Mortality of Bereavement

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"He first deceased; she for a little tried
To live without him; liked it not, and died"
—Sir Henry Wootton.

That bereavement is associated with an increased mortality rate for close relatives is an old concept that has only recently begun to receive statistical confirmation.

In 1959 Kraus and Lilienfeld reported that married people had a lower death rate at every age group than those who were widowed, single, or divorced and that there was a particularly high excess risk of mortality for young widowed people. Young *et al.* (1963) then tried to assess the "duration effect" of widowhood on the mortality of 4,486 widowers aged 55 and over and found that widowhood increased the mortality rate by about 40% in the six months following bereavement. Cox and Ford (1964) analysed data about 60,000 women awarded widows' pensions in 1927 and concluded that the mortality of widows is probably not exactly the same in each of the five years following bereavement and seems to be higher in the second year after bereavement. The need for further studies in this field was stressed by Kraus and Lilienfeld (1959) and by Young *et al.* (1963), and a survey was therefore made to assess the effect of bereavement on the mortality of close relatives in a small semirural community. This survey differed from those previously made in that it included close blood relatives as well as the widowed and because a total community study was made in an area where the investigator (W.D.R.) possessed a close personal knowledge of the people included in the survey.

Method

The survey was made in a defined area, centred upon the small market town of Llanidloes (pop. 2,350). The area was so defined that with very few exceptions all residents were patients of a single group practice. A small cottage hospital, a chronic sick unit, and an old people's residential home are situated within the area.

The name, sex, age, address, certified cause of death, and place of death of all those people normally resident in the area who died in the six-year period following 1 January 1960 were obtained from the county medical officer of health. The marital state of these people and the identity of those of their close relatives who also lived in the area were determined with the help of the practice secretaries and the secretary of the local cottage hospital. Those people were considered close relatives who were either a spouse, parent, child, or sibling. Those people who had no close relatives alive when they died were excluded from the survey. The remainder were matched by age, sex, and marital state with a similar control group known to have relatives living in the area. This was done by arbitrarily selecting alternate names from the relevant age/sex lists of the practice age/sex register. It was not found possible to match all the paired couples exactly for age or marital state, and five widowed people were paired with people still married. The identity of the close relatives of the control group was determined in a similar way for that of the survey group. In determining the subsequent mortality of close relatives in this

control group the assessment was made in each case from the time of death of the individual with whom the control had been paired.

Results

A total of 5,184 patients lived in the defined survey area; their age and sex distribution is given in Table I. During the period under review 488 residents died; 404 residents died within the survey area and 84 other residents died in hospitals or private homes outside the area; the age and sex distribution of these people is given in Table II. Of the 488 residents who died, 108 had no close relatives living in the area and they, together with the nine recorded as neonatal deaths, were excluded from the survey. The remaining 371 (76%) form the survey group; the age and sex distribution of this group is given in Table III. When the 371 residents forming the survey group died they had a total of 903 close relatives living in the area; the comparative figure for the control group is 878. The number and type of close relatives extant at the time of real or hypothetical death for both the survey and control groups are given in Table IV. The number of each type of relative who died in the years following bereavement is

TABLE I.—Age/Sex Distribution of Patients Resident Within Survey Area

Age	Male	Female	Total
0-9	375	358	733
10-19	349	303	652
20-29	296	284	580
30-39	329	297	626
40-49	313	354	667
50-59	345	357	702
60-69	288	367	655
70-79	157	228	385
80-89	65	101	166
90-99	5	13	18
Total	2,522	2,662	5,184

TABLE II.—Age/Sex Distribution of People Who Died

Age	Male	Female	Total
Neonates	5	4	9
0-9	1	1	2
10-19	3	—	3
20-29	2	1	3
30-39	3	2	5
40-49	6	9	10
50-59	29	9	38
60-69	48	35	83
70-79	67	75	142
80-89	70	93	163
90-99	10	20	30
Total	244	244	488

TABLE III.—Age/Sex Distribution of Deceased Patients (Excluding Neonates) With Close Relatives in Area

Age	Male	Female	Total
0-9	1	1	2
10-19	3	—	3
20-29	2	—	2
30-39	3	2	5
40-49	6	4	10
50-59	27	7	34
60-69	43	32	75
70-79	57	57	114
80-89	50	57	107
90-99	6	13	19
Total	198	173	371

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shown in Table V, and this distribution is expressed as a percentage of those at risk in Table VI.

TABLE IV.—Close Relatives Alive at Time of Actual Death (Survey Group) and Hypothetical Death (Control Group)

	Male	Female	Total
<i>Survey Group</i>			
Spouse ..	51 (5.7%)	105 (11.6%)	156 (17.3%)
Parent ..	16 (1.8%)	19 (2.1%)	35 (3.9%)
Children ..	201 (22.3%)	235 (26.0%)	436 (48.3%)
Sibling ..	123 (13.6%)	153 (16.9%)	276 (30.5%)
Total ..	391 (43.3%)	512 (56.7%)	903 (100%)
<i>Control Group</i>			
Spouse ..	51 (5.8%)	115 (13.1%)	166 (18.9%)
Parent ..	9 (1.0%)	20 (2.3%)	29 (3.3%)
Child ..	222 (25.3%)	188 (21.4%)	410 (46.7%)
Sibling ..	132 (15.0%)	141 (16.1%)	273 (31.1%)
Total ..	414 (47.2%)	464 (52.8%)	878 (100%)

Statistical Method

The following test was used to determine whether the proportion of deaths in the survey group was significantly greater than the proportion of deaths in the control group.

For large samples u is approximately normally distributed with zero mean and unit variance, where

$$u = \frac{p_1 - p_2 - \frac{1}{2}}{\left[pq \left(\frac{1}{N_1} + \frac{1}{N_2} \right) \right]^{\frac{1}{2}}}$$

which is algebraically equivalent to

$$u = a - \frac{rA}{N} - \frac{1}{2} \left[\frac{ABr(N-r)}{N^3} \right]^{\frac{1}{2}} = \sqrt{\chi^2}$$

using the customary notation for a 2×2 contingency table, and a correction for continuity.

A one-tail test is appropriate here, so a value of u greater than or equal to 1.64 will be significant at the 5% level. For

the 1% level the value of u is 2.33. For very small values of A and B exact values for the probabilities were obtained from *Tables of the Hypergeometric Probability Distribution* by Lieberman and Owen, but none of these small sample tests were significant.

The statistical significance of the differences in mortality recorded between close relatives in the survey and control groups during the first year of bereavement is given in Table VII.

All Close Relatives

The number of close relatives who died each year following bereavement is given in Table V. This shows that there is a considerable difference between the number of deaths recorded in the survey and control groups and that the difference is

FIG. 1.—Percentage of deceased people whose death was followed each year by the death of a close relative.

greatest during the first year of bereavement. During the first year 43 (4.76%) bereaved close relatives died compared with 6 (0.68%) in the control group. This difference in risk between the two groups was found to be highly significant at the 0.001% level. During the second year the comparative figures for the bereaved and control groups were 18 (1.99%)

TABLE V.—Distribution of Relatives who Died Following Bereavement

	-1 Year			-2 Years			-3 Years			-4 Years			-5 Years			-6 Years		
	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total
<i>Survey Group</i>																		
Spouse ..	10	9	19	2	7	9	3	—	3	1	2	3	2	—	2	—	—	—
Parent ..	3	2	5	2	—	2	1	2	3	—	1	1	—	1	1	—	—	—
Child ..	6	1	7	1	1	2	1	1	2	—	—	—	—	—	—	—	—	—
Sibling ..	6	6	12	1	4	5	1	1	2	3	1	4	—	1	1	—	2	2
Total ..	25	18	43	6	12	18	6	4	10	4	4	8	2	2	4	—	2	2
<i>Control Group</i>																		
Spouse ..	2	—	2	1	4	5	2	1	3	2	—	2	—	4	4	—	—	—
Parent ..	1	—	1	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—
Child ..	—	—	—	3	—	3	—	—	—	—	—	—	1	—	1	—	—	—
Sibling ..	1	2	3	2	1	3	—	3	3	2	1	3	1	—	1	1	—	1
Total ..	4	2	6	6	5	11	2	5	7	4	1	5	2	4	6	1	—	1

TABLE VI.—Distribution of Relatives who Died Following Bereavement Expressed as a Percentage of those at Risk each Year

	-1 Year			-2 Years			-3 Years			-4 Years			-5 Years			-6 Years		
	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total
<i>Survey Group</i>																		
Spouse ..	19.6	8.5	12.2	4.9	7.1	6.6	7.7	—	2.5	2.8	2.2	2.4	5.7	—	1.6	—	—	—
Parent ..	18.8	10.5	14.3	14.3	—	6.7	9.1	11.6	10.7	—	6.6	3.6	—	7.1	4.2	—	—	—
Child ..	3.0	0.4	1.6	0.5	0.4	0.5	0.5	0.4	0.5	—	—	—	—	—	—	—	—	—
Sibling ..	4.8	3.9	4.3	0.9	2.7	1.9	0.9	0.7	0.8	2.4	0.7	1.6	—	0.7	0.4	—	0.7	0.4
<i>Control Group</i>																		
Spouse ..	3.9	—	1.2	2.0	3.5	3.0	4.2	0.9	1.9	4.3	—	1.3	—	3.6	2.6	—	—	—
Parent ..	11.0	—	3.4	—	—	—	—	12.5	3.6	—	—	—	—	—	—	—	—	—
Child ..	—	—	—	1.3	—	0.7	—	—	—	—	—	—	0.5	—	0.2	—	—	—
Sibling ..	0.8	1.4	1.1	1.5	0.7	1.1	—	2.6	1.1	1.6	0.7	1.1	0.8	—	0.4	0.8	—	0.4

and 11 (1.25%); the difference between these figures was not significant.

The difference between the groups is exemplified further by Fig. 1; this shows the percentage of deceased people whose death was followed each year by the death of a close relative. It shows that close relatives of 11.6% (43) of the survey group died within a year of bereavement and that the corresponding figure for the control group was only 1.6% (6). It also shows that while the mortality rate for the control group shows a relatively small fluctuation over the six-year period there is an apparent change in pattern for the survey group, and the mortality rate for the bereaved group remains higher than that of the control group for the first three or four years following bereavement.

The risk for male relatives was found to be greater than for female relatives. During the first year of bereavement 6.4% of the 391 male relatives at risk died, compared with 3.5% of the 512 female relatives. This difference in risk between the sexes was significant at the 5% level.

Widows and Widowers

During the first two years of bereavement the mortality rate for widowed people in the bereaved group was higher than for those in the control group. The difference between the two groups is shown in Tables V and VI. Of recently widowed people, 12.2% died during the first year of bereavement, 6.6% of those at risk died during the second year, and 2.5% during the third year. Though 12.2% of widowed people in the bereaved group died during the first year of bereavement only 1.2% of the control group died. This increase in risk for widowed people during the first year of bereavement was significant at the 0.01% level.

The mortality rate for widowers was considerably higher than the mortality rate for widows. During the first year of bereavement 19.6% of widowers and 8.5% of widows in the bereaved group died. This difference in risk between the widowers and widows was significant at the 5% level.

Of the bereaved widowers, 13.7% died during the first six months of bereavement, 5.9% died during the second six months, and 4.9% died during the following 12 months. This different mortality rate for widowers during the first and second six months of bereavement was significant at the 1% level and confirms the findings of Young *et al.* (1963) that the mortality rate of widowers is particularly high during the first six months of bereavement. Conversely, the suggestion by Cox and Ford (1964) that the mortality of widows is higher than average in the second year of bereavement was, in this survey, found to be not significant at the 10% level and therefore not confirmed.

Close Relatives Excluding Widowed People

Apart from widowed people, there were 747 close relatives in the bereaved group and 712 in the control group. During the first year of bereavement 3.21% of these close relatives died in the survey group compared with 0.56% in the control group. This increase in risk for bereaved relatives was significant at the 0.1% level.

The mortality rates for the bereaved parents, children, and siblings are shown in Tables V and VI. These show an increase in mortality during the first and sometimes the second year of bereavement for each type of relative and that in each case the increase in mortality for the bereaved male relative is greater than for the female relative. The statistical significance of the differences in mortality determined for these various groups is shown in Table VII.

TABLE VII.—Statistical Significance of the Differences in Mortality Recorded During the First Year of Bereavement

	Total	Male	Female
All relatives	0.001	0.01	0.1
Parents	N.S.	N.S.	N.S.
Widowed	0.01	5.0	1.0
Children	5.0	N.S.	N.S.
Siblings	5.0	N.S.	N.S.
All relatives (excluding widowed people)	0.1	1.0	N.S.

N.S. denotes that the levels were not found to be statistically significant.

Place of Death

An assessment was made to determine whether the place at which people die is related in any way to the subsequent mortality of close relatives. The various places at which death occurred and the number of deaths which occurred at each site are given in Table VIII. This shows that in this area, though little difficulty is experienced in admitting the old, the chronic sick, and the dying into hospital, a very high proportion of people die at home. Because the place of death is often chosen by the patient, his family, or the people caring for him, the fact that 25.9% of the people without close relatives die at home is noteworthy.

TABLE VIII.—Places at Which People Died

	Home	Hospital	Chronic Sick Unit	Old People's Home	Other Sites	Total
<i>Original Sample</i>						
Male	108	86	24	12	14	244
Female	104	70	57	8	5	244
Total	212	156	81	20	19	488
%	43.4	32.0	16.6	4.1	3.9	100
<i>No Close Relatives</i>						
Male	10	9	12	9	2	41
Female	18	12	29	6	1	67
Total	28	21	41	15	3	108
%	25.9	19.4	38.0	13.9	2.8	100
<i>Those with Close Relatives</i>						
Male	98	78	12	3	12	203
Female	86	57	28	2	4	177
Total	184	135	40	5	16	380
%	48.4	35.6	10.5	1.3	4.2	100

Table IX gives the percentages of people who died each year, at the sites listed, whose death was followed by the death of a close relative. Close relatives of 13 (7.1%) of the 184 people who died at home died within the ensuing year, compared with the relatives of 17 (12.6%) of the 135 people who died in a general hospital and 7 (17.5%) of the 40 people who died in a chronic sick unit. Close relatives of 24 (13.7%) of the 175 people who died in hospital died within the following year. It seems, therefore, that the risk to a bereaved close relative of dying within one year of bereavement is determined, in part, by the place of death of the first relative. If the first relative dies in hospital the bereaved close relatives carry twice the risk of dying within a year of bereavement than if the first relative had died at home. This increase in risk for bereaved close relatives when the original death occurred in hospital compared with at home was significant at the 5% level.

TABLE IX.—Percentages of People Who Died Each Year, At the Sites Listed, Whose Death was Followed by the Death of a Close Relative

	Years of Bereavement					
	-1	-2	-3	-4	-5	-6
Died at home	7.1	5.0	1.2	2.5	0.6	0.6
Died in hospital	12.6	3.7	3.8	4.0	2.0	1.0
Died in chronic sick unit	17.5	0.1	6.7	—	—	—
Died in old people's home	—	—	20.0	—	—	—
Died at other sites	37.5	—	20.0	—	—	—

Similarly, a difference in risk was found to occur when the original death occurred at some site other than at home or hospital. It was found that 19 people died at sites other than hospital or home and that 16 of these people had close relatives living in the area. The "other sites" included roads, fields, a cemetery, chapel, shop, wood, bowling-green, and pond. Deaths at these sites were invariably sudden and the shock to relatives consequently great. Their grief was often increased by the need for a necropsy and inquest. Six (37.5%) of these deaths at other sites were followed within one year by the death of a close relative, and of the close relatives at risk during this period 11.6% (6) died.

Close relatives of 13.7% of the people who died in hospital and of 37.5% of those who died at other sites died within one year of bereavement. This increase in risk for the relatives of people who died at other sites compared with those who died in hospital was significant at the 5% level.

Close relatives of 7.1% of the people who died at home and of 37.5% of those who died at other sites died within one year of bereavement. This increase in risk for the relatives of people who died at other sites compared with those who died at home was significant at the 0.01% level.

Age of Relatives who Die Following Bereavement

The age distribution of all the people resident in the area who died during the six-year period is given in Table II. The mean age of death for this group was 73.35 ± 13.8 . The mean age of those people whose death was followed within one year by the death of a close relative was 70.9 ± 13.2 . The mean age of the relatives who died during the first year of their bereave-

FIG. 2.—Age distribution of relatives who died within one year of bereavement.

ment was slightly lower at 69.75 ± 14.7 . These figures suggest that people who die following bereavement are on average slightly younger than the relatives who predeceased them and that they die at an earlier age than is usual for the community in which they live. Fig. 2 shows the age distribution of relatives who died within one year of bereavement. This chart is biphasic, with two modes, A and B. Histograms (not shown) of the age distribution of all the people who died in the area and of those people whose death was followed within one year by the death of a close relative each have only one mode, and these occur in the same general age distribution as mode B in Fig. 2. The presence of mode A in the chart suggests that a

significant number of relatively young people are particularly at risk during the first year of bereavement.

Summary

A survey was made in a semirural area (pop. 5,184) to determine whether bereavement produced an increased mortality among bereaved close relatives—these being defined as a spouse, a child, a parent, or a sibling. During a six-year survey period 488 residents died; 371 of these people had close relatives living in the survey area, and the subsequent mortality of their 903 close relatives was compared with that of a control group; this control group was composed of the 878 close relatives of 371 people matched by age, sex, and marital state with the people who had originally died.

It was found that 4.76% of bereaved close relatives died within one year of bereavement compared with 0.68% in the control group. This sevenfold increase in risk between the bereaved and control group was significant at the 0.001% level, and indicates that bereavement carries a considerably increased risk of mortality. This risk was found to be greater for male than for female relatives: 6.4% of the 391 male relatives at risk died, compared with 3.5% of 512 female relatives. This difference in risk between the sexes was significant at the 5% level.

The increase in risk was particularly great for widowed people and least for female children. During the first year of bereavement 12.2% of widowed people died, compared with 1.2% in the control group. This increase in risk for widowed people was significant at the 0.01% level. Of the remaining close relatives in the survey group, 3.21% died during the first year of bereavement, compared with 0.56% in the control group. This increase in risk for bereaved close relatives, excluding the widowed, was significant at the 0.1% level.

There is a relation between the place at which a person dies and the subsequent mortality of bereaved relatives. The risk of close relatives dying during the first year of bereavement is doubled when the primary death causing bereavement occurs in a hospital compared with at home. This difference in risk was significant at the 5% level.

If the primary death occurs at some site—for example, a road or field—other than at home or hospital, the risk of a close relative dying during the first year of bereavement is five times the risk carried by the close relatives of people who die at home. This difference in risk was significant at the 0.01% level, though the small size of the sample reduces the significance that can be attributed to the result.

People who die following a bereavement are on average slightly younger than the relatives who predeceased them, and they die at an earlier age than is usual for the community in which they live.

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