Socio-Economic Costs of Bereavement in Scotland

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SOCIO-ECONOMIC COSTS OF BEREAVEMENT IN SCOTLAND

TECHNICAL REPORT

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Acknowledgement is also given to staff at ISD Scotland who provided data related to bereavement from Practice Team Information (PTI).

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1. The SECOB Project: aims and outputs

The Socio-Economic Costs of Bereavement in Scotland (SECOB) research project was undertaken for the Scottish Government Health Directorates from 2010-2012 as part of on-going work to inform national policy on bereavement and bereavement care practice. The project had three main aims:

a) To articulate the likely nature and scope of bereavement's impact on social and economic aspects of life for Scottish citizens as evidenced in relevant literature;

b) To seek to estimate the socio-economic costs of bereavement in an emergent sub-set of key aspects, and

c) To develop methodological approaches that will enhance capacity for large-scale research into the socio-economic impact of bereavement.

There are three main related documentary outputs from the research. Firstly, the main study report has been produced to give overview of the project as a whole, and to focus particularly on the main findings relating to aim b). The sub-set of key aspects that emerged as both important and feasible to research included health, employment, and income. Accordingly, the main study report is designed to be of value to a wide readership and to be read first.

Secondly, in relation to aim a), a separate literature scoping document has been produced. This pulls together a range of literature relevant to this wide field, and is designed to give an overview and selected insights, rather than providing a formal systematic review.

Finally, the current document has been produced in relation to aim c). As such, it is designed as a technical report that presents details of the datasets used, methods of analysis, results achieved, and strengths and limitations of the methods. The report is structured sequentially so that all these details are presented for each of the discrete data sets in turn. This should be of particular value to academics with interest in reviewing and further developing methodology in this field. To this end, the technical report presents more comprehensive details than are given in the main report. Specifically, there are more detailed sub-group analyses of the main data sets, and there is inclusion of a supplementary data set on sickness absence in one NHS Health Board in Scotland. As the technical report provides limited explanation of the context for the research, and as discussion of its outcomes herein tends more to methodological implications, it is recommended that the main study report is accessed first for broader understandings of the socio-economic costs of bereavement.

All three inter-related documentary outputs from the SECOB study are available on the website of The Scottish Grief and Bereavement Hub by following this link: http://www.griefhub.org.uk/

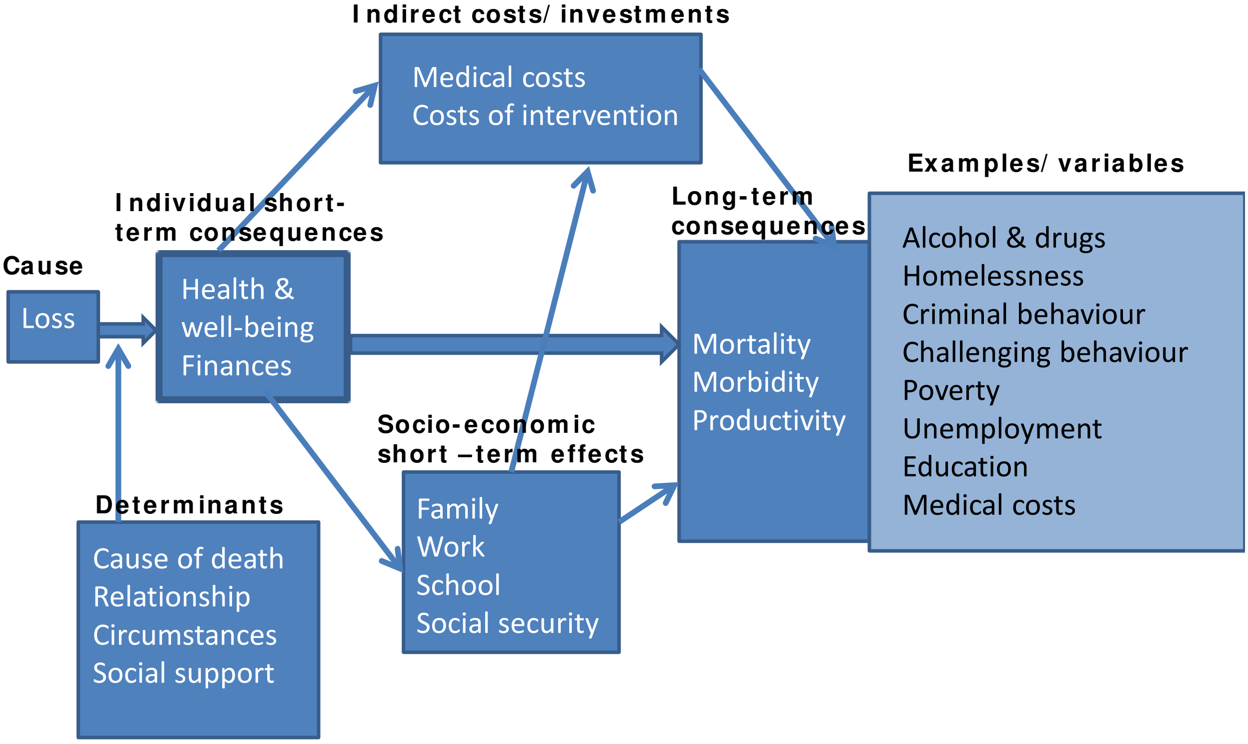
2. Selecting the datasets: context and process

Scoping of the literature highlighted many areas of life that are affected by bereavement. It is, however, often difficult to establish the nature and extent of impact in these areas because: (i) bereavement is experienced differently by individuals and communities; (ii) attributing impact specifically to bereavement tends to be difficult, given a number of other likely concurrent influences, and (iii) availability of, and access to, relevant, reliable data is often problematic. Many empirical studies involve small sample sizes, limiting capacity to generalise findings at a population level. Notable exceptions to this include national scale studies undertaken by Li and colleagues in Denmark (e.g. Li et al 2009) which have investigated impacts of bereavement on various health parameters and conditions. Moreover, in Scotland the work of Boyle, Feng and Raab (2011) has shown how a national data set can be used to study how widowhood increases mortality.

Within this broad context, there is the additional methodological challenge of identifying those areas where impact can be feasibly and reliably gauged in financial terms (i.e. estimating a cost in £). Our scoping of the literature yielded few examples where techniques from health economics had been brought to bear on relevant large datasets. We could find no examples of national studies which had developed sets of methodologies to estimate costs relating to the socio-economic impacts of bereavement.

In order to address some of these challenges in the Scottish context, an analytic model was created to identify potential areas where further exploration and analysis could be valuable (Figure 1 below). This served as a heuristic device to help distinguish possible determinants, and short and long term consequences of bereavement. Given the scope of the challenge of identifying and, where possible, measuring the socio-economic impacts in Scotland, this initial model also suggested the wisdom of focusing on a few key aspects in depth for this initial study. Accordingly we decided to take forward new research in selected areas where our team had expertise and where economic costs were likely to be significant and estimating these was feasible given the available data.

Figure 1. Analytic model for the SECOB project



Extensive work was undertaken to identify where relevant high quality datasets might exist. In addition to searching published literature and web based portals, we drew on professional knowledge and networks. In the end we prioritised the following aspects for more in-depth study: health, income, and employment. This was linked to the availability of three national datasets, two of which were particular to Scotland. These were:

1) The Scottish Longitudinal Study (SLS) (Longitudinal Studies Centre - Scotland 2012)[1];
2) Practice Team Information (PTI) from ISD Scotland (ISD Scotland 2012)[2];
3) The British Household Panel Survey (BHPS) (Institute for Social and Economic Research 2012)[3].

[1] Longitudinal Studies Centre – Scotland http://www.lscs.ac.uk/
[2] Practice Team Information, ISD Scotland http://www.isdscotland.org/Health-Topics/General-Practice/GP-Consultations/
[3] British Household Panel Survey https://www.iser.essex.ac.uk/bhps

Analyses of these datasets forms the main part of the SECOB study. However, during the project we were also able to access anonymised employee absence data from one of the fourteen NHS Health Boards in Scotland. This regional data is included in this technical report as a supplementary resource because we believe that bereavement related absences are likely to be a major cost driver. The analysis, detailed in section 6 of this report, indicated some of the challenges and potential insights that would be relevant for a larger national study of sickness absence due to bereavement.

All datasets used in this study contained data that were already in anonymised formats, so that we were at no time privy to personal data from identifiable individuals. Moreover we complied carefully with the conditions attached to use of particular datasets, as reflected in our acknowledgements.

In the following four sections of the report we present each data set in turn, along with methods of analysis, results achieved, and conclusions including related strengths and limitations.

3. Scottish Longitudinal Study

3.1 Context

This section of the report details the use of the Scottish Longitudinal Study (SLS) to examine two specific aspects of health affected by bereavement. Through our initial search work it became apparent that the SLS could provide sufficiently robust and comprehensive longitudinal data to enable estimations of cost in relation to the specific impact of spousal bereavement on medical utilisation and mortality. Before presenting this material in depth it is useful to provide some context and rationale.

Medical utilisation and mortality are some of the more measurable components of the societal costs of bereavement. In countries with compulsory national health services, governments finance the majority of medical expenses and thus, the medical costs related to bereavement are often borne by society. This makes it important to consider the extent of this extra bereavement related expenditure when deciding on the level of bereavement related services and interventions to make available.

Oswald and Powdthavee (2008) used the British Household Panel Survey (BHPS) to estimate the impact of losing a mother, father, spousal partner, sibling, child, and friend on mental distress (GHQ) and found that the largest emotional impact comes when it is the spouse who has died. However, this is not corroborated in a range of other studies where it has been identified that loss of a child, particularly an adult child, may have similar or worse impacts (Bonanno et al., 2005; Cleiren, 1993; Nolen-Hoeksema and Davis, 1999). Nevertheless, specific impacts for the spousally bereaved are widely described in the literature. Widowers are likely to have insufficient caloric intakes due to difficulties in cooking (Koehn, 2001), and widows often suffer from greater poverty and associated higher morbidity and mortality (Benzeval and Judge, 2001; McGarry and Schoeni, 2005). Spousal bereavement is also associated with the higher risk of psychosocial stress, depression, and anxiety and, further, increases mortality risk (Wittstein et al., 2005; Hart et al., 2007; Stroebe, Schut and Stroebe, 2007; Espinosa and Evans, 2008; van den Berg, Lindeboom and Portrait, 2011).

The higher risk of mortality for those who have suffered a spousal bereavement compared to those who have not, however, does not provide conclusive evidence on the impact of spousal bereavement on mortality. In particular it is plausible that the underlying health and the risk of mortality is correlated between a couple, such that, bereavement is more likely to occur for those couples with poor health. This correlation between the mortality risk of a couple may be due to marriage selection (Waldron, Hughes and Brooks, 1996; Cheung, 1998; Murray, 2000), where a couple's health is interlinked because they are likely to possess some common characteristics whether observed or unobserved. For example, income, education and occupation and common environmental risk factors and life-style behaviours such as diet, smoking, and exercise (Michaud and van Soest, 2008). Thus, the health and mortality of the surviving spouse may be determined not only by the impact of the bereavement but also by these common factors. However, marriage selection also applies to remarriage after bereavement where the healthy stand a better chance of opting out of the widowhood condition through remarriage, leaving the less healthy in (Stroebe, Schut and Stroebe 2007). A further confounding factor is that one cause could kill both with an interval. For example, a car crash killing one immediately and the other partner dying two weeks later in hospital, in which case the latter would be a widow or widower who has died (Stroebe, Schut and Stroebe 2007). Therefore, the bereavement effect needs to be disentangled from a range of complex factors.

Many studies have examined the spousal bereavement effect on mortality (Wilson, 2002; Espinosa and Evans, 2008; van den Berg, Lindeboom and Portrait, 2011, Boyle, Feng and Raab, 2011; Simeonova, 2013). Espinosa and Evans (2008) and van den Berg, Lindeboom and Portrait (2011) tested the bereavement effect and demonstrated that bereavement causes increases in mortality of the surviving spouse and that the bereavement effect is strong and instantaneous. Simeonova (2013) investigated what potentially causes the association between spousal bereavement and mortality and found that reductions in health care utilisation due to bereavement have a negative effect of survival, but these only account for a small part of the overall negative effect of widowhood on longevity. Boyle, Feng and Raab (2011) used the Scottish

Longitudinal Study (SLS) to show that the widowhood effect is large, especially for older women and that the increased risk is highest shortly after widowhood but remains significant for over ten years. While the impact of spousal bereavement on the mortality of the surviving spouse has attracted much attention, few studies have examined changes in medical utilisation of the surviving individuals caused by the bereavement. Thompson et al. (1984) and Prigerson et al. (2001) showed that spousal bereavement causes an increase in the odds of illness but that GP visits decrease rather than increase. They conclude that bereaved individuals who are most in need of health services might not access such help. However, Goda, Shoven and Slavov (2012) found that medical out-of-pocket spending is approximately 29% higher when an individual becomes widowed. Guldin et al. (2012) investigated the bereavement impact caused by cancer on bereaved relative's healthcare utilisation and use of medicine. They find that the rise in healthcare utilisation was observable both before the loss and during the first year after the loss.

The primary purpose of using the SLS was to estimate the impact of spousal bereavement on hospital utilisation in terms of inpatient days and mortality. The analysis strategies comprised a survival model for mortality and then a difference-in-differences (DiD) model for inpatient days conditional on survival. In the survival analysis, the average annual inpatient days and a long-term illness indicator prior to bereavement were used as proxies to control for the unobserved common factors which influence the health status of both the bereaved individual and their deceased spouse. Within the DiD analysis these unobserved common factors were controlled for by using the level of hospitalisation pre bereavement. In addition, we used propensity score matching methods in all models in order to create a non-bereaved group which was comparable with the bereaved group. This method places a greater weight on the longitudinal experience of those within the non-bereaved group who more closely matched the initial characteristics of the bereaved cohort.

This section is organized as follows: Section 3.2 introduces the data sets; Section 3.3 outlines the identification strategies and survival analysis; Section

3.4 summarises the results, and finally, Section 3.5 presents conclusions, including strengths and limitations of the methodology.

3.2. Data

3.2.1 The SLS data set

The Scottish Longitudinal Study (SLS) sample is drawn from the Scottish Census which is conducted every 10 years and collects data on all residents in Scotland (Boyle et al., 2009). The first wave of SLS data was collected in 1991 and drew a representative sample of 5.3% of the Scottish population based on 20 semi-random birthdays. Participating individuals are referred to as 'SLS members' and their household members as 'non-SLS members.' The second wave (2001 Census) of data comprises SLS members in 1991 if they were still alive and lived in Scotland in 2001, new SLS members who were born after 1991 or moved into Scotland after 1991, and household members of SLS members in 2001. Only SLS members are followed over time such that their data from 1991 and 2001 can be linked.

The SLS data set provides extensive information on demography, socio-economic status, household composition, housing status, ethnicity, and long-term illness. The same information is, in general, available for both SLS and non-SLS members other than data on vital events and medical utilisation, explained below, which are only available for SLS members.

3.2.2 Vital events and health utilisation dataset

SLS members can be linked to other rich administrative datasets such as vital events data (births, stillbirths, infant deaths, deaths and spousal deaths) held by the General Register Office Scotland (GROS)[4], National Health Service Central Register (NHSCR)[5] data (migration in or out of Scotland) and NHS data (cancer registrations and hospital inpatient admissions) held by the Administrative Data Liaison Service[6]. In this study, SLS members were linked to their death records, spousal deaths records, and the Scottish Morbidity Record 1 (SMR01) which includes information on inpatient admissions. The records of vital events started

[4] General Register Office Scotland http://www.gro-scotland.gov.uk/
[5] National Health Service Central Register http://www.gro-scotland.gov.uk/national-health-service-central-register/index.html
[6] Administrative Data Liaison Service http://www.adls.ac.uk/nhs-scotland/

in 1991 and ended in 2009 and contain information on month and year of death, month and year of spousal death, and age of the deceased. Note that the spousal death records are only available when the SLS member is named as the spouse on a deceased person's death certificate. If a SLS member dies before their spouse then it is rare that they are named on their spouse's death certificate.

The SMR01 (general acute inpatient days and day cases) covers the period 1981 to 2009. SMR01 records the dates of admissions and discharges from which inpatient days and the number of treatment episodes in a year were calculated for each SLS member. When the dates of admission and discharge were the same day, this was treated as one inpatient day for the subsequent analysis.

3.2.3 Analytic sample dataset

To identify the impact of spousal bereavement, only the SLS members who were in their first marriage in 1991 were selected into our analytic sample. This selection criterion excluded the influence from previous marriages no matter whether they were ended by divorce or the death of the spouse and excluded those who migrated to Scotland in 1991 as their marital status at this point was unknown[7]. The sample size in this first selection was 113,878. Next, this sample was partitioned into the bereaved group for members who suffered spousal bereavement in the period of analysis (1991-2009), and the non-bereaved group, otherwise.

The 113,878 SLS members were used to create an annual panel data set starting from 1991 up to the end of 2009. However, information from the census was only available for the years 1991 and 2001. To avoid any potential issues in terms of bereavement impacting on other control variables in our analyses, only the baseline information from the 1991 census was controlled for in our subsequent analysis. The only exception was for age where the age variable increased by 1 each year.

3.3 Empirical methodology

A major goal was to investigate the change in mortality risk due to bereavement. The Cox-proportional Hazard model was employed to investigate

[7] Non-SLS members are not included because the data form is cross-sectional

the difference in post-bereavement mortality between the two groups. However, for the non-bereaved group, the bereavement date did not exist and, thus, a hypothetical bereavement date needed to be generated for each non-bereaved SLS member. For this purpose the Nearest-Neighbour Propensity Score Matching (NNPSM) approach was employed. In the estimation, the baseline year was the year when spousal bereavement or hypothetical bereavement occurred. A variable was generated for each SLS member from vital events to indicate the number of years after (hypothetical) bereavement to death or to the end of the sample period (2009).

Another goal was to identify the impact of spousal bereavement on hospital inpatient days. The Difference-in-Differences (DiD) technique which compares the bereaved group with a comparable non-bereaved group before and after spousal bereavement was used. In this process, not only were the unobserved time-variant factors which were common to both groups eliminated, but the unobserved factors which were constant in each group were also eliminated. All analyses were performed using STATA 12.0.

3.3.1 Propensity score matching to obtain a hypothetical bereavement date

Bereavement research indicates that bereavement is influenced by a range of factors including for example, age, gender, health, income and social class (Howarth, 2007; Oliviere, Monroe & Payne, 2011). For the SLS data analysis, propensity score matching was used as a way to correct the estimation of the bereavement effects and control for the existence of confounding factors. This was based on the idea that the bias between the bereaved and those who were not bereaved (controls) was reduced when the comparison of outcomes was performed using bereaved and controls who were as similar as possible (Becker & Ichino, 2002).

Propensity score matching employs a predicted probability of group membership (e.g. bereaved and controls). The probability of group membership is based on observed predictors measured before the time of bereavement, for example, age, gender, health, financial situation, employment (Guo & Fraser, 2009). Therefore, the method of propensity score matching proposes to summarise pre-bereavement characteristics of each participant into a single-index variable (i.e. the propensity score of becoming bereaved) which makes matching feasible when having a large number of characteristics (Becker & Ichino, 2002).

In order to apply propensity score matching, the characteristics of the bereaved and the comparison group must have substantially overlapped before the bereavement occurred. Matching takes place on variables that are precisely measured and stable to avoid extreme baseline scores that will regress toward the mean. In addition, a composite variable which minimises group differences across many scores should be employed (Guo & Fraser 2009).

To assign the non-bereaved SLS members a hypothetical bereavement date, the NNPSM which is a one-to-one matching was implemented (Caliendo and Kopeinig, 2008). Here each non-bereaved SLS member was matched to their nearest bereaved SLS member and assumed their bereavement date as his/her hypothetical bereavement date.[8] The NNPSM

was based on the Logistic regression in Equation 1:

$$(1) \quad SB\_INV_i = \alpha_0 + X_i'\alpha + e_i$$

where SB_INV_i is an inverse bereavement indicator of SLS member i which is 1 if the member was in the non-bereaved group and 0, otherwise. X_i is a covariate vector comprising of the member's baseline characteristics in 1991 and includes sex, age, race, education, social class, long-term illness and spouse's age in 1991. α is a set of coefficients and e_i is a stochastic error term. The predicted probability that each SLS member would have not become bereaved during the sample period was their propensity score which was then employed to match a non-bereaved member to their closest bereaved member (i.e. their characteristics in 1991 suggested that they had similar chances of bereavement to the bereaved member). Some members including the bereaved and the non-bereaved were not matched (1,511 bereaved members and 9,347 non-bereaved

[8] In Stata, the nearest neighbour matching generates a matched identification variable for the treated units. The matching process goes from the untreated units to the treated units. Thus, the treated units can find the matched untreated unit and assign the bereavement date from the untreated units to the treated units. On the contrary, if we regard the bereaved as the treated units and the non-bereaved as the untreated units, it is unable to assign the bereavement date from untreated units to the treated units because spousal bereavement does not occur for the non-bereaved.

members were unmatched due to the missing values in their covariates in Equation 1). These unmatched members were excluded from our analytic sample. In addition, the matched non-bereaved members whose hypothetical bereavement year fell later than their year of death were also dropped from the analyses (8,310 members dropped).[9] Finally, the total number of members selected was 94,710 including 15,007 bereaved members and 79,703 non-bereaved members.

While the non-bereaved cohort presented a possible comparison group for the bereaved, there may be reasons, other than the impact of the bereavement itself, why their longitudinal experience in terms of mortality and healthcare utilisation may differ from the bereaved group. In order to create a more comparable non-bereaved group the non-bereaved were weighted in terms their similarity to the bereaved cohort given their baseline characteristics. To do this Kernel-based Propensity Score Matching (KPSM) using the Kernel matching method was used to generate a *closeness* weight for each non-bereaved member in our sample (Caliendo and Kopeinig, 2008). While the bereaved were all given a weight of 1 in the subsequent analysis, those non-bereaved who more closely matched the bereaved cohort in terms of their characteristics in 1991 were given a higher weight compared to those who were dissimilar to the bereaved cohort. KPSM is a one-to-many matching process in which the weight for each non-bereaved member is calculated by a Kernel function based on the predicted probability that they would have become bereaved given their initial characteristics obtained from the probit estimation given in Equation 2: [10]

$$(2) \quad SB_i = \theta_0 + X_i'\theta + \epsilon_i$$

where SB_i is a bereavement indicator of member *i* which is 1 if the member is in the bereaved group and 0, otherwise. The other definitions are the same as Equation 1 where now θ is a set of coefficients. The

[9] It should be noted that after an SLS member dies we did not have information on their spouse's subsequent death. These individuals were dropped because there was no post hypothetical bereavement information and including them would have biased the result because they were less likely to be included in the bereaved cohort because their time at risk of bereavement was shorter than those who survived for longer.

[10] The weight (w_{ij}) is equal to $K\left[\frac{P_i-P_j}{h}\right] / \sum_{j\in\{SB=0\}} K[\frac{P_i-P_j}{h}]$, where *K* is a kernel function, *h* is the bandwidth (the bandwidth used is 0.06) and *P* is propensity score. *i* is the bereaved individual and *j* is the non-bereaved individual.

results of Equation 1 and Equation 2 are shown in Table 1 and Table 2 (both below) respectively.

Table 1. Nearest-Neighbour Propensity Score Matching (Logistic Regression)

Bereavement indicator (1: non-bereaved; 0: bereaved)	Coef.	St. Err.
Male	0.621***	0.025
Age	0.02***	0.002
Ethnicity (ref. White)		
Indian	1.005***	0.269
Chinese	1.026**	0.429
Others	1.264***	0.403
Education (ref. No high degree or qualification)		
First degree	0.375***	0.058
Other high qualification	0.232***	0.042
Social class based on occupations (ref. Managerial and technical occupations)		
Professional Occupation	0.072	0.008
Skilled Non-manual occupation	0.058	0.037
Skilled Manual occupation	-0.214***	0.039
Partly skilled occupation	-0.129***	0.04
Unskilled occupation	-0.301***	0.044
Armed forces	0.535	0.345
Others	0.135***	0.035
Long-term illness	0.157***	0.026
Spouse's age	-0.107	0.002
Constant	6.099***	0.056
Pseudo R^2	0.212	
Sample size	103,020	

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table 2. Kernel Propensity Score Matching (Probit Regression)

Bereavement indicator (1: bereaved; 0: non-bereaved)	Coef.	St. Err.
Male	-0.255***	0.015
Age	-0.004**	0.001
Ethnicity (ref. White)		
Indian	-0.517***	0.127
Chinese	0.519**	0.205
Others	-0.559***	0.184
Education (ref. No high degree or qualification)		
Education - First degree	-0.179***	0.031
Education - Other high qualification	-0.122***	0.023
Social class based on occupations (ref. Managerial and technical occupations)		
Professional Occupation	-0.053	0.042
Skilled Non-manual occupation	-0.002	0.021
Skilled Manual occupation	0.128***	0.021
Partly skilled occupation	0.096***	0.022
Unskilled occupation	0.204***	0.026
Armed forces	-0.181	0.156
Others	0.029	0.02
Long-term illness	0.012	0.016
Spouse's age	0.057***	0.001
Constant	-3.691***	0.03
Pseudo R^2	0.258	
Sample size	94,710	

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

3.3.2 Descriptive statistics

This section provides a description of the sample under consideration. Table 3 presents percentages and means for the bereaved, non-bereaved, and weighted non-bereaved samples.

Table 3. SLS member characteristics for those that were a couple in 1991

Variable	Bereaved group	Non-bereaved group	Non-bereaved group (weighted)
	Sample size (%)	**Sample size (%)**	**Sample size (%)**
Died			
Within 1991-1995 (A)	348 (2.56%)	775 (0.97%)	800 (5.33%)
Within 1996-2000 (B)	1,236 (8.24%)	1,944 (2.44%)	1,624 (10.82%)
Within 2001-2005 (C)	1,935 (12.89%)	2,814 (3.53%)	1,703 (11.34%)
Within 2006-2009 (D)	1,912 (12.74%)	3,040 (3.81%)	1,270 (8.46%)
Become widow/widower			
Within 1991-1995 (I)	3,915 (26.09%)	-	-
	[(A): 348 (B): 781 (C): 651 (D): 450]		
Within 1996-2000 (II)	4,135 (27.55%)	-	-
	[(B): 455 (C): 839 (D): 581]		
Within 2001-2005 (III)	3,944 (26.28%)	-	-
	[(C): 445 (D): 618]		
Within 2006-2009 (IV)	3,013 (20.08%)	-	-
	[(D): 263]		
Baseline Characteristics 1991			
Sex			
Male	5,293 (35.27%)	40,761 (51.14%)	5,773 (38.47%)
Female	9,714 (65.75%)	38,942 (48.86%)	9,233 (61.52%)
Education			
First degree or higher degree	470 (3.13%)	6,306 (7.91%)	478 (3.19%)
Other high qualification	975 (6.5%)	8,301 (10.41%)	955 (6.36%)
No high degree or qualification	13,562 (90.37%)	65,096 (81.67%)	13,574 (90.45%)
Ethnicity			
White	14,979 (99.81%)	78,739 (98.79%)	14,971 (99.76%)

Indian	15 (0.01%)	513 (0.64%)	17 (0.11%)
Chinese	6 (0.04%)	157 (0.2%)	8 (0.05%)
Others	7 (0.03%)	294 (0.37%)	11 (0.07%)
Social class based on occupations			
Professional occupations	231 (1.54%)	3,304 (4.15%)	241 (1.61%)
Managerial and technical occupations	2,220 (14.79%)	19,641 (24.64%)	3,154 (21.02%)
Skilled non-manual occupations	2,053 (13.68%)	15,198 (19.07%)	1,979 (13.19%)
Skilled manual occupations	1,823 (12.15%)	14,919 (18.72%)	1,887 (12.57%)
Partly skilled occupations	1,603 (10.68%)	10,695 (13.42%)	1,630 (10.86%)
Unskilled occupations	1,274 (8.49%)	4,876 (6.12%)	1,250 (8.33%)
Armed Forces	9 (0.06%)	446 (0.56%)	13 (0.09%)
Others[1]	5,794 (38.61%)	10,624 (13.33%)	5,853 (39%)
Long term illness	3,215 (21.42%)	7,429 (9.32%)	3,369 (22.45%)
	Mean (Std.)	**Mean (Std.)**	**Mean (Std.)**
Age in 1991	59.9 (11.66)	43.2 (13.31)	60.03 (12.99)
KPSM Weight[2]	1 (0)	--	0.188 (0.319)
Number of members	15,007 (15.85%)	79,703 (84.15%)	15,007
	Mean (Std.)	**Mean (Std.)**	**Mean (Std.)**
Post bereavement duration (years)[3]	6.88 (4.99)	6.96 (5.12)	7.13 (5.15)
Average inpatient days (per person per year)			
Within 1991-1995	1.61 (11.9)	0.74 (7.21)	2.09 (17.09)
Within 1996-2000	2.46 (12.59)	0.89 (6.93)	2.43 (12.43)
Within 2001-2005	3.44 (13.25)	1.09 (8.29)	2.73 (13.53)
Within 2006-2009	4.48 (17.79)	1.32 (8.35)	2.93 (14)

[1] The category of others includes the categories of inadequately described occupation, occupation not stated, and no job in last 10 years or aged under 16.

[2] The maximized and minimized values of the KPSM weights are 1.917 and 0.014. The weights of 3,401 out of 79,703 non-bereaved members are greater than 1.

[3] Refers to years of available data after bereavement.

The bereaved members were approximately 15.85% of the total sample. The mortality rate of the bereaved group was higher than that of the non-bereaved group in each period. For both groups, in general, the mortality rate increased as the cohort aged. The brackets below the sample size for widows/widowers denotes the death of bereaved members who became bereaved in different periods. For example, there were 348, 781, 651, and 450 bereaved members who became bereaved between 1991 and 1995 (subgroup I) and subsequently died within 1991-1995, 1996-2000, 2002-2005, and 2006-2009, respectively. Similarly, there were 455, 839, and 581 bereaved members who became bereaved during 1996 and 2000 (subgroup II) who subsequently died in the same period and follow-up periods. These patterns indicate that the number of deaths was larger in the time period immediately after bereavement and fewer in subsequent periods.

With respect to demographic and socio-economic characteristics, there were approximately 30% more females in the bereaved group than males, whereas it was the reverse in the non-bereaved group with about 2.28% more males. The education level of the bereaved group was lower than that of the non-bereaved group with 90.37% of the bereaved cohort reporting no higher degrees or qualifications compared to 81.67% for the non-bereaved cohort. The big difference for both groups in terms of social class was in managerial and technical occupations in which 14.79% of the bereaved group were employed, and 24.64% of the non bereaved group. A further 38.61% of the bereaved group had occupations classified as *others*[11], whereas the non-bereaved group had 13.33%. This may be linked to the differences in their education levels. As for age, the bereaved, on average, were older than the non-bereaved by 16 years. The average post (hypothetical) bereavement duration for both groups was about 6.9 years which indicated the maximal years of data available for each SLS member after (hypothetical) spousal bereavement (not including the year of losing their spouse) until the year of death or the last year of the sample period (2009) if death did not occur. With respect to inpatient days, the bereaved had more admissions to hospital than the non-bereaved with increasing admission trends in both groups as they aged.

Column 3 in Table 3 shows the weighted non-bereaved group, who were the comparison group for the subsequent analysis. After weighting, the differences in all characteristics, apart from death in the first time block and the post bereavement duration, between the bereaved group and the non-bereaved

[11] The category of others includes inadequately described occupations and occupation not stated.

group diminished. The weighted non-bereaved group, in general, appeared to have similar initial characteristics to the bereaved group. The two exceptions where the weighted numbers were greater than their unweighted comparisons imply that many non-bereaved members with higher weights died in the first time block.

3.3.3 Estimating the impact of bereavement

Estimating the impact on survival using a Cox Proportional-Hazard model

The weighted Cox Proportional-Hazard model was used with the weight generated by KPSM to analyse the impact of spousal bereavement on survival post bereavement. To control for the unobserved common mortality factors within a couple, the indicators of long-term illness in the entry year (1991) and average inpatient days per year before (hypothetical) bereavement were used to proxy these unobserved factors.[12] These provided a reasonable proxy for health status at bereavement and, meaning it is plausible that they were highly correlated with those unobserved factors which were common among spouses. The model is as seen in Equation 3:

$$(3) \quad \boldsymbol{h_i(t) = h_0(t)\mathbf{exp}\,(\rho_1 SB_i + W_i'\rho)}$$

where $h_i(t)$ is the surviving years of a member *i* after (hypothetical) spousal bereavement until time *t*. Here, *t* denotes the year of death or the last year of the sample period. $h_0(t)$ is the baseline hazard function which need not be specified. *SB* is the indicator of being bereaved where 1 is given to the bereaved members and 0, otherwise. ρ_1 is the difference in mortality hazard between the bereaved and the non-bereaved. W_i is a vector of covariates including the indicator of long-term illness in 1991, the average annual inpatient days prior to (hypothetical) spousal bereavement, sex, education, ethnicity, social class and age and age squared in the year becoming bereaved. ρ is a coefficient vector of the covariates.

[12] Espinosa and Evans (2008) run a series of Cox proportional hazard models beginning with only the widowhood indicator and progressively increase the number of covariates. If the estimated bereavement effect remains stable with the increase in covariates, this implies that widowhood is uncorrelated with observed covariates. It is plausible that observed and unobserved covariates are positively correlated and thus, the bereavement effects are not fully capturing unobserved factors.

Estimating the impact on hospitalisations

Next the difference-in-differences model (DiD) used to estimate the impact of spousal bereavement on hospitalisations conditional on survival is outlined. As mentioned earlier the health status of a couple may be highly correlated due to both observed and unobserved factors such that those with a high risk of hospitalisation may be more likely to become bereaved. The observed factors such as social class, race, education, age, and occupation may cause this high correlation through an assortative matching process. The unobserved factors, for example, diet, exercise, hobbies, and health behaviours, may influence a couple's joint health status through the common lifestyle and environmental risks after marriage. In order to control for these unobserved and observed factors and thus identify the impact of spousal bereavement, a DiD model was used. The concept of DiD is shown in Equation 4:

$$(4) \quad \Delta^{SB} = \left(H_{BG}^{After\,SB} - H_{BG}^{Before\,SB}\right) - \left(H_{NBG}^{After\,SB} - H_{NBG}^{Before\,SB}\right)$$

where *SB*, *BG*, and *NBG* denote spousal bereavement, bereaved group, and non-bereaved group, respectively. The first parenthesis eliminates the time constant factors in the bereaved group. In addition, the second parentheses attempts to control for time-variant factors not related to bereavement by using the longitudinal experience of the non-bereaved group as a control. This relies on the longitudinal experience of the non-bereaved group providing a reasonable counterfactual of the expected longitudinal experience of the bereaved group had they not become bereaved. Because bereavement is non-random the propensity score weighting approach is needed to place greater importance on the longitudinal experience of those non-bereaved that had similar initial characteristics as the bereaved and thus create a *comparable* non-bereaved group. Thus, the time-variant factors not related to bereavement can be controlled for by subtracting the second parentheses from the first to leave only the spousal bereavement impact (Δ^{SB}).

This strategy was used with the created panel data set to identify the impact of spousal bereavement on the inpatient days used conditional on survival. The estimation equation is given in Equation 5:

$$(5)\quad H_{it} = \alpha_0 + \alpha_1 SB_{it} + \alpha_2 P_{it} + \alpha_3 SB_{it} \cdot P_{it} + X'_{it}\alpha + \varepsilon_{it}$$

where H_{it} is the utilization of inpatient days for member *i* in year *t*. *SB* has been defined above. *P* indicates post bereavement where 1 is given to the post bereavement years and 0, otherwise. *SB·P* is the interaction term of both indicators. X_i is a vector of covariates including age, ethnicity, and dummies for long-term illness in 1991, sex, ethnicity, and social class. The value 1 represents having long-term illness and males, respectively, and 0, otherwise. α is a vector of coefficients that represent the relationship between controlling factors (*X*) and hospitalisation and ε is the stochastic error term. α_3 is of particular interest as it represents the estimated impact of spousal bereavement on annual inpatient days.

Considering the possible decay of the bereavement impact

While the above analysis considers that bereavement has a continuing constant impact after the bereavement date, the possibility that the impact varies across the post bereavement period was also considered. The number of years post bereavement (D) is accounted for in Equation 6 where the post bereavement duration is measured as an ordinal variable indicating the years after (hypothetical) bereavement and starts from 0, the year of bereavement. This is a control for the non-bereaved group which attempts to pick up any systematic variation over time unrelated to the bereavement event. In addition, the interaction term of post bereavement duration and *SB* is added in Equation 6 representing a possible trend for the bereavement effect. The estimation equation is as Equation 6:

$$(6)\quad H_{it} = \beta_0 + \beta_1 SB_{it} + \beta_2 P_{it} + \beta_3 SB_{it} \cdot P_{it} + \beta_4 D_{it} + \beta_5 D_{it} \cdot SB_{it} + X'_{it}\beta + \varepsilon_{it}$$

where β_4 presents the average time effect of the non-bereaved group after hypothetical bereavement. β_5 presents the post bereavement time effect for the bereaved group compared to the non-bereaved group and reveals the pattern of utilisation in inpatient days during the post bereavement period caused by bereavement.

Two-Part Model

In many cases there were no annual inpatient days for members. Thus, due to the truncated nature of the data, the Two-Part Model (2PM) (Jones, 2000), which is a two-stage estimation, was employed to estimate the impact of factors on the number of inpatient days. The first stage estimates the probability of there being any hospitalisation within the year and the equation is Equation 7:

$$(7) \quad P(y_{it}^{*} = 1|Z) = \emptyset(Z_{it}'\gamma)$$

$$\begin{cases} y_{it}^{*} = 1 \; if \; y_{it} > 0 \\ y_{it}^{*} = 0 \; if \; y_{iy} = 0 \end{cases}$$

where y_{it} denotes the number of inpatient days of member *i* in year *t* and $\emptyset$ is the cumulative density function of the standard normal distribution. *Z* is a covariate vector which includes the covariates defined in Equation 5 and Equation 6, respectively. The equation at the second stage estimates the number of inpatient days only considering those members who have at least 1 inpatient day and is shown in Equation 8. The natural logarithm of inpatient days is used due to the skewed nature of the data.

$$(8) \quad \log(y_{it}) = Z_{it}'\theta + \epsilon_{it} \quad y_{it} > 0$$

Finally, the expected number of inpatient days was calculated using the probability obtained from the first stage multiplied by the estimated inpatient days obtained from the second stage. The weighted population-averaged (PA) estimations with the weighting generated by KPSM were used in the Two-part model. Unlike a random-effects model, the PA model need not fully specify the distribution of the population in terms of their individual effects as the PA model focuses only on the marginal distribution. For the binary outcome, the coefficient of the bereavement indicator within the PA model relates to the probability of an average individual who is bereaved being hospitalised compared to the probability of an average individual who is non-bereaved being hospitalised. With continuous outcomes, the coefficients of population-averaged estimation are often very close to those of random-effects estimation (Neuhaus, Kalbfleisch and Hauck, 1991).

3.4 Results

3.4.1 Survival analysis

Table 4 (below) shows the result of the Cox-proportional Hazard estimation. The bereavement indicator, age, sex, education dummies, social class dummies in skilled manual occupations, partly skilled occupations, unskilled occupations, and others, the long-term illness indicator, and the average inpatient days per year prior to bereavement showed significant associations with the hazard of death. The bereaved group had a mortality rate that was 18.2% higher than the non-bereaved group after controlling for other factors. In terms of the other controlling factors the mortality rate increased by 26.2% when age increased by one year. Males had a higher mortality rate than females by 54.8%. The people holding a degree or other higher qualification had lower mortality rate than those not holding either by 22.2% and 17.4%, respectively. The people in skilled manual occupations, partly skilled occupations, unskilled occupations, and others had higher mortality rates than those in managerial and technical occupations by 20.2%, 15.4%, 32.1%, and 42.8%, respectively. With respect to long-term illness and average annual inpatient days, the people reporting long-term illness prior to bereavement had a 35.3% higher mortality rate than those not reporting and the mortality rate increased by 0.5% when the average annual inpatient days prior to bereavement increased by one.

3.4.2 Inpatient days

Table 5 (page 26) presents the results of the Two-Part Model. The first column shows that spousal bereavement, age, sex, education, long-term illness, and social class have a significant association with the probability of a hospitalisation. The bereavement impact increased the probability of a hospitalisation. Age had a nonlinear association with the probability with the association being negative before 35 years old and positive after 35. Males had significantly higher probability of hospitalisation than females and having a long-term illness in 1991 increased this probability of hospitalisation. With respect to education and social class based on occupation, people holding a degree or other higher qualification had significantly less probability of hospitalisation than those who did not. Unskilled members had a higher hospitalisation probability compared with those

Table 4. Cox-Proportional Hazard estimation (weighted)

Dependent variable: Post (hypothetical) bereavement duration	**Hazard Ratio**	**Robust Std. E**
SB (Spousal Bereavement)	1.182***	0.025
Age	1.262***	0.019
Square of age	0.999***	0.0001
Male	1.548***	0.038
Ethnicity (ref. White)		
Indian	0.845	0.337
Chinese	1.88*	0.707
Other	0.451	0.42
Education (ref. No high degree or qualification)		
First degree	0.778***	0.056
Other high qualification	0.826***	0.043
Social class based on occupations (ref. Managerial and technical occupations)		
Professional occupations	1.046	0.098
Skilled non-manual occupations	1.015	0.05
Skilled manual occupations	1.202***	0.053
Partly skilled occupations	1.154***	0.054
Unskilled occupations	1.321***	0.07
Armed forces	0.969	0.582
Others	1.428***	0.055
Proxies for omitted common factors		
Long-term illness	1.354***	0.033
Average annual inpatient days prior to bereavement	1.005***	0.001
Sample size	83,593	
Wald X^2	5,078.49	

Notes: 1. * p<0.10, ** p<0.05, *** p<0.01. 2. There are two reasons that sample size reduces to 83,593 in the survival analysis. First, those individuals who die after (hypothetical) bereavement date but in the same year of becoming bereaved are excluded because the survival duration is 0. Second, those individuals who become bereaved early within the sample period are excluded because their average annual inpatient days prior to bereavement are not available.

Table 5. Two-Part Model estimations (weighted regression)

Panel Estimation	First Part	Second Part
	Population-averaged	
	Coef. (Semi-robust Std. E)	Coef. (Semi-robust Std. E)
SB (Spousal bereavement)	-0.015* (0.008)	-0.043*** (0.013)
Post (Post bereavement)	0.093*** (0.007)	0.235*** (0.013)
SB* Post	0.108*** (0.01)	0.100*** (0.017)
Age	-0.007*** (0.002)	-0.048*** (0.003)
Square of age	0.0001*** (0.00002)	0.001*** (0.00002)
Male	0.109*** (0.008)	-0.005 (0.012)
Ethnicity (ref. White)		
Indian	0.150* (0.078)	0.075 (0.117)
Chinese	0.173 (0.157)	0.115 (0.153)
Others	-0.147 (0.093)	-0.348*** (0.103)
Education (ref. No high degree or qualification)		
First degree	-0.133*** (0.019)	-0.106*** (0.031)
Other high qualification	-0.061*** (0.015)	-0.099*** (0.022)
Long-term illness	0.282*** (0.009)	0.26*** (0.013)
Social class based on occupations (ref. Managerial and technical occupations)		
Professional occupations	0.034 (0.026)	0.008 (0.04)
Skilled non-manual occupations	-0.022* (0.013)	-0.03 (0.019)
Skilled manual occupations	0.014 (0.013)	0.072*** (0.019)
Partly skilled occupations	0.026* (0.013)	0.056*** (0.019)
Unskilled occupations	0.043*** (0.015)	0.106*** (0.022)
Armed forces	-0.204** (0.081)	0.227 (0.139)
Others	0.021* (0.012)	0.123*** (0.018)
Constant	-1.544*** (0.066)	2.018*** (0.091)
Year dummy	Yes	Yes
Wald χ^2	11,954.59	11,374.77
Sample size	1,713,361	229,071

* p<0.10, ** p<0.05, *** p<0.01

with managerial and technical occupations, whereas the armed forces had a lower probability of hospitalisation.

The second column of Table 5 shows those factors which influence the number of inpatient days conditional on being hospitalised. The impact of spousal bereavement increased the number of inpatient days by 10%.[13] Among those who were hospitalised, increases in age had a nonlinear association with the number of inpatient days. Education and long-term illness had similar results as shown in the first part of the model. People who held degrees or other higher qualifications had less inpatient days than those who did not by 10.6% and 9.9% days per year, respectively. Long-term illness was associated with 26% more inpatient days per year. As for ethnicity and social class, the people classified as *others* for ethnicity had less inpatient days than white by 34.8% days per year. The people in the social class of skilled manual occupations, partial skilled occupations, unskilled occupations, and others had more inpatient days than those in managerial and technical occupations by 7.2%, 5.6%, 10.6%, and 12.3% days per year, respectively. As for gender differences in inpatient days, males had higher probability of having inpatient days than females but there was no difference between the males and females once they were hospitalised.

Table 6 below shows the result of Equation 6 and has similarities with those in Table 5 after controlling for two more variables, post bereavement duration and the interaction term of post bereavement duration and *SB*. In the first part, both variables had significant associations with the probability of having any inpatient days within the year. For the non-bereaved group, the probability decreased when the post bereavement duration increased whereas, for the bereaved group, the probability had a positive association with the post bereavement duration compared to the non-bereaved group. In the second part, these two variables also had a significant and positive association with the number of inpatient days. When the post (hypothetical) bereavement duration increased one year, the number of inpatient days increased by 0.7% for the

[13] The coefficients of the second part estimation in the tables refer to the percentage change in inpatient days for a 1 unit change in the explanatory variables.

Table 6. Two-Part Model estimations controlling for possible decay effect of bereavement (weighted regression)

Panel Estimation	First Part	Second Part
	Population-averaged	
	Coef. (Semi-robust Std. E)	Coef. (Semi-robust Std. E)
SB (Spousal Bereavement)	-0.019^{**} (0.008)	-0.046^{***} (0.013)
Post (Post bereavement)	0.11^{***} (0.008)	0.228^{***} (0.015)
SB* Post	0.071^{***} (0.011)	0.072^{***} (0.022)
Decay effect of bereavement impact		
Post-bereavement duration (year)	-0.003^{***} (0.001)	0.007^{***} (0.002)
Post-bereavement duration* SB	0.009^{***} (0.002)	0.007^{**} (0.003)
Age	-0.006^{***} (0.002)	-0.046^{***} (0.003)
Square of age	0.0002^{***} (0.00002)	0.001^{***} (0.00002)
Male	0.11^{***} (0.008)	0.001 (0.012)
Ethnicity (ref. White)		
Indian	0.151^{*} (0.079)	0.074 (0.119)
Chinese	0.173 (0.157)	0.119 (0.155)
Others	-0.146 (0.093)	-0.348^{***} (0.105)
Education (ref. No high degree or qualification)		
First degree	-0.133^{***} (0.019)	-0.105^{***} (0.032)
Other high qualification	-0.061^{***} (0.015)	-0.096^{***} (0.022)
Long-term illness	0.282^{***} (0.009)	0.258^{***} (0.013)
Social class based on occupations (ref. Managerial and technical occupations)		
Professional occupations	0.034 (0.026)	0.008 (0.04)
Skilled non-manual occupations	-0.022^{*} (0.013)	-0.029 (0.019)
Skilled manual occupations	0.014 (0.013)	0.071^{***} (0.019)
Partly skilled occupations	0.026^{*} (0.013)	0.056^{***} (0.019)
Unskilled occupations	0.043^{***} (0.015)	0.106^{***} (0.022)
Armed forces	-0.204^{**} (0.081)	0.234^{*} (0.14)
Others	0.021^{*} (0.012)	0.124^{***} (0.018)
Constant	-1.546^{***} (0.066)	1.959^{***} (0.091)
Year dummy	Yes	Yes
Wald χ^2	11,994.21	11,424.97
Sample size	1,713,361	229,071

* p<0.10, ** p<0.05, *** p<0.01

non-bereaved compared to 1.4% for those bereaved (0.7% difference between the bereaved and non-bereaved). These results are inconsistent with our expectation of decay in the impact of bereavement with time. However, after controlling for the possible decay of the bereavement impact, the initial bereavement impact on the probability of having any inpatient days and on the number of inpatient days was still significant at 1% level though the coefficients decreased to 0.071 and 0.072 from 0.108 and 0.100 respectively, shown in Table 5.

The estimated increase in inpatient days caused by the bereavement impact was calculated using the estimations presented in Tables 4 and 5. The results are shown in Table 7.

Table 7. Two-Part estimations (weighted)

Constant bereavement impact		Decaying bereavement impact	
Group	Average inpatient days (per bereaved per year)	Group	Average inpatient days (per person per year)
Bereaved group (Sample size: 15,007 members)	0.3384 (0.3375 ~ 0.3395)	Bereaved group (Sample size: 15,007 members)	0.3394 (0.338 ~ 0.34)
Non-bereaved group (Sample size: 79,703 members)	0.1638 (0.1636 ~ 0.1641)	Non-bereaved group (Sample size: 79,703 members)	0.1636 (0.1633 ~ 0.1638)
Increase in inpatient days caused by bereavement impact	0.1114 (0.110 ~ 0.113)	Increase in inpatient days caused by bereavement impact	0.0781 (0.077 ~ 0.079)

Note: 1. The inpatient days for each SLS member was calculated by his/her predicted probability obtained from the first stage multiplying his/her predicted inpatient days obtained from the second stage.
2. The parentheses under the numbers contain the 95% confidence intervals.

Under the assumption of a constant bereavement impact after the bereavement event, the inpatient days for an average individual who was bereaved was estimated to be 0.338 days per person/per year and 0.164 days for an average individual who was non-bereaved. The results were similar after controlling for a possible trend in the bereavement impact post bereavement. After controlling for the other factors the average increase in inpatient days caused by bereavement was estimated to be 0.111 days whereas it reduced to 0.078 days immediately after bereavement after controlling for the possible trend in the bereavement impact. The cost of an average inpatient day (excluding long stay) in Scotland in 2011/2012 was estimated to be £561.63 per day[14]. Thus, the total cost of inpatient days caused by bereavement was approximated to between £43.80 and £62.90 per bereaved per year.

3.5. Conclusion

Bereavement is a complex area and it is not easy to monetise the costs of bereavement impact. As has been seen, we used the SLS data, appropriate linkage, and a number of analytic techniques to attempt to monetise costs in terms of medical utilisation, and to investigate the difference in death hazard between the bereaved and the non-bereaved. In doing so we would contend that imaginative deployment and combinations of a range of existing methodologies has enabled meaningful comparisons of these health impacts for the bereaved and non-bereaved. In particular the use of propensity score matching and a difference-in-differences strategy have proved to be strengths that suggest a way forward for learning from longitudinal data of this kind.

In concluding this section it is useful to summarise the main findings that have accrued from our use of these methods, to note related limitations, and to identify areas for further research highlighted through our use of the SLS data to study spousal bereavement.

Firstly, we have presented the results of the comparison in post (hypothetical) bereavement survival duration between the bereaved group and the non-bereaved group. After controlling for the omitted common factors between a surviving spouse and his/her deceased spouse, we found that the bereaved were more fragile than the non-bereaved which is consistent with previous studies (Espinosa and Evans, 2008; van den Berg, Lindeboom and Portrait, 2011; Simeonova, 2013). The bereaved had 18.2% higher mortality rate compared to the mortality rate of the non-bereaved.

Second, spousal bereavement significantly increased the use of inpatient days. It raised the use of inpatient days by between approximately 0.078 and 0.111 inpatient days per bereaved/per year and the monetary cost is between £43.80

[14] Refers to specialty costs and activity - inpatients in all specialties (excluding long stay), by board in the link: http://www.isdscotland.org/Health-Topics/Finance/Costs/File-Listings-2012.asp. £561.63 is calculated by dividing the net total cost (£2,752) by the average length of stay (4.9 days).

and £62.90 per bereaved/per year. According to Scotland's census in 2011, the total resident population age 16 years old or more is 4,089,946 and 9.06% of this population is widowed[15]. Thus the total cost of inpatient days caused by spousal bereavement impact is estimated to be about £16,230,051 to £23,307,539 per year. However, this cost may be underestimated because some of those reporting being married may have been previously widowed and to some extent may be still suffering from a previous spousal bereavement.

Third, the bereavement impact on inpatient days did not diminish but instead increased over time post bereavement, which is contrary to our expectation. A possible explanation is a lagged effect from bereavement through mental health problems to medical utilisation. When bereavement occurs, grief may cause mental health problems but it takes time for these changes to translate into hospital utilisation. In the early stages of grief, the bereaved may seek professional consultants to relieve their mental problems but prolonged grief may derive various psychiatric disorders and physical symptoms that require further hospitalisation. Once bereaved people use healthcare or treatment interventions, it may reduce the severity of their mental or physical disorders and the need for additional hospitalisations, however, given that on average we only had 7 years of follow-up data we were not able to observe this recovery within the current data.

Fourth, socioeconomic characteristics, for instance, education and social class, were also found to be significant determinants of utilisation of inpatient days and mortality. These two determinants present consistent results that highly educated people corresponding to professional occupations, managerial and technical occupations, or skilled non-manual occupations use less inpatient days and have lower mortality risks than less educated people corresponding to skilled manual occupations, partly skilled occupations unskilled occupations, or others.

In the analysis we only considered the impact on mortality and cost of inpatient days. These are only two components of the societal costs and more research is needed to explore the other components, for instance, other medical utilisation,

[15] Refer to Scotland's Census Results Online: http://www.scrol.gov.uk/scrol/browser/profile.jsp

substance abuse, poverty, crime, and labour force participation and productivity, to present a more comprehensive take on the societal costs caused by spousal bereavement. However, even when only considering the impact on mortality and hospital inpatient admission the impact of bereavement is substantial and further research is needed to explore the extent to which bereavement support services could reduce these and other costs. Further research on the possible decay of bereavement impact and on whether the impact of bereavement depends on the cause of death and other possible determinants would also be beneficial as it would allow interventions to be targeted on those who are likely to need the greatest support.

4. PTI data: general practice contacts for the bereaved

4.1 Context

This section of the report moves back from the world of spousal bereavement and its more final impacts of mortality and secondary care usage to consider a more intermediate indicator of health impact, namely, bereavement-related contacts with particular General Practice primary care services in Scotland. Following extensive enquiries to try to locate definitive longitudinal datasets that could illuminate community-based health and healthcare experiences of bereaved Scottish people, the most promising source appeared to be Practice Team Information (PTI) supplied by Information Services Division Scotland (ISD Scotland)[16]. Accordingly this section of the report presents information about the use of the PTI dataset in the SECOB project. Before presenting this material it is useful to provide some context.

From our initial scoping of the literature a rather mixed and incomplete picture emerges. Lloyd-Williams, Wilkinson, and Lloyd-Williams (1998) carried out a small study in a general practice in North-Wales where they assessed the number of consultations made by children both pre- and post-bereavement due to death of a parent. The bereaved were found to increase consultation, in contrast to a non-bereaved control group. In contrast, Prigerson, Jacobs and Winker (2001) studied an adult population and found spousal bereavement caused an increase in odds of illness but that GP visits decreased rather than increased. They concluded that bereaved individuals who are most in need of health services might not access such help. In the apparent absence of national studies in Scotland, there seemed reason to try to use the existing ISD data on consultations in order to estimate cost.

4.2 The dataset

PTI data is collected from a sample of Scottish general practices about face-to-face consultations between patients and a member of the practice team. These consultations may be in the surgery or the patient's home. The practice team is currently defined for PTI purposes as all GPs including locums and registrars

[16] ISD Scotland, Practice Team Information (PTI) http://www.isdscotland.org/Health-Topics/General-Practice/GP-Consultations/

(GPs in training), and practice-employed nurses (including practice nurses, phlebotomists and health care assistants). Additionally, for the three years between 2003/04 and 2005/06 inclusive, community nurses (i.e. district nurses and health visitors) also recorded PTI data.

Currently there are around 60 practices participating in PTI in Scotland, and these are broadly representative of the Scottish Population in terms of age, gender, deprivation and urban/rural mix. PTI data are routinely used to provide estimated numbers of patient consultations in general practice for Scotland as a whole. PTI data are also frequently used to estimate the number of consultations for a specific condition, and to estimate the number of patients who consult because of a condition, in any one year in Scotland. The ability of PTI data to shed light on actual numbers of contacts is its key strength in the context of SECOB. The BHPS dataset (see section 5) examines whether or not there has been contact but does not explicitly provide numbers.

The SECOB research group received a data set containing information on patients consulting a member of general practice staff coded as being for *bereavement* or *bereavement counselling and support* for the years 2003/04 to 2009/10. Table 8 below indicates the data entry codes relevant to both categories used by practice staff to record information about consultations. Numbers were too small to meaningfully analyse each code separately.

4.3 Findings

Simple collation of data and descriptive analyses were undertaken in order to examine relevant trends.

4.3.1 Bereavement

Figures 2 to 5 show the trends across the years 2003/04 to 2009/10 for numbers and rates of patients consulting for *bereavement*. Figures 2 and 3 below indicate the numbers and rates of patients consulting a because of bereavement across the seven year period. Figure 2 depicts the estimated number of patients consulting (males, females and total), and Figure 3 depicts the rate per 1,000 registered with a GP in Scotland (males, females and overall).

Table 8. Data collection codes for *bereavement* and *bereavement counselling and support*, 2003/04-2009/10

Bereavement

Bereavement	Death of father	Death of partner
Family bereavement	Death of mother	Death of wife
Death of spouse	Death of brother	Husband died
Death of infant	Death of sister	Death of husband
Sudden infant death	Suicide of close relative	Family bereavement
Death of pet	Death of sibling	Bereavement reaction
Death of son	Death of child	Uncomplicated bereavement
Death of daughter	Relative killed	

Bereavement counselling and support

Bereavement counselling
Referral to bereavement counsellor
Bereavement support

Figure 2. Estimated number of patients consulting for *bereavement* at least once in the year

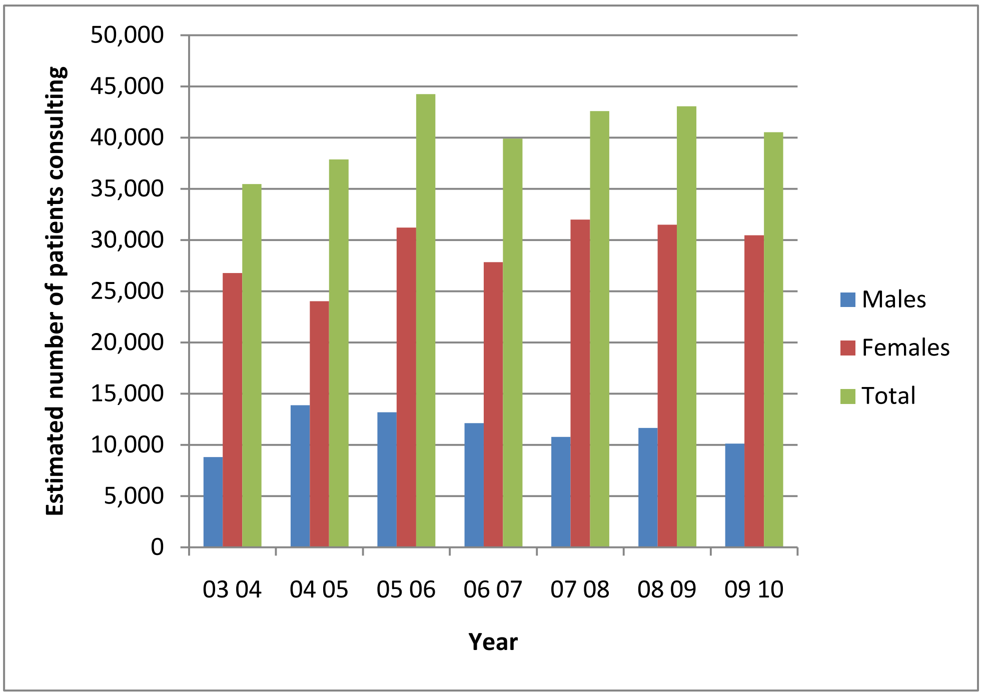
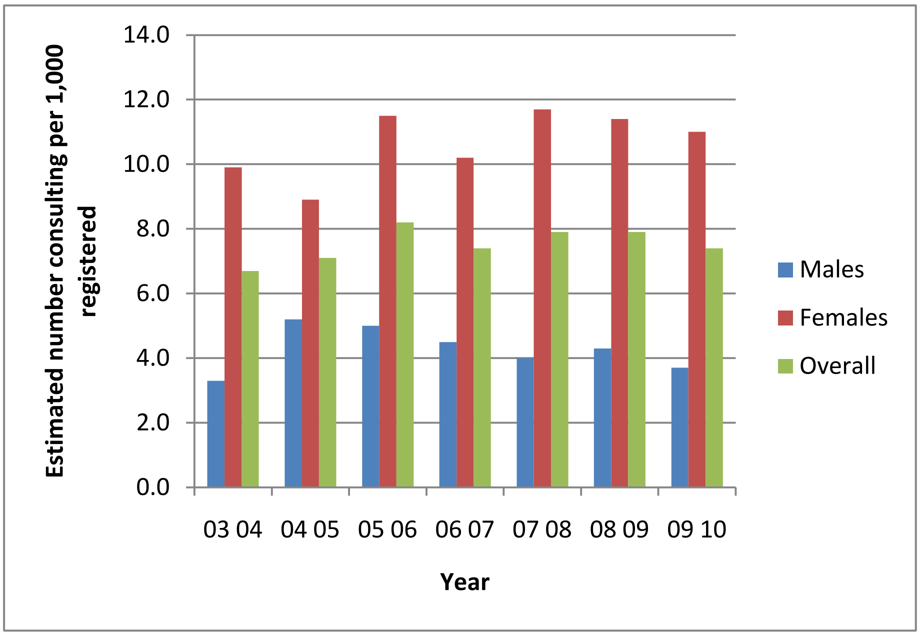


Figure 3. Estimated number of patients consulting for *bereavement* per 1,000 registered with a GP



Figures 4 and 5 indicate the numbers and rates of consultations, for example, some patients may consult more than once. Figure 4 depicts the estimated number of consultations (males, females and total) and Figure 5 depicts the rate of consultation per 1,000 population (males, females and overall).

Figure 4. Estimated number of consultations for *bereavement*

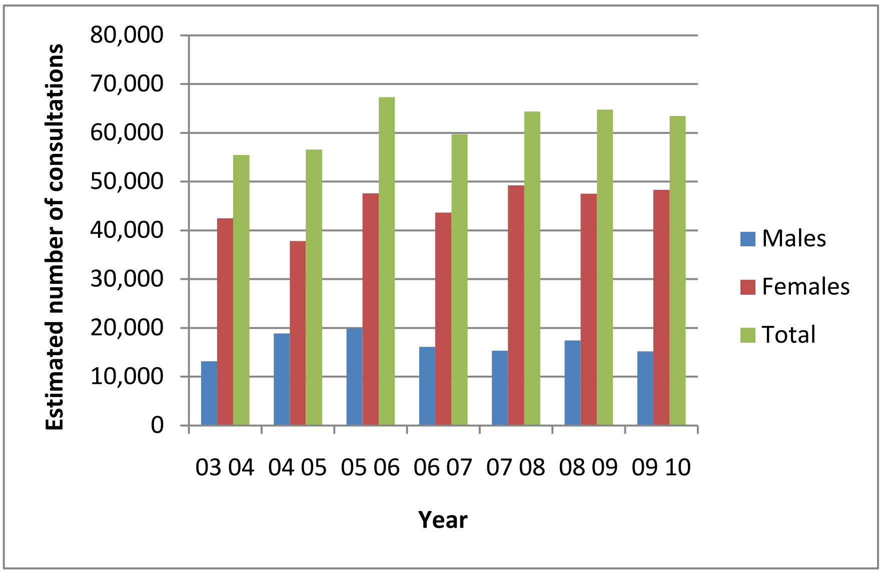
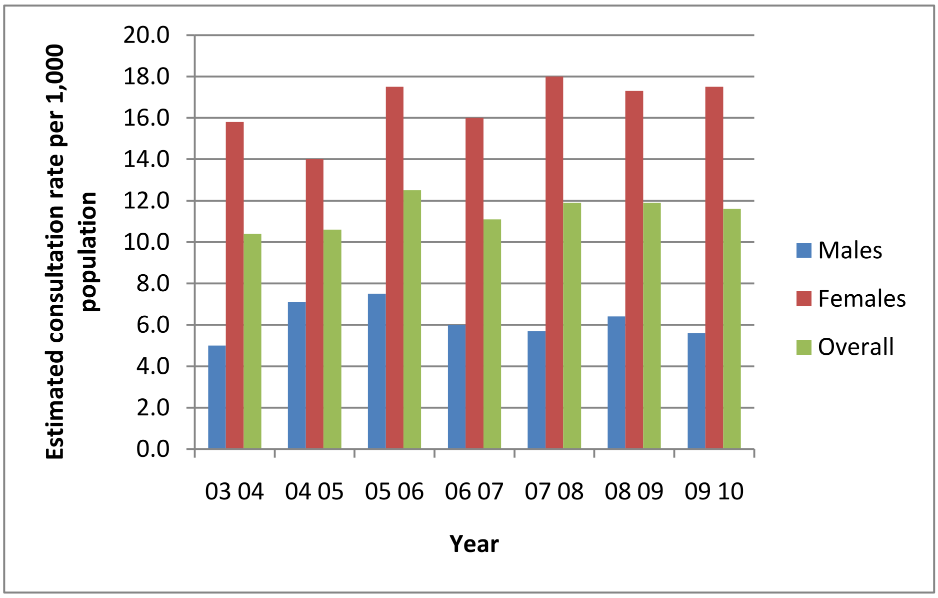


Figure 5. Estimated consultation rate for *bereavement* per 1,000 population



Across all years, in general, more women consulted their GP for *bereavement* relative to men. Additionally, of the women who consulted, they did so more frequently than the men who consulted. Only small changes are apparent across the years. To illustrate the detail and bring together the information presented within the tables the years 2003/04 were compared with 2009/10. The prevalence of men consulting for bereavement in 2003/04 was 3.3 (per 1,000). This corresponds to a contact rate of 5.0 per 1,000 population, or 13,180 contacts across the country. For women prevalence was 9.9, with a contact rate of 15.8, or 42,490 contacts in total in Scotland. In 2009/10 rates for men were 3.7 (per 1,000) and for women, 11.0, with contact rates of 5.6 (15,200 contacts) and 17.5 (48,300 contacts) respectively. Small increases in rates are apparent between 2003/04 and 2009/10. Table 9 below provides further breakdown of consultation number and rates for bereavement in the year 2009/10.

4.3.2 Bereavement counselling and support

Figures 6 to 9 show the trends across the years 2003 to 2010 for numbers and rates of patients consulting at a general practice for *bereavement counselling and support*. Figures 6 and 7 below indicate the numbers and rates of patients

Table 9. Numbers and rates of consultations for *bereavement* in Scotland, 2009/10

Estimated number of patients consulting in Scotland		
	Number	Confidence Interval**
Men	10110	8180-12030
Women	30460	26680-34240
Total	40520	35170-45870
Estimated number of patients consulting per 1000 registered		
Men	3.7	3.0-4.4
Women	11.0	9.7-12.4
Total	7.4	6.4-8.4
Estimated number of consultations in Scotland		
Men	15200	11810-18580
Women	48300	42040-54550
Total	63460	54570-72350
Estimated consultation rate per 1000 population		
Men	5.6	4.3-6.8
Women	17.5	15.2-19.7
Total	11.6	10.0-13.2

*Confidence Interval = we are 95% confident that the 'true' value will be in between the lower and upper limits shown in brackets after the estimate.

consulting a GP or practice nurse at least once in the year. Figure 6 depicts the estimated number of patients consulting (males, females and total), and Figure 7 depicts the rate per 1,000 registered with a GP in Scotland (male, female and overall). Across all years there were in general more females visiting their GP for *bereavement counselling and support* relative to males.

Figure 6. Estimated number consulting for *bereavement counselling and support* at least once in the year

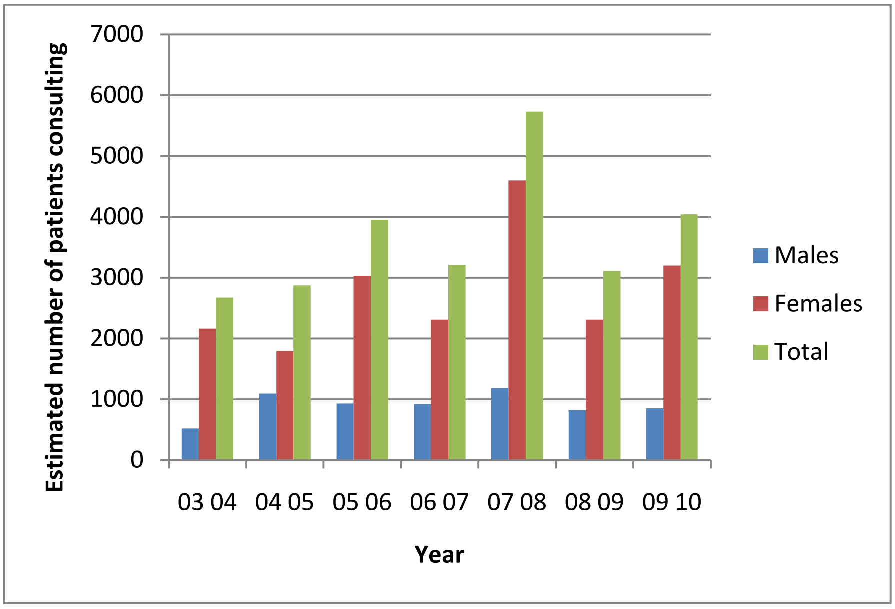
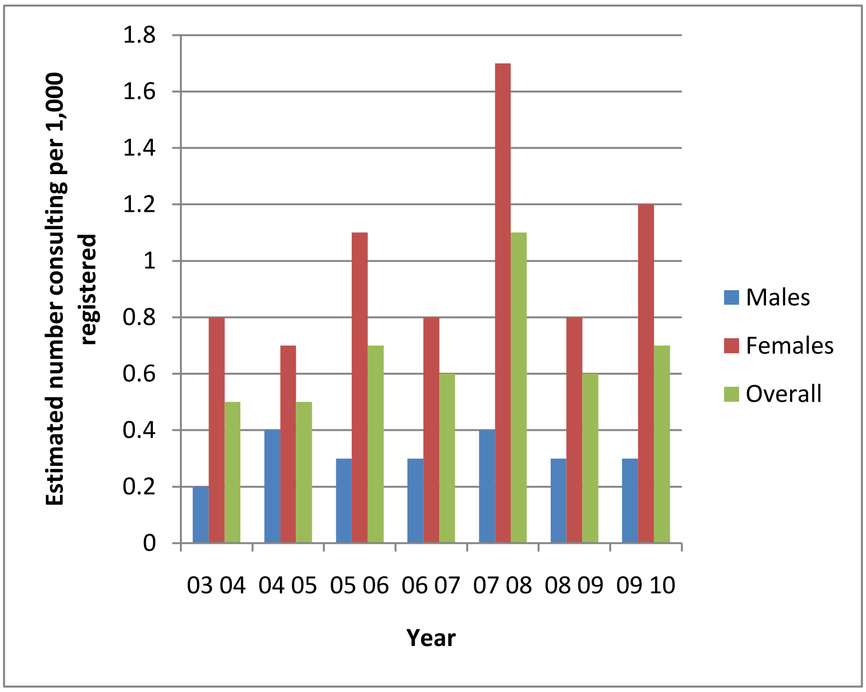


Figure 7. Estimated number consulting for *bereavement counselling and support* per 1,000 registered with a GP



Figures 8 and 9 indicate the numbers and rates of consultations, for example, some patients may consult more than once. Figure 8 depicts the estimated number of consultations (males, females and total) and Figure 9 depicts the rate of consultation per 1,000 population (males, females, overall).

Figure 8. Estimated number of consultations for *bereavement counselling and support*

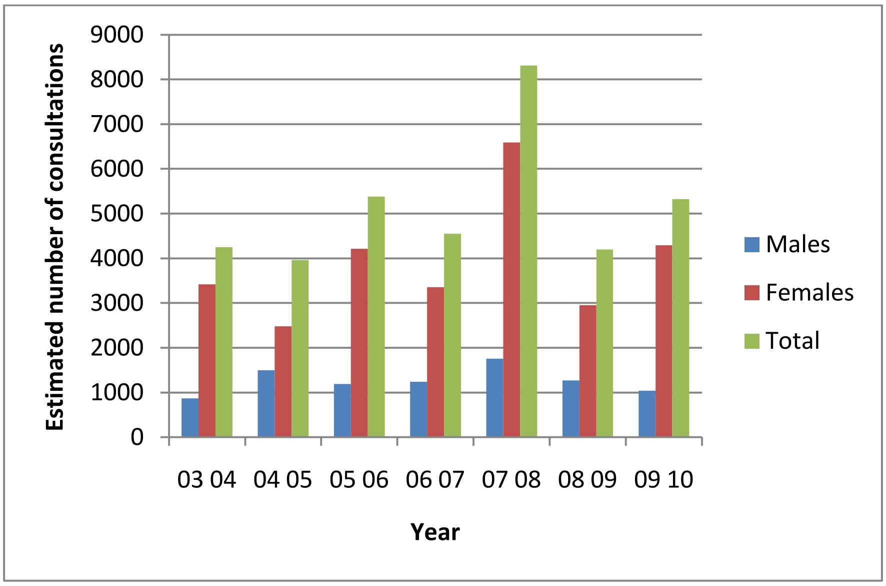
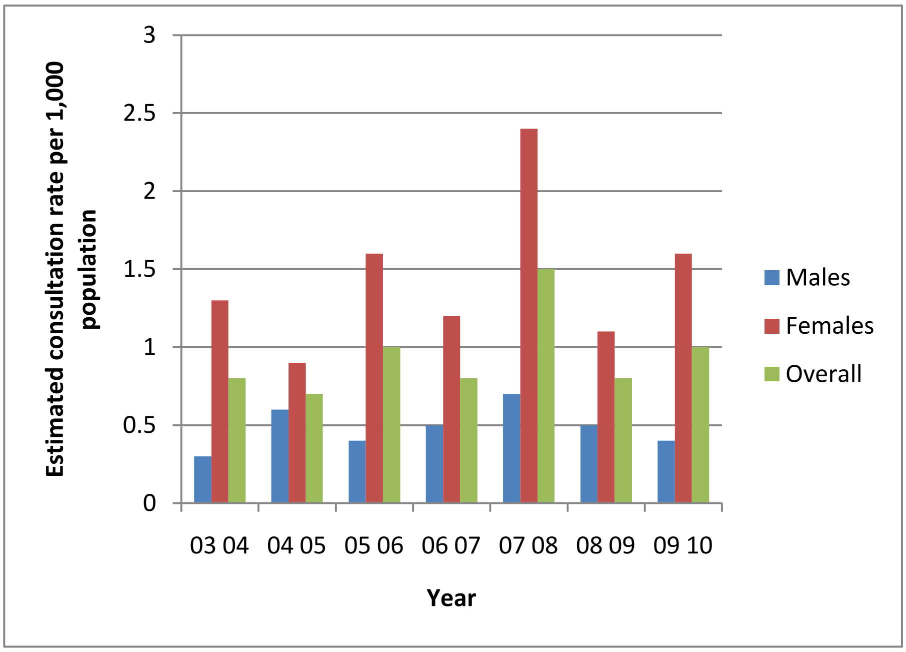


Figure 9. Estimated consultation rate for *bereavement counselling and support* per 1,000 patients population



Across the years small fluctuations are noted generally, with 2007/08 showing peaks for numbers and rates of consultations. These peaks were not sustained to 2009/10. In general, more women than men visited their general practice for *bereavement counselling and support* and of these they consulted more often than the men who made contact for the same reason. Again, to illustrate the detail and bring together the information presented within the tables the years 2003/04 were compared with 2009/10. The prevalence of men consulting for *bereavement counselling and support* in 2003/04 was 0.2 (per 1,000). This corresponds to a contact rate of 0.3, or 870 contacts across Scotland. For women prevalence was 0.8, with a contact rate of 1.3, or 3,420 contacts in Scotland in total. In 2009/10 rates for men were 0.3 (per 1,000) and for women, 1.2, with contact rates of 0.4 (1,040 contacts) and 1.6 (4,290 contacts) respectively. Small increases in rates are apparent between 2003/04 and 2009/10. Data from 2009/10 on patients who had contacted their GP because of bereavement or received support and counselling are described in Table 10 below.

Table 10. Numbers and rates of consultations for bereavement counselling and support, 2009/10

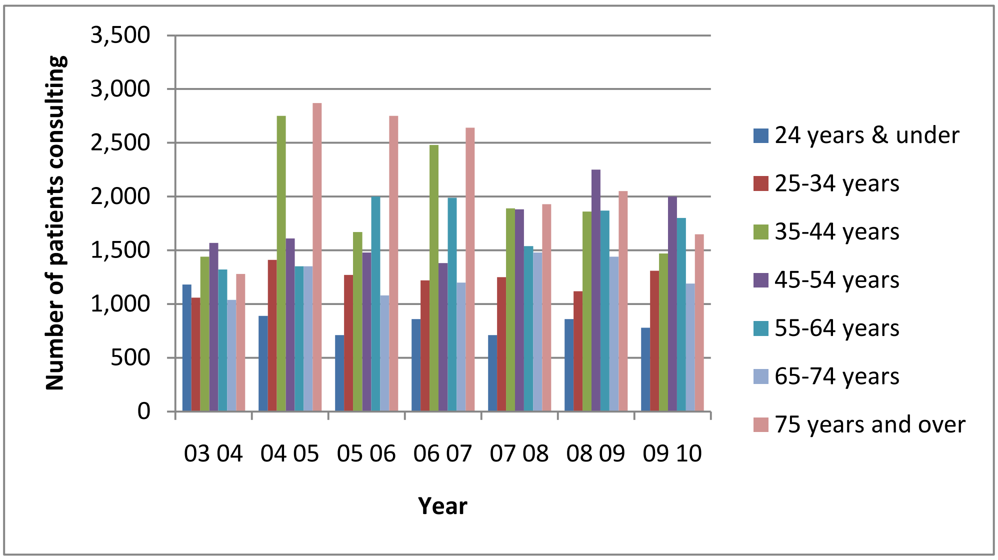
Estimated number of patients consulting in Scotland, 2009/10		
	Number	Confidence interval*
Males	850	560-1130
Females	3200	2440-3960
Total	4040	3070-5010
Estimated number of patients consulting per 1000 registered		
Males	0.3	0.2-0.4
Females	1.2	0.9-1.4
Total	0.7	0.6-0.9
Estimated number of consultations in Scotland		
Males	1040	620-1460
Females	4290	3120-5450
Total	5320	3870-6760
Estimated consultation rate per 1000 population		
Males	0.4	0.2-0.5
Females	1.6	1.1-2.0
Total	1.0	0.7-1.2

*Confidence Interval = we are 95% confident that the 'true' value will be in between the lower and upper limits shown in brackets after the estimate.

4.3.3 Age group analysis

The PTI data was also broken down by age groups for males and females. Some exploration took place of differences within and between genders in consultation patterns. Figure 10 below indicates the numbers of men registered with a GP in Scotland, across a range of age groups, who consulted for *bereavement* in the time period 2003/04 to 2009/10. In general, the numbers consulting were low across the period for each age group. For example, for men 24 years of age and under the number consulting was less than 1,000 for all but one year (2003/04). From 2004/05 to 2007/08 the highest numbers consulting were for men aged 75 and over, reaching 2,870 in 2004/05. From 2004/05 the numbers of men consulting in age groups 35-44 years and 75 and over increased by more than 1,000 per year. The higher numbers were sustained across three years, and reduced again from 2007/08 to 2009/10. There was a small increase, from 1,570 to 2,000, in the number of men aged 45-54 years consulting for *bereavement* over the seven year period.

Figure 10. Number of men consulting for bereavement



The numbers of women who consulted for bereavement in each age group across the seven year period was higher than the numbers of men consulting (Figure 11). The peak number consulting was 8,600 for women aged 45-54 years in 2008/09. Numbers of women aged 24 years and under who consulted remained low throughout, and numbers of women 75 years and over who consulted was also relatively low compared with middle age groups. For those aged 75 and over the pattern of consulting was stable with a peak of 3,820 in 2009/10. Women in the age groups 35-44, 45-54 and 55-64 years had the sustained highest numbers consulting across the seven years. In the last three years of data collection (2007/08 to 2009/10) the numbers of women aged 45-54 years who consulted was highest of all age groups and peaked at 8,600 in 2008/09.

The numbers of consultations for bereavement for men (Figure 12) were fewer than for women (Figure 13) for each age group across the seven year period. The highest numbers of consultations occurred in men aged 75 or more in three of the seven years (2004/05, 2006/07, 2007/08) with a peak at 4,170 in 2004/05. Higher numbers of consultations were also seen in men in middle age groups with most consultations in four of the seven years, though there was some fluctuation across the period.

Figure 11. Number of women consulting for bereavement

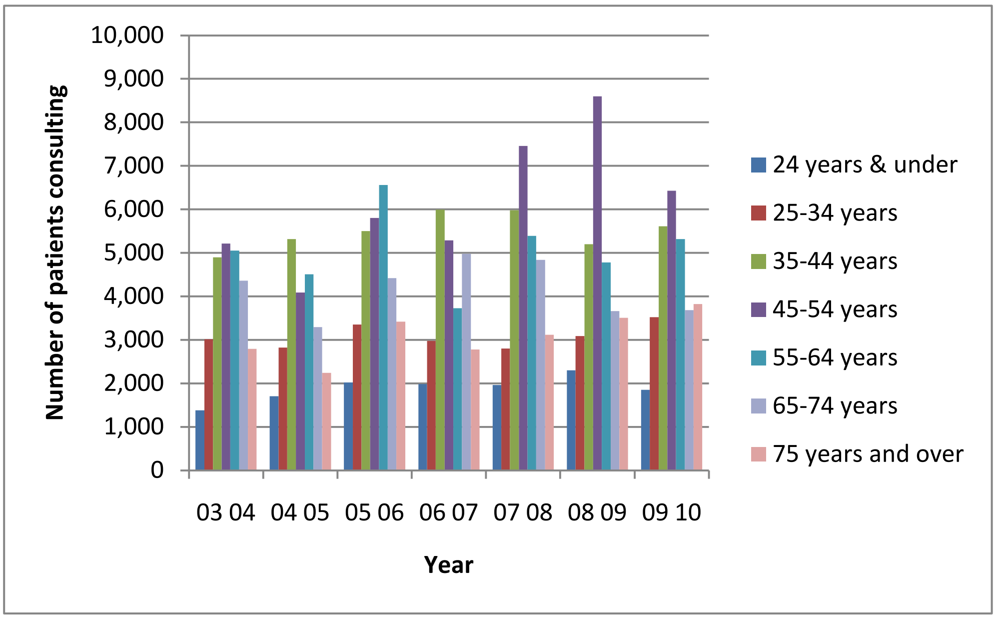
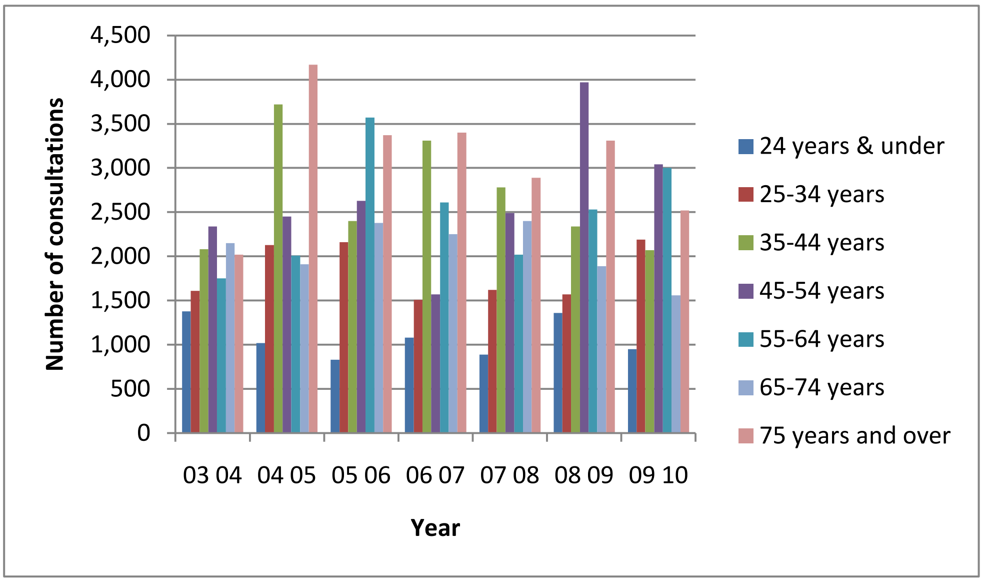
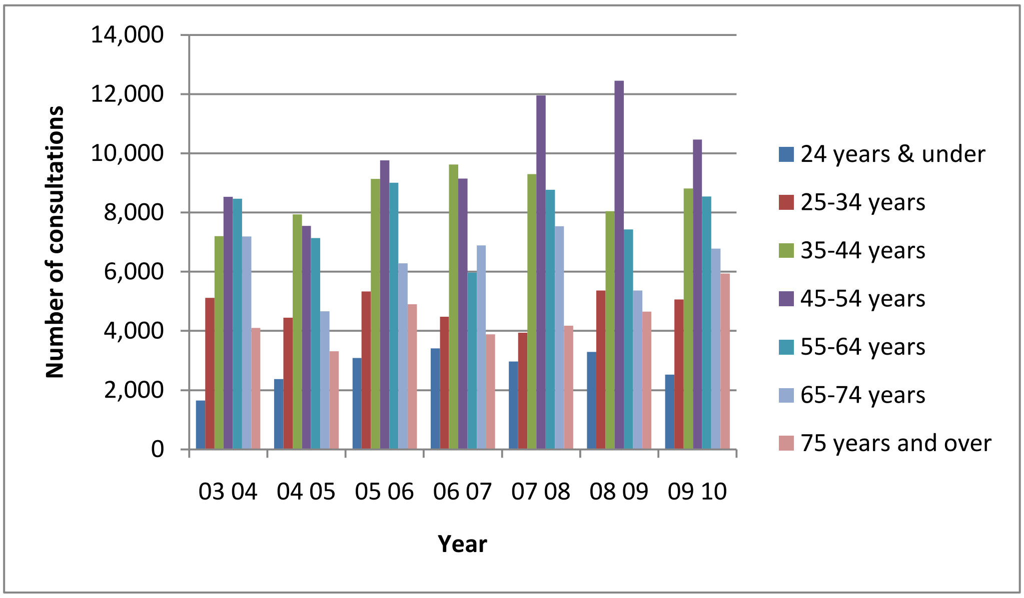


Figure 12. Number of consultations for bereavement: men



Women in middle age groups (35-44, 45-54, 55-64 years) had the highest numbers of consultations and these are more sustained across the seven year period than was apparent in men (Figure 13). For women aged 45-54 the number of consultations peaked at 12,450 in 2008/09. Older women, 75 years and more, had fewer consultations with a peak of 5,940 in 2009/10. In 2008/09 the number of consultations in older women was 4,650, about a third of the number of consultations for the 45-54 years age group.

Figure 13. Number of consultations for bereavement: women



It may be that there is raised awareness in general practice of older men who have been bereaved, particularly of a spouse, and some concern that they do worse than women and for this reason a consultation for bereavement is more likely to be coded as such. The explanation for consulting in middle aged people being more prevalent is more elusive, but may be due to this being a time when there is more exposure to death, for example, losing parents. Untimeliness of the event, for example, death of a child or of a peer may also be a reason for consulting more often.

4.3.4 Costing

In order to give an estimate of the total cost of bereavement to general practice in Scotland, ISD Scotland provided information for the study on the cost of consultation that is calculated using figures on overall funding provided for general practice and expenditure. The NHS Costs Book[17] provides information on overall funding for primary medical services, and it shows the expenditure on all general medical services in Scotland, in the year ending 31 March 2011, to be a little over £741 million. The current estimated number of GP and practice nurse consultations across Scotland (the year ending 31 March 2011) is roughly 23 million. On the basis of the costs and PTI figures some highly generalised statements can be made about how expenditure on general medical services has

[17] The NHS Costs book http://www.isdscotland.org/Health-Topics/Finance/Costs/

translated in terms of numbers of face to face consultations with patients. For example, in 2010/11, there was roughly one face to face patient contact with a GP or practice nurse per £32 of expenditure overall. This is the best available figure, though it should be noted that practice activity covers more than patient consultations.

This means that an estimated cost of consultations recorded to be for a bereavement related reason from the period 2009/10, based on the 60 representative GP practices used by the PTI, was £2,200,960 (63,460 GP/practice nurse consultations for bereavement + 5,320 counselling consultations x £32.00). In turn, it can be estimated that GP consultations made for bereavement related reasons account for an extremely small part of overall spending on general medical services in Scotland (i.e. 0.3%; £2.2M ÷ £741M x 100).

4.4 Conclusion

In contrast to the depth and complexity of the SLS as a dataset, and the time taken to prepare it for analyses, the PTI data were limited and analyses were rudimentary. As such it is necessary to be cautious in considering its value in illuminating primary healthcare experiences related to bereavement in Scotland. As indicated above, data is only gathered on consultations that are explicitly coded as bereavement related, and the estimated multiplier for costing is a crude one.

To summarise, the Practice Team Information data show a strikingly low prevalence of GP visits explicitly related to bereavement. The contrast to the secondary care findings from the SLS is highlighted when this is translated into an annual economic cost of about £2.2 million per year for NHS Scotland. Clearly one explanation for this rather counter-intuitive finding is that the impact of bereavement may be a causative factor in many GP visits that are not recorded explicitly as bereavement related. A further explanation may be that the bereaved seek less GP care for other illnesses and therefore are more likely to require hospitalisations for untreated conditions. Again this would cast bereavement as a diffuse influence that is hard to capture in routine datasets.

Accordingly, we believe the true cost of bereavement in terms of visits to Scottish GP practices is likely to be much more substantial.

5. The British Household Panel Survey

5.1 Context

The preceding two sections of the report have presented work with Scottish national datasets where various health-related impacts of bereavement were examined. However, we wished to look at some other socio-economic impacts where feasible. In the absence of Scottish national datasets on income and employment that seemed to be obviously linkable to bereavement data within the time span of our study, we decided to draw on a UK national dataset, the British Household Panel Survey (BHPS)[18]. Although this meant the data would not be exactly representative of the Scottish population, one of the potential advantages of the BHPS lay in its inclusion of data on health, income and employment for UK households. Accordingly this section of the report presents details of use of the BHPS dataset in the SECOB project. The context as regards bereavement and the impact on health has already been provided, in sections 3.1 and 4.1 above. Here a brief introduction to the types of impact in terms of income and employment are provided.

A key piece of research informing the development of SECOB was the study by Corden, Sloper and Sainsbury (2002) of parents who had cared for a disabled or chronically ill child who had subsequently died. It was found that bereaved families frequently suffered a long term effect on their income. In the time leading up to the death parents were often unable to continue working and faced increasing medical expenses. This, and funeral expenses as well as reduction in social welfare benefits at the time of the death led to further impoverishment in bereavement. Parents also indicated that re-engaging in work was both psychologically difficult and difficult in terms of finding work after having an extended period out with the workplace. Population statistics for 2002 in Stockholm County in Sweden also showed increasing financial burden for households in which one member was in the last three years of life, particularly for those in lower income groups (Hanratty et al. 2007). However, the changes in income in absolute and in relative terms provided differing perspectives. All income groups had overall increases in absolute income in the year studied, due

[18] British Household Panel Survey https://www.iser.essex.ac.uk/bhps

to increasing age and inflation. In relative terms, the income changes were most pronounced in low income groups, both in downwards and upwards directions. The supportive Swedish welfare system may account for some increases. Again, increased spending on health care in the last three years of life and reduced earnings from employment were seen to lead to lower income in bereavement for some families. A longitudinal study by (Evans et al. 2008) taking place in New York State over two years (1998-2000) also identified lower income in older people who had been bereaved of a spouse, close friend or family member.

The Normative Aging Study in the USA found that older men benefited in terms of their physical health if they were able to continue to work in the short and longer term after bereavement (Fitzpatrick and Bosse 2000). However, Alam et al (2012) found that there were gender differences in getting back to work for parents who had lost a child to cancer. In the time before the death fathers kept working while mothers were more likely to reduce their hours or take time off paid employment. Following bereavement, gender differences persisted with fathers returning to their jobs soon after the loss but mothers preferring to stay out of work to care for surviving children and manage the household in the short term. In the longer term fathers continued to work, though often in different roles and with changed attitudes to work, while mothers remained reluctant to return or were searching for new jobs.

The analysis we go on to describe below provides some insight to the effect on households in the UK of bereavement on income and employment as well as, in the first instance, health.

5.2 Data

The BHPS, a UK representative survey, is carried out within the Institute for Social and Economic Research at the University of Essex. It is an annual survey with the main objective of increasing understanding of social and economic change at the individual level and household level in Britain. The BHPS is also designed to identify, model and forecast such changes, the causes and their consequences respective to numerous socio-economic variables. An additional purpose is to provide a resource for research across a wide range of disciplines

(Taylor, Jenkins and Sacker 2009). It was, therefore, seen as a reliable data source for use in the SECOB project.

The BHPS began in 1991 with about 10,000 British adults participating from 5000 different households. Participant numbers increased in subsequent years, particularly in 1999 when a booster sample for Scotland and Wales was included and 2001 when Northern Ireland was included. From 2009 onwards the BHPS changed, and long-serving sample members of the BHPS were asked to join a larger survey, Understanding Society[19]. The SECOB project focused on the BHPS from 1991 to 2008, as the survey overall followed the same design and data was available at the beginning of the SECOB project in January 2011. However, the number of Scottish households surveyed in the BHPS was too small to yield adequate statistical power and it was decided to draw on data from across the UK to inform the study.

In terms of defining a bereaved individual the SECOB project only considered those participants who had lived with the deceased at some point between 1991 and 2008 prior to their death, as this was the only certain method to establish who had experienced bereavement. Some participants of the BHPS may have experienced bereavement outside the household or outside this time period, which would not have been detected or included in the present analyses.

5.3 Measures

Health

Health related variables measured in BHPS were a) visits to a GP, b) General Health Questionnaire-12 (GHQ-12) score (Goldberg and Williams 1988, McCabe et al. 1996), and c) self-reported health (Bierman et al. 1999). The GHQ-12 was anchored by 'Have you recently…' followed by 12 questions (e.g. 'felt you couldn't overcome your difficulties?'), on a scale from 1 (better than usual) to 4 (much less than usual). Self-reported health for the last 12 months was measured by asking participants to think back over the last 12 months and rate how their health had been compared to others their own age (1=excellent; 2=good; 3=fair; 4=poor; 5=very poor).

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[19] Understanding Society https://www.understandingsociety.ac.uk/

Income and employment

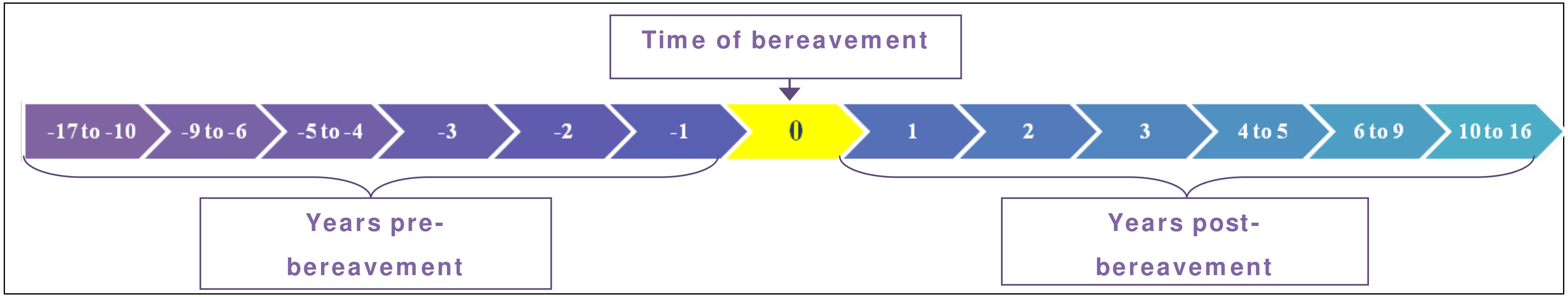
Household equivalised income was measured in the BHPS using the McClements Equivalence Scale, which takes the size and composition of the household into account when calculating their income. As a reference point, the scale uses the example of a couple with no children. In this way larger households are adjusted downwards and smaller households are adjusted upwards relative to this reference point (Jenkins 2010). It should be noted that an individual dying within a household thus has two impacts on household equivalised income. One, it reduces the number of individuals living within the household and two, it may impact on household income. Employment status was measured by a derived dummy variable (1=employed, 0=not employed).

5.4 Statistical analyses

In the preparation of the BHPS dataset the time of death of a household member was considered as the time point 0 (zero). The years pre and post bereavement were given as negative and positive values, respectively (Figure 14 below).

There were a low number of participants with available data at either end of the bereavement period, as a participant could take part in a maximum of 18 years (or waves) of data collection, from 1991 to 2008. Therefore, bereavement periods were grouped with the years 17 to 10 pre-bereavement transformed into one group, the years 9 to 6 pre-bereavement another group and the years 5 to 4 pre-bereavement a third group. The same grouping was applied post-bereavement where the years 10 to 16 were transformed into one group, the years 6 to 9 into another and the years 4 to 5 into a third group. The three years pre-bereavement, the time of bereavement, and the three years post-bereavement were not grouped together but analysed per year as the numbers of participants were higher for these time points. This means that there were sufficient numbers of participants in each grouping for the statistical analyses used. The identification of bereavement was only possible from 1992 onwards and it was unknown whether individuals had previously suffered bereavement. Therefore, the grouping for the post-bereavement period only went up to 10 to 16 years post bereavement and not 17 years as in the pre-bereavement period.

Figure 14. Timeline for analysis: definition of years pre-bereavement and post-bereavement



5.4.1 Propensity score matching

As for the SLS data, propensity score matching was used to control for the effects of confounding factors. See section 3.3.1 (p11) for a description of propensity score matching, its aims and adoption for the SECOB study. For BHPS data analysis, the propensity score matching was divided into two steps; 1) nearest-neighbour matching and 2) kernel-based matching based on the reference year 1991 and including all 10,264 participants. However, not all participants were included in the subsequent analyses comparing the bereaved relative to the matched controls, as some were not successfully matched.

First, a hypothetical bereavement year had to be created for the controls in order to compare pre- and post-bereavement differences between the controls and the bereaved. This was done using *nearest-neighbour-matching* (Guo & Fraser, 2009). Only respondents in 1991 were selected as the propensity score matching was based on their characteristics in 1991 (before any bereavement). Those who became bereaved sometime between 1992 and 2008, already had an actual bereavement year. In order to apply a *hypothetical* bereavement year to the controls, they were matched based on the variables described in Table 11. The controls were given the hypothetical bereavement year which corresponded to the bereaved individual they were most like based on the propensity score from the nearest neighbour matching. Now both the bereaved and the matched controls had a bereavement year.

Table 11. Variables used in the propensity score matching analyses

Variables	Description of variables
Age	Age
Gender	Gender
Health of household	Average self-reported health in the household for the past 12 months
GP visits	Whether or not an individual has visited their GP in the last 12 months
High education in household	Whether any member of household has higher education
Number of adults in household	Number of adults in the household
Oldest adult in household	Age of the oldest person in the household
Household equivalised income	Takes into account number and relationship between household members
Employment	Whether or not an individual is in employment

The second method, kernel-based matching, was applied in order to give the controls a weight for the likelihood of them becoming bereaved (Guo & Fraser, 2009). Again, the controls were matched with the bereaved based on the variables described in Table 11 above. The weight of the likelihood of the matched controls becoming bereaved based on their 1991 characteristics was included when comparing the bereaved relative to the matched controls using STATA 11.0.

In order to test whether the propensity score matching had successfully matched controls with the bereaved for 1991 (i.e. before any bereavement had occurred) regression analyses were employed (Table 12).

Table 12. Regression analyses testing differences between bereaved and matched controls on matching variables for 1991*

Variables	Coefficient	Standard Error	p-value	Adjusted R square
Age	-1.043	0.926	0.260	0.0002
Gender	-0.018	0.025	0.481	-0.0003
Health - household	-0.011	0.039	0.778	-0.0006
GP visit	-0.016	0.060	0.795	-0.0006
Education - household	0.021	0.024	0.388	-0.0002
Number of adults - household	0.089	0.044	0.045	0.0020
Age of oldest adult in household	0.127	0.756	0.866	-0.0006
Household equivalised income	317.623	455.345	0.486	-0.0003
Employment	0.045	0.025	0.075	0.0014
Household size	-0.022	0.008	0.006	0.0041

* Number of observations= 1554

There were no differences found in the bereaved and the matched controls in age, gender, average health of the household, whether they visited their GP or not, whether the household included an individual with higher education, the age of the oldest adult in the household, household equivalised income or employment, suggesting that these variables were matched successfully. However, there were significant differences in number of adults in the household (β=0.089; $p<0.05$; odds ratio=-1.05) and the size of the household (β=-0.022; $p<0.05$; odds ratio=-1.68), suggesting that even after applying the propensity score matching procedures the bereaved were more likely to have a larger number of adults in the household as well as a higher number of people in the household pre-bereavement.

5.4.2 Descriptive statistics

After applying propensity score matching to the non-bereaved sample in the BHPS there were 4,109 males and 3,619 females in the matched control group and 777 in the bereaved group (339 males and 438 females; based on 1991 sample only). The mean age across the matched control group was 58.34 (SD=18.58), with a mean age for males of 58.56 (SD=19.13) and for females of 58.34 (SD=18.16). The mean age across the bereaved group was 54.68 (SD=16.96), and a mean age for males of 54.91 (SD=17.51) and for females 54.51 (SD=16.54). The numbers of matched controls across the bereavement period are presented in Table 13 below, and numbers for the grouped bereavement periods are given in Table 14 (p 55). The number of individuals in Table 14 includes all people even if they did not respond to that particular wave. The number observations include only those who responded to a particular wave, and may have multiple responses during a bereavement period.

5.4.3 Statistical methods

Primary outcome measures

Differences between the bereaved and the matched control group were investigated using either logistic regression for dichotomous outcome variables (GP visits, employment), or linear regression for linear outcome variables (GHQ-12, health status, household equivalised income) as described below.

Table 13 Number of bereaved and matched controls across the bereavement period (including gender; based on participants answering BHPS questionnaire)

Group	Bereavement Period																	
	-17	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**-2**	**-1**	**0***
Bereaved	31	61	100	145	193	241	287	314	349	398	445	485	535	581	623	677	707	658
Males	10	24	41	58	78	98	119	136	152	174	193	215	237	255	273	290	307	284
Females	21	37	59	87	115	143	168	178	197	224	252	270	298	326	350	387	400	374
Matched control	465	777	1115	1550	1989	2478	2930	3154	3380	3718	4368	4499	4788	4805	4974	5163	5121	4909
Males	247	416	567	799	1006	1262	1510	1667	1773	1971	2363	2466	2599	2579	2614	2706	2634	2530
Females	218	361	548	751	983	1216	1420	1487	1607	1747	2005	2033	2189	2226	2360	2457	2487	2379
Group	**Bereavement Period**																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**		
Bereaved	616	547	496	445	390	339	295	255	226	191	155	134	100	74	51	25		
Males	262	225	202	178	159	134	116	98	86	74	62	53	38	29	19	11		
Females	354	322	294	267	231	205	179	157	140	117	93	81	62	45	32	14		
Matched control	4499	4157	3784	3412	3051	2658	2250	1980	1734	1419	981	781	524	397	205	54		
Males	2329	2159	1984	1772	1578	1368	1156	993	864	693	441	325	201	154	74	14		
Females	2170	1998	1800	1640	1473	1290	1094	987	870	726	540	456	323	243	131	40		

Note: numbers are based on number of observations in the BHPS per year for the derived bereavement period variable.

Table 14. Number of observations for the grouped bereavement periods*

Group	Bereavement Period											
Observations:	**-17 to -10**	**-9 to -6**	**-5 to -4**	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**	**4 to 5**	**6 to 9**	**10 to 16**
Bereaved (observations)	1372	1677	1116	623	677	707	658	616	547	496	835	1115	730
Bereaved Males	564	734	492	273	290	307	284	262	225	202	337	434	286
Bereaved Females	808	943	624	350	387	400	374	354	322	294	498	681	444
Matched control (observation)	14458	15965	9593	4974	5163	5121	4909	4499	4157	3784	6463	8622	4361
Matched control Males	7474	8573	5178	2614	2706	2634	2530	2329	2159	1984	3350	4381	1902
Matched control Females	6984	7392	4415	2360	2457	2487	2379	2170	1998	1800	3113	4241	2459

* Note: Number of observations for the grouped bereavement periods. Individuals may have multiple responses during the grouped bereavement periods.

Linear regression and logistic regression

Regression is a statistical method used to predict values of an outcome (the dependent variable) from one or more predictors (independent variables) (Coolican, 2004). For example, to predict the outcome of the GHQ-12 (the dependent variable) at different time points in the bereavement period (the independent variables) the GHQ-12 score was regressed on a dummy variable for each bereavement period (i.e. years both before, during and after bereavement). These variables were also interacted with an indicator for the bereaved group to capture the differences across the bereavement period in the bereaved and matched controls. By doing this, any changes or stability in the GHQ-12 measure between the matched control and the bereaved could be investigated throughout the bereavement period. Below we only report the coefficients for the interaction terms. By excluding the actual year of bereavement in the matched controls (year 0), the results of the regression analyses were interpreted in relation to the matched controls at the time point in which their hypothetical bereavement occurred.

A logistic regression, or logit model, was used when the outcome was dichotomous, for example, whether the individual visited the GP, or whether the individual was employed (yes/no responses). Here, the coefficients indicate how the log odds of, for example, a GP visit or employment differ across the bereavement periods. In order to improve the interpretation of logistic regression coefficients the exponential of the coefficient is taken to examine how odds ratio of visiting the GP changes between the bereaved and the matched control over the bereavement period.

Secondary outcome measures

In addition, age and gender were controlled when investigating the primary outcomes (listed above), as these are variables that are known to generate differences in outcomes (Howarth, 2007; Oliviere, Monroe & Payne, 2011). Subsequently, the analyses of primary outcomes were performed by investigating relative differences by gender for bereaved men or women and matched control men or women, controlling for age. Initially three age groups were investigated in relation to the primary outcome variables: ages 0 to 18;

ages 19 to 64, and ages 65 and over. However, those under 18 years of age do not get included in the full questionnaire leaving too few respondents under 19 years on which to perform statistical analyses as described. Differences within the two remaining age groups were therefore investigated, controlling for gender.

5.5 Results

5.5.1 Health

GP visits

Table 15 provides the results of the analysis that examined the likelihood of bereaved and matched controls visiting the GP. It was found that the bereaved were less likely to visit their GP relative to the matched controls at 5 to 4 years pre-bereavement (β=-0.268; $p<0.05$; OR=-0.57). The odds ratio (OR) for the coefficient was calculated with the coefficient expressed as the log odds (i.e. log(coeff)=odds ratio). This applies to all odds ratio calculations for GP visits and employment. No other significant differences were found at the 5% level.

Table 15. GP visits in the bereaved relative to matched controls (controlled for age and gender)

Control Variables	Coeff.	SE	p-value
Age	0.016	0.001	0.0001
Gender	-0.456	0.036	0.0001
Bereavement Period*			
-17 to -10	-0.157	0.090	0.081
-9 to -6	-0.145	0.087	0.094
-5 to -4	-0.268	0.108	0.013
-3	-0.046	0.147	0.757
-2	-0.004	0.140	0.975
-1	-0.077	0.137	0.572
0	0.074	0.146	0.613
1	0.159	0.153	0.298
2	-0.024	0.162	0.881
3	-0.106	0.171	0.536
4 to 5	0.009	0.129	0.944
6 to 9	-0.041	0.114	0.720
10 to 17	0.042	0.145	0.770
Constant	0.601	0.129	0.0001

Number of observations=103,224; Pseudo R^2=0.024; Coeff=Coefficient; SE=standard error.
*The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

GP visits within gender

Table 16 shows that bereaved women were less likely to have visited their GP in the time period 5 to 4 years pre-bereavement relative to matched control women (β=-0.423; $p<0.05$; OR=-0.37). In men the bereaved were less likely to visit their GP in the grouped periods 9 to 6 years pre-bereavement (β=-0.240; $p<0.05$; OR=-0.62) and 6 to 9 years post-bereavement (β=-0.343; $p<0.05$; OR=-0.47) relative to the matched controls (Table 17). No other significant differences were identified.

Table 16. GP visits in bereaved women relative to matched control women (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	0.009	0.001	0.000
-17 to -10	-0.080	0.126	0.529
-9 to -6	-0.058	0.125	0.641
-5 to -4	-0.423	0.155	0.006
-3	-0.124	0.208	0.551
-2	0.138	0.193	0.473
-1	-0.011	0.191	0.955
0	0.241	0.205	0.239
1	0.220	0.218	0.314
2	-0.008	0.224	0.973
3	-0.043	0.232	0.852
4 to 5	0.184	0.178	0.299
6 to 9	0.234	0.157	0.136
10 to 17	-0.088	0.181	0.627
Constant	0.904	0.177	0.000

Number of observations=50,720; Pseudo R^2=0.008; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 17. GP visits in bereaved men relative to matched control men (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	0.023	0.001	0.000
-17 to -10	-0.237	0.130	0.067
-9 to -6	-0.240	0.121	0.048
-5 to -4	-0.119	0.151	0.433
-3	0.042	0.210	0.840
-2	-0.156	0.205	0.446
-1	-0.142	0.198	0.473
0	-0.093	0.210	0.658
1	0.110	0.217	0.611
2	-0.023	0.235	0.922
3	-0.141	0.253	0.577
4 to 5	-0.179	0.190	0.347
6 to 9	-0.343	0.168	0.041
10 to 17	0.193	0.239	0.420
Constant	-0.153	0.187	0.413

Number of observations=52,504; Pseudo R^2=0.033; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

GP visits within age groups

Within the age group 19 to 64 years there were no significant differences between the bereaved and their matched controls (Table 18). In addition, there were no significant differences in the bereaved relative to the matched controls within the age group 65 and over (Table 19).

Table 18. GP visits in bereaved relative to matched controls within the age group 19 to 64 years (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	-0.262	0.057	0.0001
-17 to -10	-0.289	0.159	0.070
-9 to -6	-0.237	0.150	0.114
-5 to -4	-0.291	0.179	0.103
-3	0.024	0.246	0.923
-2	-0.098	0.223	0.662
-1	-0.028	0.216	0.897
0	0.135	0.225	0.547
1	-0.059	0.237	0.803
2	-0.301	0.259	0.245
3	-0.288	0.288	0.316
4 to 5	-0.101	0.206	0.624
6 to 9	-0.222	0.178	0.212
10 to 17	0.067	0.210	0.748
Constant	1.734	0.177	0.000

Number of observations=25,225; Pseudo R^2=0.0091; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 19. GP visits in bereaved relative to matched controls within the age group 65 and over (controlled for gender)

Bereavement Period*	Coeff.	SE.	P-value
Gender	-0.251	0.058	0.0001
-17 to -10	-0.290	0.164	0.077
-9 to -6	-0.229	0.155	0.139
-5 to -4	-0.302	0.182	0.097
-3	0.022	0.250	0.929
-2	-0.086	0.232	0.710
-1	-0.003	0.221	0.990
0	0.126	0.230	0.583
1	-0.040	0.241	0.869
2	-0.361	0.262	0.169
3	-0.355	0.294	0.227
4 to 5	-0.132	0.211	0.533
6 to 9	-0.214	0.183	0.243
10 to 17	0.046	0.216	0.833
Constant	1.758	0.181	0.000

Number of observations=23,876; Pseudo R^2=0.009; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

GHQ-12

The results displayed in Table 20 below indicate that the bereaved, as a group, reported significantly more distress (i.e. worse health) two years pre-bereavement (β=0.542; p< 0.05), one year pre-bereavement (β=0.436; p< 0.05), in the year of bereavement (β=2.038; p< 0.0001), and one year post-bereavement (β=0.767; p< 0.05). In addition, in the 10 to 16 years post-bereavement the bereaved reported more distress relative to the matched controls (β=0.401; p< 0.05).

Table 20. GHQ-12 in the bereaved relative to the matched controls (controlled for age and gender)

Control Variables	Coeff.	SE	p-value
Age	-0.014	0.002	0.0001
Gender	-0.635	0.054	0.0001
Bereavement Period*			
-17 to -10	-0.009	0.140	0.952
-9 to -6	-0.150	0.132	0.255
-5 to -4	0.218	0.164	0.184
-3	0.192	0.221	0.384
-2	0.542	0.211	0.001
-1	0.436	0.205	0.033
0	2.038	0.213	0.0001
1	0.767	0.224	0.001
2	0.204	0.235	0.384
3	0.244	0.246	0.321
4 to 5	0.112	0.189	0.555
6 to 9	-0.028	0.162	0.863
10 to 16	0.401	0.204	0.049
Constant	2.407	0.194	0.0001

Number of observations= 18,728; R^2= 0.0247; Adj. R^2= 0.0234; Coeff.= coefficient; SE= standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

GHQ-12 within gender

In women, the bereaved reported significantly higher levels of distress two years pre-bereavement (β=0.660; p< 0.05), one year pre-bereavement (β=0.573; p< 0.05), in the year of bereavement (β=2.494; p<0.0001) and one year post-bereavement (β=1.181; p<0.0001) (Table 21). In men, the bereaved reported significantly higher levels of distress in the year of bereavement (β=1.446; p<0.0001) relative to their matched controls (Table 22). There were no other significant differences found for both men and women at the 5% level of significance.

Table 21. GHQ-12 in bereaved women relative to matched control women (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	-0.016	0.002	0.000
-17 to -10	-0.145	0.192	0.448
-9 to -6	0.009	0.184	0.963
-5 to -4	0.136	0.230	0.554
-3	0.061	0.305	0.841
-2	0.660	0.290	0.023
-1	0.573	0.280	0.041
0	2.494	0.291	0.000
1	1.181	0.305	0.000
2	0.406	0.319	0.203
3	0.258	0.332	0.437
4 to 5	0.335	0.252	0.184
6 to 9	0.163	0.213	0.443
10 to 16	0.338	0.260	0.195
Constant	2.542	0.264	0.000

Number of observations=10,822; Adjusted R^2=0.022; Coeff.=coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

GHQ-12 within age groups

Table 23 shows that in the age group 19 to 64 the bereaved reported significantly more distress in the year of the bereavement relative to their matched controls (β=2.026; p<0.0001). In the time period 10 to 16 years post-bereavement the bereaved 19 to 64 year olds also reported higher levels of distress (β=0.840; p<0.05). This trend was also evident in the group aged 65 and over, as the bereaved reported significantly higher levels of distress in the year of bereavement (β=2.037; p<0.0001) and the time period 10 to 16 years post bereavement (β=0.829; p<0.05) (Table 24).

Table 22. GHQ-12 in bereaved men relative to matched control men (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	-0.012	0.002	0.000
-17 to -10	0.185	0.204	0.366
-9 to -6	-0.349	0.186	0.061
-5 to -4	0.338	0.232	0.146
-3	0.367	0.315	0.244
-2	0.398	0.305	0.192
-1	0.261	0.298	0.382
0	1.446	0.310	0.000
1	0.223	0.326	0.493
2	-0.061	0.344	0.859
3	0.241	0.363	0.508
4 to 5	-0.207	0.285	0.466
6 to 9	-0.332	0.250	0.183
10 to 16	0.493	0.334	0.140
Constant	1.608	0.281	0.000

Number of observations=7906; Adjusted R^2=0.009; Coeff.=coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 23. GHQ-12 in bereaved relative to matched controls within the age group 19 to 64 years (controlled for gender)

Bereavement Period*	Coeff.	SE	P-value
Gender	-0.548	0.080	0.000
-17 to -10	-0.098	0.241	0.683
-9 to -6	-0.277	0.211	0.190
-5 to -4	0.148	0.260	0.570
-3	0.190	0.344	0.581
-2	0.524	0.320	0.102
-1	0.166	0.300	0.579
0	2.026	0.311	0.000
1	0.590	0.329	0.072
2	0.124	0.343	0.718
3	0.426	0.356	0.231
4 to 5	0.046	0.275	0.867
6 to 9	0.131	0.232	0.573
10 to 16	0.840	0.280	0.003
Constant	1.354	0.254	0.000

Number of observations=9,014; Adjusted R^2=0.019; Coeff.=coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 24. GHQ-12 in bereaved relative to matched controls within the age group aged 65 and over (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	-0.546	0.082	0.000
-17 to -10	-0.070	0.249	0.779
-9 to -6	-0.317	0.217	0.144
-5 to -4	0.092	0.266	0.728
-3	0.143	0.353	0.686
-2	0.490	0.330	0.137
-1	0.136	0.307	0.657
0	2.037	0.317	0.000
1	0.636	0.336	0.059
2	0.084	0.350	0.810
3	0.454	0.365	0.213
4 to 5	0.007	0.281	0.981
6 to 9	0.116	0.237	0.626
10 to 16	0.829	0.285	0.004
Constant	1.362	0.259	0.000

Number of observations=8,657; Adjusted R^2=0.019; Coeff.=coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Self-reported health status

The bereaved reported significantly better self-reported health (i.e. for the last 12 months) than the matched control in both the 17 to 10 year pre-bereavement period (ß=-0.176, $p<0.0001$) and the nine to six year pre-bereavement period (ß=-0.183, $p<0.0001$) (Table 25). Self reported health was scored on a scale from 1 (excellent) to 5 (very poor).

Table 25. Self-reported health status in the bereaved relative to matched controls (controlled for age and gender)

Control Variables	Coeff.	SE	p-value
Age	0.010	0.000	0.0001
Gender	-0.094	0.014	0.0001
Bereavement Period*			
-17 to -10	-0.176	0.037	0.0001
-9 to -6	-0.183	0.036	0.0001
-5 to -4	-0.051	0.044	0.245
-3	-0.066	0.059	0.265
-2	-0.094	0.056	0.092
-1	-0.020	0.055	0.708
0	-0.003	0.057	0.959
1	-0.041	0.059	0.493
2	-0.043	0.062	0.490
3	-0.111	0.066	0.095
4 to 5	-0.035	0.051	0.500
6 to 9	-0.071	0.043	0.099
10 to 17	0.001	0.052	0.992
Constant	1.817	0.052	0.0001

Number of observations=17,978; R^2=0.048; Adj. R^2=0.046; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Self-reported health status within gender

In women, the bereaved reported significantly better self-reported health status in the periods 17 to 10 years pre-bereavement (β=-0.187; $p<0.0001$) and nine to six years pre-bereavement (β=-0.155; $p<0.05$; Table 26) than the matched control. There were no other significant differences in bereaved women and matched control women at any other time point pre- or post-bereavement. Bereaved men also reported significantly better health in the grouped bereavement periods 17 to 10 years pre-bereavement (β=-0.178; $p<0.05$) and nine to six years pre-bereavement (β=-0.235; $p<0.0001$; Table 27). In addition, bereaved men reported significantly better health three years pre-bereavement (β=-0.177; $p<0.05$), two years pre-bereavement (β=-0.194; $p<0.05$), three years post- bereavement (β=-0.208; $p<0.05$) and in the grouped period four to five years post bereavement (β=-.162; $p<0.05$), relative to their matched control group.

Table 26. Self-reported health status in bereaved women relative to matched control women (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	0.010	0.001	0.000
-17 to -10	-0.187	0.048	0.000
-9 to -6	-0.155	0.048	0.001
-5 to -4	-0.026	0.059	0.656
-3	0.020	0.078	0.795
-2	-0.021	0.073	0.772
-1	0.008	0.071	0.912
0	0.036	0.074	0.632
1	-0.030	0.078	0.700
2	-0.039	0.080	0.626
3	-0.056	0.086	0.512
4 to 5	0.056	0.066	0.391
6 to 9	-0.039	0.054	0.479
10 to 17	0.014	0.064	0.821
Constant	1.777	0.067	0.000

Number of observations=10,338; Adjusted R^2=0.042; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 27. Self-reported health status in bereaved men relative to matched control men (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	0.010	0.001	0.000
-17 to -10	-0.178	0.055	0.001
-9 to -6	-0.235	0.052	0.000
-5 to -4	-0.063	0.064	0.323
-3	-0.177	0.087	0.042
-2	-0.194	0.083	0.020
-1	-0.057	0.082	0.482
0	-0.053	0.085	0.535
1	-0.062	0.088	0.483
2	-0.050	0.094	0.592
3	-0.208	0.100	0.037
4 to 5	-0.162	0.078	0.037
6 to 9	-0.123	0.067	0.069
10 to 17	-0.029	0.088	0.737
Constant	1.780	0.077	0.000

Number of observations=7,633; Adjusted R^2=0.048; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Self-reported health status within age groups

Table 28 shows that in the age group 19 to 64 the bereaved relative to the matched control group reported significantly better self-reported health in the grouped bereavement periods 17 to 10 years pre-bereavement (β=-0.441; $p<0.0001$), the nine to six years pre-bereavement (β=-0.398; $p<0.0001$), and five to four years pre-bereavement (β=-0.139; $p<0.05$) relative to their matched controls. Those aged 19 to 64 also reported better health one year post-bereavement (β=-0.205; $p<0.05$), three years post-bereavement (β=-0.251; $p<0.05$), and six to nine years post bereavement (β=-0.155; $p<0.05$) in relation to their matched controls.

Table 28. Self-reported health status in bereaved relative to matched controls within the age group 19 to 64 years (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	-0.104	0.021	0.000
-17 to -10	-0.441	0.062	0.000
-9 to -6	-0.398	0.057	0.000
-5 to -4	-0.139	0.069	0.044
-3	-0.171	0.091	0.061
-2	-0.134	0.084	0.110
-1	-0.117	0.080	0.141
0	-0.064	0.082	0.432
1	-0.205	0.085	0.016
2	-0.163	0.089	0.066
3	-0.251	0.093	0.007
4 to 5	-0.097	0.073	0.186
6 to 9	-0.155	0.061	0.011
10 to 17	-0.007	0.071	0.927
Constant	2.676	0.066	0.000

Number of observations=8,775; Adjusted R^2=0.024; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Those bereaved individuals aged 65 and over also reported better health in the grouped bereavement period 17 to 10 years pre-bereavement (β=0-.437;

p<0.0001), the nine to six years pre-bereavement (β=-0.413; p<0.0001) and five to four years pre-bereavement (β=-0.148; p<0.05), in relation to their matched controls. The bereaved aged over 65 also reported better health in the year after the bereavement (β=-0.192; p<0.05), three years after bereavement (β=-0.265; p<0.05) and in the six to nine years post bereavement (β=-0.154; p<0.05) in relation to their matched controls (Table 29).

Table 29. Self-reported health status in bereaved relative to matched controls within the age group 65 and over (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	-0.108	0.022	0.000
-17 to -10	-0.437	0.064	0.000
-9 to -6	-0.413	0.058	0.000
-5 to -4	-0.148	0.071	0.036
-3	-0.167	0.093	0.074
-2	-0.142	0.086	0.101
-1	-0.115	0.081	0.158
0	-0.067	0.083	0.419
1	-0.192	0.087	0.027
2	-0.165	0.091	0.069
3	-0.265	0.095	0.005
4 to 5	-0.103	0.074	0.165
6 to 9	-0.154	0.062	0.013
10 to 17	-0.018	0.073	0.801
Constant	2.688	0.067	0.000

Number of observations=8,432; Adjusted R^2=0.024; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

5.5.2 Income

In the grouped time period 10 to 16 years post-bereavement the bereaved earned significantly more relative to the matched controls (β=2117.619, p<0.0001; Table 30). There were no other significant differences in household equivalised income in the bereaved relative to the matched controls when controlling for both age and gender.

Table 30. Household equivalised income in bereaved relative to matched controls (controlled for age and gender)

Control Variables	Coeff.	SE	p-value
Age	-198.894	6.072	0.0001
Gender	1029.372	209.916	0.0001
Bereavement Period*			
-17 to -10	-410.552	548.334	0.454
-9 to -6	-238.704	513.525	0.642
-5 to -4	-502.814	640.087	0.432
-3	-475.008	861.395	0.581
-2	262.676	822.740	0.750
-1	154.119	801.590	0.848
0	-425.437	828.067	0.607
1	-178.427	867.350	0.837
2	-394.262	914.694	0.666
3	-600.494	955.821	0.530
4 to 5	-181.470	735.965	0.805
6 to 9	1130.463	630.026	0.073
10 to 16	2117.619	795.822	0.008
Constant	30704.58	754.105	0.0001

Number of observations=18,892; R^2=0.076; Adj. R^2=0.075; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Income within gender

In women, the bereaved also had a significantly higher household equivalised income in the grouped bereavement period 10 to 16 years post-bereavement (β=2514.758, $p<0.05$; Table 31). In men, however, there were no significant differences in household equivalised income in the bereaved and matched controls throughout the years pre- and post-bereavement (Table 32).

Table 31. Household equivalised income in bereaved women relative to matched control women (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	-223.832	7.685	0.000
-17 to -10	39.121	681.806	0.954
-9 to -6	-699.356	652.583	0.284
-5 to -4	-375.298	814.360	0.645
-3	-5.376	1086.238	0.996
-2	400.190	1030.732	0.698
-1	212.518	998.861	0.832
0	-1506.010	1030.496	0.144
1	-513.157	1077.658	0.634
2	-707.751	1131.269	0.532
3	-1491.674	1178.699	0.206
4 to 5	-827.302	895.741	0.356
6 to 9	1021.123	754.396	0.176
10 to 16	2514.758	924.322	0.007
Constant	31948.240	932.867	0.000

Number of observations=10,893; Adjusted R^2= 0.091; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 32. Household equivalised income in bereaved men relative to matched control men (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	-167.353	9.765	0.000
-17 to -10	-1006.242	900.890	0.264
-9 to -6	305.077	820.861	0.710
-5 to -4	-670.727	1021.651	0.512
-3	-1033.642	1389.418	0.457
-2	103.900	1338.279	0.938
-1	99.165	1312.385	0.940
0	1026.547	1358.122	0.450
1	283.941	1425.649	0.842
2	42.414	1513.593	0.978
3	662.478	1588.131	0.677
4 to 5	755.989	1245.443	0.544
6 to 9	1354.956	1092.471	0.215
10 to 16	1154.548	1462.561	0.430
Constant	30117.910	1230.372	0.000

Number of observations=7,999; Adjusted R^2= 0.0581; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Income within age groups

In the age group 19 to 64 the bereaved had a significantly higher household equivalised income in the year before bereavement relative to their matched controls (β=2148.972; p<0.05). In the grouped bereavement periods six to nine years post-bereavement (β=2497.637; p<0.0001) and 10 to 16 years post-bereavement (β=1841.629; p<0.05) the bereaved also had a higher household equivalised income relative to their matched controls (Table 33).

Table 33. Household equivalised income in bereaved relative to matched controls within the age group 19 to 64 years (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	1382.197	216.933	0.000
-17 to -10	238.896	656.866	0.716
-9 to -6	604.628	575.792	0.294
-5 to -4	303.416	703.331	0.666
-3	49.779	937.249	0.958
-2	1539.860	868.047	0.076
-1	2148.972	819.452	0.009
0	257.571	841.461	0.760
1	743.017	883.445	0.400
2	680.618	931.090	0.465
3	1630.655	963.219	0.091
4 to 5	1820.808	743.636	0.014
6 to 9	2497.637	627.953	0.000
10 to 16	1841.629	761.397	0.016
Constant	13757.820	679.573	0.000

Number of observations=9,165; Adjusted R^2=0.044; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Those aged 65 and over, and were bereaved, also had a significantly higher household equivalised income in the grouped bereavement period four to five years post-bereavement (β=1788.919; p<0.05), six to nine years post-bereavement (β=2607.279; p<0.0001) and 10 to 16 years post bereavement (β=1899.262; p<0.05) relative to their matched controls (Table 34).

Table 34. Household equivalised income in bereaved relative to matched controls within the age group aged 65 and over (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	1431.877	221.147	0.000
-17 to -10	247.445	675.612	0.714
-9 to -6	557.048	589.551	0.345
-5 to -4	357.847	714.723	0.617
-3	264.439	955.926	0.782
-2	1498.638	888.742	0.092
-1	2025.225	833.777	0.015
0	238.260	853.531	0.780
1	809.568	899.784	0.368
2	822.551	946.108	0.385
3	1673.749	980.640	0.088
4 to 5	1788.919	755.632	0.018
6 to 9	2607.279	638.164	0.000
10 to 16	1899.262	772.714	0.014
Constant	13673.180	688.218	0.000

Number of observations=8,805; Adjusted R^2=0.046; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

5.5.3 Employment

In the year of bereavement (β=-0.341; p<0.05; OR=-0.47), and two years post-bereavement (β=-0.419; p<0.05; OR=-0.38) the bereaved population, in general, was less likely to be employed relative to the matched controls (see Table 35).

Table 35. Likelihood of employment in bereaved relative to matched controls (controlled for age and gender)

Control Variables	Coefficient	SE	p-value
Age	-0.109	0.002	0.0001
Gender	0.377	0.039	0.0001
Bereavement Period*			
-17 to -10	-0.048	0.101	0.631
-9 to -6	0.028	0.097	0.774
-5 to -4	-0.017	0.121	0.886
-3	0.025	0.164	0.879
-2	-0.108	0.155	0.489
-1	-0.166	0.153	0.278
0	-0.341	0.160	0.034
1	-0.156	0.165	0.344
2	-0.419	0.175	0.017
3	-0.213	0.185	0.248
4 to 5	-0.091	0.142	0.522
6 to 9	0.083	0.121	0.495
10 to 17	0.149	0.155	0.334
Constant	5.939	0.156	0.0001

Number of observations=103,112; Pseudo R^2=0.354; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Employment within gender

In women the bereaved were less likely to be employed in the year of bereavement (β=-0.522; $p<0.05$; OR=-0.28) and two years post-bereavement (β=-0.642; $p<0.05$; OR=-0.19; Table 36). In men, however, there were no significant differences between the bereaved and matched controls across the bereavement period investigated (Table 37).

Table 36. Employment in bereaved women relative to matched control women (controlled for age)

Bereavement period*	Coeff.	SE	p-value
Age	-0.109	0.002	0.000
-17 to -10	-0.048	0.132	0.718
-9 to -6	-0.116	0.130	0.371
-5 to -4	-0.139	0.163	0.394
-3	0.021	0.218	0.924
-2	-0.278	0.206	0.178
-1	-0.245	0.204	0.231
0	-0.522	0.214	0.015
1	-0.382	0.219	0.082
2	-0.642	0.233	0.006
3	-0.400	0.246	0.104
4 to 5	-0.105	0.185	0.572
6 to 9	0.075	0.158	0.634
10 to 17	0.026	0.198	0.897
Constant	6.009	0.204	0.000

Number of observations=50,657; Pseudo R^2=0.351; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 37. Employment in bereaved men relative to matched control men (controlled for age)

Bereavement Period*	Coeff.	SE	p-value
Age	-0.109	0.002	0.000
-17 to -10	-0.059	0.156	0.705
-9 to -6	0.210	0.145	0.149
-5 to -4	0.133	0.182	0.464
-3	0.026	0.247	0.915
-2	0.111	0.237	0.638
-1	-0.071	0.233	0.761
0	-0.113	0.244	0.644
1	0.136	0.252	0.589
2	-0.133	0.267	0.617
3	0.024	0.281	0.933
4 to 5	-0.078	0.219	0.723
6 to 9	0.083	0.190	0.664
10 to 17	0.263	0.254	0.301
Constant	6.228	0.241	0.000

Number of observations=52,455; Pseudo R^2=0.359; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Employment within age groups

There were no significant differences in employment in the bereaved relative to the matched controls in the 19 to 64 age group (Table 38) or the 65 and over age group (Table 39).

Table 38. Employment in bereaved relative to matched controls within the age group 19 to 64 years (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	0.346	0.081	0.000
-17 to -10	0.114	0.227	0.615
-9 to -6	0.239	0.199	0.231
-5 to -4	0.097	0.242	0.687
-3	-0.177	0.347	0.609
-2	-0.145	0.316	0.646
-1	-0.259	0.312	0.407
0	-0.421	0.321	0.190
1	-0.121	0.334	0.716
2	-0.669	0.362	0.064
3	-0.176	0.407	0.665
4 to 5	-0.371	0.297	0.212
6 to 9	-0.186	0.257	0.467
10 to 17	0.068	0.298	0.820
Constant	-2.547	0.240	0.000

Number of observations=25,204; Pseudo R^2=0.011; Coeff=Coefficient; SE=standard error

* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

Table 39. Employment in bereaved relative to matched controls within the age group 65 and over (controlled for gender)

Bereavement Period*	Coeff.	SE	p-value
Gender	0.351	0.087	0.000
-17 to -10	0.008	0.251	0.975
-9 to -6	0.211	0.217	0.332
-5 to -4	0.082	0.256	0.748
-3	-0.016	0.370	0.965
-2	-0.347	0.342	0.310
-1	-0.376	0.346	0.278
0	-0.555	0.354	0.117
1	-0.155	0.362	0.669
2	-0.444	0.378	0.240
3	-0.241	0.451	0.593
4 to 5	-0.324	0.319	0.310
6 to 9	-0.135	0.267	0.613
10 to 17	0.022	0.321	0.945
Constant	-2.660	0.255	0.000

Number of observations=23,855; Pseudo R^2=0.011; Coeff=Coefficient; SE=standard error
* The bereavement period variables represent the interactions terms and therefore the relative difference at each point over the bereavement period between the bereaved and the matched controls. The changing probability of GP visit for the matched control group is also controlled for in the analysis but these coefficients are not reported.

5.5.4 Summary of main findings

This section brings together key findings from the BHPS analyses provided in detail in the sections above, summarises them and provides some discussion of what this means:

a) The bereaved were significantly less likely to visit their GP, relative to the matched controls at 5 to 4 years pre-bereavement ($p<0.05$).
b) GHQ-12 scores indicated the bereaved, as a group, reported significantly more distress (i.e. worse health) two years pre-bereavement ($p<0.05$), one year pre bereavement ($p<0.05$), in the year of the bereavement ($p<0.001$), and in the year after bereavement ($p<0.05$). In the 10 to 16 years post-bereavement the bereaved also reported significantly higher GHQ-12 scores indicating more distress relative to the matched controls ($p<0.05$).

c) The bereaved reported significantly better self-reported health (i.e. for the last 12 months) in both the 17 to 10 year pre-bereavement period ($p<0.001$) and the 9 to 6 year pre-bereavement period ($p<0.001$).
d) The bereaved had a significantly higher household equivalised income in the period 10 to 16 years post-bereavement ($p<0.05$), relative to the matched controls.
e) The bereaved were significantly less likely to be employed in the year of bereavement ($p<0.05$) and two years post bereavement ($p<0.05$), relative to the matched controls.

There were no other significant differences between the bereaved relative to the matched controls at any other time point in the bereavement period for the variables investigated using BHPS data (i.e. whether or not visiting their GP, GHQ-12, self-reported health, household equivalised income or employment).

Only in the GHQ-12 analysis was there evidence of a sustained effect of bereavement, where the bereaved showed significantly more ill health or distress in the two years ahead of bereavement, the year of bereavement and the year afterwards. This kind of trend may be as expected and is also reflected in the wider bereavement literature, for example, Utz, Caserta and Lund (2012) found this to be the case in a sample of spousally bereaved individuals.

The analysis also showed that the bereaved are less likely to visit their GP in the years following their loss. However, King et al (2013) identified a slightly higher consultation rate in a cohort of bereaved spouses and partners of people who had died of cancer compared with controls (incidence rate ratio 1.06). The PTI analysis to some extent supports both by identifying overall low numbers consulting for bereavement, and low level cost to the NHS in Scotland. Data recording anomalies may account for some discrepancy between the data and actuality for PTI, but consideration of the large longitudinal BHPS study may give more confidence in saying that low level engagement with bereaved relatives in general practice is the reality.

Less likelihood of the bereaved being employed relative to matched controls, as found in the BHPS analysis, may be intuitively the case and previous studies of unpaid carers support the finding that carers find it difficult to sustain working alongside caring responsibilities (Arksey 2002). Re-engaging with work in the years and months following bereavement is also difficult for some carers. For others, non carers who are bereaved, taking time off afterwards can be problematic, as demonstrated in a recent article on the BBC website[20] which argues for legislation to make bereavement leave a right. Depending on the relationship to the deceased, circumstances of the death, support available and other factors people may have a range of needs as regards going back to work. Currently different policies and needs of employers may hamper a return to work that is beneficial to both parties. Further analysis and discussion of issues related to work follow in the next section of this report.

The BHPS results additionally showed significant differences in self reported health and household equivalised income between bereaved and controls which occur at time periods many years before and after the bereavement. Propensity score matching and the use of the control group in our study to reduce the effect of confounding factors indicates it was the bereavement which caused the differences. However, without further analysis and identification of trends commentary on why this might be the case was not considered possible.

5.5.5 Strengths and limitations of BHPS

The key strength of using BHPS in the SECOB study was its coverage of three areas of particular interest, namely, health, income and employment. It was also possible to compare trends before and after bereavement for BHPS members who had been bereaved, and a matched control group. However, the main BHPS variables have limitations in terms of the formulation of their answering categories and bases for comparison. The GHQ-12, for instance, has been criticised because of difficulties resulting from the item phrasing used, and variance in participants' distress (Cornelius et al. 2013, Smith et al. 2013). Asking respondents to compare their usual health status with their current health status makes individual GHQ scores incomparable (within persons and between persons) because of different points of reference. Scoring can be artificially low if a person with chronic ill health responds that their current

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[20] Should everybody get paid bereavement leave? http://www.bbc.co.uk/news/magazine-21841950

status is no different from usual (Cornelius et al. 2013, Smith et al. 2013). For example, if an individual never lost sleep over worrying before bereavement and does that sometimes since bereavement, they would probably answer ‘rather more than usual’ the first time the question is answered after bereavement. A year later (BHPS collects data annually), when sometimes losing sleep over worrying has become usual, the person could answer ‘no more than usual’, while the frequency of losing sleep actually has not changed. Yet, the score would at the first wave be 3, while at the second it would be 2, suggesting a drop of worrying while trying to sleep.

In terms of the self reported health scale, the same major limitation applies in that it is also heavily dependent on personal views and may differ greatly from medical examination (Liu et al. 2010). Again, this means that the measure is not directly comparable within and between persons. In addition the BHPS analysis combines very different types of bereavement and therefore the final estimates are only an average of the bereavement effect for all these individuals.

6. NHS board data

6.1 Context

This section provides details of the use of a further dataset received by the SECOB project team from one health board in Scotland, containing information about the impact of bereavement on employment related factors like days lost from work, and employee absence post bereavement. It was used in the study to shed some light on the time taken off after bereavement and what this may mean for the bereaved person and for the organisation. How much time adults will spend off work though their bereavement is challenging to assess and very little data of this nature exists. This exploratory exercise on a limited data set points to a number of important issues for future attention.

It has been suggested that up to 5% of the working population are, at any one time, on leave for bereavement (Wojcik 2000). The length of absence may depend on who has died, for example, the death of a child for a parent may result in a greater number of days off. An estimate of 1-12 weeks was identified by Gibson, Gallagher and Jenkins (2010) for those bereaved of a child by suicide. Flexibility around bereavement is a requirement for companies, though in reality there is much variability and lack of understanding among employers and employees (Charles-Edwards 2005). When there is support for grief in the workplace it means bereaved workers can generally return to productivity fairly soon, morale in the workplace is improved, and the amount of sick leave is minimised (McGuinness 2007). Savings may, therefore, be made in the long term when it has been suggested that bereavement costs *'billions of dollars'* to companies (Eyetsemitan 1998).

6.2 Data

The data was from an NHS board in Scotland that was making enquires of its employee absence recording system to quantify numbers of days staff take off work due to bereavement. Ethical approval was received from the board for the SECOB study to use the data, and no identifiable information was provided. The data reported below provides some insight of the impact of bereavement on employment related factors, in this case days lost from work.

Data reported here were collected over a period of 34 months (May 2008-February 2011). In this time there were 25,875 absences and of these 161 were known to have been due to bereavement. However, 969 were also of unknown origin and a proportion of these may have also been for bereavement. Of the 161, the absentee had returned to work in 153 cases (closed cases) and eight cases remained open with the employee still absent. There were 153 female (95%) and 8 male (5%) absentees, possibly reflecting the gender make up of employees within the organisation. The relationship between the absentee and the deceased was known in 100 of the closed cases, and for five absences there were two deceased recorded. Data was collected from employees in a range of job groups: Nursing/Midwifery; Administrative Services; Support Services; Personal and Social Care; Allied Health Profession; Healthcare Sciences. No data was provided for medical staff. One hundred and four absentees were in Nursing/Midwifery roles.

The board provides employees with up to one working week of paid leave in the event of the death of a close family member or dependent. This can be extended for a second week with discretionary payment or non payment depending on the circumstances of the bereaved employee (i.e. relationship, travel needs). This means that a two week period is available before any ensuing period of sickness absence.

6.3 Results

6.3.1 Relationship to deceased

Exploration of the data identified the relationship between the employee and the deceased and the mean number and spread of days off work for each relationship. However, in a third of cases information about the relationship had not been provided by the employee and was unavailable for analysis. For the cases in which this information was available, most employees (n=71, 46%) who had time off work related to bereavement had lost a parent in the three year data collection period. Loss of a partner accounted for only 10 absences (whether ‘partner’ includes spouse or not is unclear). Mean lengths of time off ranged from 25.9 for loss of a sibling to 52.8 days when the loss was of a child.

For all relationships the mean number of days off work related to bereavement exceeded the two week period allowed.

6.3.2 Days off for bereavement by job group

Data on the job group of employees taking days off work for bereavement indicated that those in nursing and midwifery roles make up the largest group taking time off. Nurses and midwives are the largest group of employees in the NHS in Scotland (42.7%)[21], and their representation in this way is unsurprising. Across the period of data collection there were 104 (65%) absences for bereavement recorded for nurses and midwives with a mean length of absence of 32.2 days. For the other roles included in the dataset (administration, allied health profession, health care sciences, personal and social care, support services) the mean number of days off work for bereavement for each group was also in excess of the two week limit set by the board.

The data presented above provides insight to bereavement related absence from work for one organisation. This type of data is difficult to identify across organisations in Scotland and by SECOB having access to this small dataset a range of interesting questions for further research have arisen. In terms of the health board, the impact of bereavement absences on staff schedules and service quality may be a key consideration. We wonder what the health board thinks about this and how it is being addressed. We also wonder how rates compare with other public and private sector services in Scotland. In terms of the type of roles of employees, it may be particularly hard for some engaged in health related services to re-engage with their jobs after bereavement. For example, for nurses and midwives there may be emotional or psychological impact on staff who have to provide care to dying patients and their families soon after a personal loss. In addition, when a large proportion of employees in an organisation are women, as is the norm in health care settings, some of those whose partner or elderly parent has died may have to take on additional roles in child care or care for a remaining elderly parent. Making new care arrangements can take much emotional endeavour and long lengths of time. These kinds of questions are important in the socio-economic context and

[21] NHS Workforce information, ISD Scotland http://www.isdscotland.org/Health-Topics/Workforce/Nursing-and-Midwifery/

demonstrate how little is actually known or in the public arena at the moment. This small exploratory exercise has set off new lines of enquiry and debate that may lead to further research.

7. Conclusion: developing methodology to gauge the socio-economic impacts of bereavement

The preceding sections of this technical report have presented details of each of the datasets used in the study, methods of analysis, results achieved, and related respective strengths and limitations. We hope that this will be of value to those with an interest in developing further research in this broad field, especially for studies attempting to estimate costs in monetary terms.

As has been seen, in the ostensible absence of a comparable national study, and one definitive methodology for advancement, our study has taken a pragmatic approach involving innovative use of relevant, available data sets. From our scoping of the literature, it appeared valuable to develop methods whereby non-bereaved comparison groups could be identified to enable study of any differences with those who have been bereaved. To this end, a key strategy has been to use propensity score matching techniques with large, longitudinal data sets (i.e. the SLS and BHPS). As such, we feel that this application is one of the strongest elements of our study, especially in regard to the SLS given its specific relevance to Scotland and very large sample size. However, it is worth bearing in mind that propensity score matching is more appropriate when the study sample is very large.

However, large, robust data sets of relevance to the impacts of bereavement are not numerous in Scotland (nor, we believe in the UK). For instance we could find no large scale data sources available for analyses looking at the effect bereavement has on children and other vulnerable individuals (e.g. people with learning difficulties and special needs). As such, one of the methodological challenges in this field involves locating, and/or developing, suitable “big” data. We believe that our key finding of a hidden, latent effect of bereavement on length of hospital stays provides a vanguard example of the usefulness of applying innovative methodology with “big” longitudinal data.

However, as highlighted in the section on the SLS, our explorations of spousal bereavement have been confined to its impact on mortality and hospital inpatient admission. Further research on the possible decay of the bereavement impact and on whether the impact of bereavement depends on the cause of death and other possible determinants would be beneficial as it would allow interventions to be targeted on those who are likely to need the greatest support. Moreover, there is a need to look more comprehensively at the societal costs caused by spousal bereavement, for instance, other medical utilisation, substance abuse, poverty, crime, and labour force participation and productivity.

Our analyses using the BHPS dataset did range wider in that they were not confined to spousal bereavement, and covered not only health, but also income and employment. Again propensity score matching proved useful with this longitudinal dataset to attempt to create a comparable matched control group. However, the resultant findings about health did not always unequivocally converge, raising questions as well as providing some insights. As highlighted in the section on the BHPS, we share other researchers' reservations about the validity of some aspects of the formulation of the GHQ-12 and the self reported health measure. Accordingly further research might usefully identify or develop longitudinal datasets relevant to the impact of bereavement using other indicators of health.

Our analyses of the PTI data from general practice in Scotland were necessarily rudimentary. There is a clear need to gather more sophisticated, routine data about the impact of bereavement in terms of general practice service usage, and this is recommended in our main report. In turn this would allow the deployment of more sophisticated analysis techniques.

In conclusion, we believe that from a technical, methodological point of view, we have made some initial inroads into gauging impacts, especially in terms of estimating costs. However, much work remains to be done and we hope that other researchers will join us in addressing these challenges.

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