Does country influence the health burden of informal care? An international comparison between Belgium and Great Britain

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ARTICLE INFO

ABSTRACT

The aim of this paper is to determine whether the association between the provision of informal care and the health status of caregivers is affected by the country of residence. We focus on two European countries, Belgium and Great Britain, and develop a methodology, which consists of matching a subset of areas from Britain with areas in Belgium that are demographically and socioeconomically similar. These pairs of areas are then used as fixed effects in logistic regressions of poor health. This allows us to take into account the influence of area type on health and to remove the influence of these local contextual characteristics from the estimated country effects. Results suggest that, although caregiving is more prevalent in Britain, the health burden associated with heavy caregiving activities is lower in Britain than in Belgium. This may be explained by the better targeting of long-term home care policies towards more severely dependent patients in Britain than in Belgium.

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Introduction

Informal caregivers are people providing care or assistance to family members, friends or other individuals who are sick or disabled. Whilst it is common for an elderly individual to care for their spouse, much of the caring burden rests on recipients' children (most often daughters) in middle to early old age (Dahlberg, Demack, & Bambra, 2007; Hirst, 2002; Hoffmann & Rodriguez, 2010). Their role is becoming increasingly important as the proportion of older people in the population grows. By substituting and complementing formal care services, informal care can help the elderly and people with disabilities to stay at home (OECD, 2005). At the same time, providing informal care has been identified as a challenge to the health of caregivers themselves. Informal caregivers are more likely to report poor subjective health (Beach, Schulz, Yee, & Jackson, 2000), to present depressive symptoms (Beach et al., 2000; LoGiudice et al, 1998) and even to have a higher risk of mortality (Schulz & Beach, 1999), mainly because providing informal care can be stressful and time-consuming.

The factors influencing a carer's decision to provide care, and its burden are multiple and complex. They include the intensity and duration of care required and the level of impairment of the cared for person. Care and its burden may also be influenced by the welfare state environment in which the carer and recipient live. The provision of formal care services, for example, is likely to influence whether individuals assume caring responsibilities since informal care often acts as complement to or substitute for formal care (Bonsang, 2009; Clarke, 1999; Van Houtven & Norton, 2004). In addition, wider welfare state policies also determine the degree to which it is financially feasible to give up formal employment to provide informal care for a dependent family member (Arksey & Moree, 2008; Guo & Gilbert, 2007; Pavolini & Ranci, 2008; Pfau-Effinger, 2005).

Recent research in social epidemiology has investigated the link between welfare regimes and health inequalities. Eikemo, Huisman, Bambra, and Kunst (2008) showed that welfare regimes contribute to health inequalities in various European countries. In particular, health inequalities appear to be smaller in countries with Bismarckian-type welfare regimes (characterised by a social-transfer approach, where benefits are related to earnings, as well as a marginal role of the market), than in others. This has been demonstrated with both self-assessed health, and in a cross-

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country comparison of mortality in 22 European countries (Mackenbach et al, 2008). In the last decade, welfare reform has relied on the voluntary sector, such as non-governmental organizations (NGOs) and informal caregivers, to provide health and social services, making informal carers an increasingly important component of the overall welfare. So far, however, there is little research addressing health inequalities linked to the provision on informal care.

In this context, the objective of our paper is to compare associations between the provision of informal care and the health of caregivers in two European countries belonging to two different welfare regimes. The Belgian health care system has been classified as a Bismarckian (or Corporatist) welfare state (Eikemo & Bambra, 2008). Belgium has a generous provision of health care services, and achieves good levels of horizontal equity (Van Doorslaer, Koolman, & Jones, 2004). Compulsory health insurance covers the whole population and provides a very broad benefits package (covering 72% of all health care expenditures; Gerkens & Merkur, 2010). Delivery is based on independent medical practice (including NGOs), free choice of service provider, and predominantly fee-for-service payment (Gerkens & Merkur, 2010). Britain, in contrast, is classified as a Liberal regime; there is a market emphasis with the state prioritizing care in the community, providing only minimum benefits that are often targeted and means tested. Britain has recently, however, placed increasing emphasis on the voluntary welfare sector to improve the provision of health and social services (Milligan & Fyfe, 2004). Consistently with this broad typology, Farfan-Portet, Popham, Mitchell, Swine, and Lorant (2010) observed a higher prevalence of informal care provision in Britain than in Belgium. However, they did not explore differences between the two countries in associations between informal care provision and the caregiver's health. This paper aims to fill in this gap.

The adverse health burden associated with the provision of informal care may be linked with welfare regimes because of a complex interaction of several factors, including the labour market as well as welfare provision and design. There is recent evidence that institutional settings (determined into a large proportion by welfare regimes) might determine the impact of informal care on labour market participation among older workers (Bolin, Lindgren, & Lundborg, 2008). In addition, welfare regimes may facilitate access to formal services through different funding schemes, either by means-tested cash transfer or direct provision of services, with the latter being more efficient in lowering the burden of caregiving for women (Sarasa, 2008). Thus, it is likely that welfare regimes associated with large provision of social and health care services, as well as with governmental support for employees to fulfil their caring responsibilities (Arksey & Glendinning, 2008; Heitmeueller, 2007), may alleviate stress related to combining work and care. In turn, we might expect them to reduce risk of poor health among caregivers.

The objective of this paper is thus to seek any differences between Belgium and Britain in the health burden of providing informal care and to go as far as we can in attributing this to differences in welfare systems. In doing this, we have had to face methodological issues. Differences between the two countries in health, and in the health burden of providing care might simply stem from differences in the individual characteristics of residents of both countries. For example, a more disadvantaged population would have a greater risk of poor health. These individual factors can be controlled for in a regression analysis, provided that we are able to find comparable data across nations. However, another source of potential confounding is the existence of contextual influences operating at the local level, such as the local labour market or the availability of services. Disregarding these intra-

national local differences may wrongly attribute the effect of these local contexts to cross-country differences. There are also important differences between Belgium and Britain in terms of physical geography and dimensions: Britain is a larger country with a range of settlement patterns, which includes extremes of rurality and remoteness not found in Belgium. Individuals from these areas are likely to be outliers and thus exert strong leverage on regression analyses.

In a companion paper in this issue of Social Science & Medicine (Mitchell et al., 2011), we explored these methodological issues and reviewed critically the methods used in existing international comparisons. The aim was to move away from the criticized (Oakes, 2004) multilevel approach; we tried to mimic elements of experimental studies, with the idea to create two alternative 'treatment groups', one 'exposed' to Belgium's living conditions, and the other 'exposed' to Britain's living conditions. We proposed a methodological approach to making international comparisons, which consists of matching a subset of areas from Britain with those in Belgium, which are the most similar in terms of their demographic and socioeconomic profile. In this paper, we have applied the approach to our focus on the health burden of informal care. By comparing the health impact of caregiving for individuals residing in these matched areas while taking into account variation in selected aspects of local contextual characteristics (and controlling for any remaining individual level differences), we argue that observed differences are more likely to be associated with country-level welfare state policies, rather than with conditions in one particular type of local environment within each country (Mitchell et al., 2011).

Methods

The motivation and method for the international comparison using matched areas have been described in detail in our companion paper (Mitchell et al, 2011). The present paper only focuses on the informal care application, and aims at exploring differences between Belgium and Britain in the relationship between health status and provision of informal care. Therefore, the methodological approach will only be described here in brief and we refer to the companion paper for more details on the data used and the matching methodology.

Data and variables

Data were drawn from the 2001 censuses in Britain and Belgium. The Belgian dataset was a 100% sample (i.e. all individuals residing in Belgium in 2001 were included) whereas the British data was a 5% sample of those who completed the census form. This dataset is called the Samples of Anonymised Records and is representative of the whole UK population (see Cathie Marsh Centre for Census and Survey Research, 2004 for more details). For this study, UK census data were restricted to Britain only (i.e. England, Scotland and Wales). In both countries, the analysis was restricted to members of private households aged 25 to 59 (1,361,222 individuals in Britain, 4,368,637 in Belgium). This was because, in both countries, informal caregivers are most often middle-aged adults. Indeed, 25–59 year olds account for 67.8% and 61.8% of all caregivers in Britain and Belgium respectively. For those who spend a lot of time caring (i.e. those providing more than 20 h a week in Britain and more than 2 h a day in Belgium, see definition below), the corresponding percentages are 50.6% in Belgium and 60% in Britain. This reflects a higher proportion of elderly taking care of a disabled spouse among 'intensive' caregivers, but middle-aged adults still represent an important portion of these carers. Furthermore, there is evidence that stressors are particularly

important for caregivers of working age; working and caring at the same time can lead to high levels of fatigue and on to poor health (Clarke, 1999; Lilly, Laporte, & Coyte, 2007). From a welfare perspective, there are important differences between the focus of policies which aim to tackle the needs of working caregivers compared to those focused on elderly caregivers. For example, for those who work *and* care, it is important to consider reducing their care load but also enabling them to maintain or regain employment whilst caring.

In 2001, for the first time in both countries, the censuses collected information on the provision of informal care, including time spent caring. Both censuses also included a question on respondent health. Answers to both questions permit an analysis of how the association between the provision of informal care and the health status of caregivers varies between both countries. Although questions slightly differed between both censuses, efforts were made to use categories as similar as possible across countries as described below.

The health outcome variable was self-rated health; a three item question in the British census ('good', 'fairly good' and 'not good') and a five item question in the Belgian census ('very good', 'good', 'average', 'bad' and 'very bad'). To render these questions comparable, we followed Farfan-Portet et al. (2010) and classified individuals who reported 'not good' health in Britain and 'bad' or 'very bad' health in Belgium as having poor health.

In both censuses, provision of informal care was captured by two variables; whether the individual provided care or not, and the time spent caring. Combining these two questions produced a variable indicating whether an individual provided no care at all, a small amount, or a large amount of care. In both countries, it was clearly stated that answers on informal care should include only activities not related to paid employment and those due to other individuals' health problems (therefore excluding caring for healthy children). However, questions on time spent caring differed between countries; it was measured in hours per week in Britain and hours per day in Belgium. The British census defined three items for the time question ('1–19 h/w; 20–49 h/w and 50 or more h/w), while the Belgian census defined 5 items ('at least once a week, but not daily'; 'daily, $<$ 30 min'; 'daily, 30min to $<$ 2h'; 'daily, 2 h to $<$ 4 h'; 'daily, 4 h or more'). Again, following Farfan-Portet et al. (2010) and for comparability reasons, individuals in Britain who reported providing care and doing so for 'more than 20 h per week' and individuals in Belgium who reported providing care and doing so for either 'between 2 h to less than 4 h per day' or 'more than 4 h a day' were designated 'intensive caregivers'. These cut-off points were chosen to reflect the possible impact that caregiver's might have on labour market participation (individuals providing more than 20 h of care per week in Britain or at least 2 h per day in Belgium are less likely to keep working full time) as well as public policy issues (the Carer's Allowance in Britain being restricted to low-income caregivers who provide 20 or more hours of care per week).

Individuals' age, economic activity status, education, housing tenure type and family type were covariates. Indeed, economic activity, education and housing tenure are all indicators of socio-economic position, which is known to influence general health and well-being. For economic activity, individuals were categorized as being employed, unemployed (i.e. actively seeking a job) or economically inactive. Education was measured through a modified version of the 4 item ISCED classification (attainment at less than lower secondary, lower secondary, upper secondary or post secondary level). Housing tenure was categorized as owner-occupied, privately rented and socially rented. Family type is also known to influence health (Everson-rose & Lewis, 2005) and was categorized as living alone, married or

cohabitant without children, married or cohabitant with children and lone parent. Age was categorized 25–29, 30–39, 40–49 and 50–59, reflecting constraints in the data. Separate analyses were carried out for women and men as they encompass very different experience in terms of caring commitment (Dahlberg et al., 2007; Farfan-Portet et al., 2010). Ethnicity was not included as covariate because the Belgian census does not ask about it. Nationality, the usual proxy, is inaccurate as a measure of ethnicity because many children of immigrants acquire Belgian citizenship (Lorant & Bhopal, 2010).

Analysis

The objective of our analysis was to reveal the effect of country of residence on the relationship between informal care and health status. We conducted a series of logistic regression models in which the probability of reporting poor health was explained by a dummy variable indicating country of residence (Britain versus Belgium), a three item variable indicating caring status (non caregiver, non intensive caregiver and intensive caregiver) and interaction terms between country and caring dummies (in addition to control variables cited above). As mentioned above, all analyses were stratified by gender.

As explained in the introduction, a potential risk in such a study would be to wrongly attribute to cross-country differences the effect of local contextual factors that differ within and between countries (such as the labour-market situation). In a previous paper (Mitchell et al., 2011) we proposed a methodological approach, which allows minimizing such potential confounding. This methodology is based on the identification of a subset of areas from both countries, which were demographically, socially and economically very similar. Then, including a set of dummies for the type of area in which an individual resides enables us to adjust country estimates for the local contextual characteristics in the two countries.

The choice of comparable areal units between both countries was also important. The areal units used were the Local Authority Districts in Britain and Arrondissements in Belgium. Local Authority districts were chosen because it is the administrative level at which a large component of social care services is organised. The Belgian hierarchy of areal units is formed from regions (3 in the country), provinces (10 units), arrondissements (43 units) and communes (589 units). Arrondissements are mainly administrative subdivisions; many datasets are available at this level even if most political decisions are taken locally (communes) or regionally (provinces, regions and country). These were also the level most comparable in size to Local Authority Districts: the mean population size of Arrondissements is approximately 238,000 inhabitants, compared to 146,000 inhabitants for Local Authority Districts (while Belgian communes only have 17,000 inhabitants on average). Note that 6 local authority districts were excluded because they contained too few people, and that all the Inner London Local Authority Districts were considered as a single unit (in an attempt to match with Brussels), which gave a total of 433 areas (390 for Britain and 43 for Belgium).

Area matching was based on a set of variables chosen to describe contextual factors which could potentially affect the relationship between informal care and health. These variables related to labour-market conditions, levels of education, age structure, urbanization level and industrial economic past. This set of variables was first summarized into three factors through a classical principal component analysis (PCA) (see Mitchell et al., 2011, for detailed definition of input area variables as well as results of the PCA). Coordinates of areas on these factorial axes

were then used to compute a Euclidian distance between each pair of areas. We next selected a subset of 16 Belgian Arrondissements reflecting the range of area types in Belgium, and for each of these Arrondissements, we identified the three 'nearest' Local Authority Districts (i.e. the three which appeared the most similar with respect to their factorial scores). The research team collaborated on making a 'human' choice from these 3 'statistically identified' candidate matches. This was felt to enhance the matching by, for example, pairing areas that were thought to have similarity in character or geographical context which had not been included in the matching variables; a location on the coast for example. Eleven pairs of areas were based on the best 'statistical' match with 5 based on the second best match. We thus produced 16 pairs of areas, for which we obtained a good match in both statistical and subjective terms. Descriptive statistics for these matched areas are given in the Appendix. As a matter of illustration, Belgium's capital, Brussels, is matched with Birmingham, and not with London (probably because of London's much greater size). The three arrondissements of the Brussels's periphery (Leuven, Hal-Vilvorde and Nivelles) are matched with 3 areas in the periphery of London (St Albans, Richmond-upon-Thames and Elmbridge respectively). All 6 regions have a generally favourable socioeconomic profile, with relatively high levels of education and high percentage of working population compared to country average values. Similarly, two of Belgium's poorest regions, Charleroi and Liège, are matched with Liverpool and Dundee respectively, given their low levels of education and economic activity.

These 16 pairs were then used as fixed-effect components in our logistic regressions of poor health to take into account the fact that living in a particular 'type' of areas might exert an influence on health and to adjust country effect for these contextual influences. Note that our first choice strategy was to use conditional logistic regression models but, given the large sample size, our initial attempts did not converge in a reasonable amount of time. However, when the number of observations per area is large and the number of areas is, comparatively, small (which is our case), the dummy variable approach is the equivalent of the conditional logistic regression as the incidental parameters problem is not an issue (Kleinbaum & Klein, 2002; StataCorp, 2005).

Our model could be summarized by the following formula:

$$P_i = \frac{e^{(\alpha + \beta A_i + \gamma C_i + \delta I_i + \theta I_i \times C_i + \lambda X_i)}}{1 + e^{(\alpha + \beta A_i + \gamma C_i + \delta I_i + \theta I_i \times C_i + \lambda X_i)}}$$

where P_i is the probability of reporting poor health for individual i, C_i is a dummy variable indicating country of residence (Belgium versus Britain), I_i is a variable indicating caring status (non carer, non intensive and intensive caregiver), and $I_i \times C_i$ refers to interaction effects between country and caring status. X_i is a vector of individual controls (age, family type, tenure, education and activity) and A_i is a vector of dummy variables for matched pairs of areas. α, β, γ, δ, θ and λ are vectors of parameters, which were estimated using maximum likelihood estimation. Standard errors were not corrected for geographical clustering given the large size of the matched areas (Local Authority Districts and Arrondissements).

Results

Descriptive statistics

Table 1 gives descriptive statistics for the dependent variable (poor health) and all covariates included in our model by country

and gender. Percentages are given for the whole sample as well as for those resident in matched areas only (2,658,754 individuals, 46% of the whole sample). Levels of poor health were higher in Britain than in Belgium: among men, 4.4% reported having poor health in Belgium, compared to 8.1% in Britain (4.5% and 8.9% respectively, for women). Caring was more prevalent among women than men and was also more common in Britain: 11.3% (16.3%) of men (women) aged 25 to 59 were informal caregivers in Britain against 7.5% (11.7%) in Belgium. In both countries and for both men and women, caring for less than 20 h was more frequent than caring for 20 or more hours. Among other covariates, the most striking differences between Belgium and Britain were in the percentage of social renters (which was much smaller in Belgium) and the prevalence of economic inactivity (which was much higher among both British men and women than their Belgian counterparts, although employment levels were quite similar). The socioeconomic characteristics of individuals resident in the matched area sub-sample were broadly similar to their whole nation (comparing 'Matched areas' columns to 'All areas' columns in Table 1). The most striking differences between the whole and matched samples occurred in Britain. In the whole sample of British men, 8.1% reported poor health. This figure rose to 9.1% when reducing the dataset to those resident in matched areas only. The corresponding percentages for the Belgian sample were 4.4 and 4.5% for all areas and matched areas respectively. Another notable exception is the greater educational attainment among those in Britain's matched areas. The prevalence of caring in both countries was unaffected by the matching procedure.

We present three types of model results. The first is based on the whole sample and does not introduce any control for the type of area in which people reside (i.e. sample size equal to 2,881,883 for men and 2,847,975 for women) but does control for all individual level characteristics listed above. The second repeats the estimation including only those individuals who resided in our set of matched areas (i.e. 1,336,223 men and 1,322,531 women), but does not control for inter-pair differences (model without fixed-effects). The third introduces a set of dummies A_i to control for any inter-pair differences in contextual area characteristics (model with fixed-effects).

The effect of country on the health impact of informal care

Tables 2 and 3 present results for models including all individuals (model 1), only individuals resident in matched areas without fixed-effects for matched pairs of areas (model 2), and with fixed-effects (model 3), for men (Table 2) and women (Table 3) separately. Results for individual confounders were unsurprising and required no detailed comment: for both men and women, young people, married individuals with children, home owners, the employed and the higher educated had a lower risk of reporting poor health compared to all other categories. It was interesting to note that estimated impacts of these covariates were barely affected by the matching procedure (compare model 1 and model 2). This was also true for the impact of informal care on health.

Providing informal care was generally associated with poorer health and this detrimental impact on health increased with the amount of care provided for men (providing a low or high amount of care increased the risk of reporting poor health by 1.233 and 1.500 respectively in model 3). Results for women were different; providing non intensive care (i.e. less than 20 h a week) slightly reduced the risk of reporting poor health while providing intensive care increased their health risk by 1.122 in model 3.

Table 1
Socioeconomic characteristics of the Belgian and British samples.

	Men				Women			
	Belgium		Britain		Belgium		Britain	
	All areas	Matched areas	All areas	Matched areas	All areas	Matched areas	All areas	Matched areas
N	2,212,059	1,294,101	669,824	42,122	2,156,577	1,278,917	691,398	43,614
Health status (%)								
Bad health	4.4	4.5	8.1	9.1	4.5	4.7	8.9	9.7
Not bad health	95.6	95.5	91.9	90.9	95.5	95.3	91.1	90.3
Caring status								
Non carer	92.5	92.5	88.7	88.6	88.3	88.6	83.7	83.5
Less than 20 h	6.5	6.5	8.4	8.0	9.8	9.7	11.3	11.1
More than 20 h	1.0	1.0	2.9	3.4	1.9	1.8	5.0	5.4
Age (%)								
25 to 29	13.0	13.3	13.4	13.8	13.3	13.4	13.6	14.4
30 to 39	31.3	31.3	32.0	32.7	31.3	31.2	32.4	32.7
40 to 49	30.7	30.6	28.1	28.3	30.7	30.6	27.9	28.3
50 to 59	25.0	24.9	26.5	25.1	24.7	24.8	26.1	24.6
Family type (%)								
Married with children	58.7	57.0	50.5	49.0	56.4	54.4	47.1	45.4
Married without children	20.2	19.9	25.0	22.6	21.4	20.9	25.9	23.2
Lone parent	5.2	5.2	5.0	5.6	11.3	12.1	13.6	15.8
Alone	15.9	17.9	19.5	22.8	10.9	12.6	13.4	15.6
Tenure (%)								
Owner	75.0	72.1	75.2	73.5	74.7	72.1	73.6	71.7
Private rent	20.5	23.1	11.0	10.9	19.4	21.7	10.1	10.2
Social rent	4.5	4.7	13.8	15.6	5.9	6.2	16.4	18.1
Activity (%)								
Employed	84.1	83.6	83.3	80.1	65.0	65.1	69.5	67.5
Unemployed	5.8	6.6	4.6	5.7	8.9	9.3	2.8	3.0
Inactive	10.1	9.9	12.1	14.2	26.1	25.5	27.7	29.5
Education (%)								
Post secondary	31.2	33.9	24.6	31.1	33.7	35.9	23.7	29.0
Upper secondary	30.2	29.1	7.5	9.3	29.0	28.4	7.4	8.9
Lower secondary	24.4	23.1	36.1	30.1	22.8	21.7	39.2	32.9
Less than lower secondary	14.2	13.9	31.8	29.6	14.5	14.0	29.7	29.2

The effect of local contexts (measured by area pairs) also conformed to expectations. Living in a less advantaged area, characterised by low levels of education and economic activity, increased the risk of reporting poor health for both men and women compared to living in Brussels or Birmingham (see for example the odds ratios of 1.227, 1.121 and 1.118 for women living in Charleroi-Liverpool, Thuin-Swansea and Liège-Dundee respectively). Living in more isolated environments (Bastogne-Colchester or Virton-Worthing) was also associated with an increased risk of poor health, but only for men. Living in better-off environments such as Anvers-Edinburgh or Leuven-St-Albans reduced the relative risk of reporting poor health for both men and women.

Recall, however, that the introduction of area pair dummies was intended to examine differences associated with country variation while controlling for any confounding effects arising from variations between the two countries in the local conditions faced by individuals. Changes in the effect of country on health observed when (1) restricting the sample to individuals residing in areas that could plausibly belong to either countries (move from model 1 to model 2) and (2) introducing these area pairs fixed-effects to control for local contexts (move from model 2 to model 3), were of most interest.

Country effects describe the difference in the risk of reporting poor health between Belgium and Britain while the interaction terms between country and caring status describe the difference in the risk of reporting poor health associated with the provision of informal care between both countries. These were, as expected, affected by the matching procedure and differed according to the three models estimated. In model 1 (based on the whole samples), living in Britain increased the odds of reporting poor

health by 1.744 for men and 1.988 for women, compared to living Belgium. Restricting the analysis to only those individuals resident in the 16 pairs of matched areas (model 2) reduced the odds ratio for the country effect moderately to 1.706 for men and 1.879 for women. Finally, introducing fixed effects to control for the differences in contextual characteristics between pairs of matched areas (model 3) reduced the country effect more substantially to 1.551 for men and 1.755 for women. However, these remained highly significant.

In model 3, the parameter associated with the interaction between country and caring suggested that the risk of poor health associated with intensive caregiving was lower in Britain than in Belgium, for both men and women. In other words, although people in Britain are more likely to report poor health than their Belgian counterparts whatever their caring status, residing in Britain exerts an apparent *protective* effect on the health of those who provide more than 20 h a week of care compared to those providing similar levels of care in Belgium. In model 3, no significant interaction effect between country and informal care was found for those men and women caring for less than 20 h. While the matching procedure reduced the magnitude of the between-country effect on health in absolute terms, it increased the magnitude of the interaction term in absolute terms (i.e. residence in Britain is more protective in the matched model (3) than in the whole sample model (1)).

Finally, to check further for the possible influence of any remaining variation in contextual characteristics between matched areas, we re-ran models entering a fixed effect for each of the areas in the matched sample separately (i.e. introducing 31 dummies). In effect, this controlled for all area characteristics. This approach did

Table 2
Logistic regressions of poor health stratified by gender (men).

	Model 1			Model 2			Model 3		
	OR	P>|z|	95% CI	OR	P>|z|	95% CI	OR	P>|z|	95% CI
Country (ref: Belgium)	1.744	<0.001	1.720–1.466	1.706	<0.001	1.634–1.781	1.551	<0.001	1.485–1.620
Caring status (ref : non carer)									
< 20 h	1.210	<0.001	1.181–1.240	1.264	<0.001	1.225–1.304	1.233	<0.001	1.195–1.272
>= 20 h	1.402	<0.001	1.341–1.466	1.480	<0.001	1.396–1.570	1.500	<0.001	1.414–1.591
Interaction Caring status × Country									
< 20 h × Britain	0.943	0.007	0.903–0.984	1.037	0.619	0.899–1.194	1.049	0.511	0.910–1.208
>= 20 h × Britain	0.645	<0.001	0.606–0.687	0.565	<0.001	0.477–0.669	0.544	<0.001	0.459–0.645
Age (ref : 25 to 29)									
30 to 39	1.678	<0.001	1.633–1.723	1.761	<0.001	1.688–1.837	1.780	<0.001	1.706–1.857
40–49	2.762	<0.001	2.692–2.836	2.855	<0.001	2.742–2.974	2.903	<0.001	2.787–3.024
50–59	2.213	<0.001	2.156–2.272	2.044	<0.001	1.961–2.131	2.100	<0.001	2.015–2.190
Family type (ref : married with children)									
Married without children	1.038	<0.001	1.023–1.054	1.023	0.063	0.998–1.048	1.047	<0.001	1.022–1.073
Lone parent	1.191	<0.001	1.164–1.219	1.321	<0.001	1.275–1.369	1.301	<0.001	1.256–1.348
Alone	1.446	<0.001	1.424–1.458	1.478	<0.001	1.444–1.512	1.477	<0.001	1.443–1.511
Tenure (ref : owner)									
Private rent	1.302	<0.001	1.282–1.322	1.251	<0.001	1.223–1.279	1.227	<0.001	1.200–1.256
Social rent	1.601	<0.001	1.574–1.628	1.538	<0.001	1.494–1.583	1.504	<0.001	1.461–1.549
Activity (ref : employed)									
Unemployed	3.762	<0.001	3.686–3.839	3.984	<0.001	3.871–4.101	3.633	<0.001	3.258–3.741
Inactive	14.595	<0.001	14.398–14.794	14.610	<0.001	14.293–14.933	14.267	<0.001	13.957–14.584
Education (ref : post secondary)									
Upper secondary	1.464	<0.001	1.434–1.494	1.528	<0.001	1.485–1.583	1.534	<0.001	1.490–1.580
Lower secondary	1.718	<0.001	1.687–1.750	1.925	<0.001	1.872–1.979	1.872	<0.001	1.820–1.925
Less than lower secondary	2.176	<0.001	2.137–2.217	2.349	<0.001	2.284–2.416	2.272	<0.001	2.208–2.337
Area pairs (ref: Brussels-Birmingham)									
Bastogne − Colchester							1.222	<0.001	1.112–1.314
Virton − Worthing							1.282	<0.001	1.168–1.406
Maaseik − Durham							0.741	<0.001	0.703–0.781
Leuven − St Albans							0.864	<0.001	0.829–0.900
Hal-Vilvorde − Richmond upon T.							0.754	<0.001	0.723–0.786
Anvers − Edinburgh							0.705	<0.001	0.682–0.729
Dixmude − Bridgnorth							0.830	<0.001	0.747–0.921
Courtrai − Warwick							0.675	<0.001	0.640–0.712
Charleroi − Liverpool							1.289	<0.001	1.246–1.333
Thuin − Swansea							1.363	<0.001	1.297–1.432
Nivelles − Elmbridge							0.977	0.307	0.934–1.022
Gand − East Renfrewshire							0.639	<0.001	0.612–0.666
Alost − Winchester							0.741	<0.001	0.704–0.779
Namur − South Lanarkshire							1.200	<0.001	1.150–1.252
Liège - Dundee							1.093	<0.001	1.057–1.129
Number of observations	2,881,883			1,336,223			1,336,223		

not substantively change the interaction term between caring and country of residence (data not shown).

Discussion

The objective of this paper was to compare the health risk associated with informal caregiving activities between Belgium and Britain, while controlling for any confounding local contextual effects within each country. Our results showed that although caring is associated with poorer health in both countries, the risk of poor health was lower for intensive caregivers in Britain than for intensive caregivers in Belgium.

We believe that the design of our analysis offers some confidence that this differential association between caring and health is related to differences in national contexts, and not an artefact. We controlled for important individual confounders such as employment and socio-economic position; we limited our analysis to types of areas which could plausibly exist in either country in model 2; and we further controlled for any shared contextual characteristics of these matched areas in model 3 and checked for possible influence of remaining variation in area level contextual variables which varied between matched areas.

As in the companion paper (Mitchell et al, 2011), we observed that between-country differences in the risk of reporting poor

health were reduced when moving from model 1 to model 3 and that the sharpest decline was observed between model 2 and model 3. This suggests that some of the higher risk of reporting poor health in Britain is due to the fact that people in Britain are more likely to be exposed to adverse contextual characteristics than their Belgian counterparts. Controlling for these differences reduced the country effect, but it did remain highly significant. In this paper, we observed that the effect of the matching procedure ran in the opposite direction for the interaction term between country and caring. Living in Britain had an effect on the health of intensive caregivers that was *more* protective in model 3 (when one controls for inter-pair contextual differences) than in model 1. However, we also observed a greater change in this coefficient between model 1 and 2 than between models 2 and 3. That tends to suggest such differences result more from a change in the studied sample than from controlling for contextual characteristics.

The smaller health burden for British intensive caregivers was unexpected. Belgium has greater long-term health care spending than Britain (OECD Health Data, 2009). What could be the explanation for these between-country differences in the impact of informal care?

A methodological explanation could be that intensive caregivers are more prevalent in Britain than in Belgium and it is

Table 3
Logistic regressions of poor health stratified by gender (women).

	Model 1			Model 2			Model 3		
	OR	P>|z|	95% CI	OR	P>|z|	95% CI	OR	P>|z|	95% CI
Country (Great Britain vs Belgium)	1.988	<0.001	1.962–2.014	1.879	<0.001	1.805–1.956	1.755	<0.001	1.685–1.829
Caring status (ref: non carer)									
< 20 h	0.833	<0.001	0.814–0.852	0.870	<0.001	0.845–0.895	0.861	<0.001	0.836–0.886
>= 20 h	1.056	0.004	1.017–1.097	1.101	<0.001	1.048–1.156	1.122	<0.001	1.068–1.179
Interaction Caring status × Country									
< 20 h × Britain	1.178	<0.001	1.136–1.222	1.070	0.285	0.945–1.210	1.081	0.219	0.955–1.223
>= 20 h × Britain	0.909	<0.001	0.865–0.956	0.913	0.175	0.780–1.042	0.858	0.024	0.752–0.980
Age (ref : 25–29)									
30–39	1.705	<0.001	1.661–1.750	1.769	<0.001	1.694–1.847	1.801	<0.001	1.725–1.881
40–49	2.951	<0.001	2.877–3.027	2.851	<0.001	2.734–2.972	2.927	<0.001	2.807–3.052
50–59	2.561	<0.001	2.495–2.628	2.245	<0.001	2.151–2.343	2.325	<0.001	2.227–2.426
Family type (ref : married with children)									
Married without children	1.441	<0.001	1.421–1.463	1.421	<0.001	1.388–1.454	1.456	<0.001	1.423–1.491
Lone parent	1.585	<0.001	1.559–1.612	1.810	<0.001	1.764–1.857	1.736	<0.001	1.692–1.781
Alone	2.474	<0.001	2.434–2.514	2.569	<0.001	2.505–2.634	2.506	<0.001	2.444–2.570
Tenure (ref : owner)									
Private rent	1.399	<0.001	1.378–1.420	1.397	<0.001	1.367–1.427	1.352	<0.001	1.322–1.381
Social rent	1.729	<0.001	1.702–1.755	1.771	<0.001	1.762–1.861	1.677	<0.001	1.635–1.701
Activity (ref : employed)									
Unemployed	2.992	<0.001	2.926–3.058	3.121	<0.001	3.026–3.220	2.845	<0.001	2.757–2.935
Inactive	6.789	<0.001	6.699–6.880	7.406	<0.001	7.243–7.573	7.288	<0.001	7.127–7.452
Education (ref : post secondary)									
Upper secondary	1.285	<0.001	1.260–1.311	1.434	<0.001	1.394–1.476	1.473	<0.001	1.431–1.515
Lower secondary	1.494	<0.001	1.468–1.521	1.811	<0.001	1.762–1.861	1.779	<0.001	1.731–1.829
Less than lower secondary	1.927	<0.001	1.893–1.961	2.351	<0.001	2.287–2.418	2.309	<0.001	2.246–2.375
Area pairs (ref: Brussels-Birmingham)									
Bastogne − Colchester							0.776	<0.001	0.702–0.858
Virton − Worthing							0.835	<0.001	0.579–0.919
Maaseik − Durham							0.609	<0.001	0.577–0.643
Leuven − St Albans							0.826	<0.001	0.794–0.859
Hal-Vilvorde − Richmond upon T.							0.713	<0.001	0.686–0.741
Anvers − Edinburgh							0.579	<0.001	0.561–0.598
Dixmude − Bridgnorth							0.611	<0.001	0.546–0.685
Courtrai − Warwick							0.666	<0.001	0.632–0.698
Charleroi − Liverpool							1.227	<0.001	1.189–1.266
Thuin − Swansea							1.121	<0.001	1.068–1.177
Nivelles − Elmbridge							0.911	<0.001	0.874–0.949
Gand − East Renfrewshire							0.578	<0.001	0.555–0.603
Alost − Winchester							0.682	<0.001	0.649–0.718
Namur − South Lanarkshire							1.023	0.272	0.982–1.065
Liège - Dundee							1.118	<0.001	1.085–1.152
Number of observations	2,847,975			1,322,531			1,322,531		

therefore possible that British intensive caregivers are a more heterogeneous group. Since the magnitude of an effect is likely to change according to the baseline risk (Walter, 1997), the effect of caring on health may simply be more dilute in Britain than Belgium.

Another explanation however, concerns policy differences relating to state provision of, and support for, home-based care. There is considerable evidence that the policy environment is more supportive for intensive caregivers in Britain than in Belgium. In Britain, support targets more seriously dependent individuals and thus caregivers with a higher burden (Carpenter, Gambassi, Topinkoba, Schroll, & et al, 2004; Guo & Gilbert, 2007; Pavolini & Ranci, 2008; Pickard et al, 2007). The OECD notes that Britain as a whole has increased the intensity of long-term home care for severely disabled patients (OECD, 2005). Although the number of beds has been reduced, Britain has improved its targeting of services on highly-disabled patients and providing them with more hours of home care. There may also be socio-cultural differences in how the caring role itself is perceived in the two countries. It is plausible that the role is held in greater esteem in Britain, or at least is more normalised and that consequently, its impacts on health are lessened. Self-perception of the

value of one's 'work' may be important in determining its health consequences.

In addition, it may be hypothesized that services targeting directly *caregivers*, at least for those with a large care burden, might be more effective in improving their well-being than "indirect" support in the form of services provided to the *care-receiver*. In Britain, caregivers' needs are increasingly met by the voluntary sector (Milligan & Fyfe, 2004). Britain has a national strategy to address informal carers' needs and is also one of the few OECD countries providing carers with an assessment of their needs (OECD, 2005). This started in 1995 with the Carers (Recognition and Services) Act, which was later continued with the Carers and Disabled Children Act 2000 and the Carers (Equal Opportunity) Act 2004. The latter specifically focus on the needs of caregivers who desire to work. For example, Britain gives pension credits to enable the carers who are out of the labour market due to their caring role, to maintain their pension rights. In addition, caregivers also receive an official status allowing them to have access to respite services, especially for elderly caregivers (Hirst, 2003; Carers (Recognition and Services) Act 1995: Practice Guide, 1996). In contrast, Belgium has no national strategy directed to informal caregivers, and although there is a large

basket of services (reflecting the larger health-care spending, see Gerkens & Merkur, 2010), these are only directed to the care-receiver. For example, provision of home services is not coordinated in order to allow the caregiver to participate in the labour market. Nor are employers entitled to grant flexible-hours to their employees engaged in caregiving activities. Respite care is also extremely limited and provided only through a limited number of non-for-profit alternatives, such as those who act in favor of Alzheimer patients (Aidants Proches ASBL, 2010; Ons Zorgnetwerk ASBL, 2010).

Finally, long-term (health and social) care is better integrated in Britain than in Belgium, due to the key role of local authorities in coordinating care (OECD, 2005). This higher integration may lower the burden of caring for a highly disabled elderly at home. Belgium is a late starter in comprehensive geriatric coordination (Rico, Saltman, & Boerma, 2003), and still devotes an important share of his long-term expenditures to inpatient care, which may explain why the prevalence of informal caring is lower in Belgium than in Britain.

Hence, our results contribute to the debate over the advantages of policies which directly target caregivers. Such policies might represent a better option than indirect support targeted to the care-receiver (even extensive provision, as in Belgium). This limit is currently being acknowledged in Belgium. Starting in 2010, new alternatives for home care are planned at a national level, with the aim of taking into account caregivers' needs in terms of respite care, psychological support and training (Gerkens & Merkur, 2010; Moniteur Belge, 2009). However, these hypotheses require further empirical investigation. Future work should collect systematic data on services for the care-receiver and the caregiver more explicitly in order to find the most cost-effective intervention for improving the well-being of *both* parties.

Our study has some limitations. First, because the data came from the 2001 census, information on health status and caregiving is self-reported. Our conclusion rests on the assumption that self-reported health captures 'true health' in the same way in both countries. However, cultural differences, as well as differences between the questions on self-rated health in the two different censuses might lead to different reporting for the same levels of 'true health'. This is a common problem in cross-national comparisons (Jurgess, 2007). Previous work, however, has shown that different self-rated measurements do consistently assess subjective health (Eriksson, Unden, & Elofsson, 2001) and that the continuum from poor to good health can be well captured by slightly different questions (Manderbacka, Lahelma, & Martikainen, 1998). There is a large literature providing evidence that self-reported measures of health are a good proxy for 'true health' (Eriksson et al., 2001; Mackenbach, Bos, Joung, Van Den Mhen, & Tronks, 1994; Manderbacka, 1998; Manderbacka et al., 1998; Manor, Matthews, & Power, 2000). A further weakness stemming from self-report measures concerns the caring variable. Our key measure of care was a report of the number of hours spent caring. This may not be accurate and we have no knowledge of what biases may apply to it. Furthermore, we did not know the type of care given nor identify who was the care-receiver.

A second limitation is the use of cross-sectional data. We could not disentangle the direction of causality between poor health and caregiving. Furthermore, we could not control for the health of individuals before taking caring activities. The health of those who become a caregiver might well be lower than that of those who do not provide care because they are selected from a group in poor health. Indeed, persons in low socio-economic position (SEP) are more likely to face high care demands and thus become full time

carers. In this case, caregivers also belong to low SEP and as a consequence they are also more likely to be in poor health. The real situation is likely to be that causality flows in both directions within a population. However, this paper is focused on comparing the relationships between poor health and caregiving, across two countries. It is, arguably, unlikely that the effect operates in opposite directions in the two nations; the focus of interest, differences in the strength of association, is comparatively unthreatened by this limitation.

The third most significant limitation is attribution. Implicit in our approach is the idea that, once we have controlled for individual and local area influences on the association between care-giving and health, what remains must be a national-level influence and this is produced by the welfare state. This is the weakness of an observational design which, for all the methodological innovation, remains observational. As we have argued, it seems plausible and indeed likely that the welfare state systems have a role in these differences, but other factors such as culture, expectation and familial or social support, may play their part.

Conclusion

Despite differences in the prevalence of informal caring between Belgium and Britain, intensive caring responsibilities were associated with poor health in both countries. Yet, we did find differences between Belgium and Britain in the association between intensive caregiving and poor health. We speculate that the greater focus on long-term inpatient care in Belgium has reduced the prevalence of informal care but at the cost of an increased burden for those that are intensive caregivers. Indeed, the policy environment which supports carers in Britain suggests that informal care has become a more explicit component of the social policy there, than in Belgium. There is no national strategy for the protection of informal caregivers in Belgium.

Future planning for long-term care needs to take into account the national level policy context in which caregivers operate (Moniteur belge, 2009). Our results suggest a complex relationship between policies targeting the needs of the elderly through home care and the policies targeting carers. Future comparative social policy research should look at both the recipient of care and the carer itself, preferably with better data on entitlement and services use. Moreover, an in-depth analysis of the impacts of direct and indirect support for caregivers could help design systems which allow individuals to meet competing demands of caring and participating in the labour market.

Ethical approval
None.

Conflict of interest
None declared.

Appendix. Matched areas and their main characteristics

Belgium						Britain					
Name	Working	High educ	Age ratio	Mining	Pop density	Name	Working	High educ	Age ratio	Mining	Pop density
Brussels	71.1	34.7	1.8	0.8	5928.7	Birmingham	68.2	19.4	2.5	1.3	3648.9
Bastogne	78.3	25.1	2.3	0.3	39.3	Colchester	79.6	21.7	2.2	1.4	449.3
Virton	78.5	29.7	2.0	0.5	62.7	Worthing	81.8	19.9	1.2	2.8	2790.4
Maaseik	78.2	23.0	2.5	6.6	248.8	Durham	79.3	20.6	2.1	7.3	469.8
Leuven	84.5	37.5	1.6	1.0	392.2	St Albans	83.6	41.6	2.0	1.6	800.4
Hal-Vilvorde	86.1	35.2	1.7	1.5	590.5	Richmond upon Thames	83.4	34.7	1.9	1.7	2932.5
Anvers	79.0	29.1	1.6	2.2	928.2	Edinburgh	78.5	44.7	2.0	2.2	1705.3
Dixmude	83.1	19.5	1.7	0.5	131.3	Bridgnorth	83.4	22.8	1.7	2.0	82.9
Courtrai	84.3	27.6	1.7	1.0	682.6	Warwick	83.4	33.7	1.8	1.0	445.2
Charleroi	64.6	19.4	1.8	2.4	751.5	Liverpool	70.7	14.1	1.8	1.3	3290.9
Thuin	69.5	24.0	1.8	2.1	155.5	Swansea	72.2	21.8	1.7	3.8	530.2
Nivelles	79.8	42.0	2.2	1.2	321.0	Elmbridge	80.7	38.2	1.8	2.3	1265.6
Gand	83.0	33.7	1.7	1.9	523.3	East Renfrewshire	81.4	41.6	2.0	1.8	513.0
Alost	84.2	26.4	1.5	0.8	554.7	Winchester	83.4	35.8	1.8	1.3	162.2
Namur	75.8	29.4	2.0	1.8	242.9	South Lanarkshire	75.4	26.7	2.0	2.3	171.4
Liège	69.4	26.2	1.6	1.5	734.3	Dundee	69.7	27.8	1.8	1.7	2453.6
Country mean[2]	78.5	26.8	1.8	1.6	469.2	Country mean	78.9	21.8	1.9	3.3	1005.2

Columns give the % of working population aged 25–59 in 2001 (Working), the percentage of individuals with post secondary education aged 25–64 in 2001 (High educ), the ratio of people aged under 25 to over 64 in 2001 (Age ratio), the percentage of working population employed in energy, mining or water industries in 1981 (Mining), the number of inhabitants per squared kilometre in 2001 (Pop density).

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