Factors Associated with Mortality after Widowhood

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Abstract: A non-concurrent prospective study in Washington County, Maryland identified 4,032 (1,204 male, 2,828 female) White persons aged 18 and over who were enumerated in a 1963 non-official census and who became widowed between 1963 and 1974, and an equal number of married persons, each matched to a widowed as to race, sex, year of birth and geography of residence. All were followed to 1975, the date of a second census. Mortality rates based on person-years at risk were about the same for widowed as for married females, but significantly higher for male widowed than male married, even after adjustment for a number of demographic, socioeconomic, and behavioral variables. Mortality rates among widowed males who remarried were very much lower than among those who did not remarry, but no significant difference was observable among widowed females who did or did not remarry. Multiple regression analysis also showed that, for both sexes and independently of other factors, moving into a nursing home or other chronic care facility was associated with higher mortality than any other residential change or no change, and living alone was associated with higher mortality than living with someone else in the household. (*Am J Public Health* 1981;71:802–809.)

Throughout recorded history possession of a mate has been considered a desirable state, and bereavement a great tragedy.[1] That loss of spouse may be a highly stressful event has been recognized, in modern times, by the Social Readjustment Rating Scale of Holmes in which widowhood is given a much heavier weighting than any of the other events likely to occur in a lifetime.[2]

References to bereaved persons pining away and dying of grief abound in the romantic literature, and were early supported by data such as that of Lucien March who found that the sex-age-specific mortality rates for 1886–1895 in France, Prussia, and Sweden were two to three times as high for widowed and divorced as for married, with the rates for single persons falling between the two.[3] Subsequently many others have used mortality data by marital status for numerators and census counts by marital status for denominators, and have generally arrived at the same conclusions as March.[4–11] Although such essentially cross-sectional analyses may be flawed by errors in both numerator and denominator,[12–15] it seems unlikely that the errors can account for all the differences found.

Prospective studies have also been conducted in which individuals have been classified as to whether or not they were newly widowed, and followed over time for ascertainment of subsequent mortality. Some studied only widowed and found a weak indication of higher mortality rates in the first year than in subsequent years after bereavement.[16–18] Others either had a group of married controls or used the entire married population of the area as a comparison group;[19–23] in general they reported markedly lower widowed/married relative risks of mortality than did the cross-sectional analyses. Few of them, however, have taken into account the effects of migration in their calculations, and only three had data on socioeconomic status or education.[18, 20, 22]

The present study was undertaken with the following general objectives:

1. In a population with known demographic characteristics, to determine the magnitude of excess mortality among recently widowed as compared to married;
2. To evaluate the role of certain known risk factors for their effect on mortality rates of widowed and married in this population; and
3. To examine associations of other ascertainable social and behavioral factors with mortality among the widowed, especially any that might be causal and susceptible to modification.

Although some of these questions have been examined in the studies cited above, the present study is unique in that it enabled simultaneous consideration of several behavioral characteristics not heretofore evaluated for their relation to mortality of widowed persons.

Materials and Methods

The study was conducted in Washington County, a semi-rural part of mid-western Maryland with a 1960 population of 91,219 of whom about 98 per cent were White. The study populations were drawn from the White persons listed as married in a non-official health census conducted in 1963. The census obtained data on an estimated 98 per cent of the non-institutionalized population. The selected subjects were

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TABLE 1—Initial Characteristics of Populations W (Widowed) and M (Married)

Population Characteristics		Population W N = 4032	Population M N = 4032	Statistical Significance
Matching Factors		%	%	
Sex	Male	29.9	29.9	
	Female	70.1	70.1	
Age	18–44	9.3	9.3	
	44–54	18.4	18.4	
	55–64	28.3	28.3	
	65–74	28.3	28.4	
	75+	15.8	15.7	
Geography	Urban	50.1	50.1	
	Suburban	9.8	9.8	
	Rural & small town	40.0	40.0	
Years schooling in 1963	0–8, Not Stated	55.6	50.2	
	9–12	35.4	38.5	$p < .001$
	13+	9.0	11.2	
Years in domicile at Time Zero	0–4	5.5	5.2	
	5–9	15.3	15.9	
	10–24	46.0	46.4	
	25+	29.5	29.9	
	Not Stated	3.7	2.7	
Number of persons in household in 1963	1	0.2	0.1	
	2	49.0	49.9	
	3+	50.2	49.6	
	Not Stated	0.6	0.4	
Marital history in 1963	Married only once	80.2	81.9	
	Married more than once	15.6	15.1	
	Not Stated	4.2	3.0	
Age at first marriage	< 20	32.1	27.6	
	20–29	51.4	56.1	
	30+	8.8	9.8	$p < .001$
	Not Stated	7.7	6.5	
Cigarette smoker in 1963	Yes	31.1	26.9	
	No	63.3	68.5	$p < .001$
	Not Stated	5.6	4.7	
Frequency of church attendance in 1963	> 40/year	40.9	49.4	
	2–40/year	28.8	26.3	$p < .001$
	< 2/year	19.7	15.8	
	Not Stated	10.5	8.5	
Number of bathrooms in 1963 domicile	< 1	17.7	13.5	
	1–1½	73.7	78.0	$p < .001$
	2+	6.4	7.4	
	Not Stated	2.1	1.1	
Animals on premises in 1963	Some	56.8	56.2	
	None	39.4	40.9	
	Not Stated	3.8	3.0	
Source of drinking water in 1963	City	65.4	66.9	
	Well	15.3	15.1	
	Other, Not Stated	19.3	18.0	

followed until July 15, 1975, the date of a second non-official health census of Washington County which obtained data on an estimated 90 per cent of the population. Both censuses were sponsored jointly by the National Cancer Institute, the Washington County Health Department, and the Johns Hopkins School of Hygiene and Public Health. They included questions about marital status, education, cigarette smoking, and number of bathrooms in household.

Population W (widowed) was enrolled from a chronological list of deaths between July 16, 1963 and July 15, 1974 of married residents of Washington County who were in the 1963 census. The widowed spouses were recorded as members of population W with the date of death of spouse, designated as Time Zero, being the date of entry into the study. Widowed persons who died as a result of the same accident that killed their spouses were not entered in the study.

Population M (married) was enrolled by selecting, for each member of population W, a married individual from the 1963 census listing matched to the population W person as to race, sex, year of birth, and geographic category of residence, and verified by other sources as still married and living with spouse as of Time Zero.

Both populations were followed to the July 15, 1975 date of the second health census, resulting in a potential follow-up time in the study ranging from 12 to 143 months. For

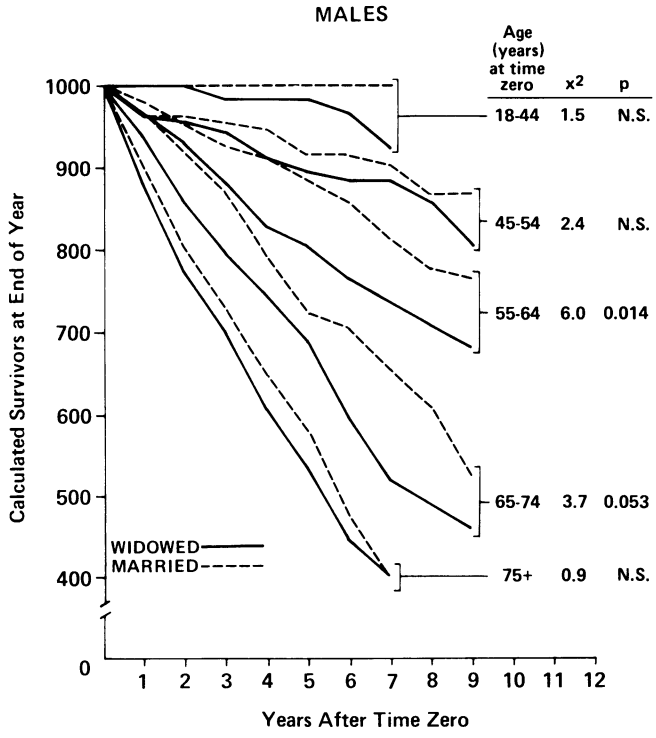

FIGURE 1—Calculated survivorship of widowed and married males by age group and by years after Time Zero

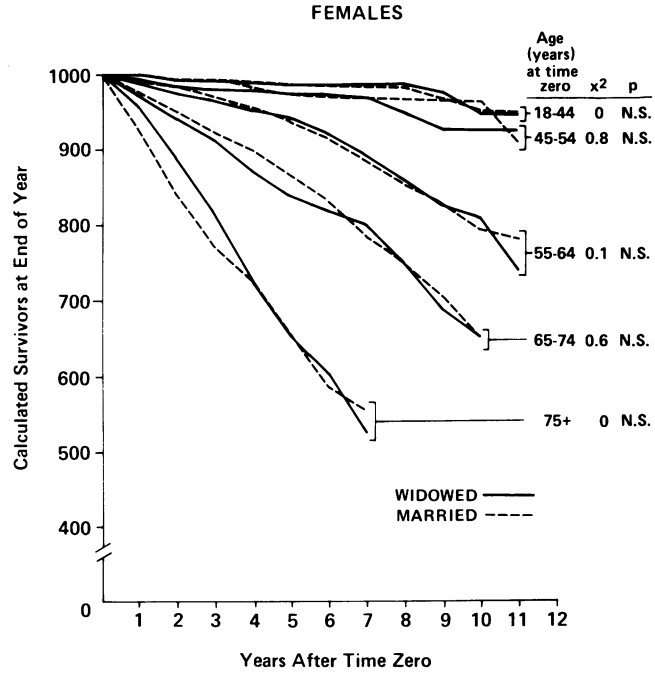

FIGURE 2—Calculated survivorship of widowed and married females by age group and by years after Time Zero

those not listed in the 1975 census and not known to have died before then, tracing efforts included phone calls to relatives or neighbors to ascertain the 1975 status or when the subject was last known to be alive; the latter became the date of withdrawal from the study if more precise information was not available.

Any member of population M who became widowed after entry into the study was withdrawn from population M and enrolled in population W as of the date of death of the spouse.

Sources of information utilized in tracing subjects entered in the study included, in addition to the 1975 health census: death certificates of Washington County residents; newspaper obituaries; city directories, which are published annually and list approximately 75 per cent of the county population; telephone directories, on file since 1963; and court house records of marriages and divorces.

Results

The characteristics of the two starting populations W and M as obtained from the 1963 census listings are shown in Table 1. Aside from the matching characteristics of sex, age, and geography of residence, the two populations of 4,032 each were also very similar as to residential stability, number of persons in household, marital history, presence of animals on premises, and source of drinking water in 1963. The widowed population, however, had received significantly fewer years of schooling than the married population, had married at an earlier age, attended church less frequently, had a larger percentage of cigarette smokers and a larger percentage living in domiciles with less than one full bathroom for its exclusive use; the latter is an excellent indicator of low socioeconomic status.

Some of the characteristics by which the two populations differed are known to be associated with mortality,[9] so after testing for interactions and finding none, binary variable multiple regression analyses by the method suggested by Feldstein[24] and modified by Shah and Abbey[25] were performed separately for the 1,204 male and 2,828 female pairs, with the outcome shown in Table 2. The crude mortality rates per 1,000 person-years were significantly higher for widowed than married males, and adjustment for the effects of age, education, cigarette smoking, age at first marriage, frequency of church attendance, and number of bathrooms in domicile changed the rates very little. The crude mortality rates for females exhibited a smaller though statistically significant ($p = .028$) difference between widowed and married which became non-significant after adjustment for the characteristics listed.

Figures 1 and 2 illustrate the results of survivorship calculations for each sex and age group in populations W and M. Each graph is terminated when the actual study population, either W or M. dropped below 50 where rates became quite unstable. Each $\chi 2$, however, was based on the entire 12-year experience of the age group.

As would be expected, the survivorship curves are steeper for older than for younger, steeper for males than for females. They are also steeper for widowed males than for married males, but this is not true among the females. In addition, as reported in a previous paper,[26] there was no

TABLE 2—Crude and Adjusted[a] Mortality Rates per 1000 Person-Years among Widowed and Married Study Populations for the Entire 12 Years of Study.

Mortality per 1000 person-years.	Population		p (difference)
	W(Widowed)	M(Married)	
Crude rate—Males	67.0	50.2	<0.001
Adjusted rate—Males	65.3	51.8	0.002
Crude rate—Females	25.6	21.7	<0.05
Adjusted rate—Females	24.1	23.2	N.S.

[a]Adjusted for the effects of age, education, age at first marriage, cigarette smoking, frequency of church attendance, and number of bathrooms in domicile.

evidence among widowed of either sex that their excess mortality in the period immediately following bereavement is significantly greater than in subsequent time intervals.

Table 3 shows the 12-year mortality rates per 1,000 person-years for male and female widowed and married, by age group, and the relative risk of mortality W/M for each sex-age group. The males showed the highest W/M relative risks, ranging from 2.61 for 18–44 years old to 1.16 for the 75+ age group, with the relative risks of only the age 55–64 and age 65–74 groups attaining statistical significance. None of the female age groups' relative risks was statistically significant. The calculated trend line of relative risk with age has a statistically significant downward slope for males, but not for females.

One behavioral factor that might have a substantial impact on mortality among the widowed is remarriage, partly because it is such a common occurrence. As seen in Figure 3, at least half the male widowed under age 55 had remarried during the course of this study. Remarriage among females was less common, the percentage remarried in any age group being similar to that among males 20 years older.

The difference in mortality rates between the widowed males who remarried and those who did not remarry was substantial. As shown in Table 4, the age-specific mortality rates among widowed males who remarried were even lower than the rates among married males, and the ratio of remarried/not remarried mortality rates ranged from about ⅛ to ½. The comparable figures for widowed females are virtually meaningless because of the small numbers involved.

It has been suggested that one reason for the higher mortality among widowed persons who do not remarry is that they are too sick to remarry.[6, 10, 19] Table 5 eliminates all the widowed who either died or for other reasons were withdrawn from the study in the first three years after Time Zero, and compares the subsequent experience of up to nine years of those survivors who remarried in the first three years with that of those who did not. While the numbers are smaller and statistical significance thus more difficult to attain, it is clear that, as before, males who remarried, especially the younger ones, experienced substantially lower mortality rates than those who did not remarry. As in Table 4, the small numbers of widowed females who remarried plus the already low mortality rates among females made their remarried/not remarried ratios almost meaningless.

Table 6 shows the results of a binary variable multiple regression analysis covering the entire follow-up period for male and female widowed. Each factor in the table is adjusted for effects of the other two, as well as for age when widowed, geography, education, age at first marriage, fre-

TABLE 3—Total Study Mortality Rates per 1000 Person-Years

Sex	Age	Population W (Widowed)			Population M (Married)			Relative Risk W/M	95% Confidence Limits of Relative Risk
		Person-Years At Risk	Deaths	Death Rate per 1000 Person-Yrs	Person-Years At Risk	Deaths	Death Rate per 1000 Person-Yrs		
Male	18–44	519	5	9.6	542	2	3.7	2.61	0.5–13.4
	45–54	1017	26	25.6	1072	17	15.9	1.61	0.9– 2.9
	55–64	1463.5	65	44.4	1594	44	27.6	1.61	1.1– 2.3
	65–74	1629.5	130	79.8	1721	107	62.2	1.28	1.0– 1.6
	75+	1196	164	137.1	1145	135	117.9	1.16	0.9– 1.4
Female	18–44	1987	7	3.5	2035	7	3.4	1.02	0.4– 2.9
	45–54	3337	23	6.9	3315	17	5.1	1.34	0.7– 2.5
	55–64	4850.5	91	18.8	4635	80	17.3	1.09	0.8– 1.5
	65–74	4144.5	154	37.2	3536	115	32.5	1.14	0.9– 1.4
	75+	1460	129	88.4	1141	98	85.9	1.03	0.8– 1.3

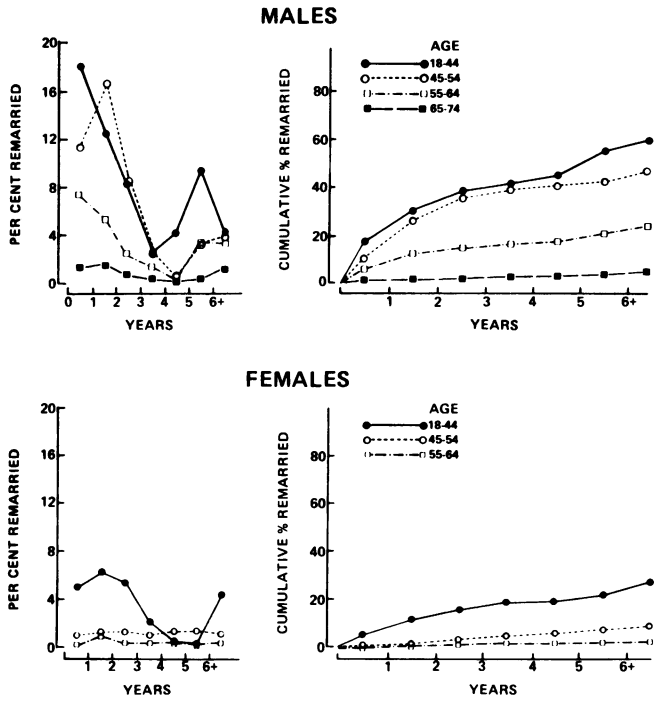

FIGURE 3—Yearly and cumulative remarriage rates of widowed males and females by age group and by years after bereavement

quency of church attendance in 1963, cigarette smoking in 1963, and animals on premises in 1963. The mortality difference by change in marital status after widowhood was significant at the $p < .01$ level for males but not for females. The mortality difference was significant for both sexes by change in address after widowhood; the major contributor to this was the extremely high mortality rate (even after adjustment for age, etc.) among the subjects who had moved into nursing homes, retirement homes, or chronic care facilities. Also, for both sexes, mortality rates were significantly higher for those who lived alone than for those who lived with others in the household.

Discussion

Few if any studies have been able prospectively to compare mortality rates of widowed and married populations matched so closely, with so much known about their relevant demographic and life-style characteristics, and to follow them so completely. The residential stability of Washington County residents is reflected in the data of Table 1 showing that the subjects had a median of 18 years living in their residence at time of entry into the study. In the 12 years of the study, only 3.3 per cent of the widowed and 0.4 per cent of the married could not be traced at all, presumably because they moved away. Even for these, supplementary information sources were helpful in establishing an approximate date of departure so that person-years at risk could be determined.

Some potential sources of bias were evaluated. The effect of possible temporal changes in mortality rates was assessed by dividing the W and M populations into three cohorts by date of entry into the study and following each cohort for three years; no significant differences were found in mortality rates or W/M relative risks among the three cohorts. The use of person-years in calculations of mortality rates avoids bias that might result from systematic differences in length of follow-up of the two populations. On the other hand, person-years calculations could give erroneous results if relative risk of mortality varied substantially with time in the study. Relative risks by interval after Time Zero were evaluated by two different analytical procedures in a previous paper, with no statistically significant time trends found.[26]

There could be an error resulting from the assumption, in person-years comparisons, that mortality experience among persons lost to follow-up is the same as that among those who stay in the study. Considering the low losses to follow-up, the difference would have to be extreme to affect the findings. Furthermore, matched pairs comparisons which do not rely on that assumption were also performed with W and M subjects matched also by length of follow-up,

TABLE 4—Twelve-year Mortality Rates per 1000 Person-Years by Sex and Age of Members of Population W Who Remarried and of Those Who Did Not Remarry, Compared to Mortality Rates in Total Populations W and M

		12-Year Mortality Rates per 1000 Person-Years		Population W						
				Remarried			Did Not Remarry			
Sex	Age	Population W Total	Population M Total	Person-Years at Risk	Deaths	Mortality Rate per 1000 Pers-Yrs	Person-Years at Risk	Deaths	Mortality Rate per 1000 Pers-Yrs	Relative Risk Remarried/Not Remarried
Male	18–44	9.6	3.7	345	1	2.9	174	4	23.0	0.13
	45–54	25.6	15.9	576	7	12.2	441	19	43.1	0.28*
	55–64	44.4	27.6	427	11	25.8	1036.5	54	52.1	0.49*
	65–74	79.8	62.2	204	7	34.3	1425.5	123	86.3	0.40*
	75+	137.1	117.9	53	4	75.5	1143	160	140.0	0.54
Female	18–44	3.5	3.4	651	0	0	1336	7	5.2	0
	45–54	6.9	5.1	375	1	2.7	2962	22	7.4	0.36
	55–64	18.8	17.3	143	0	0	4707.5	91	19.3	0
	65–74	37.2	32.5	20	1	50.0	4124.5	153	37.1	1.35
	75+	88.4	85.9	0	0	—	1460	129	88.4	0

TABLE 5—Subsequent Mortality Rates per 1000 Person-Years among Two Groups of Population W Surviving to the Beginning of Year 4: Those Who Remarried within 3 Years of Bereavement and Those Who Did Not

Age	Remarried within 3 years			Did not remarry within 3 years			Relative Risk Remarried/Not Remarried
	Pers-yrs	Deaths	Mortality rate per 1000 pers-years	Pers-yrs	Deaths	Mortality rate per 1000 pers-years	
				MALES			
18–44	123.5	1	8.1	140.5	3	21.4	0.38
45–54	252.5	4	15.8	245	12	49.0	0.32*
55–64	122.5	4	32.7	542.5	28	51.6	0.63
65–74	59	3	50.8	639.5	60	93.8	0.54
75+	19.5	3	153.8	455	78	171.4	0.90
				FEMALES			
18–44	237	0	0	829	5	6.0	0
45–54	82.5	1	12.1	1675.5	11	6.6	1.85
55–64	37.5	0	0	2551.5	64	25.1	0
65–74	2	0	0	2097.5	93	44.3	0
75+	0	0	—	653	77	117.9	0

Note: Those with date of remarriage not known are excluded.
*p<.05

with results in close agreement with the person-years calculations.

The highly significant association between mortality and change of residence after widowhood for both sexes is largely the result of a mortality rate three to four times as high for those who moved into a retirement or nursing home or other facility as for those who did not. The probability is that most of those who made such a move were persons who had given up an attempt at an independent life because of their infirmities, plus those who may have first moved in with other family members but whose physical or mental condition became too difficult for the family to cope with. Nevertheless, the possibility exists that for some the move to an institution was dictated primarily by financial pres-

TABLE 6—Crude and Adjusted[a] Mortality Rates per 1000 Person-Years for Entire Study Period, among Population W (widowed) Males and Females, by Salient Behavioral Characteristics after Widowhood

Characteristic	Mortality rates per 1000 person-years					
	Males (Total Person-Years 5825)			Females (Total Person-Years 15,779)		
	Crude	Adjusted	SE of Adj Rate	Crude	Adjusted	SE of Adj Rate
Change in marital status after widowhood						
None	92.4	74.1*	3.2	27.8	25.9	0
Remarried	18.7	58.3	7.5	1.7	24.1	5.0
Do not know	0	24.3	15.2	0	14.0	12.6
Change in residence after widowhood						
None	67.3	61.2**	3.2	23.6	22.9**	1.0
Family	69.0	62.0	15.4	21.0	20.4	6.5
Facility	219.1	199.2	14.1	137.8	120.6	6.5
Other	26.8	44.3	5.4	12.5	16.5	1.7
Number in household at time of withdrawal						
1	92.2	89.6**	6.0	25.4	30.2**	1.4
2	33.9	57.9	6.9	14.3	22.9	2.6
3+	35.7	55.3	7.5	11.2	18.6	3.2
Do not know or not applicable	89.1	55.3	7.3	52.8	21.7	3.2

*p < .01 per entire category.
**p < .001 for entire category.
[a]Rates for each characteristic are adjusted for the effects of the other two, as well as for age at time of widowhood, geography of residence in 1963, years of education, frequency of church attendance, cigarette smoking, animals on premises, and age first married, by the procedure suggested by Feldstein.[24]

sures, and for these the altered way of life might bear a causal relationship to subsequent mortality. The numbers are not insignificant; 114 of the male and 144 of the female widowed in the study moved into some facility. (All of them, incidentally, were placed in the category "don't know" for the factor "number of people in household.") The large number and the high mortality rate combined illustrate the importance of adjusting for this factor when attempting to evaluate the association between other factors and mortality in a widowed population. It is interesting that only 45 males and 54 females of the married population moved into some facility in the course of the study.

The trends of the over-all findings are similar to those of many other studies, the relative risk of mortality being higher for male widowed than female, and higher for young widowed than for old. The relative risk of 2.6 for young widowed males is, however, slightly lower than that reported in some other studies, such as Kraus and Lilienfeld's relative risk of about 4 for males under age 35.[6] One explanation may lie in the remarriage rates of the young widowed males. Our data indicate that about 60 per cent of the widowed males under age 45 remarried in the period of this study, which had a median follow-up of about 6½ years for that age group. If the follow-up were not truncated by the cut-off date of July 1975, our remarriage rates might have been as high as those found in Cleveland and Gianturco,[27] who calculated the probability of eventual remarriage of White males widowed at ages 20–24 to be .98, and .88 for ages 25–34 and 35–44. Using their data it would appear that a cross-sectional census of widowed males aged 35–44 would show only about 35 per cent of those who had been widowed. Coupling those findings with this study's sizable difference in mortality rates between the male widowed who remarry and those who do not, can account for most of the comparatively large relative risks found in studies using census data for the population at risk in the various marital status categories.

The cause of the difference in mortality rates between those who remarry and those who do not remains a question. Is it because the healthy remarry while the sick do not, or is it because remarriage provides care and social support that tend to reduce mortality? Comparing the findings of Tables 4 and 5 showing that the mortality rate advantage of remarrying is greater when the first three years' experience is included gives some support to the selectivity hypothesis that it is the less healthy who fail to remarry. However, the data of Table 5 showing the mortality experience of only those who had survived and were still in the study three years after bereavement also gives support to the care and social support hypothesis. Presumably those who died in the first three years would include many of those too sick to remarry, so the widowed in Table 5, both remarried and not remarried, were relatively healthy at time of bereavement.

Closely associated with the data showing reduced mortality among those who remarry is the finding shown in Table 6 that for both sexes, and even after adjustment for all the other variables including remarriage, living alone was associated with significantly higher mortality rates than living with someone. This adds further support for the hypothesis that a social support network is effective in ameliorating the effects of a stressful life event such as bereavement. Obviously one or more other persons in the household are not the same as an extended social network, but the continual availability of even one person for conversation and assistance in an emergency may be even more effective than a large number of friends or relatives who visit less frequently. No data were gathered as to sex, age, or relationship of the other persons in the household, but this could be a productive area for future studies in light of the possible causal relationship with mortality.

It seems obvious that the association with mortality of some of the characteristics included in this study have implications for life-extending interventions. If, for example, it can be demonstrated that the association between remarriage and reduced mortality is a causal one, changes in social security and income tax laws to encourage remarriage of the widowed would be justified as public health measures.

In conclusion, although this study provides data on several behavioral characteristics not heretofore evaluated for their relationship with mortality following widowhood, it also focuses attention on the lack of knowledge in certain areas such as why widowhood seems to have a sex-specific effect, with increased mortality among males but not among females. It is possible, of course, that the same physiologic and psychologic differences that give females greater longevity than males also act to make the females more resistant to the stress of widowhood. In other words, the female of the species may be inherently better able to cope with challenges of all types. In addition, while studies of female widowed may provide clues to reasons for their survivability after widowhood, it seems clear that added emphasis is needed on studies involving the weaker sex—the widowed males.

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Used Oil—The Hidden Asset

The Association of Petroleum Re-refiners announces the largest international conference to date on used oil recovery and reuse. The 4th International Conference, "Used Oil—The Hidden Asset," will be held September 28-October 1, 1981, at Caesars Palace, Las Vegas. Co-sponsored by the US Department of Energy and the National Bureau of Standards, the conference will be an intensive learning experience on the use of a neglected natural resource, "Used Oil."

The objective is to increase the recycling of used oil in the public and industrial sectors; to provide information on classifying used oil for recovery; to assist in choosing the most effective and cost efficient recovery methods; and to support state and community leaders in their efforts to establish used oil recovery programs.

The program will feature open-discussion meetings and recovery equipment exhibits. Highlights include:

- used oil recovery under RCRA
- environmental considerations
- current legislation and regulations affecting used oil recovery
- by-product utilization and waste water treatment
- industrial inplant reclamation
- detecting hazardous contamination
- methods of recovery financing
- spill clean-up
- establishing user specifications
- used oil collection programs
- technical and equipment exhibits

For registration and exhibitor information contact: USED OIL—THE HIDDEN ASSET, Association of Petroleum Re-refiners, 2025 Pennsylvania Avenue, NW, Suite 913, Washington, DC 20006, 202/ 833-2694.