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Patrick Lusyne, Neelke Vernaillen, Hilary Page and John Lievens

DEPARTMENT OF POPULATION STUDIES AND SOCIAL SCIENCE METHODOLOGY
GHENT UNIVERSITY, BELGIUM

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Interface Demography, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium
Tel: 32-2-629.20.40 Fax: 32-2-629.24.20 E-mail: esvbalck@vub.ac.be
Website: http://www.vub.ac.be/SOCO/
Vakgroep Bevolkingswetenschappen, Universiteit Gent, Korte Meer 3, B-9000 Gent, Belgium
Tel: 32-9-264.91.64 Fax: 32-9-264.91.98 E-mail: John.Lievens@rug.ac.be
Website: http://www.psw rug.ac.be/dephome/popmeth

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Patrick Lusyne, Neelke Vernaillen, Hilary Page and John Lievens

Department of Population Studies and Social Science Methodology
Ghent University, Belgium

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Patrick Lusyne, Neelke Vernaillen, Hilary Page and John Lievens

Department of Population Studies and Social Science Methodology
Ghent University, Belgium

Korte Meer 3
9000 Gent, Belgium
Tel: ++3292649165
e-mail: patrick.lusyne@rug.ac.be
URL : http://www.psw.rug.ac.be/popmeth

ABSTRACT

There is considerable empirical evidence for excess morbidity and mortality following spousal bereavement. A number of studies suggest that social support can reduce the deleterious impact of bereavement. The social support literature in its turn identifies children as a potential source of support. Surprisingly, the impact of parenthood on survival following spousal loss appears not to have been widely and systematically assessed. In this paper we use a longitudinal design, based on a linkage of the Belgian census of 1991 with the death registration records for the five-years following the census. Approximately 44,000 widowers and 105,000 widows aged between 30 and 84 are followed, together with an equal number of matched controls not experiencing bereavement. We use a log-rate model to assess the impact of having children and the impact of the number of children on excess mortality and we control for time since death of the spouse, sex, age and educational level.

Our results indicate that – controlling for age, sex, time since bereavement and education – overall, neither having children nor the number of them seem to make a difference in survival following spousal loss. The hypothesis that children systematically buffer the effects of bereavement is not supported, although we do find a very modest effect among the highly educated. Contrary thus to what many people might expect, the childless are not, in general, more vulnerable following spousal loss than parents.

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1. Introduction

To most people parenthood is a blessing. Children are in general a major source of joy and companionship and adult children usually provide a sense of comfort and security. It is, therefore, traditionally believed that - especially in old age - the childless fare less well than parents. The empirical evidence on this is inconsistent however (Zhang and Hayward, 2001)

There is, for instance, accumulating evidence that for subjective 'quality of life' measures like happiness, satisfaction and loneliness there is no difference between childless elders and parents. This might suggest that other kin and friends may substitute satisfactorily for children (Koropeckyj-Cox, 1998) but also that for most married couples – with children or without – the most salient needs for support and comfort are satisfied within marriage (Zhang and Hayward, 2001).

Regardless of the former, the latter suggestion implies that what happens following spousal loss is altogether a different story. It could be that following spousal bereavement the presence of children - arguable more than with only other kin and friends present - may result in at least some compensation for the loss of spousal support and companionship. It seems reasonable, therefore, to assume that parents have an advantage over the childless following spousal bereavement. The extent to which this advantage results in a better protection against the excess mortality that follows bereavement appears, surprisingly, not to have been widely and systematically assessed.

To assess the potential buffering effect of having children we use a longitudinal design, based on a linkage of the Belgian census of 1991 with the death registration records for the five years following the census. We assess the excess mortality related to bereavement through estimation of death-rate ratios (widowed/married) using a log-rate model, and we compare first the excess mortality for parents with that for the childless. Overall we expect to find lower levels of excess mortality among bereaved parents than among the bereaved childless.

Not only having children but also the number of children could play a role in health and mortality following bereavement. The second goal of this paper is therefore to assess whether the impact of parenthood on excess mortality following bereavement varies by the number of children.

Other factors too can affect the circumstances and the grief process, and these may interact with the effect of children. The excess mortality is for example known to depend on sex, age and time since bereavement. It could conceivably also depend on education.

As a third goal, therefore, we also assess the degree to which the differences in excess mortality between parents and childless individuals vary with these other factors.

2. Theoretical considerations.

2.1. Excess mortality following bereavement

There is firm evidence for a substantial number of countries that widowers and widows are more at risk of dying than those who are married. Although alternative explanations like homogamy and sharing of the same conditions in life are possible, there is little discussion that the bereavement itself is at least in part responsible for the excess mortality following the loss of the spouse. The explanations put forward emphasize stress as a causal agent between the bereavement and the excess mortality. Stress is believed to cause the excess mortality through its role in the etiology of numerous somatic as well as psychosomatic diseases (Bowling, 1987) and through its triggering effects on health-hazardous behaviours such as self-neglect, substance abuse and violence (Mellström et al., 1982).

Strong support for the stress-related character of excess mortality following widowhood is to be found in the particular marked excess in the period immediately following the loss of the spouse - a time when stress may be assumed to be felt most strongly (Martikainen and Valkonen, 1996a). A more or less similar argument is to be found in the differential age-effect following bereavement. Most studies find that younger widowers and widows are more affected by bereavement than older ones. This can be understood from the often more sudden and unacceptable nature of a young spouse's death, increasing the stressful nature of the bereavement (Martikainen and Valkonen , 1996b).

Despite greater female vulnerability to the consequences of quite a number of stressful life events (Kessler and McLeod, 1984), most studies find that the mortality excess following bereavement is higher among widowers than among widows (Stroebe and Stroebe, 1983). Widowers seem to be more prone to isolation from social support resources than widows and they also have a harder time adjusting to the bereaved role (Bowling, 1987).

Because there has long been empirical evidence of a social-class gradient in overall mortality it is somewhat surprising that in recent studies (Martikainen and Valkonen, 1998; Lusyne, Page and Lievens, 2001) social-class characteristics seem not to lead to differential excess mortality following bereavement. For the period shortly following bereavement we found that higher-educated individuals even had a higher relative risk than lower-educated individuals (Lusyne, Page and Lievens, 2001). The

several explanations we put forward for this all rely heavily on social support networks and their effectiveness in generating appropriate support following spousal loss. In a nutshell we argued that social support networks of higher-educated individuals tend – for both structural and cultural reasons – to be less adapted to providing appropriate support following spousal loss.

2.2. **The role of children following bereavement.**

Literature on the effect of children on excess mortality following bereavement is hard to find. The bereaved are rarely considered as a separate group: most studies distinguish only between the married and the not married or between the married and the previously married, so their focus is not on the specific situation of bereavement. Where the role of children is taken into account, it is mostly in relation to mental health. The specific combination of bereavement, mortality and the presence or number of children is very exceptional.

In general, social support could result in lower mortality through both direct and indirect health protective effects, more specifically by reducing stress and anxiety and discouraging risky and unhealthy behaviours (Tucker, et al., 1999). Especially for the widowed - who have the greatest shortfall of familial support - children mean a great potential for both social and instrumental support. Beside the importance of children as sources of long-during support (Choi 1994, cited in Zhang and Hayward, 2001), Kaunonen et al (1999) found that children are the most often mentioned source of support following the death of a spouse.

This simple picture of children providing beneficial support to their parents is, however, oversimplified and needs to be nuanced. Firstly children are not the only potential source of support in life. The childless often compensate with a more extensive network of other relatives and non-kin. They often score lower on objective measures of social support however (Zhang and Hayward, 2001; Koropeckyj-Cox, 1998; Ishii-Kuntz and Seccombe, 1989). Childless individuals also tend to have a higher marital support level than parents (Ishii-Kuntz and Seccombe, 1989). Bereavement implies for them the loss of a stronger marital support within a weaker overall support network. We can, therefore, suppose the childless widowed to be more vulnerable. Empirically, however, most studies do not find a significant difference in well-being in general between the childless individuals and parents (Zhang and Hayward, 2001).

Secondly, children do not necessarily provide beneficial support. For the widowed with adult children, the presence of children implies a potential for support but no guaranty of actual support. Moreover, adult children are not always positive resources: distant and stressful relations with offspring can be detrimental to well-being (Koropeckyj-Cox, 1998; Rogers, 1996).

Several authors suggest that excessive support received from family members can itself be stressful by eroding the autonomy and self concept of the (elder) recipient (Silverstein and Chen, 1996; Silverstein and Bengtson V. L., 1994; Davey and Eggebeen, 1998). In stressful situations though the extra support is considered as a legitimate violation of the independence (Silverstein and Chen, 1996). Silverstein and Bengtson (1994) find that support has a negative effect on positive mood for married persons, but for the widowed it is lack of support that leads to a decrease in positive mood.

In addition to being a potential source of support, children are also important as an opportunity for the parents to provide support. This reversal of the direction of the support can counter the eroding effect on autonomy and seems to have a positive effect on well-being (Chen and Silverstein, 2000; Davey and Eggebeen, 1998; Marks, 1995; Silverstein and Chen, 1996; Kaunonen, et al., 1999). However, the specific situation of bereavement should be considered. Davey and Eggebeen (Davey and Eggebeen, 1998) found that when parents gave more support to their adult children then previously shortly after a spousal loss, they reported higher levels of long-term depression.

Nevertheless, the central question is whether the deficits caused by the loss of the spouse can be compensated through social support anyway. Some consider the spouse as a unique figure to whom one is attached and for whom supportive friends or family can not compensate (Stroebe, et al., 1996; Wade and Kendler, 2000). The empirical evidence on the effect of social support on well-being and on mortality is not very conclusive (Stroebe, et al., 1996; Wade and Kendler, 2000). For the widowed in particular the evidence is also inconsistent (Koropeckyj-Cox, 1998; Zhang and Hayward, 2001).

Thirdly, the effects may vary by context. Sex is one such contextual factor that can interact with the relationship between parental status and well-being or mortality. Some expect women to be more vulnerable to the effects of childlessness on well-being as parenthood is often assumed to be more important for women and should bring a greater fulfilment (Zhang and Hayward, 2001). On the other hand, as men often seem to have smaller social support networks outside the immediate family, they can be considered as benefiting more from having children than women do (Chapman, 1989, cited in Zhang and Hayward, 2001). Therefore following spousal loss especially childless men are at greater risk of social isolation and distress. Zhang and Hayward (Zhang and Hayward, 2001) found no effect of childlessness on well-being except childless widowed men have an increased loneliness and a higher incidence of depression compared to married men with children.

Age is another contextual factor. Though children should have a beneficial effect on the well-being of their parents, we need to take the age of the respondent into account too. When we consider young bereaved persons, their children are often dependent and probably not very supportive. The responsibility for them could be a burden and for lone parents the combination of occupational and

parental roles could lead to a role overload (Kotler and Wingard, 1989). On the other hand these widowed parents could also find it helpful to recognize how much there are needed by their dependent children (Kaunonen, et al., 1999) which could lead to a reduced engagement in undesirable health practices (Umberson, 1987 cited in Rogers, 1996). Empirically, lone childless men have a larger mortality risk than married childless men (Kotler and Wingard, 1989). Kotler (Kotler and Wingard, 1989) found that for younger parents having a child in the home led to a reduced mortality for men and also for housewives, but was associated with a higher mortality risk for working women. When lone mothers are considered, they are found to have an increased risk of premature death (Martikainen, 1995) (Weitoft, et al., 2000).

The mortality is also dependent on the interaction between marital status and the number of the children. Generally authors suppose that having a larger number of children creates greater opportunities for support from offspring and therefore has a beneficial effect on well-being (Rogers, 1996) and reduces mortality, especially for older parents. However, having more young children still living at home could, as they are a larger burden, be harmful to health.

Yasuda (1997) found that women without children or who had only 1 or 2 children have a lower mortality risk than women who had 3 or more children. Irrespective of marital status, having a larger number of children is associated with a higher mortality risk among younger women, but not for the older group (Yasuda, et al., 1997). For the young group, whereas married women having more children leads to lower mortality, the reverse is found for not married working mothers (Martikainen, 1995). Tucker (1999) found a marginally reduced mortality for both men and women when they have a larger number of children. Further, the protective effect of having children seemed to increase with age for women.

We can conclude by saying that it is very hard to draw conclusions from the empirical findings in the literature for several reasons. Chief amongst these are that the findings are not consistent and that most of the studies control only for marital status and do not take interactions into account.

3. Methods

The methods used are similar to those we employed in earlier analyses of the effect of education on bereavement-related excess mortality in Belgium (Lusyne, Page and Lievens, 2001).

3.1. Data

A proper analysis of the potential buffering effect of children on bereavement-related excess mortality requires the use of longitudinal data. Our data come from the Belgian National Mortality DataBase, and are based on a linkage of the Belgian 1991 census with the death records for the five-year period following the census. The characteristics of individuals are provided by the first dataset, information on deaths by the second. Linkage of the two data sources enabled us to identify 55,706 men and 137,745 women (aged between 30 and 84 at the time of the census) who were still married at the time of the census and were widowed in the five year follow-up period. After elimination of the small number of men and women who died in the same week as their spouse (to reduce the possible confounding effect of joint accidental deaths), these individuals constitute the bereaved population for this study.

In order to compare the mortality experience of the bereaved population adequately with that of the non-bereaved population, possible selection effects have to be controlled. To this end, we *matched* each individual in the bereaved population with a married individual holding similar demographic and socio-economic characteristics at the census. We matched on sex, age, educational level (of both spouses), home ownership, workforce status and number of children using the following criteria[1]:

age	single years of age
educational level	highest diploma (twelve levels)
educational level of the spouse	highest diploma (four levels)
home ownership	owner/tenant
workforce status	self-employed, blue-collar employee, white-collar employee, unemployed, homemaker, retired, handicapped
number of children	parity of the wife

Those who were bereaved in the period of observation entered the study population at the time their spouse died (determined in weeks after the census). The time of entry for each match was set the same

[1] We can use finer matching here than in our previous analyses thanks to the preparation of a new data file with additional variables for us by Patrick Deboosere of the Vrije Universiteit Brussel (Interface Demography).

as that of the widower or widow he or she was matched to. Both populations were followed on a weekly basis from the time of entry up to March 1, 1996. Because individuals dying in the same week as their spouse were excluded from the bereaved population, this results in a potential observation period per matched pair ranging from 1 week to 260 weeks.

We were able to identify potential matches for 97.3% of the widowers and for 96.7% of the widows. If more than one potential match could be identified, we randomly selected a single match. Individuals for whom no match could be identified, were excluded. For 38,720 of the widowers and widowers who could be matched, no information on educational level and/or the number of children was available in the census. These cases were excluded from the analysis. The final dataset then consists of 86,822 men and 211,016 women, half of them bereaved, half not.

3.2. Explanatory variables

The explanatory variables in the model we estimate are: time since bereavement, sex, age at bereavement, educational level and either parental status or the number of children .

The time variable measures for each matched pair the weeks since the death of the spouse of the bereaved person. To limit the potential bias due to remarriage of some widows and widowers, we restrict our analysis to the first three years following spousal loss. The three years are divided into four successive intervals: the first half-year (0-26 weeks), the second half-year (27-52 weeks), the second year (53-104 weeks) and the third year (105-156 weeks). The first year is split in two because the mortality-increasing effect of bereavement is especially strong in the period following shortly after bereavement. Matched pairs are followed throughout an interval. If one member of a matched pair dies, the other is followed only to the end of that interval. Partly because of this and partly because some matched pairs entered the study population less than three years before the end of the follow-up period, the number of matched pairs observed declines from one interval to the next. Of the 336,558 persons in the study population for the first six months following entry, 290,010 could be followed for the second half of the first year, 248,558 for the second year, and 174,224 for the third year.

Age at bereavement is subdivided into four categories: younger than 50, 50-59, 60-69 and 70 years or older. We chose to use a lower limit for the youngest age category than in our previous analyses (50 rather than 60), despite the smaller sample size it implied, because if reflects the nature of the child-parent relationship better. Most parents under 50 will still have responsibility for young children and adolescents.

Although this categorisation is preferable from a theoretical point of view it may have empirical consequences in the form of lower levels of statistical significance. Bereavement is a rare event under age 50. The levels of significance for estimates involving this age group in particular may well be lower because of the small number of deaths involved.

We use educational level as primary indicator of social status. It is measured here as the highest diploma obtained, grouped into two categories: higher education (generally 14 years of education or more) and other (at most a diploma of secondary education). Exploratory analysis revealed that, although it does not look at first glance as if it would have much discriminating power, this categorisation contrasted most explicitly the effects of parenthood and the number of children.

The pivotal component of our analysis – the estimation of the effect of children - is examined in two ways. First we estimate the effect of parenthood independent of its quantitative aspect (childlessness versus having children). Second we assess the effect of the number of children in four categories: no children, one child, two children, three or more children.

3.3. Technique

We estimate the effects using a log-rate model. Since our main interest lies in establishing the effects of the predictors on the difference in death rates between bereaved and non-bereaved, rather than on the effect on the death rates themselves, we use a log rate ratio model.

As equation 1 (saturated model) shows, the log rate ratio *(ln(RR)*) is predicted by an overall mean *(α)* and effect parameters *(β)* for each category (main effects) and combination of categories (interaction effects) of predictors. In the four time periods we distinguish, rates are assumed to be constant (piecewise constant model).

$$\begin{aligned}\ln(RR) = \alpha &+ \beta_t^T + \beta_s^S + \beta_a^A + \beta_e^E + \beta_c^C + \beta_{ts}^{TS} + \beta_{ta}^{TA} + \beta_{te}^{TE} + \beta_{tc}^{TC} + \beta_{sa}^{SA} + \beta_{se}^{SE} + \beta_{sc}^{SC} + \beta_{ae}^{AE} \\ &+ \beta_{ac}^{AC} + \beta_{ec}^{EC} + \beta_{tsa}^{TSA} + \beta_{tse}^{TSE} + \beta_{tsc}^{TSC} + \beta_{tae}^{TAE} + \beta_{tac}^{TAC} + \beta_{tec}^{TEC} + \beta_{sae}^{SAE} + \beta_{sac}^{SAC} + \beta_{sec}^{SEC} \\ &+ \beta_{aec}^{AEC} + \beta_{tsae}^{TSAE} + \beta_{tsac}^{TSAC} + \beta_{tsec}^{TSEC} + \beta_{taec}^{TAEC} + \beta_{saec}^{SAEC} + \beta_{tsaec}^{TSAEC}\end{aligned} \qquad (1)$$

T: time; S: sex; A: age; E: education; C: children

The β-parameters can be interpreted as the difference in the log rate ratio between a specific category of a predictor and the overall mean (when effect coding is used) or between a specific category of a

predictor and the reference category of the same predictor (when dummy coding is used). The exponentiated β-parameters then represent how many times smaller or larger the rate ratio is for a specific category of a predictor with respect to the overall mean (effect coding) or with respect to the reference category of the same predictor (dummy coding). In other words, exponentiated β-parameters show how many times smaller or larger the effect of bereavement on mortality is for (combinations of) categories of predictors with respect to the mean effect or with respect to a reference category.

The input for the analysis consists of rates for each possible combination of the explanatory variables. *Lem* (Vermunt, 1993) was used to estimate the parameters.

Analysis

4.1. Model selection

In order to build a parsimonious model, we use Browne's screening method. This method tests whether the omission of an effect leads to a statistically significant increase in L^2 (decrease in model-fit). The test is performed separately in the full multivariate frequency table (partial tests) and in the marginal tables (marginal tests). The results of the tests are shown in table 1a for the analysis with parenthood and in table 1b for the analysis with the number of children.

Table 1a. Partial and marginal tests for the analysis with parenthood.

	Partial test			Marginal test		
Effects	ΔL^2	Δdf	prob.	ΔL^2	Δdf	prob.
Time * Sex * Age	7,07	9	0,63	6,14	9	0,72
Time * Sex * Education	0,53	3	0,91	0,60	3	0,89
Time * Sex * Children	0,28	3	0,96	0,07	3	0,99
Time * Age * Education	5,83	9	0,75	5,08	9	0,82
Time * Age * Children	6,27	9	0,71	6,32	12	0,89
Time * Education * Children	0,90	3	0,82	0,62	3	0,89
Sex * Age * Education	1,64	3	0,65	2,54	3	0,46
Sex * Age * Children	2,47	3	0,48	2,36	3	0,50
Age * Education * Children	2,16	3	0,54	1,08	3	0,78
Time * Sex	2,00	3	0,57	3,29	3	0,35
Time * Age	15,61	9	0,07	23,29	9	0,00
Time * Education	0,33	3	0,95	0,66	3	0,88
Time * Children	3,21	3	0,36	3,44	3	0,32
Sex * Age	5,92	3	0,11	12,98	3	0,00

Sex * Education	0,19	1	0,66	0,14	1	0,71
Sex * Children	2,08	1	0,15	2,30	1	0,13
Age * Education	5,24	3	0,15	4,87	3	0,18
Age * Children	0,90	3	0,82	1,22	3	0,75
Education * Children	2,63	1	0,10	4,54	1	0,03
Time	25,26	3	0,00	30,35	3	0,00
Sex	24,96	1	0,00	23,52	1	0,00
Age	75,28	3	0,00	76,77	3	0,00
Education	0,22	1	0,64	2,09	1	0,14
Children	0,02	1	0,90	0,02	1	0,89

Both the partial and the marginal tests show, as expected on the basis of previous analyses, that the effect of bereavement on mortality differs according to the categories of time, sex and age. These main effects are, therefore, included in the model. None of the second or higher order interaction effects with these variables has a significant contribution to the model fit. Each of these effects can be omitted without L^2 increasing in a statistically significant way.

The results for the effect of education and parenthood, however, are not conclusive. The marginal tests indicate that although inclusion of the main effects of both variables would not contribute to the fit of the model, the second-order interaction between these factors should be included in order to obtain a reasonable fit with the data. The partial test, however, does not indicate that the interaction should be included. We therefore performed a conditional test to evaluate whether the inclusion of the effect of education and children leads to a statistically significant better global model-fit.

The result of the test (not shown) is beyond all doubt: the difference in L^2 between the model with and the model without the interaction effect of education and parenthood (in addition to the effects of time, sex and age) is not statistically significant ($p > 0,3$): the inclusion of this effect does not lead to a significantly better model. This leads to the conclusion that the effect of bereavement on mortality differs neither by education nor by parenthood and also not in general by interaction between those two variables.

Closer scrutiny of the incidence/exposure mortality rates for the widowed and married in a number of subgroups reveals, however, that the exclusion of this interaction effect might obscure interesting insights. We have, therefore, retained the interaction between education and parenthood in our model. Trial runs of the analysis revealed that this influences the estimations for the other variables only marginally. Nevertheless, even more than the usual caution is necessary in the interpretation of these ‘over-fitted’ effects.

Table 1b shows the results of the partial and marginal tests for the analysis with the number of children instead of the 'parenthood'-indicator. The results for this model lead to very much the same conclusions as the previous model. Again the best fitting model includes only the main-effects of sex, age and time since bereavement making education and the number of children redundant in the estimation of the relative risks. In contrast to the previous model, for this model neither partial nor marginal tests indicated a statistically significant interaction between the educational differential and the number of children. For reasons of comparability, however, we have estimated the effect of the interaction between education and the number of children in this model too.

Table 1b. Partial and marginal tests for the analysis with the number of children.

	Partial test			Marginal test		
Effects	ΔL^2	Δdf	prob.	ΔL^2	Δdf	prob.
Time * Sex * Age	12,03	9	0,21	6,14	9	0,72
Time * Sex * Education	0,67	3	0,88	0,60	3	0,89
Time * Sex * Children	9,66	12	0,64	8,43	12	0,75
Time * Age * Education	4,39	9	0,88	5,12	9	0,82
Time * Age * Children	50,73	36	0,05	45,15	36	0,14
Time * Education * Children	9,50	12	0,65	7,49	12	0,82
Sex * Age * Education	2,38	3	0,49	2,55	3	0,467
Sex * Age * Children	29,18	12	0,00	19,31	12	0,08
Age * Education * Children	11,42	12	0,49	6,44	12	0,89
Time * Sex	1,96	3	0,58	3,29	3	0,34
Time * Age	16,35	9	0,06	70,57	9	0,00
Time * Education	0,41	3	0,93	0,67	3	0,88
Time * Children	8,94	12	0,70	8,57	12	0,73
Sex * Age	5,80	3	0,12	13,00	3	0,00
Sex * Education	0,24	1	0,62	0,13	1	0,71
Sex * Children	2,31	4	0,67	2,78	4	0,59
Age * Education	5,47	3	0,14	4,86	3	0,18
Age * Children	11,85	12	0,45	10,95	12	0,53
Education * Children	5,29	4	0,26	6,79	4	0,14
Time	25,15	3	0,00	30,36	3	0,00
Sex	24,78	1	0,00	23,52	1	0,00
Age	75,57	3	0,00	76,83	3	0,00
Education	0,21	1	0,64	2,08	1	0,14
Children	2,22	4	0,69	2,35	4	0,67

4.2. Results

Table 2a summarises the results of our analysis using the variable parenthood. In the first column, the estimates for the β-parameters are shown. These are recalculated in the second column as exponentiated β's. The latter show how many times smaller or larger the effect of bereavement on mortality is for each of the categories of the predictors compared to the mean effect (intercept). The third column gives the product of the exponentiated β's and the exponentiated intercept. This is nothing other than the implied ratio of the mortality rate for the bereaved and that for the non-bereaved matched controls. In reading the relative risks it has to be kept in mind that they are partial relative risks, that is estimated relative risks keeping the other explanatory variables constant.

Table 2a. Estimated relative risks for the model with parenthood

	β	**exp (β)**	**Estimated ratio of mortality rates (bereaved/matched controls)**
Intercept	0,54	1,73	1,73
Wald: p < 0.000			
Time since bereavement			
1-26 weeks	0,14**	1,15	2,00
27-52 weeks	-0,06*	0,94	1,63
Second year	-0,06*	0,95	1,64
Third year	-0,02	0,98	1,70
Wald: p < 0.000			
Sex			
Males	0,09**	1,09	1,89
Females	-0,09	0,92	1,59
Wald: p < 0.000			
Age at bereavement			
< 50 years	0,45**	1,56	2,71
50 – 59 years	0,10	1,11	1,92
60 – 69 years	- 0,14*	0,87	1,51
≥ 70 years	- 0,41	0,66	1,15
Wald: p < 0.000			

Education			
None, primary or secondary education	-0,08	0,92	1,59
Higher education	0,08	1,09	1,89
Wald: p < 0.123			
Children			
No children	0,09	1,10	1,90
Children	-0,09	0,91	1,58
Wald: p < 0.089			
Education * Children			
low education - no children	-0,10	0,90	1,58
low education - children	0,10	1,11	1,61
high education - no children	0,10	1,11	2,31
high education - children	-0,10	0,90	1,55
Wald: p < 0.066			

L^2 = 111.5238 (p = 0.63)

**p < 0.05; ** p < 0.01*

The intercept indicates the mean excess mortality among the bereaved. Computationally it equals the geometric mean of the relative mortality risks in each subpopulation created by taking each possible one-by-one combination of the variables in the model.

Indirectly this computational issue explains why the mean excess mortality is estimated here at a very high level - 73 per cent - compared to our own previous research for Belgium and results for other countries. The contribution to the overall mean made by the subgroups based on the particularly young youngest age-category in our model inflates this mean: excess mortality in these young subpopulations is very high. Trial runs with a categorisation of the age-variable comparable to that used in other analyses (youngest age-category defined as <60 or <65) resulted in an overall mean excess mortality between 30 and 35%, which is similar to other research.

The particularly marked excess mortality among the young bereaved is confirmed in the results for the age-differential. Keeping the other variables constant, the excess mortality among the widows and widowers under age fifty is estimated at as much as 171% (2,71). In the age group 50-59 years the excess still stands at 92% but it drops to 51% for the 60-69 years old and almost disappears for those seventy years and older.

The differentials by time elapsed since the bereavement correspond to those found in other analyses: excess mortality is especially pronounced in the period shortly after spousal loss. In the first six months following spousal loss excess mortality is approximately 1.2 times higher than in the following periods (1,9 versus 1,56 and 1,62). After the first six months little difference occurs but the excess persists.

Also as found elsewhere, excess mortality is higher (1.18 times) for widowers than for widows. Overall excess mortality is estimated at 80% for widowers and at 52% for widows.

Our expectations about the effect of the educational differential are, however, only partly confirmed. The absence of an overall effect found in our earlier analyses for Belgium is confirmed but the greater excess mortality among the higher-educated bereaved in the period immediately following bereavement is not found here[2]. The results do, however, suggest greater excess mortality among the higher-educated bereaved. Excess mortality is 1.18 times higher for the highest-educated bereaved persons compared to the others (1.09 versus 0.92).

The results for the interaction term indicate that if there is higher excess mortality among the higher-educated bereaved, this higher excess is situated mainly among those who are childless. There is approximately one and a half time times more excess mortality among higher-educated childless widows and widowers than among higher-educated widowed parents. Excess mortality for the latter seem not to differ from excess mortality among both lower-educated bereaved parents and lower-educated bereaved childless persons. Expressed another way, childlessness does not result in higher excess mortality following widowhood except among the higher-educated.

Table 2b shows the results of the analysis with the number of children. The results of the effects of sex, age, time since bereavement and education in this model correspond very closely with the results in table 2a.

Although some caution is appropriate here (the level of statistical significance is lower), the effect of the interaction term in this model seems to confirm the results in table 2a. Again excess mortality is highest for the higher-educated childless bereaved (129%). Excess mortality among higher educated widowers and widows with children seems once more not to differ of the excess mortality among the lower educated widowed irrespective of the number of children of the latter.

[2] This may result from the use of just two educational categories here

Table 2b. Estimated relative risks for the model with the number of children.

	β	exp (β)	Estimated ratio of mortality rates (bereaved/matched controls)
Intercept	0,52	1,68	1,68
Wald: p < 0.000			
Time since bereavement			
1-26 weeks	0,14**	1,15	1,93
27-52 weeks	-0,06*	0,94	1,58
Second year	-0,06*	0,95	1,59
Third year	-0,02	0,98	1,64
Wald: p < 0.000			
Sex			
Males	0,08**	1,09	1,83
Females	-0,08	0,92	1,54
Wald: p < 0.000			
Age at bereavement			
< 50 years	0,47**	1,60	2,68
50 – 59 years	0,10	1,10	1,85
60 – 69 years	-0,15*	0,86	1,45
≥ 70 years	-0,42	0,66	1,11
Wald: p < 0.000			
Education			
None, primary or secondary education	-0,04	0,97	1,62
Higher education	0,04	1,04	1,74
Wald: p < 0.405			
Children			
No children	0,14	1,15	1,93
1 Child	-0,06	0,94	1,58
2 Children	-0,03	0,97	1,63
3+ Children	-0,05	0,95	1,60
Wald: p < 0.398			

Education * Children			
low education – no children	-0,15	0,86	1,61
low education - 1 child	0,10	1,10	1,68
low education - 2 children	0,05	1,05	1,65
low education - 3 children	0,01	1,01	1,56
high education – no children	0,15	1,17	2,34
high education - 1 child	-0,10	0,91	1,49
high education - 2 children	-0,05	0,96	1,62
high education - 3 children	- 0,01	0,99	1,64
Wald: p < 0.250			

L^2 = 255,21 (p = 0.25)

**p < 0.05; ** p < 0.01*

This conclusion is in fact the most pivotal result in both the model selection and the analysis. For the majority of the bereaved, having children seems not to make difference for their survival rates.

5. Conclusion and discussion.

Overall the effect of children appears to be limited. A number of possible explanations can be advanced.

Firstly, it may well be that it is not so much the quantity of potential support from children that matters as the nature and the quality of the relationship between parent and child. Expressed in terms of time, energy and concern, the support relationship between a young widow or widower and his/her dependent children may be very unbalanced against the adult, despite being very rewarding emotionally. At older ages there may be tensions between parent and child, exacerbated by unbalanced exchanges in favour of the parent. Tensions can also be exacerbated by conflicting perceptions and interests related to the decreasing physical autonomy of the parent in general and by the difficult decisions that may have to be taken over living arrangements, particularly following the loss of the partner.

A second line of argument is not based on discordance but on the role of alternative support networks and of substitution. The more extensive investments in contacts with other kin, friends and neighbours typically made by the childless may pay off following spousal loss. Other persons may substitute for children and provide social and instrumental support to the childless as children do to parents.

Thirdly, and more fundamentally, there is the question of whether the deficits caused by loss can be compensated through social support as is predicted by the stress buffering theory. Attachment theory views the partner as unique which implies and that neither friends nor family can compensate emotionally for his/her loss. If this holds, then any social network can at most only partially buffer the harmful effects of bereavement.

Although our data show that the role of children in buffering the effect of bereavement on mortality is limited, they do not provide a means to measure the relative importance of each of these possible mechanisms.

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