of mortality. Days ill in bed at home was a reliable, though not high predictor (relative risk, 1.07). With a population of this type, perhaps the lack of association between hospitalization and death is not surprising, although almost 7 in 10 (69 percent) of recipient deaths reportedly occurred in either

hospital or nursing home beds. Time in a hospital or a nursing home did not, for a number of reasons related to recovery factors and to behavioral characteristics, satisfactorily distinguish those who were terminally ill from those who were not. Many elderly persons are discharged after brief confinement periods. Many others with serious illness may not have entered the hospital or nursing home until the final stages of their terminal conditions. Two possibilities are suggested: (1) Elderly recipients who died after a lengthy confinement at home may have been isolated from community health services and (2) even if such services were available, it was their preference to be confined at home.[17]

Sociodemographic Characteristics

Other mortality studies have demonstrated that occupation and industry classes represent cumulative environmental effects and that they reflect in part socioeconomic differences and in part environmental hazards and risks. The relative risk represented by previous lifetime employment was one of the more important findings of the analysis. That such effects are important is sustained by two of the findings in table 13.

Table 13.—Probability of death/survival using multinomial logistic analysis of sociodemographic characteristics among OAA recipients, 1973

Characteristics	Chi square[1]	Final logit coefficient	Standard error of estimate	Relative risk
Variates analyzed	26	.....	.....	.....
Initial log likelihood[2]	2,307.1	.....	.....	.....
Final log likelihood	2,142.5	.....	.....	.....
Chronological age	85.39	0.0766	0.0083	1.08
Number in habitat	8.29	.0914	.0340	1.10
Construction industry	6.36	1.1097	.4351	3.03
Farm operator occupation	5.71	1.1283	.5371	.32
Male sex	5.23	.4127	.1804	1.51

[1] $\chi^2 \geq 10.837 = \chi^2(.001)$; $\chi^2 \geq 6.635 = \chi^2(.01)$; and $\chi^2 \geq 3.841 = \chi^2(.05)$.

[2] To ensure accuracy the iteration procedure minimized 2 log likelihood, which is numerically equivalent to maximizing the log likelihood.

Construction workers, for example, represented a relative risk of death (3.03) that was three times greater than other recipients who had not been employed in such industries. Moreover, the specific occupations associated with a particular industry, as noted earlier, are important dimensions of the risk environment. About half of the construction workers had been craftsmen, for example, and about two-fifths had been laborers.

Farm operators, on the other hand, were much more likely to have survived; their relative risk (0.323) was significantly less than that of others. The significantly lower mortality of farm operators is supported by other studies but is of particular interest here because those studies have generally been based on much larger populations not limited to the poor and not confined to those aged 65 or older.[18] A tentative conclusion is that rural life for farm operators was less stressful, but other evidence relating to the study population does not fully support this. Farm operators who have been welfare recipients were more likely to have been involved in marginal or subsistence types of farming operations. This conclusion is based on the additional observation that recipients had predominantly Southern backgrounds and were more likely to have been sharecroppers—two groups historically subject to considerable economic and physical stress.

In light of this historical profile, what accounts for the significantly lower risk of death for this group? Evidence to explain the difference is not directly available, but conditions that have contributed to death at earlier ages are substantially different from those influencing survival in the later years of life. Farm operators represent not only those who managed to survive among the poor, but they stand for both a different generation of risk and a different environment of risk. Indirect support for the latter observation comes from a logit and multiple regression analysis of mortality among a younger group of disabled welfare recipients. One finding in that analysis indicates that farm operators as well as farm laborers had significantly high risks of death.[19]

The very reliable logarithmic association of age with death, first identified by Gompertz in 1825, was clearly demonstrated. What is of interest here is that the relative risk of mortality increased by a value of one (relative risk, 1.08) for each year represented. Some investigators have made the distinction between biologic and chronologic age effects, arguing that biologic age represents the influence of heredity and stress factors.[20] Such a distinction could not be made here. Some support exists for the argument that recipients may have been biologically older than their age counterparts in the general population. When an actuarial life-expectancy measure was substituted for age, it was not as effective a predictor variable. In a separate analysis of the data, with both logit and Cp regression used, an actuarial variable obtained from lifetables was found to be statistically less effective as a discriminator. This finding suggests that the stress experience among recipients was uniquely different from that found in the general population. Another study[21] made a similar observation in

[17] See Ethel Shanas and George Maddox, "Aging, Health and the Organization of Health Resources," in R. H. Binstock and E. Shanas (eds.) **Handbook of Aging and the Social Sciences,** Van Nostrand Reinhold Company.

[18] See Evelyn M. Kitagawa and Philip M. Hauser, **op. cit.;** see also **Vital Statistics: A Memorial Volume of Selections from the Reports and Writings of William Farr,** Noel A. Humphreys (ed.), London, 1885.

[19] Unpublished data from the Division of Supplemental Security Studies, Office of Research and Statistics, Social Security Administration, 1978.

[20] See H. Benjamin, "Biologic Versus Chronologic Age," **Journal of Gerontology,** February 1947.

[21] John Bartko and Robert Patterson, "Survival Among Healthy Old Men: a Multivariate Analysis," in Samuel Granick and Robert Patterson (eds.), **Human Aging II—An Eleven Year Followup Biolomedical and Behavioral Study,** National Institute of Mental Health, 1971. See also John McCoy and Robert Manicke, **op. cit.**

their analysis of survival and concluded that it reflected the atypical characteristics of the population of healthy men being studied.

A higher mortality rate among men was supported in the logit analysis as indicated by their relatively greater risk (one and one-half times that of women). With a wider age distribution, their relative risk would have been likely to be even greater. The relative risk for men cannot be fully explained by the data at hand. According to an earlier study,[22] some of the sex difference in mortality is innate and the much larger proportion of males who die in infancy cannot be explained by systematic variation in the environment. Environmental explanations link some of the cause of men's greater relative risk to smoking and drinking patterns or to cumulative effects associated with hazardous work. The analysis of risk effects associated with occupation and industry accounts for some of these relationships.

The effects of household density were indirectly represented in the sociodemographic logit analysis by the number of persons included in the housing unit. As the results shown in table 13 suggest, the relative risk of mortality increased by an increment of one (relative risk, 1.10) for each additional person represented. A cursory observation might be that this finding contradicts the health logit results relating to personal isolation. Two possible different situations are suggested by the evidence: (1) An unmarried person, perhaps an aged widow in declining health, who shared human companionship before death and (2) an aged recipient who was severely debilitated and isolated before death.

Residential/Household Characteristics

The preceding findings on household density effects were further supported in the logit results on residential/household characteristics (table 14). As noted, the attempt to identify significant risk factors associated with the environmental settings of the recipient population was largely unsuccessful. It is difficult to specify adequately the milieu variables representing complex exposure situations, particularly when they may be emergent or may have had an effect at an earlier period.

Except for household composition measures, no other variable classification was significant. Regional differences were not significant. Rural-urban residence and type of dwelling unit had no significant association with mortality. The one salient theme to emerge in the analysis was the indirect association between mortality and the presence of persons other than a spouse in the household. The findings further demonstrate that recipients living alone had a probability of survival similar to that of recipients who lived with a spouse.

[22] William Petersen, **Population**, Macmillan, 1975, pages 223-234. See also F. C. Madigan, "Are Sex Mortality Differentials Biologically Caused?" **Milbank Memorial Fund Quarterly**, April 1957.

Table 14.—Probability of death/survival using multinomial logistic analysis of household composition among OAA recipients, 1973

Household composition[1]	Chi square[2]	Final logit coefficient	Standard error of estimate	Relative risk
Variates analyzed	30	.....	.....	.....
Initial log likelihood[3]	2,307.6	.....	.....	.....
Final log likelihood	2,238.6	.....	.....	.....
Alone	25.22	0.7151	0.1424	0.49
With spouse only	17.13	.7577	.1830	.47
With spouse and others	6.51	.6662	.2610	.51

[1] "Self and others only" category deleted in analysis.

[2] $\chi^2 \geq 10.837 = \chi^2(.001)$; $\chi^2 \geq 6.635 = \chi^2(.01)$; and $\chi^2 \geq 3.841 = \chi^2(.05)$.

[3] To ensure accuracy the iteration procedure minimized 2 log likelihood, which is numerically equivalent to maximizing the log likelihood.

Conclusions and Implications

The initial hypothesis that mortality of the aged welfare population would be greater than that of their contemporaries in the general population was not supported. As noted, other investigators have observed that differences between the poor and nonpoor in mortality rates or between levels of socioeconomic status, tend to become less distinguishable among those aged 65 and over.

Why mortality rates were lower among white recipients and higher among those other than white cannot be directly ascertained from the data available. Survival patterns represent unique experiences of an accumulated past. Whites may simply have had earlier life experiences that avoided higher risk situations. Their recipiency experience may have been of a shorter duration, suggesting that as a group they had been exposed to less economic and social stress. In contrast, their higher death rate in the general population probably represents the accumulated burden of chronic disease uniquely indicative of a higher socioeconomic status and its associated health behavior.

A basic consideration underlying all of the mortality findings of the analysis presented here is the constraining influence of an interval of observation limited to a single year. The implications are that conditions, circumstances, and related risks associated with relatively steep trajectories of terminal decline are given a greater opportunity to emerge as significant. Effects of other factors perhaps equally serious though less fatal in the shorter run, have tended to be underemphasized. If, for example, continuous observations had been available for a longer period of time, would cancer and heart trouble have continued to be salient predictors, or would other conditions such as stroke and emphysema have emerged as important?

The findings also point to a greater need to know more about the epidemiological circumstances of the social environment and the types of support systems that may be an integral part of the terminal decline process. Perhaps the most socially relevant issue identified in the analysis focuses

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Table 5.—Number and percentage distribution of dual beneficiaries,[1] by years of OASDHI-covered employment, age, and sex, December 1975

Age and sex	Total		Years of OASDHI-covered employment											
			0–2		3–6		7–10		11–14		15–20		20 or more	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	439,470	100.0	56,960	100.0	98,390	100.0	100,330	100.0	68,090	100.0	65,470	100.0	50,410	100.0
Under 55	5,180	1.2	110	.2	320	.3	550	.5	1,190	1.8	1,870	2.9	1,140	2.3
55–59	4,190	.9	160	.3	240	.2	460	.5	1,040	1.5	1,160	1.7	1,130	2.2
60–61	2,890	.7	390	.7	500	.5	530	.5	340	.5	510	.8	620	1.2
62–64	56,250	12.8	4,760	8.4	8,950	9.1	15,680	15.6	10,510	15.4	9,550	14.6	6,800	13.5
65–71	182,070	41.4	18,480	32.4	35,640	36.2	45,190	45.0	29,000	42.6	28,380	43.3	25,380	50.4
72 and over	188,890	43.0	33,060	58.0	52,740	53.6	37,920	37.8	26,010	38.2	24,000	36.7	15,340	30.4
Men	298,650	100.0	14,660	100.0	61,410	100.0	72,800	100.0	52,380	100.0	52,870	100.0	44,670	100.0
Under 55	4,100	1.4	10	.1	120	.2	310	.4	950	1.8	1,620	3.1	1,090	2.4
55–59	3,390	1.1	20	.1	110	.2	320	.4	880	1.7	970	1.8	1,090	2.4
60–61	1,590	.5	40	.3	40	.1	270	.4	240	.5	420	.8	580	1.3
62–64	39,170	13.1	480	3.3	5,150	8.4	11,420	15.7	8,020	15.3	7,870	14.9	6,230	13.9
65–71	123,680	41.4	2,880	19.6	20,780	33.8	32,880	45.2	22,010	42.0	22,700	42.9	22,430	50.2
72 and over	126,720	42.4	11,230	76.6	35,210	57.3	27,600	37.9	20,280	38.7	19,290	36.5	13,250	29.7
Women	140,820	100.0	42,300	100.0	36,980	100.0	27,530	100.0	15,710	100.0	12,600	100.0	5,740	100.0
Under 55	1,080	.8	100	.2	200	.5	240	.9	240	1.5	250	2.0	50	.9
55–59	800	.6	140	.3	130	.4	140	.5	160	1.0	190	1.5	40	.7
60–61	1,300	.9	350	.8	460	1.2	260	.9	100	.6	90	.7	40	.7
62–64	17,080	12.1	4,280	10.1	3,800	10.3	4,260	15.5	2,490	15.8	1,680	13.3	570	9.9
65–71	58,390	41.5	15,600	36.9	14,860	40.2	12,310	44.7	6,990	44.5	5,680	45.1	2,950	51.4
72 and over	62,170	44.1	21,830	51.6	17,530	47.4	10,320	37.5	5,730	36.5	4,710	37.4	2,090	36.4

[1]Annuitants with OASDI benefits in force; excludes the transitionally insured and "special age-72" beneficiaries.

primary insurance amount of $101.40 (table 4). This difference in benefit levels is attributable to the fact that the younger beneficiaries were predominantly receiving disability insurance benefits, which tend to be higher than retirement benefits.

Table 5 reveals marked differences related to age in the number of years of covered employment under the social security program. Dual beneficiaries aged 72 and over had fewer years of covered work than did those aged 65–71. Only 54,000 or 30 percent of those aged 65–71 had 6 or fewer years of covered employment, but 86,000 or 45 percent of those aged 72 and over had this little covered employment. In part, at least, this pattern reflects changes in coverage provisions under the social security program in the 1950's. Older beneficiaries in occupations and industries to which coverage was extended during that time were more likely than younger beneficiaries to have had a reduced opportunity to engage in covered employment.

Antecedents of Mortality

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on the surrounding circumstances of the isolated terminally ill population. Although isolation appears to be an important defining aspect of risk, it is evident that it is only a necessary and not a sufficient condition in the mortality equation.

What are the types of support systems available at the community level for populations in declining health? How are previous living arrangements associated with mortality? What types of support systems might be implemented for the socially isolated with terminal illness? Other useful longitudinal information would help provide answers to these and other questions that have both policy as well as methodological significance.