

A Retrospective Cohort Study on Retirement and Mortality for Male Employees of a Local Government of Japan

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This retrospective cohort study describes the mortality pattern after retirement and examines associations of the last job position and work status immediately after retirement with the mortality for male employees who retired from Kochi prefectural government. The subjects include 514 retirees over the 1977-1981 period, who were followed for 9.8 years after retirement, and 721 retirees over the 1982-1986 period, who were followed for 5.8-9.8 years. All subjects were hypothesized to have retired at a normal retirement age. Mortality risk was stable through the follow-up period subdivided into two-year intervals in both cohorts of retirees. In both cohorts, men who did not work immediately after retirement had increased mortality within the first two years of retirement compared with those who worked immediately after retirement. This finding is consistent with the mortality pattern explained by health related selection into working after retirement. The present study does not show a meaningful mortality fluctuation over the post-retirement period among male employees of the local government. Lack of information on ages and health status at retirement of individual subjects hampers discussion about causality of observed associations between two study variables concerning pre- and post-retirement characteristics and post-retirement mortality. *J Epidemiol*, 1998 ; 8 : 47-51.

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Various health outcomes have been examined in relation to normal retirement: overall mortality^{1,2}, coronary mortality^{3,4}, self-reported health measures⁵⁻⁹, physical health rated in medical examination¹⁰, risk factors for coronary heart disease¹¹, mental health^{9,12,13}, stressfulness^{13,14} and health services utilization¹⁵. Although retirement is purported to be a disruptive life event with negative implications for health, few studies have confirmed the adverse impact of normal retirement on health^{16,17}. It is only coronary mortality that seems to be adversely affected by retirement^{3,4}. Many longitudinal studies have reported infrequent deterioration of health following normal retirement^{6,7,14} and have found no difference in pre- and post-retirement changes in health measures between persons who had experienced normal retirement and those who continued to work^{6,10,11,15}. Normal retirement may have positive effects on health among certain types of retirees^{5,13}.

Attention has also been given to characteristics which may

influence adaptation to retirement: age, gender, pre- and post-retirement health measures, socioeconomic status, characteristics of the last job such as job status and work contents, financial problems with retirement, and social networks and support in the post-retirement period^{5,14,18-20}.

The baby boom generation is approaching the normal retirement age. Epidemiologic studies are needed which shed light on health needs of emerging cohorts of retirees. Unfortunately, to our knowledge, no epidemiologic study of retirement and health has been reported in Japan. Previous studies of this topic have been conducted in the United States and European countries where the retirement age is 65. Because the normal retirement age of Japanese employees is younger than that, caution must be exercised to extrapolate from the findings of the previous studies to estimate the situation among Japanese employees. Further, although many Japanese retirees intend to engage in jobs in various settings after the normal retirement at

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age 60, it is not clear whether working after retirement is beneficial to well-being of the retirees.

This retrospective cohort study describes a mortality trend following normal retirement among male employees of a prefectural government of Japan. The last job position and work status immediately after retirement were chosen as pre- and post-retirement characteristics which might influence the relation between retirement and subsequent mortality.

MATERIALS AND METHODS

The subjects include men who retired from Kochi prefectural government between 1977 and 1986. A total of 1,235 male retirees were identified with annual directories of the persons who had retired from the government. The staff-office of the government has been publishing the directories. Each directory presents the name, the last job position (administrative, professional, clerical), and work status immediately after retirement (working, not working) of each person who retired in the preceding fiscal year after 17 or more years of employment. Further, individual directories give names of the retirees who died in the preceding year. Occurrence of deaths was ascertained with pension payment records. The deceased between 1977 and 1991 were identified with the annual directories published between 1978 and 1992. The directories include no information on the dates of birth, retirement or death of individual subjects. In the present analysis, subjects were hypothesized to have retired on March 31 in the fiscal year when they had reached the normal retirement age of 60. The authors fixed on the mid-year day (June 30) as the date of death. The mortality follow-up of 514 retirees over the 1977-1981 period was terminated on December 31 in the tenth year of retirement. A total of 69 deaths were identified during the 9.8-year follow-up. For 712 retirees over the 1982-1986 period, the mortality follow-up was terminated on December 31, 1991 (range of the follow-up period: 5.8-9.8 years). A total of 63 deaths occurred in the latter cohort during the follow-up period. The remaining 1,103 subjects, who were not found in the list of the deceased, were considered to be alive as of the closing dates of follow-up. The proportion of the censored cases whose observations were terminated before completion of the 9.8-year follow-up was 73.8% (532/721) among the retirees over the 1982-1986 period. Because of such a high proportion of the censored in one of the two cohorts, analysis was stratified by cohorts of retirees.

The follow-up period of 9.8 years was subdivided into two-year intervals and probability of death (conditional proportion dying) occurring in individual intervals was computed with the actuarial life table method. For the last job position and work status immediately after retirement, changes in their influences with time on subsequent mortality, i.e., time-dependency, was examined as follows²⁰. The post-retirement period was strati-

fied into five non-overlapping intervals; 0-1.9 years, 2.0-3.9 years, 4.0-5.9 years, 6.0-7.9 years and 8.0-9.8 years after retirement. For individual stratified intervals, proportionality of hazards was assumed and separate Cox proportional hazards models were fitted. Only the subjects surviving to the beginning of the corresponding interval were used and those dying after the interval were regarded as censored cases. Because all deaths were hypothesized to have occurred on the mid-year day of the corresponding year, the data has tied event times²². In order to handle the ties, the exact conditional probability under the proportional hazard assumption was computed. Analysis was performed with the PHREG procedure using the exact method for handling ties of Release 6.12 SAS/STAT software.

RESULTS

Table 1 shows probability of death in individual two-year intervals of the postretirement period for each cohort of retirees. The probability was relatively stable through the follow-up period in both cohorts.

Table 2-3 show hazard ratios of two-year mortality for individual intervals with regard to the last job position and work status immediately after retirement. As shown in table 2, in the cohort of retirees over the 1982-1986 period, the retirees who were at nonadministrative positions including professional and clerical ones had increased mortality between the fourth and the fifth years of retirement than those at administrative positions (hazard ratio = 5.2, 95% confidence interval 1.5-18.4). Table 3 shows that the retirees who did not work immediately after retirement had increased mortality within the first two

Table 1. A life table analysis for computing conditional probability of death in individual 2-year intervals by cohort of retirees.

Years after retirement	Number entering interval	Number withdrawn alive	Number exposed to risk	Number dying	Conditional proportion dying
Retirees over the 1977 - 1981 period					
0 - 1.9	514	0	514	13	0.025
2.0 - 3.9	501	0	501	13	0.026
4.0 - 5.9	488	0	488	15	0.031
6.0 - 7.9	473	0	473	13	0.027
8.0 - 9.8	460	0	460	15	0.033
Retirees over the 1982 - 1986 period					
0 - 1.9	721	0	721	16	0.022
2.0 - 3.9	705	0	705	16	0.023
4.0 - 5.9	689	143	617.5	15	0.024
6.0 - 7.9	531	273	394.5	11	0.028
8.0 - 9.8	247	116	189	5	0.027

Table 2. Associations between the last job position and mortality during individual 2-year intervals by cohort of retirees.

Years after retirement	Retirees at administrative positions					Retirees at non-administrative positions					Hazard ratio	
	Number entering interval	Number withdrawn alive	Number exposed to risk	Number dying	Conditional proportion dying	Number entering interval	Number withdrawn alive	Number exposed to risk	Number dying	Conditional proportion dying	(Non-administrative vs. Administrative)	95% CI
Retirees over the 1977 - 1981 period												
0 - 1.9	244	0	244	5	0.021	269	0	269	7	0.026	1.27	0.40 - 4.01
2.0 - 3.9	239	0	239	3	0.013	262	0	262	10	0.038	3.08	0.85 - 11.19
4.0 - 5.9	236	0	236	7	0.030	252	0	252	8	0.032	1.08	0.39 - 2.96
6.0 - 7.9	229	0	229	5	0.022	244	0	244	8	0.033	1.52	0.50 - 4.64
8.0 - 9.8	224	0	224	8	0.036	236	0	236	7	0.030	0.83	0.30 - 2.28
Retirees over the 1982 - 1986 period												
0 - 1.9	398	0	398	6	0.015	323	0	323	10	0.031	2.07	0.75 - 5.69
2.0 - 3.9	392	0	392	6	0.015	313	0	313	10	0.032	2.11	0.77 - 5.81
4.0 - 5.9	386	78	347	3	0.009	303	65	270.5	12	0.044	5.20	1.47 - 18.41
6.0 - 7.9	305	144	233	7	0.030	226	129	161.5	4	0.025	0.78	0.23 - 2.66
8.0 - 9.8	154	68	120	4	0.033	93	48	69	1	0.014	0.44	0.05 - 3.91

CI: Confidence interval.

Table 3. Associations between work status immediately after retirement and mortality during individual 2-year intervals by cohort of retirees.

Years after retirement	Retirees who worked					Retirees who did not worked					Hazard ratio	
	Number entering interval	Number withdrawn alive	Number exposed to risk	Number dying	Conditional proportion dying	Number entering interval	Number withdrawn alive	Number exposed to risk	Number dying	Conditional proportion dying	(Not working vs. Working)	95% CI
Retirees over the 1977 - 1981 period												
0 - 1.9	292	0	292	2	0.007	222	0	222	11	0.050	7.42	1.64 - 33.47
2.0 - 3.9	290	0	290	6	0.021	211	0	211	7	0.033	1.61	0.56 - 4.79
4.0 - 5.9	284	0	284	6	0.021	204	0	204	9	0.044	2.12	0.76 - 5.97
6.0 - 7.9	278	0	278	8	0.029	195	0	195	5	0.026	0.89	0.29 - 2.72
8.0 - 9.8	270	0	270	9	0.033	190	0	190	6	0.032	0.94	0.34 - 2.65
Retirees over the 1982 - 1986 period												
0 - 1.9	421	0	421	4	0.010	300	0	300	12	0.040	4.27	1.38 - 13.24
2.0 - 3.9	417	0	417	6	0.014	288	0	288	10	0.035	2.43	0.88 - 6.69
4.0 - 5.9	411	91	365.5	7	0.019	278	52	252	8	0.032	1.71	0.62 - 4.70
6.0 - 7.9	313	158	234	6	0.026	218	115	160.5	5	0.031	1.20	0.37 - 3.93
8.0 - 9.8	149	69	114.5	3	0.026	98	47	74.5	2	0.027	1.04	0.17 - 6.21

CI: Confidence interval.

years of retirement than those who worked immediately after retirement (hazard ratios = 7.4, 95% confidence interval 1.6-33.5 among the retirees over the 1977-1981 period; hazard ratio = 4.3, 95% confidence interval 1.4-13.2 among the retirees over the 1982-1986 period). In other periods, there was no significant difference in mortality according to the last

job position or work status immediately after retirement in either cohort.

To examine whether either the last job position or work status immediately after retirement may modify the effect of another variable on mortality, mortality for individual two-year intervals was regressed on the last job position, work sta-

tus after retirement, and an interaction term between the two study variables. No interaction term was significant at the probability level of 0.05 in either cohort. Therefore, a model including the two study variables simultaneously was fitted to examine the effect of each variable on mortality when adjusting for the possible confounding effect of the other²³. As shown in Table 4, hazard ratios for individual study variables were similar to those obtained from analysis in which they were examined separately.

DISCUSSION

According to the notion of retirement process, Atchley has identified five phases in the post-retirement period: the honeymoon phase in which the individual wallows his newly acquired freedom of time and space, the disenchantment phase in which the individual copes with various losses involved in retiring, the reorientation and stability phases during which the individual accepts retirement and establishes a stable life, and the termination phase which is the period of disabling illness²⁴. The first two phases may have particular implications for health. A few studies examined the pattern of mortality after retirement in this context and reported that low yearly mortality rates preceded the elevation of mortality in the second or third year of retirement^{1,2,18}. Such a pattern of mortality fluctuation over the retirement period is not clear in the present study. Two years of time interval chosen in the present analysis may be too long to examine the precise pattern of

mortality after retirement. Unfortunately, due to the limited sample size and infrequency of dying, computing mortality rates in shorter intervals did not lead to meaningful results in the present study. A large cohort of retirees which allows computation of yearly mortality rates has to be followed with regard to the mortality pattern after retirement. Further, the mortality trend after retirement should be evaluated with obtaining mortality data on a comparison population. Although an ideal comparison population is composed of age comparable persons who continued to work during the study period^{1,18}, no data is available which describes mortality of such a group of persons. When the study subjects were stratified by work status immediately after retirement, the mortality experience of persons who worked immediately after retirement might reflect that of such a comparison population. However, stratification by work status leads to a biased selection of healthy subjects into the stratum of working after retirement.

This study detects a difference in mortality within two years of retirement by work status immediately after retirement. In succeeding years, the work status measured immediately after retirement was not associated with mortality. Such a pattern of the association is consistent with that explained by the healthy worker effect; health related reasons account for work status immediately after retirement and the mortality difference according to work status at the starting point wears off over time in follow-up studies^{25,26}. If retirees who did not work after retirement due to health related reasons were chosen as a comparison group, the reduced mortality risk of the retirees who worked immediately after retirement would be more evident than that observed.

Among the retirees over the 1982-1986 period, a mortality difference by the last job position was observed between the fourth and the fifth years of retirement. No availability of information on ages of individual subjects hampers discussion about causality of this association. Since some employees at administrative positions keep up a custom to retire from the government a few years before they reach the normal retirement age, the mortality difference by the last job position may be confounded by age at retirement.

Other limitations of the present study are as follows. First, the completeness of death ascertainment by pension payment records has not been evaluated. Since it is unlikely that the extent of ascertainment differs by calendar years and across the last job positions and work status immediately after retirement, the incompleteness seems to result in nondifferential misclassification which dilutes the association between individual study variables and mortality²⁷. Second, because of no information on reasons for retirement, all subjects were regarded as normal retirees. Since normal, involuntary retirement and early, voluntary retirement due to poor health or job-related difficulties present differential effects on health after retirement^{7,18}, analysis should have been limited to the former type of retirees. No

Table 4. Hazard ratios of mortality during individual 2-year intervals when the last job position and work status immediately after retirement were simultaneously adjusted.

Years after retirement	The last job position (Non-administrative vs. Administrative)		Work status (Not working vs. Working)	
	Hazard ratio	95% CI	Hazard ratio	95% CI
Retirees over the 1977 - 1981 period				
0 - 1.9	0.63	0.19 - 2.09	8.09	1.66 - 39.59
2.0 - 3.9	2.94	0.76 - 11.52	1.12	0.35 - 3.54
4.0 - 5.9	0.79	0.26 - 2.34	2.33	0.77 - 7.07
6.0 - 7.9	1.68	0.52 - 5.51	0.74	0.23 - 2.42
8.0 - 9.8	0.82	0.28 - 2.45	1.02	0.33 - 3.08
Retirees over the 1982 - 1986 period				
0 - 1.9	1.29	0.44 - 3.77	3.89	1.17 - 12.86
2.0 - 3.9	1.63	0.55 - 4.82	2.03	0.69 - 6.01
4.0 - 5.9	5.16	1.39 - 19.48	1.00	0.35 - 2.89
6.0 - 7.9	0.69	0.18 - 2.58	1.38	0.38 - 4.92
8.0 - 9.8	0.39	0.04 - 3.861	1.38	0.21 - 8.99

CI: Confidence interval.

information is available which leads to identifying early retirees among the study subjects. However, such a type of retirement seems to be uncommon in the study population. For example, in the 1996 fiscal year when the authors could obtain the frequency of early retirement from Kochi prefecture government, of 96 male retirees, 14 (14.6%) retired before reaching the normal retirement age of 60 and 7 (7.3%) died in office.

Overall, the present study shows stable mortality through ten-year period after normal retirement among male employees of a prefectural government. Neither the last job position nor work status immediately after retirement seems to be causally related with post-retirement mortality when considering influences of unmeasured factors on the association between retirement and health. Further studies of health consequences of normal retirement should be conducted with obtaining information on potential confounders of the association, such as exact ages and health status at retirement of individual subjects.

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