Care arrangements and caregivers' health: should we care about how they care?

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Abstract
In the current context of aging population, it is important to study informal caregivers who are the main providers of support for elderly dependent people. This work aims at estimating from French data the effect of care arrangements on caregivers' health. We use separate models for coresiding and non-coresiding caregivers and investigate the effect of care intensity, informal support, formal care and the relationship between the caregiver and the elderly.

Using the French Disability and Health Survey (2008), we estimate the effect of care arrangements on three variables: self-assessed health, reporting that informal care affects general health, and reporting that informal care has negative mental health consequences. These last two indicators, by focusing on the particular effect of care on health, allow avoiding reverse causality problems. The self-assessed health model is estimated using an ordered logit model, the general and mental health equations are estimated simultaneously using a bivariate probit model.

The results show that informal care has a negative effect on health mainly when it is intensive (more than 20 hours per week for coresiding caregivers and daily assistance for non-coresiding caregivers). In addition, while informal support is beneficial for non-coresiding caregivers, formal care has no effect. Finally, for non-coresiding caregivers, it seems that when informal care results from a personal choice (care provided by friends or neighbors, and children-in-law) rather than from social norms (care from children), it reduces the health risk. Similarly, for coresiding caregivers, we find that daughters providing care to their mother – who are more constrained by social norms – face more health consequences than sons.

Keywords: Informal care; General health; Mental health; Formal care; Informal support; Care relationships
JEL: I10; J14; C25; D13

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1. Introduction

In France, the number of dependent elderly is expected to double by 2060, reaching 2.3 million people. More generally, between 2000 and 2060, the proportion of people aged 75 and older will increase from 8% to 16% (French National Institute of Statistics and Economic Studies). In Europe, the proportion of 80 and over is projected to rise from 5% in 2010 to 12% in 2060 (Eurostat). In this context of aging population, it is important to understand the consequences of informal care (i.e. care provided by the family and other relatives). Indeed, the support of elderly people in France is based mainly on informal caregivers. The French High Family Council estimates that 3.6 million elderly people live in ordinary households and receive care due to health problems; 48% of them receive only informal care, 20% only formal care and 32% are helped by both formal (i.e. professional) and informal care. Care hours provided by family caregivers are estimated at over one billion hours, which would represent 77% of the total hours of care. Informal caregivers will be even more important in the future given increasing pressures on the sustainability of long-term care systems.

At first sight, informal care could be considered as a good way of reducing public expenditures. In effect, informal care hours would represent more than 7 billion Euros if they were valuated at the French minimum wage rate (French High Family Council). However, informal care has many economic (employment consequences, out-ot-pocket expenditures, unpaid labor) and non-economic (physical, social and emotional well-being) costs, not only for caregivers but also for care receivers, caregivers' families, caregivers' employers and the society (Fast et al., 1999; Keating et al., 2014; Van Houtven and Norton, 2006). The European Commission and the OECD have acknowledged in recent reports (2009, 2011) the importance of supporting caregivers. In France, the draft law on the Adaptation of society to the aging of the population, adopted by the National Assembly in September 2014,

implements respite care, reinforces counseling and training services and underlines the need to reconcile paid employment and informal care.

The economic literature has been more interested by the effect of informal care on the labor market (Lilly et al., 2010, 2007) than by caregivers' health. In addition, studies that estimate health effects of informal care do not assess whether heterogeneous care arrangements lead to different health consequences. It is important to investigate the effect of informal care on health, not only because it is costly in terms of caregivers' well-being, but also because health problems can lead to many other costs. Firstly, caregivers seem to be characterized by a higher probability of medication use (Do et al., 2013; Houtven et al., 2005). Secondly, it has been shown that problems of depression among caregivers are associated with missed work (Wilson et al., 2007), which represents an economic cost for both caregivers and care employers. Finally, caregivers' stress and burden may lead to early institutionalization of dependent elderly people (Spillman and Long, 2009; Yaffe et al., 2002). Caregivers' health problems may also decrease the quality of informal care and even increase the risk of elder abuse (Schulz and Beach, 1999; Smith et al., 2011).

This work aims at estimating from French data the effect of multiple care arrangements on the general and mental health of informal caregivers. We thus use separate models for coresiding caregivers (i.e. caregivers who live in the same household than the dependent elderly person) and non-coresiding caregivers and investigate the effect of care intensity, informal support, formal home care and the relationship between the caregiver and the elderly. From a public policy perspective, this study identifies the most harmful care arrangements in terms of caregivers' health. It provides insights for policymakers on how to shape public policies aimed at supporting informal caregivers.

The article is organized as follows: section 2 offers a summary of the existing literature; section 3 presents the data and methodology used; section 4 provides some descriptive statistics, and the results of the estimations. Finally, the last section is devoted to discussion and the conclusion.

2. Background

Health effects of informal care have mainly been documented in gerontology, psychology, psychiatry, medicine and political science. Meta-analysis that compare groups of caregivers with non-caregivers (Pinquart and Sörensen, 2003; Vitaliano et al., 2003), longitudinal studies that examine transitions of individuals into and out of caregiving (Burton et al., 2003; Hirst, 2005; O'Reilly et al., 2008; Schulz et al., 2003; Seltzer and Li, 2000) and recent literature reviews (Schulz and Sherwood, 2008; Yee and Schulz, 2000) all indicate that informal care has negative effects on both physical and mental health. Indeed, informal caregivers have poorer general health (self-reported health, physical symptoms), physiological measures (antibodies and stress hormones) and health habits than non-caregivers (Burton et al., 2003; O'Reilly et al., 2008; Pinquart and Sörensen, 2003; Vitaliano et al., 2003). In contrast, O'Reilly et al. (2008) find that caregivers have lower mortality and are less likely to report long-term illnesses than non-caregivers. This may be due to a self-selection phenomenon of healthy individuals into the caregiver role. Concerning mental health, caregivers show higher levels of stress, depression, distress, and lower levels of subjective well-being than non-caregivers (Burton et al., 2003; Hirst, 2005; Pinquart and Sörensen, 2003; Seltzer and Li, 2000). Moreover, some studies find that the death of the care recipient is followed by a significant decline in depressive symptoms (Haley et al., 2008; Schulz et al., 2003). It should be noted that the detrimental effect of informal care on mental health has been found to be higher than for physical health (Pinquart and Sörensen, 2007, 2003; Schulz and Sherwood,

2008). Indeed, physical health is more closely associated with mental health than with caregiving stressors (Pinquart and Sörensen, 2007).

There are two main limitations to these studies. First, they use non-representative samples that overrepresent caregivers of demented elderly (Pinquart and Sörensen, 2007, 2006, 2003; Vitaliano et al., 2003; Yee and Schulz, 2000) or that focus on particular care relationships, such as care provided by a spouse or by a daughter (Burton et al., 2003; Seltzer and Li, 2000). The second limitation of these studies is their descriptive nature. Indeed, most analysis is cross-sectional and the authors recognize that the causal direction of the association between informal care and health cannot be assessed due to endogeneity problems (Pinquart and Sörensen, 2007; Schulz and Sherwood, 2008; Vitaliano et al., 2003; Yee and Schulz, 2000). In addition, it has been underlined that studies are bivariate rather than multivariate (Yee and Schulz, 2000), or match caregivers and non-caregivers only on demographic characteristics (Pinquart and Sörensen, 2003; Vitaliano et al., 2003). The existence of multiple confounding factors not controlled for – such as care arrangements, the health of elderly dependent people, or the socioeconomic status of the caregiver – may bias the results.

Recent economic papers have extended the existing literature by controlling for more factors (Bobinac et al., 2011, 2010; Byrne et al., 2009; Hansen et al., 2013) and by adjusting for the endogeneity of the relationship between health and informal care using longitudinal data, instrumental variables methods (Coe and Van Houtven, 2009; Do et al., 2013) and fixed effects models (van den Berg et al., 2014). Estimates confirm that informal care has negative physical and mental health consequences, but some effects depend on the gender and marital status of the caregiver and on the duration of caregiving. Informal care significantly decreases the health related quality of life (Bobinac et al., 2011); it increases the probability of having pain affecting daily activities and reporting fair or poor health (Do et al., 2013); and it leads to

heart conditions for single caregiver men providing continued caregiving (Coe and Van Houtven, 2009). With regard to mental health, informal care has negative effects on happiness (Bobinac et al., 2010) and life satisfaction (van den Berg et al., 2014) and is psychologically burdensome (Byrne et al., 2009). In addition, caregiving deteriorates the well-being of coresiding women (Hansen et al., 2013) and increases the depression index of married caregivers providing continued caregiving (Coe and Van Houtven, 2009).

Although the economic literature adjusts for endogeneity problems and control for more characteristics, there still exists limitations. Firstly, a large proportion of papers do not account for the characteristics of the elderly. Secondly, the economic literature has been mainly interested in estimating the global effect of informal care without assessing whether heterogeneous care arrangements lead to different health consequences. Thirdly, the studies use non-representative samples of relatively burdened caregivers (Bobinac et al., 2011, 2010) or focus on care provided by children and children-in-law (Coe and Van Houtven, 2009; Do et al., 2013; Hansen et al., 2013) which limits generalizability. Lastly, results on data from Norway, US, Korea or Australia, cannot be easily applied to the French case due to cultural differences and variations in healthcare systems. For example, informal care in Norway is mainly an emotional support since personal care is provided through public or private services (Hansen et al., 2013).

Little is known concerning the effect of specific care arrangements on caregivers' health. The intensity of care seems to be an important factor since some papers have found that informal care has negative effects on health only for caregivers providing more than 20 hours of care per week (Hirst, 2005; O'Reilly et al., 2008; van den Berg et al., 2014). Concerning the effect of informal and formal support on caregivers' health, Pinquart and Sörensen (2007) found that informal support is associated with better physical health while formal support has no

effect. In contrast, White-Means (1997) states that the probability of reporting that the health status has deteriorated because of informal care decreases when the probability of using formal home care increases. In regards with care relationships, the literature has mainly assessed the difference between spouse and child caregivers. Generally, results highlight that the detrimental effect of informal care on health is higher for spouses than for children (Hirst, 2005; Pinquart and Sörensen, 2003; Schulz and Sherwood, 2008; Seltzer and Li, 2000). In contrast, Vitaliano et al. (2003) found no difference between spouses and children and Pinquart and Sörensen (2007) explain that being a spouse is associated with a better physical health. In fact, it is difficult to interpret if such differences are due to confounding factors (spouses provide more care than children, live together with the elderly dependent person and may be initially in poorer health) or if they are explained by norms, social resources, and family and work responsibilities. Indeed, caring for a spouse is more normative (Pinquart and Sörensen, 2007) and may constitute a marriage commitment (Vitaliano et al., 2003). Children face more family constraints, work responsibilities and social commitments, which may intensify their burden (Pinquart and Sörensen, 2007; Vitaliano et al., 2003). On the other hand, these responsibilities may constitute personal and social resources to mitigate the effects of informal care (Seltzer and Li, 2000). Concerning other care relationships, providing informal care to a friend or neighbor decreases the risk of distress among women (Hirst, 2005) and children seem to experience less burden than children-in-law (Byrne et al., 2009). In contrast, Do et al (2013) find that the health effect of care is higher for daughters than for daughters-in-law, but they cannot rule out the fact that this is due to a problem of instrument. Finally, the literature stresses that caregiver women report more health problems than male caregivers (Hansen et al., 2013; Pinquart and Sörensen, 2006, 2003; Schulz and Sherwood, 2008; Vitaliano et al., 2003; Yee and Schulz, 2000). A large part of this gender effect can be explained by uncontrolled confounding factors (women provide more care than men, they are

less likely to obtain support and to quit the caregiving role). Alternatively, women may detect and report health problems more easily. They also may feel more responsible for caregiving due to gender role expectations and socialization (Pinquart and Sörensen, 2006); whereas the caregiver role is more likely to have been chosen for men (Yee and Schulz, 2000).

This work contributes in several ways to the existing literature. First, we use data that provide valuable information on the characteristics of both the caregiver and the dependent elderly person. The indicators of the consequences of informal care on general and mental health that we use, by focusing on the particular effect of informal care on caregivers' health, allow us to get rid, at least partially, of the endogeneity problem. Second, we study the effect of multiple care arrangements on the general and mental health of informal caregivers. We estimate separate models for coresiding and non-coresiding caregivers and investigate the effect of care intensity, informal support, formal home care and the relationship between the caregiver and the elderly. By considering all possible care relationships and caregivers of both demented and non-demented individuals, we achieve a high level of generalizability and representativeness. Finally, this work provides information on health effects of informal care in the French case.

3. Method

Data

In order to study the relationship between care arrangements and caregivers' health, we use a matching of the Ordinary Households section and the Caregivers section of the French Disability and Health Survey (*Enquête Handicap Santé*). This survey was carried out in 2008 by the French Institute of Statistics and the Ministry of Health and provides valuable information on both dependent people and their caregivers. The Ordinary Households section aims at describing non-institutionalized individuals with disabilities or activity restrictions. It

provides information on the socioeconomic and demographic characteristics of 29,931 individuals, as well as on their family situation. Furthermore, it gives details on deficiencies, functional limitations, activity restrictions and health problems faced by individuals. The Caregivers section describes the informal caregivers reported by the dependent persons in the Ordinary Households section. These caregivers are asked about the assistance they provide, its articulation with formal care, and its consequences on family life, working life, social life and health.

The Ordinary Households section allows us to select a sample of 4,644 dependent elderly persons aged 60 and over based on activity restrictions. An individual is considered dependent if he reports difficulties in performing alone at least one essential activity of daily living (ADL) or one instrumental activity of daily living (IADL). Among these dependent elderly persons, 3,846 receive informal care (aid with daily life tasks, financial or material aid, and moral support) and they list a total number of 6,274 informal caregivers. 69% of these caregivers (4,359) fall within the scope[2] of the Caregivers section of the survey, they can be divided into two groups: the coresiding (N=1,668) and the non-coresiding (N=2,691) caregivers. Dependent persons are asked if they agree to give the contact information of their caregivers so that they can be surveyed in the Caregivers section. This information has been obtained for 84% (N=1,399) of coresiding caregivers and 61% of non-coresiding caregivers (N=1,653). Finally, some caregivers (17% of coresiding caregivers and 28% of non-coresiding caregivers) could not be contacted or did not respond to the Caregivers survey which leaves us with 1,165 coresiding and 1,194 non-coresiding caregivers. We will discuss

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[2] In the Ordinary Households section of the survey, some dependent elderly persons (and the caregivers they report) have been studied as part of extensions in some French departments and are not considered in the Caregivers section. If we assume that the geographical location of elderly dependent people has no impact on the relationship between care arrangements and caregivers' health, this does not induce selection bias.

later in this paper the potential selection bias induced by the non-transmission of contact information and by caregivers' non-response.

We remove the caregivers that provide only a financial or material assistance and the caregivers that help several persons due to disability or health reasons. Indeed, we have information only on one care relationship and we want to *"exclude health variations associated with multiple caregiving role"* (Hirst, 2005). Our final sample contains 1,032 coresiding caregivers and 880 non-coresiding cargivers.

Variables of interest

The relationship between care arrangements and caregivers' health is studied using three health indicators: the self-assessed health (SAH), an indicator of the consequences of informal care on general health (GH) and an indicator of the consequences of informal care on mental health (MH). The self-assessed health provides information on the general state of health of the caregiver, it has five possible values (1: very good, 2: good, 3: moderate, 4: bad or 5: very bad health). The indicator of the consequences of informal care on general health is equal to 1 if the caregiver feels that informal care affects his health and 0 otherwise. Finally, the mental health indicator is built using the following question: *"I am now going to read you some less positive aspects of informal care. Tell me if they apply to you."* If the caregiver reports that he feels morally tired, depressive, or anxious/stressed/overtired, the mental health indicator has a value of 1. Otherwise, it has a value of 0.

We are interested in the effect of several care arrangements variables on caregivers' health. First, we consider separately coresiding and non-coresiding caregivers. Second, we study the effect of informal care intensity. It is measured by the number of hours of care provided per week (less than 6 hours per week, between 7 and 20 hours per week, 21-34 hours per week, more than 35 hours per week, do not know/not able to quantify) for coresiding caregivers, and by the frequency of care (less than once a week, weekly, daily) for non-coresiding caregivers.

Third, we investigate the effect of informal support using the following question *"When you happen to be unavailable, can you count on other people to replace you?"* The informal support variable takes the value 1 if the caregiver reports that he can count on a family member or another relative and 0 otherwise. Fourth, we analyze the role of formal home care (FHC). This variable has a value of 1 if the dependent elderly person receives care from health or social workers at home, and 0 otherwise. Finally, we study the effect of the relationship between the caregiver and the elderly person. For coresiding caregivers, we consider 8 caregiver-elderly person relationships: husband-wife, wife-husband, daughter-mother, son-mother, daughter-father, son-father, care from a sibling and care from other relatives. For non-coresiding caregivers, we consider 9 arrangements: daughter-mother, son-mother, daughter-father, son-father, care from a child-in-law, care from a sibling, care from a friend or neighbor, care from a grandchild and care from other relatives.

Econometric model

We first estimate the effect of care arrangements on the self-assessed health (equation 1 below) using an ordered logistic regressio, separately for coresiding and non-coresiding cargivers. SAH^* represents the unobserved latent health, the error term u_i follows a logistic distribution and X is a set of characteristics of the caregiver and the dependent elderly person being cared for. We control for the duration of informal care (for less than 3 years, for 3-8 years, for more than 8 years, since always), demographic and socioeconomic characteristics of the caregiver (age, sex, education level, working or not, monthly household income) and for family characteristics of the caregiver (living with a partner or not, having at least one child or not). We also control for the sex of the elderly dependent person in order to take into account the potential gendered dimension of care relationships. Finally, we take into account the health of the dependent elderly (number of restrictions in ADL and IADL, Alzheimer's

disease, cognitive limitations)[3]. Controlling for the health of the dependent elderly is important for three reasons. First, it has been shown that the health of the dependent elderly has a direct effect on the caregiver's health and subjective well-being. Not taking into account this *"family effect"* would overestimate the effect of providing informal care on health and well-being (*"caregiver effect"*) (Bobinac et al., 2011, 2010). Second, the health of the dependent elderly gives information on the difficulty of providing informal care (Pearlin et al., 1990). More precisely, the literature has shown that providing informal care for demented people is more harmful for health than providing care for individuals with only physical problems (Pinquart and Sörensen, 2007, 2003; Schulz and Sherwood, 2008). Finally, the health of the elderly provides information on family caregivers' health due to assortative matching − that is, the tendency of similar people to marry each other − and shared health behaviors (Hirst, 2005; Vitaliano et al., 2003).

Model 1

$$(1)\ SAH_i^* = \alpha_1 Intensity_i + \alpha_2 Support_i + \alpha_3 FHC + \alpha_4 Relationship_i + \alpha_5 X_i + u_i$$

$$SAH_i = j \Leftrightarrow c_j < SAH_i^* < c_{j+1}\ \forall j = 1, \dots, 5$$

In this first model, which uses a very general health indicator, informal care intensity and formal home care are probably endogenous due to reverse causality. Indeed, the self-assessed health may cause informal care intensity and formal home care to change (Houtven et al.,

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[3] It should be noted that the results concerning the duration of informal care are potentially endogenous due to simultaneity bias. Consequently, they should be interpreted cautiously. Indeed, there may exist a *"selection out"* phenomenon: caregivers with health problems are more likely to stop providing care (Coe and Van Houtven, 2009; Do et al., 2013; O'Reilly et al., 2008). Nevertheless, we chose to include the duration of informal care in our model because we think it provides valuable information on the history of care relationships. When we remove the duration variable, results remain unchanged.

2005). If a caregiver is in bad health, he may reduce his informal care supply and substitute formal home care for informal care. The indicators of the consequences of informal care on general and mental health (equations 2 and 3 below), by focusing on the particular effect of informal care on caregivers' health, allow us to get rid, at least partially, of the reverse causality problem for informal care. In addition, when an elderly dependent person receives formal home care, the caregiver has to precise why. We control when the caregiver reports that *"this is tiring or too physically demanding"* in order to take into account the effect of caregiver's health on formal home care.

Residuals of equations (2) and (3) are likely to be correlated at the individual level due to interactions between general health and mental health. Indeed, it has been underlined that there is a negative feedback loop between mental and physical health problems (Pinquart and Sörensen, 2007). In addition, some unobserved variables may impact the report of both general health and mental health problems (e.g., the initial health of the caregiver). Consequently, we estimate simultaneously the general health and the mental health equations using a bivariate probit model in which the error terms $\left(u_{GH_i}; u_{MH_i}\right)$ are assumed to follow a multivariate normal distribution. This model is estimated separately for coresiding and noncoresiding caregivers and GH_i^* and MH_i^* represent the latent health.

While the indicators of general and mental health consequences of informal care make it possible to overcome the reverse causality problem, we cannot rule out the possibility that there exist unobserved factors influencing the health consequences of care and that are correlated with care arrangements (e.g., the initial health of the caregiver, altruism). This will be discussed in section 5. We nevertheless think that the indicators of the health consequences of informal care limit the omitted variable bias by being much less general than the self-assessed health.

Model 2

$$(2)\ GH_i^* = \beta_1 Intensity_i + \beta_2 Support_i + \beta_3 FHC + \beta_4 Relationship_i + \beta_5 X_i + u_{GH_i};\ GH_i = \begin{cases} 1\ if\ GH_i^* > 0 \\ 0\ otherwise \end{cases}$$

$$(3)\ MH_i^* = \gamma_1 Intensity_i + \gamma_2 Support_i + \gamma_3 FHC + \gamma_4 Relationship_i + \gamma_5 X_i + u_{MH_i};\ MH_i = \begin{cases} 1\ if\ MH_i^* > 0 \\ 0\ otherwise \end{cases}$$

$$with\ (u_{GH_i};\ u_{MH_i}) \sim N \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}$$

In the samples of coresiding and non-coresiding caregivers, some individuals provide informal care to the same elderly dependent person. Indeed, among the dependent elderly persons with at least one coresiding (*resp.* non-coresiding) informal caregiver surveyed, 6% (*resp.* 29%) have two or more coresiding (*resp.* non-coresiding) caregivers described in the Caregivers section. For several reasons, caregivers of a same dependent elderly person are likely to report similar health consequences: i) a caregiver's health assessment may depend on another caregiver's health assessment, ii) a caregiver's health assessment may depend on another caregiver's characteristics and iii) caregivers of a same person face a similar environment (e.g., unobserved health characteristics or personality of the dependent elderly person, family characteristics). These three channels correspond to Manski's *"endogenous effects"*, *"contextual effects"* and *"correlated effects"* (Manski, 2007). Consequently, we allow the residuals to be correlated at the dependent elderly level and adjust standard errors by using clustered robust standard errors in the two models (the self-assessed health model and the model on health consequences of informal care). All the parameters of equations (1), (2) and (3) are estimated by the maximum likelihood method.

4. Results

Descriptive statistics

Table I below provides descriptive statistics of the variables used in our analysis for both the sample of coresiding caregivers (N=1,032) and the sample of non-coresiding caregivers (N=880). Coresiding caregivers are characterized by a poorer health than non-coresiding caregivers: 13% report a bad or very bad self-assessed health, 30% feel that informal care affects health and 55% feels that informal care has negative effects on mental health, as compared to 4%, 11% and 35%, respectively, for non-coresiding caregivers.

As far as care arrangements are concerned, 21% of coresiding caregivers provide less than 6 hours of informal care per week, 26% provide between 7 and 20 hours of care, 17% provide between 21 and 34 hours of care, 20% provide more than 35 hours of care and 15% are not able to quantify the number of care hours they provide. In the sample of non-coresiding caregivers, 15% of individuals provide informal care less than once a week, 46% provide weekly assistance and 39% provide daily assistance. Non-coresiding caregivers receive more support than their coresiding counterparts: 83% report informal support and 79% declare formal home care, *versus* 67% and 67%, respectively, for coresiding caregivers. Concerning the relationship between the caregiver and the elderly person, coresiding caregivers are mostly husbands or wives (in 66% of cases) while non-coresiding caregivers are mainly daughters or sons providing care to their mother (in 54% of cases). Around 10% of non-coresiding caregivers are friends and neighbors, thus informal care from the social network seems important.

As regards control variables, coresiding and non-coresiding caregivers have similar distributions for the duration of informal care and income. Between 17 and 20% have been providing care for less than 3 years, 33-36% have been provided care for 3 to 8 years, around 40% have been provided care for more than 8 years and 3-8% have been provided care since always. By contrast, they differ in demographic characteristics, education, work status and

family characteristics. Coresiding caregivers are older (71% are 60 and older *versus* 31% of non-coresiding caregivers), less educated and less often in the workforce (17% *versus* 52%) than non-coresiding workers. This is due to the fact that coresiding and non-coresiding caregivers are basically from two different generations. Coresiding caregivers are women in 53% of cases, in comparison with 66% for non-coresiding caregivers. They provide informal care to women in 60% of cases as compared to 77% for non-coresiding caregivers. The reason for this is that husbands providing informal care increase the proportion of men caregivers in the coresiding sample and elderly dependent husbands receiving care increase the proportion of dependent men. Regarding family characteristics, coresiding caregivers live less often with a partner (78% *versus* 89%) and have slightly less often children than non-coresiding caregivers. Finally, coresiding caregivers seem to provide care to slightly more dependent people than non-coresiding ones: the dependent elderly has at least one restriction in essential activities of daily livings in 65% of cases and has Alzheimer's disease in 12% of cases, in comparison with 56% and 9%, respectively, for non-coresiding caregivers.

Table I – Descriptive statistics for coresiding (N=1,032) and non-coresiding (N=880) caregivers

	Coresiding	Non-coresiding
Health variables		
Self-assessed health (%)		
Very good	10.09	19.52
Good	36.66	51.94
Moderate	40.45	24.77
Bad	10.67	3.20
Very bad	2.13	0.57
The caregiver feels that informal care affects health (%)		
Yes	29.82	11.18
No	70.18	88.82
The caregiver feels that informal care has negative effects on mental health (%)		
Yes	55.12	34.71
No	44.88	65.29
Care arrangements		
Intensity of informal care (%)		
Less than 6 hours per week	21.21	-
Between 7 and 20 hours per week	26.46	-
21-34 hours per week	16.75	-
More than 35 hours per week	20.31	-
Do not know, not able to quantify	15.27	-
Frequency of informal care (%)		
Less than once a week	-	14.59
Weekly	-	46.07
Daily	-	39.34
Informal support (%)		
Yes	66.63	82.97
No	33.37	17.03
Formal home care (%)		
Yes	66.90	79.17
No	33.10	20.83
The elderly person receives help from professionals because this is tiring or too physically demanding (if any, %)		
Yes	15.20	11.10
No	84.80	88.90
Relationship between the (coresiding) caregiver and the elderly person (%)		
Care provided by a husband to his wife	33.43	-
Care provided by a wife to her husband	32.36	-
Care provided by a daughter to her mother	11.34	-
Care provided by other relatives	9.30	-
Care provided by a son to his mother	7.36	-
Care provided by a sibling	2.23	-
Care provided by a daughter to her father	2.03	-
Care provided by a son to his father	1.94	-
Relationship between the (non-coresiding) caregiver and the elderly person		
Care provided by a daughter to her mother	-	35.57
Care provided by a son to his mother	-	18.41
Care provided by a friend or neighbor	-	9.55
Care provided by a daughter to her father	-	8.52
Care provided by other relatives	-	7.73
Care provided by a child-in-law	-	6.25
Care provided by a sibling	-	6.02
Care provided by son to his father	-	4.32
Care provided by a grandchild	-	3.64
Duration of informal care (%)		
For less than 3 years	17.10	20.38

For 3 to 8 years	36.41	33.29
For more than 8 years	43.55	38.74
Since always	2.94	7.58
Demographic, socioeconomic and family variables		
Age (%)		
Less than 50 years of age	14.24	34.20
Between 50 and 60 years of age	15.12	34.32
Between 60 and 70 years of age	24.03	20.34
70 and older	46.61	11.14
Sex (%)		
Male	47.38	33.86
Female	52.62	66.14
Sex of the dependent elderly (%)		
Male	40.12	22.84
Female	59.88	77.16
Education level for coresiding caregivers (%)		
No diploma	31.50	-
Certificate of primary education or Junior school certificate	33.70	-
Higher diploma	34.80	-
Education level for non-coresiding caregivers		
No diploma or Certificate of primary education	-	29.82
Junior school certificate or Vocational qualifications	-	40.60
Higher diploma	-	29.58
Work (%)		
Yes	17.44	52.50
No	82.56	47.50
Monthly household income (%)		
Less than 1200 EUR	22.45	20.99
1200-1800 EUR	22.45	23.62
1800-2500 EUR	22.55	21.82
2500-4000 EUR	21.60	22.38
More than 4000 EUR	10.96	11.19
Living with a partner (%)		
Yes	78.30	88.75
No	21.70	11.25
Having at least one child (%)		
Yes	79.71	84.29
No	20.29	15.71
Health of the dependent elderly		
At least one restriction in ADLs (%)		
Yes	64.53	55.91
No	35.47	44.09
Mean number of restrictions in ADLs	1.91	1.45
At least one restriction in IADLs (%)		
Yes	96.71	98.52
No	3.29	1.48
Mean number of restrictions in IADLs	5.76	5.44
Alzheimer (%)		
Yes	12.49	9.00
No	87.51	91.00
Cognitive limitations (%)		
Yes	48.74	45.80
No	51.26	54.20

Source: French Disability and Health Survey (2008).
Field: informal caregivers of dependent elderly persons (1st column: subsample of 1,032 coresiding caregivers, 2nd column: subsample of 880 non-coresiding caregivers).

Estimation results

Tables II and III (see below) present the results of the two models (the ordered logit model for self-assessed health and the bivariate probit model for general and mental health effects of informal care), respectively, for coresiding and non-coresiding caregivers. For the sake of convenience, the coefficients of the caregiver-elderly person relationships are not reported in table II and III. The significant differences between these coefficients and the corresponding levels of significance are summarized in table IV below.

Self-assessed health

While the indicators of health consequences of informal care show interesting patterns depending on care arrangements, the self-assessed health is mainly explained by caregivers' demographic and socioeconomic characteristics. For both coresiding and non-coresiding caregivers, the probability of reporting bad health increases with caregiver's age, decreases with the education level and is lower for working caregivers. Non-coresiding caregivers with incomes over 1,800 Euros per month have a lower probability of declaring bad health. In addition, for coresiding-caregivers, providing care to a person with cognitive limitations leads to negative health effects.

The absence of significant effects of care arrangements on self-assessed health may be partly explained by the very general nature of this variable, or by endogeneity problems. Indeed, if caregivers who are in bad health reduce their informal care supply, this will underestimate the effect of care intensity on health. In addition, confounding factors influencing both care arrangements and self-assessed health may exist. Thus, in the remainder of the paper, we will rather focus on the indicators of general and mental health consequences of informal care.

Table II – Estimations for coresiding caregivers (N=1,032)

	SAH Coefficients of the ordered logit model 1: very good … 5: very bad	General health Marginal effects of the biprobit 1: informal care affects health	Mental health Marginal effects of the biprobit 1: informal care has negative effects on mental health
Care arrangements			
Intensity of informal care (per week)			
Less than 6 hours	Ref.	Ref.	Ref.
7-20 hours	-0.127	0.022	0.053
21-34 hours	0.008	0.152***	0.181***
More than 35 hours	0.105	0.148***	0.165***
Do not know, not able to quantify	-0.149	0.043	0.063
Informal support			
Yes	-0.173	-0.049*	-0.035
No	Ref.	Ref.	Ref.
Formal home care			
Yes	-0.019	0.039	0.021
No	Ref.	Ref.	Ref.
The elderly person receives help from professionals because this is tiring or too physically demanding			
Yes	0.365*	0.125***	0.145***
No	Ref.	Ref.	Ref.
Caregiver-elderly person relationship (a)			
Duration of informal care (%)			
For less than 3 years	Ref.	Ref.	Ref.
For 3 to 8 years	0.230	-0.023	-0.039
For more than 8 years	0.135	-0.078**	-0.089**
Since always	0.641	-0.049	-0.179*
Demographic, socioeconomic and family variables			
Age			
Less than 50	Ref.	Ref.	Ref.
Between 50 and 60	0.927***	0.096*	0.127**
Between 60 and 70	0.955***	0.037	0.146**
70 and older	1.396***	0.030	0.090
Sex			
Male	Ref.	Ref.	Ref.
Female	0.302	0.036	0.028
Sex of the dependent elderly			
Male	Ref.	Ref.	Ref.
Female	-0.008	0.054	0.047
Education level			
Low	Ref.	Ref.	Ref.
Medium	-0.156	0.015	0.079**
High	-0.511***	0.017	0.033
Work			
Yes	-0.529**	-0.060	-0.042
No	Ref.	Ref.	Ref.
Monthly household income			
Less than 1200 EUR	Ref.	Ref.	Ref.
1200-1800 EUR	-0.180	0.048	-0.015
1800-2500 EUR	-0.050	0.001	-0.038
2500-4000 EUR	-0.048	0.028	-0.040
More than 4000 EUR	0.253	0.043	-0.042
Living with a partner			
Yes	-0.069	-0.034	0.024

No	Ref.	Ref.	Ref.
Having at least one child			
Yes	-0.065	0.062	0.078*
No	Ref.	Ref.	Ref.
Health of the dependent elderly			
Number of restrictions in ADLs	-0.021	0.007	0.001
Number of restrictions in IADLs	-0.012	0.003	0.004
Alzheimer			
Yes	-0.048	0.039	0.023
No	Ref.	Ref.	Ref.
Cognitive limitations			
Yes	0.481***	0.087***	0.110***
No	Ref.	Ref.	Ref.
Number of observations used	1,031	1,029	
Correlation coefficient	-	0.593***	

*: significant at the 10% level, **: 5% level, ***: 1% level.

Source: French Disability and Health Survey (2008).

Field: coresiding informal caregivers of dependent elderly persons.

Lecture: when the dependent elderly has cognitive limitations, the probability of reporting bad health raises, the probability that informal care affects health increases by 8.7 percentage points and the probability that informal care has negative effects on mental health increases by 11 percentage points at the 1% level.

(a) We also control for the relationship between the caregiver and the elderly person. A comparison of the coefficients of the caregiver-elderly person relationships is provided in table IV for the general health and the mental health of coresiding and non-coresiding caregivers.

Table III – Estimations for non-coresiding caregivers (N=880)

	SAH Coefficients of the ordered logit model 1: very good … 5: very bad	General health Marginal effects of the biprobit 1: informal care affects health	Mental health Marginal effects of the biprobit 1: informal care has negative effects on mental health
Care arrangements			
Frequency of informal care			
Less than once a week	Ref.	Ref.	Ref.
Weekly	-0.005	-0.030	0.101**
Daily	0.308	0.065*	0.152***
Informal support			
Yes	-0.144	-0.063***	-0.184***
No	Ref.	Ref.	Ref.
Formal home care			
Yes	-0.145	0.022	-0.019
No	Ref.	Ref.	Ref.
The elderly person receives help from professionals because this is tiring or too physically demanding			
Yes	0.193	0.077***	0.043
No	Ref.	Ref.	Ref.
Caregiver-elderly person relationship (a)			
Duration of informal care (%)			
For less than 3 years	Ref.	Ref.	Ref.
For 3 to 8 years	0.192	-0.008	-0.056
For more than 8 years	0.277	-0.004	-0.061
Since always	0.287	-0.014	-0.048
Demographic, socioeconomic and family variables			
Age			

Less than 50	Ref.	Ref.	Ref.
Between 50 and 60	0.460***	-0.023	-0.021
Between 60 and 70	0.558**	-0.027	-0.033
70 and older	1.059***	0.006	-0.036
Sex			
Male	Ref.	Ref.	Ref.
Female	0.141	0.087**	0.219***
Sex of the dependent elderly			
Male	Ref.	Ref.	Ref.
Female	-0.145	-0.034	-0.015
Education level			
Low	Ref.	Ref.	Ref.
Medium	-0.309*	0.018	0.058
High	-0.430**	0.089***	0.089*
Work			
Yes	-0.352**	-0.016	-0.009
No	Ref.	Ref.	Ref.
Monthly household income			
Less than 1200 EUR	Ref.	Ref.	Ref.
1200-1800 EUR	-0.348	-0.023	-0.055
1800-2500 EUR	-0.465*	-0.026	-0.119**
2500-4000 EUR	-0.914**	-0.015	-0.062
More than 4000 EUR	-1.381***	-0.150**	-0.114
Living with a partner			
Yes	0.412*	-0.004	0.071
No	Ref.	Ref.	Ref.
Having at least one child			
Yes	0.200	-0.048*	0.065
No	Ref.	Ref.	Ref.
Health of the dependent elderly			
Number of restrictions in ADLs	-0.009	0.008	0.016
Number of restrictions in IADLs	-0.008	0.004	0.008
Alzheimer			
Yes	-0.221	0.042	0.037
No	Ref.	Ref.	Ref.
Cognitive limitations			
Yes	0.243	0.043*	0.061
No	Ref.	Ref.	Ref.
Number of observations used	876	874	
Correlation coefficient	-	0.914***	

*: significant at the 10% level, **: 5% level, ***: 1% level.

Source: French Disability and Health Survey (2008).

Field: non-coresiding informal caregivers of dependent elderly persons.

Lecture: an individual whose education level is high has a lower probability or reporting bad health at the 5% level. However the probability of reporting that informal care affects health increases by 8.9 percentage points at the 1% level and the probability that informal care has negative effects on mental health increases by 8.9 percentage points at the 10% level.

(a) We also control for the relationship between the caregiver and the elderly person. A comparison of the coefficients of the caregiver-elderly person relationships is provided in table IV for the general health and the mental health of coresiding and non-coresiding caregivers.

Care intensity, informal and formal support

For both coresiding and non-coresiding caregivers, the intensity of informal care is an important predictor of the probability that informal care affects general and mental health. For coresiding caregivers, informal care has negative effects on general and mental health if they provide more than 20 hours of care per week. This is consistent with previous papers (Hirst, 2005; O'Reilly et al., 2008; van den Berg et al., 2014). For example, providing 21-34 hours of care per-week increases the probability that informal care affects general health by 14.8 percentage points and the probability of negative mental health effects by 16.5 percentage points, in comparison with caregivers providing less than 6 hours per week. The mean estimated probability of general health consequences goes from 16% for coresiding caregivers providing less than 6 hours of care per week to 40% for those helping more than 35 hours per week. For mental health, the probability goes from 38% to 67% (see figure 1 below). Concerning non-coresiding caregivers, informal care provided on a weekly or daily basis is significantly associated with mental health problems. On the other hand, general health is affected only by daily assistance at the 10% level. This smaller effect of informal care on general health than on physical health confirms previous findings (Pinquart and Sörensen, 2007, 2003; Schulz and Sherwood, 2008). Daily care raises by 6.5 percentage points the probability of general health problems and by 15 percentage points the probability of mental health problems, as compared to care provided less than once a week. The mean estimated probability of reporting that informal care affects general health goes from 9% for care provided less than once a week to 19% for daily care. For mental health, it goes from 25% to 41% (see figure 2 below).

As far as other care arrangements are concerned, informal support has an effect mainly for non-coresiding caregivers, it decreases the probability of reporting general health consequences of informal care by 6 percentage points and reduces the probability of mental

health problems by 18 percentage points. After controlling for the fact that some elderly dependent persons receive formal support because care is too tiring or too physically demanding, we find that formal home care has no significant effect on caregivers' health.

Figure 1 – Estimated probability that informal care affects general health or mental health according to the intensity of informal care for coresiding caregivers
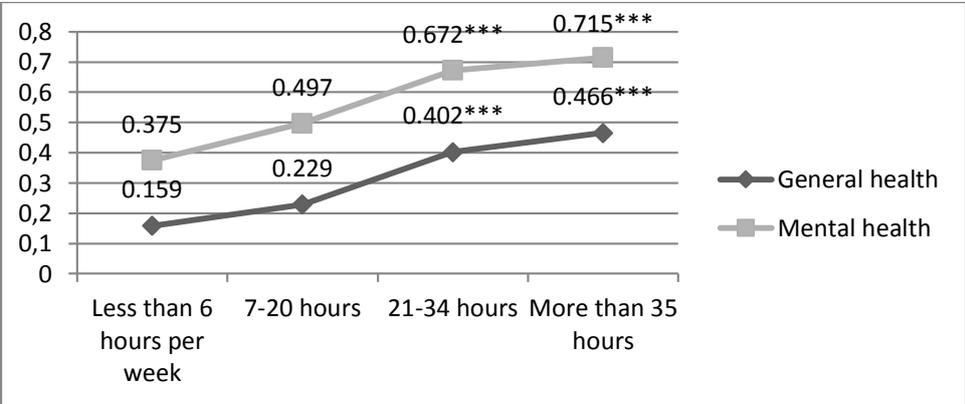
*: significant at the 10% level, **: 5% level, ***: 1% level.
Source: French Disability and Health Survey (2008).
Field: coresiding informal caregivers of dependent elderly persons.

Figure 2 – Estimated probability that informal care affects general health or mental health according to the frequency of informal care for non-coresiding caregivers
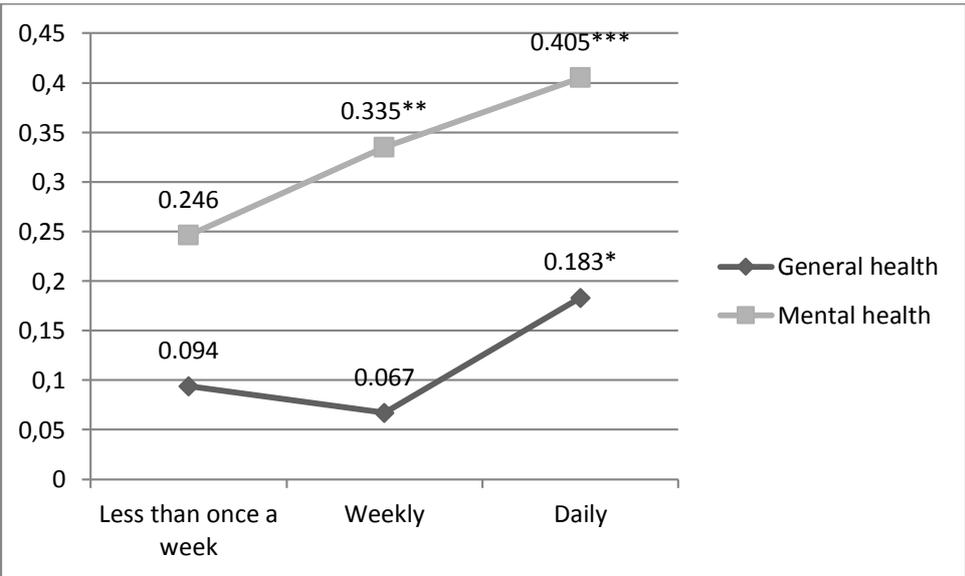
*: significant at the 10% level, **: 5% level, ***: 1% level.
Source: French Disability and Health Survey (2008).
Field: non-coresiding informal caregivers of dependent elderly persons.

Relationship between the caregiver and the elderly person

The health consequences of informal care also depend on the relationship between the caregiver and the elderly person (see table IV below). For coresiding caregivers, children report adverse effects in terms of general health significantly less often than wives, and sons providing care to a mother have a lower probability of general health problems than husbands, which is in accordance with the literature (Hirst, 2005; Pinquart and Sörensen, 2003; Schulz and Sherwood, 2008; Seltzer and Li, 2000). However, we cannot rule out that this is simply due to the fact that children, who are younger, have a better initial health state. Indeed, if we look at mental health, there is no more difference between children and husbands or wives. The comparison of the coefficients also shows that sons providing care to their mother have a lower probability that care affects general or mental health than daughters providing care to their mother. This gender effect may be explained by the fact that daughters' involvement in care is constrained by social norms whereas sons are more likely to choose the caregiver role. This idea can be related to the concept of *"prescription"* developed by Akerlof and Kranton (2000) in their seminal paper. They consider that the utility of individuals depends on their identity (i.e. a person's self image) which is based on social categories (e.g., "man" or "woman"). Prescriptions indicate the appropriate behavior in these categories (e.g., "women are supposed to care for their relatives") and individuals who deviate from the prescribed behavior suffer a utility loss.

Concerning non-coresiding caregivers, the probability that informal care affects general health is lower for grandchildren than for children or siblings. This effect is probably explained by differences in initial health since it is no longer significant for mental health (except for the difference between grandchildren and sons providing care to their mother). In addition, friends and neighbors and children-in-law report less often that informal care has negative general and mental health consequences than children and siblings. Again, this result may

reflect that when informal care results from a personal choice (care from friends or neighbors, from children-in-law) rather than from social norms (care from children), it reduces the health risk. The smaller health consequences incurred by children-in-law in comparison with children support Do et al. (2013)'s result but differ from Byrne et al. (2009).

Table IV – Comparison of the coefficients of the caregiver-elderly person relationships

Coresiding caregivers	Non-coresiding caregivers
General health	**General health**
Daughter-mother < Wife-husband (*)	Friend or neighbor < Daughter-mother (**)
Other relative < Wife-husband (***)	Friend or neighbor < Son-mother (*)
Sibling < Wife-husband (*)	Friend or neighbor < Daughter-father (**)
Daughter-father < Wife-husband (***)	Friend or neighbor < Other relative (**)
Son-father < Wife-husband (*)	Friend or neighbor < Sibling (**)
Son-mother < Wife-husband (**)	Child-in-law < Daughter-mother (*)
Son-mother < Daughter-mother (*)	Child-in-law < Daughter-father (*)
Son-mother < Husband-wife (**)	Child-in-law < Sibling (*)
Other relative < Husband-wife (*)	Grandchild < Daughter-mother (***)
Other relative < Daughter-mother (***)	Grandchild < Son-mother (**)
Other relative < sibling (*)	Grandchild < Daughter-father (**)
	Grandchild < Other relative (**)
	Grandchild < Sibling (**)
	Grandchild < Son-father (*)
Mental health	**Mental health**
Son-mother < Daughter-mother (*)	Friend or neighbor < Daughter-mother (**)
Son-mother < Sibling (*)	Friend or neighbor < Son-mother (**)
	Friend or neighbor < Daughter-father (*)
	Friend or neighbor < Sibling (**)
	Child-in-law < Daughter-mother (***)
	Child-in-law < Son-mother (***)
	Child-in-law < Daughter-father (**)
	Child-in-law < Other relative (*)
	Child-in-law < Sibling (**)
	Grandchild < Son-mother (*)

Source: French Disability and Health Survey (2008).
Field: informal caregivers of dependent elderly persons (1st column: sample of coresiding caregivers; 2nd column: sample of non-coresiding caregivers).
Lecture: This table reports the significant differences between the coefficients of the caregiver-elderly person relationships and the corresponding levels of significance. For example, for coresiding caregivers, a son who provides informal care to his mother has a lower probability of reporting that care affects health than a husband who provides informal care to his wife at the 5% level.

Control variables

Health consequences of informal care are mainly influenced by care arrangements. Regarding control variables, caregivers with higher education level seem to detect more easily the effect of care on health. Cognitive limitations of dependent elderly persons have detrimental effects on both the general and the mental health of coresiding caregivers and on the general health of

non-coresiding caregivers. For example when the dependent person has cognitive limitations, it increases by respectively 9 percentage points and 11 percentage points, the probability that informal care affects general health and mental health for coresiding caregivers. This is in line with Pearlin et al. (1990), Pinquart and Sörensen (2007, 2003) and Schulz and Sherwood (2008). In addition, for coresiding caregivers, the probability of health problems seems to increase with age and decreases with the duration of care. This second effect may be due to a *"selection out"* phenomenon (caregivers in bad health are more likely to stop caregiving) or an adaptation phenomenon. Finally, among non-coresiding caregivers, women and individuals with lower incomes have a higher probability of reporting that informal care has general and mental health consequences.

Robustness test: discussion on the selection bias

As outlined above, the elderly dependent persons have agreed to give the contact information of respectively 84% and 61% of the coresiding and non-coresiding caregivers they have reported. Then, 17% of the coresiding caregivers and 20% of the non-coresiding caregivers could not be contacted or did not respond to the Caregivers section of the survey. Table A1 in appendix provides descriptive statistics on the available characteristics of the caregivers reported by the dependent persons and who fall within the scope of the Caregivers section of the survey (1st column) and on the caregivers that have answered the survey, considered in this study (2nd column). It should be noted that characteristics of the former are provided by the dependent elderly persons whereas characteristics of the latter are reported by the caregivers themselves. Coresiding caregivers declared by the dependent elderly and coresiding caregivers that have participated in the survey have similar characteristics and provide care to individuals with similar health problems. The information on care hours is much more precise when the caregiver answers than when the dependent person answers.

However, if we focus on caregivers for whom the number of care hours is known, the distribution is similar.

Concerning non-coresiding caregivers, there are 41% of missing values for the frequency of informal care when reported by the dependent person (not shown here). If we limit the analysis to caregivers for whom we know the frequency of care, the subsample of caregivers that have answered the survey seems to overrepresent caregivers providing daily assistance, they represent 39% of the caregivers as compared to 33% in the total sample of non-coresiding caregivers. As regards with care relationships, the proportion of daughters providing care to their mother is higher in the subsample than in the total sample (36% *versus* 25%). Finally, the subsample of non-coresiding caregivers who have participated to the survey contains a slightly larger proportion of women and provides care to individuals who have more of often cognitive limitations than the total sample of non-coresiding caregivers reported by the dependent elderly persons.

This non-random aspect of the sample does not on its own bias the estimation of the health consequences of informal care, if all variables influencing selection are controlled in the health equation (Sartori, 2003). Of greater concern is that unobserved factors influencing selection may be correlated with the error term in our equation of interest. The selection bias is thus equivalent to an omitted variable bias (Heckman, 1979) and skews the results in inconsistent estimates. For example, it is possible that the caregivers who participate to the survey are the most involved and the most affected by informal care.

Work in progress:

The next step of this work will be to adjust the estimates for selection bias. This will consist in estimating a four-equation model. The first equation will deal with the non-transmission of contact information by elderly dependent persons, the second selection equation will take into account caregivers' non-response (conditionally to the transmission of contact information), the third and fourth equations will estimate the effect of care arrangements on

the probability that informal care affects general or mental health on caregivers that have participated to the Caregivers section of the survey.

In order to identify this model, we will need two exclusion variables (one for each selection equation) that appear in the selection equations but do not affect the probability that informal care affects health. In the Ordinary Households section of the survey, a mail-back questionnaire has been left for elderly dependent people. We can use the fact that the elderly dependent person has or has not completed and returned this paper questionnaire as an indicator of the degree of compliance with the survey, and thus of the probability of transmitting caregivers' contact information. Concerning the second selection equation, finding a good exclusion variable is more difficult at first sight. We could test if the total number of caregivers of an elderly person has an effect on the probability that a given caregiver participates to the survey (for example, through a free-rider phenomenon).

5. Discussion

Our contribution to the literature was to estimate from French data the effect of care arrangements on caregivers' health. We used separate models for coresiding and non-coresiding caregivers to investigate the effect of care intensity, informal support, formal home care and the relationship between the caregiver and the elderly. By considering all possible care relationships and caregivers of dependent persons with different health problems, we achieve a high level of generalizability. Finally, the indicators of the consequences of informal care on general and mental health that we use allow us to get rid, at least partially, of the endogeneity problem.

The estimations highlight that it is important to study care arrangements, and not only the global effect of caregiving. Informal care has a detrimental effect on the general and mental health of coresiding caregivers when they provide more than 20 hours per week. For non-coresiding caregivers, both weekly and daily care affect mental health while the general health is associated only with daily assistance. In addition, informal support has a beneficial effect on health for non-coresiding caregivers and formal care has no significant effect. Finally, it seems that when informal care results from a personal choice (care provided by friends and neighbors, and children-in-law) rather than from social norms (care from children), it reduces the health risk for non-coresiding caregivers. For coresiding caregivers,

we find that sons providing informal care to their mother face less health consequences than daughters. This gender effect may be due to the fact that daughters' care decisions are constrained by social norms whereas sons are more likely to freely choose the caregiver role. In terms of public policies, measures aimed at mitigating the adverse effects of informal care should primarily focus on intensive caregivers. Second, policymakers should encourage informal support and solidarity, not only from the family but also from the social network (friends, neighbors) of dependent elderly people.

The main limitation of this study is that we have no information on the initial health state of individuals before they enter the caregiver role. Several papers have underlined that caregivers may have initially particular health characteristics (Coe and Van Houtven, 2009; Do et al., 2013; Hirst, 2005; O'Reilly et al., 2008; Vitaliano et al., 2003). This *"selection in"* effect is not too problematic if the initial health state of the caregiver is not correlated to care arrangements. Indeed, this study focuses on caregivers and thus takes place after the decision of providing care. However, it may be the case that the initial health state of the caregiver has an effect on the intensity of informal care. There are two possible theories. If we assume that there exists a healthy caregiver effect (O'Reilly et al., 2008), meaning that healthier individuals provide more care, this would underestimate our effect of care intensity. Our estimates should then be considered as lower bounds. On the contrary, if we think that individuals in bad health have a lower opportunity cost of providing care (Hirst, 2005), this would overestimate our effect of care intensity which is more problematic. Another limitation is that the indicators of health consequences that we use require that individuals are aware of the effect of informal care on their health. These subjective variables may also result in justification bias.

While the existing literature has mainly focused on negative aspects of informal care, future research could study positive outcomes. Indeed, even intensive caregivers report that informal care has positive effects; it strengthens their relationships with others, gives meaning to their lives, it makes them feel needed and good about themselves (Schulz and Sherwood, 2008). Examining both positive and negative aspects would provide a better picture of the overall impact of informal care. In addition, it is possible that positive outcomes mitigate the effect of informal care on health. If these positive aspects differ depending on the relationship between the caregiver and the dependent elderly person, this could explain more precisely some of our results.

6. Appendix

Table A1 – Characteristics of the total samples and studied subsamples for both coresiding and non-coresiding caregivers

Coresiding caregivers	N=1,668	N=1,032
Caregivers' characteristics		
Intensity of informal care (%)		
Less than 6 hours per week	22.55	25.03
Between 7 and 20 hours per week	33.11	31.23
21-34 hours per week	19.25	19.77
More than 35 hours per week	25.08	23.98
Relationship between the caregiver and the elderly person (%)		
Care provided by a man to his wife	34.47	33.43
Care provided by a woman to her husband	30.34	32.36
Care provided by a daughter to her mother	11.27	11.34
Care provided by other relatives	9.05	9.30
Care provided by a son to his mother	8.03	7.36
Care provided by a sibling	1.98	2.23
Care provided by a daughter to her father	2.52	2.03
Care provided by a son to his father	2.34	1.94
Age (%)		
Less than 50 years of age	15.17	14.24
Between 50 and 60 years of age	14.45	15.12
Between 60 and 70 years of age	23.90	24.03
70 and older	46.48	46.61
Sex (%)		
Male	49.64	47.38
Female	50.36	52.62
Health of the dependent elderly		
At least one restriction in ADLs (%)		
Yes	61.51	64.53
No	38.49	35.47
Mean number of restrictions in ADLs	1.81	1.91
At least one restriction in IADLs (%)		
Yes	96.64	96.71
No	3.36	3.29
Mean number of restrictions in IADLs	5.49	5.76
Alzheimer (%)		
Yes	11.29	12.49
No	88.71	87.51
Cognitive limitations (%)		
Yes	47.54	48.74
No	52.46	51.26

Non-coresiding caregivers	N=2,691	N=880
Caregivers' characteristics		
Frequency of informal care (%)		
Less than once a week	14.83	14.59
Weekly	51.77	46.07
Daily	33.40	39.34
Relationship between the caregiver and the elderly person (%)		
Care provided by a daughter to her mother	25.27	35.57
Care provided by a son to his mother	17.17	18.41
Care provided by a friend or neighbor	12.52	9.55
Care provided by a daughter to her father	6.13	8.52
Care provided by other relatives	28.22	7.73
Care provided by a child-in-law	-	6.25
Care provided by a sibling	6.02	6.02
Care provided by son to his father	4.68	4.32
Care provided by a grandchild	-	3.64
Age (%)		
Less than 50 years of age	36.10	34.20
Between 50 and 60 years of age	33.75	34.32
Between 60 and 70 years of age	19.40	20.34
70 and older	10.75	11.14
Sex (%)		
Male	38.24	33.86
Female	61.76	66.14
Health of the dependent elderly		
At least one restriction in ADLs (%)		
Yes	52.62	55.91
No	47.38	44.09
Mean number of restrictions in ADLs	1.38	1.45
At least one restriction in IADLs (%)		
Yes	98.81	98.52
No	1.19	1.48
Mean number of restrictions in IADLs	5.13	5.44
Alzheimer (%)		
Yes	8.12	9.00
No	91.88	91.00
Cognitive limitations (%)		
Yes	41.99	45.80
No	58.01	54.20

Source: French Disability and Health Survey (2008).

Field: informal caregivers of dependent elderly persons (1st column: caregivers reported by the dependent elderly persons in the Ordinary Households section of the French Disability and Health Survey and who fall within the scope of the Caregivers section of the survey; 2nd column: caregivers considered in this study).

Note: the response categories "child-in-law" and "grand-child" do not exist in the Ordinary Households section, they are thus recorded in the "other relatives" category.

7. Acknowledgements

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