

PAPERS AND SHORT REPORTS

Bereavement and cancer: some data on deaths of spouses from the longitudinal study of Office of Population Censuses and Surveys*

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Abstract

Registration of cancer and mortality after the death of a spouse were assessed using data from the longitudinal study of the Office of Population Censuses and Surveys (OPCS). The study population comprised 1% of the people counted in England and Wales in the 1971 census, for whom data on subsequent vital events were linked with their census records. There was little evidence of an increase in registrations of cancer after the death of a spouse and only a slight suggestion of increased mortality from cancer. For other causes of death there was some evidence of increases in mortality during widow(er)hood.

In so far as the death of a spouse is often a very stressful event, these data may be interpreted as providing little support for the hypothesis that stress is implicated in the aetiology of cancer.

Introduction

More than 50 years ago Evans suggested that the death of a spouse or other close relation could be an important cause of cancer.¹ This hypothesis is just one of many that link psychological factors,^{2,3} such as personality and temperament, or psychosocial factors,³⁻⁵ such as patterns of stressful events,⁶⁻⁸ with the aetiology of cancer and other diseases. Most of the reports cited above concluded that there was epidemiological

evidence to support some hypotheses that psychosocial stresses contribute to the aetiology of chronic diseases, although many methodological weaknesses in the studies leave interpretation of their results in some doubt. For example, many relied on retrospectively ascertaining the occurrence of potentially stressful events or the psychological predisposition of members of the study population and on the use of instruments such as the social readjustment rating scale,⁹ interpretation of which is sometimes problematical.¹⁰ More widely encountered problems of epidemiological studies, such as small study populations and poor choice of control groups, also contribute to the difficulties of interpretation. Furthermore, a physiological mechanism to account for an increase in the incidence of or mortality from cancer after stressful events has yet to be specified in detail. A consensus seems to be developing, however, that susceptibility to cancer may be increased through immunosuppressive and neuroendocrinal pathways in people subject to stress.^{2,11}

Although the evidence for a link between stress and cancer is thus equivocal, the loss of an important emotional relationship has been identified in several studies as an event with a high risk of subsequent illness.^{1,12,13} Loss of a spouse will presumably often fall into this category; not surprisingly, widow(er)hood is given the highest rating on the social readjustment rating scale. The response of the bereaved spouse to the loss of his or her partner, however, is likely to depend on many factors, which are summarised by Parkes.¹⁴ We should not, therefore, regard the death of a spouse uncritically as a proxy indicator of a stressful event. Relevant factors antecedent to the bereavement include earlier experiences of bereavement, life crises, mental illness, the degree of attachment to and reliance on the bereaved person, and the degree to which the death was expected. The response can also be expected to depend on socioeconomic characteristics of the bereaved person, including age, sex, social class, race, and religion, as well as on aspects of personality such as proneness to grief and inhibition of feelings. The degree of social or familial support available to the bereaved person and the pattern of secondary stress experienced are likely to be important.¹⁵

Adequate investigation of this complex set of stressful events, modifying factors, and outcomes is difficult as the results to

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date show. Long term, large scale prospective studies are required to discern the relations between events and outcomes.^{16 17} This report describes results obtained during the course of a large prospective study based on linking data from the 1971 census with subsequent routinely collected data on mortality and registrations of cancer.¹⁸ Patterns of incidence of and mortality from cancer during widow(er)hood were examined. In particular, some of the analyses investigated the evidence for an increase in the incidence of cancer (as measured by the rate of registration of new cancers) during widow(er)hood, and others looked for evidence of a reduction in the duration of survival from registration of cancer to death if the spouse had died before or during the course of the cancer. The effects of several socioeconomic variables measured at the census were investigated, but of course no psychometric data were available. Mortality from causes other than cancer during widow(er)hood were also examined briefly.

Subjects and methods

The longitudinal study of the Office of Population Censuses and Surveys (OPCS) was based on a 1% sample of people counted in England and Wales in the 1971 census.¹⁸ Census records for subjects in the sample were linked with information about subsequent events experienced by them. The data were obtained from other OPCS routine data collections including those for death and registration of cancer. The census characteristics of subjects whose spouses died and the subsequent incidence of cancer and mortality patterns among these subjects were the main focus of interest in the study reported here. Several different analyses using data from the longitudinal study were carried out.

In all the analyses we calculated the numbers of deaths or registrations expected in the study population¹⁸ by applying death or registration rates by five year age groups and sex (and, in some cases, survival period) in a standard or comparison group to the person years at risk¹⁹ of death or registration by five year age groups and sex (and survival period) in the group studied. Approximate 95% confidence limits for the ratio of observed to expected deaths or registrations were also calculated.²⁰

Results

The first two analyses reported here made use of relatively simple linkages between patients' census records and any records of their subsequent registration for cancer or death, or both. The longitudinal study population included 4905 widows aged under 60 who were counted in England and Wales at the 1971 census and traced in the National Health Service Central Register. Of these, 75 were registered with new cancer during 1971-3 and 205 died during 1971-5. Table I shows the number of these registrations analysed by the site of cancer and the year in which the first marriage of the widow had terminated as reported in the 1971 census return. Widows not stating the year of termination of their first marriage were omitted from the analysis. In a very small number of cases widowhood might have occurred after a subsequent, not first marriage. The numbers of registrations of cancer expected if registration rates in these widows were the same as those in all women of the same ages in the longitudinal study are also shown, together with 95% confidence limits for the ratio of observed to expected registrations of cancer. Table II shows corresponding results for deaths from all causes and from cancer. A similar analysis could not be performed for widowers as only women aged under 60 were asked for details of their marital history at the 1971 census.

Tables I and II do not provide firm evidence of an excess of either registrations or deaths over the numbers expected. Slightly more deaths were observed than expected among those whose first marriage terminated before 1969, and registrations and deaths (particularly with breast neoplasms) in those whose first marriage terminated before 1966. It was in this group of widows that the most time was available for any effect of bereavement to appear as a new cancer or as death after a latent period of a few years. Interpretation of the results of these tables must, however, be cautious as the cohort of women whose first marriage terminated before the 1971 census was incomplete. Some members of the cohort would have remarried, emigrated, or died before the 1971 census and so been excluded from these analyses.

TABLE I—Registration of cancer observed (and expected*) during 1971-3 in widows aged under 60 at 1971 census, by site of cancer and year of termination of first marriage (and 95% confidence intervals for ratio of observed to expected registrations)

	Year of termination of first marriage		
	Before 1966	1966-8	1969-71
All malignant neoplasms (ICD codes 140-209*)	40 (33.7) (0.84-1.59)	13 (13.7) (0.50-1.55)	14 (13.9) (0.54-1.62)
Malignant neoplasms of breast (ICD 174)	12 (8.5) (0.71-2.34)	3 (3.5) (0.15-2.13)	5 (3.7) (0.41-2.83)
Malignant neoplasms of lung (ICD 162)	6 (3.4) (0.62-3.50)	3 (1.4) (0.38-5.33)	0 (1.4)

*Based on age specific registration rates in all women in the longitudinal study during 1971-3.

TABLE II—Observed (and expected*) deaths during 1971-5 in widows aged under 60 at 1971 census, by cause of death and year of termination of first marriage (and 95% confidence intervals for ratio of observed to expected deaths)

	Year of termination of first marriage		
	Before 1966	1966-8	1969-71
All causes	95 (86.9) (0.88-1.33)	46 (34.1) (0.98-1.59)	38 (34.6) (0.77-1.48)
All malignant neoplasms (ICD 140-209*)	42 (36.7) (0.81-1.52)	14 (14.4) (0.52-1.56)	18 (14.6) (0.72-1.88)
Malignant neoplasm of the breast (ICD 174)	15 (9.1) (0.91-2.61)	4 (3.6) (0.27-2.50)	4 (3.7) (0.27-2.43)
Malignant neoplasm of the lung (ICD 162)	5 (5.7) (0.27-1.84)	3 (2.3) (0.23-3.25)	0 (2.4)

*Based on age specific mortality in all women in the longitudinal study during 1971-5.

This may introduce biases, such as that resulting from the likelihood that those who remarry are healthier than those who do not.

All the following analyses used more complex links between the subjects' census records and records of at least two subsequent events (widow(er)hood, registration of cancer, or death) in following complete cohorts identified at the 1971 census. Tables III and IV show registrations of cancer during 1971-5 and deaths during 1971-6 after the death of a spouse during 1971-5 among the complete cohorts of married men and women at the 1971 census. Of the 133 007 married men in the study population at the 1971 census, 4016 suffered widowhood before the end of 1976; in the same period 8563 of the 131 277 married women in the study population were widowed.

Table III shows that the numbers of registrations of cancer were close to those expected in women but were slightly more than expected in men. Table IV also fails to provide firm evidence of more deaths

TABLE III—Observed (and expected*) registration of cancer during 1971-5 after death of spouse earlier in 1971-5 (and 95% confidence intervals for ratio of observed to expected registrations)

	Women	Men
All malignant neoplasms (ICD 140-209*)	122 (120.9) (0.83-1.20)	114 (96.9) (0.97-1.41)

*Based on age and sex specific registration rates in the whole longitudinal study during 1971-5.

than expected from cancer after the death of a spouse, except for a slight excess in men. Most of the excess deaths from all causes was accounted for by those not caused by cancer, mainly by circulatory and respiratory diseases in the widowers and by accidents, poisonings, and violent deaths in the widows. Tables V and VI show that when the data were examined by the interval between the death of the spouse and the subject's death, deaths in the periods immediately after the death of the spouse exceeded those expected, especially in the widows. In almost every case the ratio of observed to expected deaths was at least as large for all deaths from other causes as for those from cancer. More detailed analyses of deaths from other causes after bereavement will be presented in a later report.

Tables I and III provide only slight evidence of an increased incidence of cancer, and tables II and IV may suggest increased mortality from cancer after the death of a spouse. A consistent explanation would be that the duration of survival from the registration of cancer to death is reduced during widow(er)hood. Tables VII and VIII investigate the hypothesis of reduced duration of survival more directly.

Table VII shows observed and expected numbers of deaths during 1971-5 after registration of cancer earlier in the period 1971-5 by marital state at the 1971 census. The expected numbers are based on mortality in all members of the longitudinal study registered during 1971-5 as having cancer. The evidence of a slight excess of observed over expected deaths in widows and single men and the overall deficit in observed deaths in married and single women parallel the patterns of mortality seen in earlier analyses by marital state.^{18 21}

TABLE IV—Observed (and expected*) deaths during 1971-6 after death of spouse earlier in 1971-6, by cause and sex (and 95% confidence intervals for ratio of observed to expected deaths)

	Women	Men
All causes	691 (665.9) (0.96-1.12)	662 (587.1) (1.04-1.22)
All malignant neoplasms (ICD 140-209 ²⁶)	135 (134.0) (0.84-1.19)	137 (120.1) (0.95-1.34)
All non-cancers (ICD 000-139, 240-999)	555 (530.4) (0.96-1.14)	524 (463.5) (1.03-1.23)

*Based on age and sex specific mortality in the whole longitudinal study population during 1971-6.

As in tables I and II, however, potential biases in the incomplete cohort examined must be kept in mind. The next analysis overcame these problems by following a complete cohort from the census through registration of cancer and on to widow(er)hood and death if these occurred. Table VIII shows deaths after the death of a spouse when this occurred between registration of cancer and death of the subject compared with the pattern of deaths expected in all those who registered as having cancer. In the longitudinal study population 108 women were both registered as having cancer during 1971-5 and subsequently widowed during 1971-6; the corresponding number of men was 71. Although the number of deaths in this group, who suffered the death of a spouse after registration of their cancer, was greater than that in the group comprising all those registered as having cancer, the evidence of increased mortality, and hence reduced survival rate, was far from conclusive even among the widowers.

TABLE V—Observed (and expected*) deaths in women during 1971-6 by interval from death of spouse (and 95% confidence intervals for ratio of observed to expected deaths)

	Interval (days) from death of spouse					
	1-30	31-60	61-90	91-183	184-365	366+
All causes	43 (17.7) (1.74-3.23)	31 (18.7) (1.12-2.31)	22 (17.8) (0.77-1.82)	60 (55.9) (0.81-1.37)	89 (100.2) (0.71-1.09)	446 (452.7) (0.89-1.08)
All malignant neoplasms (ICD 140-209 ²⁶)	6 (4.0) (0.53-2.97)	5 (4.2) (0.36-2.49)	7 (4.1) (0.66-3.24)	7 (11.3) (0.24-1.18)	20 (20.4) (0.59-1.47)	90 (89.9) (0.80-1.22)
All non-cancers (ICD 000-139, 240-999)	37 (13.8) (1.87-3.64)	26 (14.5) (1.16-2.57)	15 (13.7) (0.60-1.73)	53 (44.5) (0.89-1.54)	69 (79.5) (0.67-1.09)	355 (362.1) (0.88-1.09)

*Based on age and survival period specific mortality in all women in the longitudinal study during 1971-6.

TABLE VI—Observed (and expected*) deaths in men during 1971-6 by interval from death of spouse (and 95% confidence intervals for ratio of observed to expected deaths)

	Interval (days) from death of spouse					
	1-30	31-60	61-90	91-183	184-365	366+
All causes	26 (19.0) (0.88-1.96)	25 (19.1) (0.84-1.88)	26 (17.4) (0.97-2.14)	65 (54.1) (0.92-1.52)	108 (93.9) (0.94-1.38)	412 (380.8) (0.98-1.19)
All malignant neoplasms (ICD 140-209 ²⁶)	6 (4.0) (0.53-2.97)	4 (4.0) (0.25-2.25)	4 (3.2) (0.31-2.81)	9 (11.4) (0.35-1.40)	25 (19.2) (0.83-1.88)	89 (78.2) (0.91-1.39)
All non-cancers (ICD 000-139, 240-999)	20 (15.1) (0.80-1.98)	21 (15.1) (0.85-2.06)	22 (14.1) (0.97-2.30)	56 (42.6) (0.99-1.69)	83 (74.7) (0.88-1.37)	322 (301.9) (0.95-1.19)

*Based on age and survival period specific mortality in all men in the longitudinal study during 1971-6.

TABLE VII—Observed (and expected*) deaths during 1971-5 after registration of cancer earlier in the period, by marital state at 1971 census (and 95% confidence intervals for ratio of observed to expected deaths)

	Men	Women
Single	232 (215.7) (0.94-1.22)	268 (280.6) (0.84-1.08)
Married	2216 (2252.6) (0.94-1.03)	1088 (1135.8) (0.90-1.02)
Widowed	353 (335.3) (0.94-1.17)	773 (716.5) (1.00-1.16)
Divorced	31 (28.3) (0.74-1.52)	31 (27.0) (0.77-1.60)

*Based on age, sex, and survival period specific mortality during 1971-5 in all longitudinal study members registered as having cancer 1971-5.

TABLE VIII—Observed (and expected*) deaths during 1971-6 after death of spouse during period for those registered as having cancer earlier in 1971-5 (and 95% confidence intervals for ratio of observed to expected deaths)

	Widows	Widowers
All causes	21 (19.1) (0.67-1.63)	30 (23.8) (0.84-1.76)

*Based on age, sex, and survival period specific mortality during 1971-6 in all members of the longitudinal study registered as having cancer in 1971-5.

Discussion

From the above analyses there appeared to be at most only very slight evidence of greater than expected incidence of cancer after the death of a spouse and hardly better evidence that survival from registration of cancer to death is less in the widowed than in the population as a whole.

The evidence in table II is of a long term effect perhaps leading to reduced survival in a selected cohort of women who survived and remained widowed until 1971. Short term effects in complete cohorts are to be seen in tables V and VI, but interpretation of these results as evidence of a role for stress associated with bereavement in the aetiology of cancer must be cautious, especially as the latent period for the development of many cancers is several years. The effect is most clearly seen in other major causes of death and hence in the overall pattern

of mortality from all causes. This accords with the hypothesis that disturbed emotions or stress are risk factors for cardiovascular disease, at least for some types of personality,²² as most of the deaths from causes other than cancer are in this category. Further examination of the data in table VIII by duration of survival during widow(er)hood does not support the hypothesis of more deaths than expected immediately after the death of a spouse, although the very small numbers of observations make any such separation of the results in the table difficult to interpret. Examination of survival by site of cancer may also be important because the pattern of incidence of sites of cancer in widow(er)s was different from that in the comparison group and survival varied with the site. All further analyses, however, must await the greater numbers of observations obtainable in a longer period of follow up.

Patterns of mortality after the death of a spouse have been studied extensively.²³⁻²⁴ Results are not consistent in all studies, but there seems to be an earlier and greater excess of observed over expected deaths in men than women. This is not the pattern seen in tables V and VI, which show a greater early excess in women. Several hypotheses are capable of explaining the results in this and earlier studies. The most plausible is that the excess of deaths may be a result of the stress of bereavement or of loss of support from the spouse. Other explanations include the effects of a common marital environment, of homogamy, of simultaneous accidental deaths of both partners (when the younger partner is conventionally regarded as having been widowed), and of "postponement" of the expected death of a chronically ill spouse until after the death of his or her partner. A full report on the patterns of incidence of and survival during widow(er)hood in the longitudinal study using data from the whole period 1971-81 is in preparation.

Apart from the opportunity it offers to study the relations between the events of interest, one of the potential strengths of the longitudinal study is the facility for separating results according to any combination of variables about which data were collected in the census. Although our results have been presented separately for each sex (and the effects of age are taken into account in the calculation of expected death and registration rates), we have not attempted to separate the results by other census variables because of the limited size of our samples of widow(er)s. Thus we have not examined directly indicators of the widow(er)'s socioeconomic state or the measure of familial and social support to the widow(er) that types of households and families could provide. Similarly, the degree to which the death of the spouse was expected or predictable could be assessed to some extent by consideration of the cause of that death. In fact, a substantial excess of deaths (16 as opposed to 7.2 expected) occurred in women whose partner died of an unpredictable cause—namely an accident, poisoning, or a violent cause—compared with only a few excess deaths (60 as opposed to 55.8 expected) in women whose partner died of a predictable cause—namely lung cancer. The pattern was similar in men.

The investigations were of adequate power to detect large excesses of observed registrations and deaths over the expected numbers. For example, the analysis in table I of registrations of breast cancer in women whose first marriage terminated before 1966 has a power²⁵ of about 70% for detecting a relative risk of 2, and that in table VII of cancer registrations in widowers a power of about 65% for detecting a relative risk of 1.5. The results presented here therefore suggest quite strongly that large excesses were not to be seen after the death of a spouse.

Some of the weaknesses of earlier studies have already been noted; this study overcame some of these weaknesses.¹⁶⁻¹⁷ It was large overall, although there were relatively few people in the study population who suffered some of the combinations

of events that were of interest. The data on the stressful event, widow(er)hood, were not determined retrospectively (except for data on termination of marriage in tables I and II) and are likely to be reliable. Furthermore, the data did not have to be collected specifically for this study. Death was a reliable measure of outcome, cancer registration somewhat less so, and the census data were at least as reliable as in most ad hoc studies. The control groups used in the analyses generally comprised all members of the longitudinal study of the same sex, irrespective of their marital states. Repetition of some of the analyses with members of the longitudinal study who were or had ever been married and were the same sex as the control group may be desirable as, of course, only those who are married are at risk of widow(er)hood. Further analyses controlling for potential confounding factors would be desirable if the observed numbers of events were sufficient.

Overall, however, this study provides little evidence for a link between bereavement and cancer. Indeed, it quite strongly suggests that a large excess of registrations of cancer or deaths over those expected will not be seen after the death of a spouse. Future analyses making use of longer periods of follow up of the original longitudinal study population may help to clarify the relation a little, but further large prospective studies,¹⁷ using carefully designed psychometric instruments for measuring stressful events and their impact, and with careful choice of control groups, are still required.

We thank John Fox and Emily Grundy for their help and comments and many members of the OPCS staff for compiling the data on which the paper is based. DJ was supported by a Medical Research Council programme grant and DL by a Cancer Research Campaign grant.

References

- Evans E. *A psychological study of cancer*. New York: Dodd Mead and Co, 1926.
- Greer S. Psychological enquiry: a contribution to cancer research. *Psychol Med* 1979;9:81-9.
- Cox T, Mackay C. Psychosocial mechanisms in the aetiology and development of cancer. *Soc Sci Med* 1982;16:381-96.
- Cooper CL. Psychosocial stress and cancer. *Bulletin of the British Psychological Society* 1982;35:456-9.
- McQueen DV, Siegrist J. Social factors in the etiology of chronic disease: an overview. *Soc Sci Med* 1982;16:353-67.
- Goldberg EL, Comstock GW. Life events and subsequent illness. *Am J Epidemiol* 1976;104:146-58.
- Susser M. The epidemiology of life stress [Editorial]. *Psychol Med* 1981;11:1-8.
- Rabkin JG, Struening EL. Life events, stress and illness. *Science* 1976;194:1013-20.
- Holmes TH, Rahe RH. The social readjustment rating scale. *J Psychosom Res* 1967;11:213-8.
- Dohrenwend BS, Dohrenwend BP. Some issues in research in stressful life events. *J Nerv Ment Dis* 1978;166:7-15.
- Henry JP. The relation of social to biological processes in disease. *Soc Sci Med* 1982;16:369-80.
- LeShan L. An emotional life history pattern associated with neoplastic disease. *Ann NY Acad Sci* 1966;125:780-93.
- Muslin HL, Gyarfas K, Pieper WJ. Separation experience and cancer of the breast. *Ann NY Acad Sci* 1966;125:802-6.
- Parkes CM. *Bereavement: studies of grief in adult life*. London: Tavistock, 1972. (Also Harmondsworth: Penguin, 1975.)
- Kaplan BH, Cassel JC, Gore S. Social support and health. *Med Care* 1977;15, suppl:47-57.
- Anonymous. Mind and cancer [Editorial]. *Lancet* 1979;i:706-7.
- Fox BH. Premorbid psychological factors as related to cancer incidence. *J Behav Med* 1978;1:45-133.
- Fox AJ, Goldblatt PO. *Longitudinal study: socio-demographic mortality differentials*. London: HMSO, 1982. (Series LS No 1. Office of Population Censuses and Surveys.)
- Hill ID. Computing man years at risk. *Br J Prev Soc Med* 1973;26:132-4.
- Vandenbroucke JP. A shortcut method for calculating the 95 per cent confidence interval of the standardised mortality ratio. *Am J Epidemiol* 1982;115:303-4.
- Office of Population Censuses and Surveys. *Registrar General's statistical review 1967. Part III. Commentary*. London: HMSO, 1971.
- Jenkins CD. Recent evidence supporting psychologic and social risk factors for coronary disease. *N Engl J Med* 1976;294:987-94, 1033-8.
- Jacobs S, Ostfeld A. An epidemiological review of the mortality of bereavement. *Psychosom Med* 1977;39:344-57.
- Susser MW. Widowhood: a situational life stress or a stressful life event? *Am J Public Health* 1981;77:793-5.
- Cohen J. *Statistical power analysis for the behavioural sciences*. New York: Academic Press, 1969.
- World Health Organisation. *Manual of the international statistical classification of diseases, injuries and causes of death*. 8th revision. Geneva: WHO, 1969.

(Accepted 24 May 1984)