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Characteristics of care-givers and care recipients influencing the impact of paid care services on family care-giver burdens

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ABSTRACT
In the last few decades, a number of researchers have attempted to identify the effects of paid care services on alleviating the sense of burden of family care-givers, especially care-givers to people with dementia. However, few researchers have considered the possibility that paid care services alleviate the sense of burden only among those care-givers who possess specific characteristics. Without considering this point, the impact of paid care services would be averaged over an entire sample, and one might overlook the effects on these specific care-givers. With this background, this study examines the relationship between family care-givers' sense of burden and the amount of paid care services in Japan and identifies groups of care-givers among whom these services are significantly associated with a lesser sense of burden. The sense of burden of 339 family care-givers to older care recipients with dementia was measured using a modified version of the Caregiver Burden Inventory. In order to examine their association with the amount of paid care services received, logistic regression analysis was individually applied to groups of care-givers who exhibit specific characteristics. The results suggested that paid care services alleviated two out of five components of burden, provided the groups to which the analyses are applied are appropriately defined. In particular, two subsets of the entire sample, comprising young care-givers aged 49 or below, and including male care-givers, indicated that their overall sense of social and emotional burden were alleviated by the use of paid care services. The practical implications for policy makers are discussed.

KEY WORDS – care-giver burden, paid care service, dementia.

Introduction

Caring for an impaired older person is very stressful and challenging for the person's family members. It is widely recognised globally that alleviating care-givers' sense of burden is an important issue. As paid home care services

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seem to be a promising solution for this problem, a number of researchers have attempted to identify the effects of these services in the last few decades. However, as the most vulnerable or distressed family care-givers may be the ones most likely to self-select paid care services (Mullan 1993; Pot *et al.* 2005), it is often difficult to find a negative association between the sense of burden (or distress) and the amount of paid care services provided and assess the effectiveness of these services.

Previous studies can be classified by two methodological approaches. The first group is based on longitudinal studies. (Harper *et al.* 1993; Pot *et al.* 2005; Schacke and Zank 2006; Zarit *et al.* 1998). Care-givers were divided into two groups, those receiving paid care services and control groups, and changes in their sense of burden were compared. Although the conclusions of these studies were inconsistent, as indicated by Pot *et al.* (2005), several previous studies have successfully identified positive impacts (Harper *et al.* 1993; Pot *et al.* 2005; Schacke and Zank 2006; Zarit *et al.* 1998).

The second group includes cross-sectional studies in which data are collected at a specific point and in which the association of the sense of burden (or distress) with the amount of paid care services and other variables is analysed using regression and other methods (Cohen, Colantonio and Vernich 2002; Kumamoto, Arai and Zarit 2006; Nagatomo *et al.* 1999; Nakagawa and Nasu 2011). The conclusions of this group were also ambiguous. In some studies, utilisation of paid care services was not associated with a lesser sense of burden (Chappell and Reid 2002; Cohen, Colantonio and Vernich 2002; Nagatomo *et al.* 1999). However, at least two previous cross-sectional studies have successfully identified the effectiveness of paid care services on care-givers' sense of burden. First, Kumamoto, Arai and Zarit (2006) used structural equation modelling and found a significant negative association between care-givers' sense of burden and use of paid care services. Second, Nakagawa and Nasu (2011) introduced the concept of service utilisation level, which was defined as the gap between the amount of paid care services that a care-giver utilised and the amount that he or she required, and showed that a smaller gap (*i.e.* sufficiency in the amount of care services) was associated with a lesser sense of care-giver burden. However, this service utilisation level is based on a subjective index (*i.e.* the amount that family care-givers required) and thus highlights a significant weakness in the results.

Some authors have questioned the ambiguity of the association between care services and care-givers' sense of burden. Schacke and Zank (2006) and Zarit *et al.* (1998) suggest five reasons for this ambiguity. First, according to some studies, people in treatment groups were not using the amount of care services they were supposed to use. Second, some studies revealed that people in control groups were using services similar to those used by people in treatment groups, and these studies failed to compare the two groups appropriately. Third, some studies failed to consider that stress among care-givers can decrease significantly over time, even in an untreated control group, and did not appropriately compare the treatment and control groups (Knight and Macofsky-Urban 1993). Fourth, few studies investigated the effects of paid care services over both short- and long-term periods, implying that variations in survey periods might have caused inconsistent results. Fifth, some studies employed unidimensional scales to assess care-giving stress and psychological wellbeing and thus lacked specificity in selecting sufficiently sensitive outcomes to detect the effects of intervention (one such example is Cohen, Colantonio and Vernich 2002).

In addition to these points, the present paper considers a new possibility that few previous studies took into account: paid care services alleviate the sense of burden only among those care-givers who are sensitive to paid care services. Here 'sensitive' refers to those people whose sense of burden differed substantially when they utilised lesser and greater amounts of formal services. In other words, the impact of paid care services on a care-giver might depend on the characteristics of the care-giver and his/her care recipient. If this proposition is true, then a study that neglects this point may fail to detect the impact of paid care services because this impact would be averaged over an entire sample. Moreover, even if a study successfully detects this impact by avoiding the five methodological deficiencies mentioned above, it might underestimate the impact on sensitive care-givers, while overestimating the impact on other care-givers. To the authors' knowledge, no earlier studies investigating the association between paid care services and care-givers' sense of burden have considered this important point.

With this background, we sought to identify the conditions of older Japanese people and their family care-givers under which paid care services alleviated care-givers' sense of burden. In other words, we identified several characteristics of care-giver–care recipient dyads such that care-givers' sense of burden was effectively alleviated by paid care services. Identification of such characteristics will support the proposition mentioned above. To identify the effectiveness of paid care services on specific aspects of care-givers' sense of burden, a multidimensional Caregiver Burden Inventory (CBI; Novak and Guest 1989) was utilised.

Rationale of choosing covariates

The choice of care-giver and care recipient characteristics was determined by reviewing previous studies. Nagatomo *et al.* (1999) found that a care-giver's burden was significantly associated with the level of cognitive impairment of the care recipient (as measured by the revised Hasegawa dementia rating scale), behavioural disturbances in demented patients (as measured by the Dementia Behaviour Disturbance scale) and the mental fatigue of relative care-givers (as measured by the 30-item General Health Questionnaire; GHQ). Cohen, Colnantonio and Vernich (2002) found that care-givers' sense of burden was significantly associated with the gender of the care-givers and care recipients, whether the care-givers are relatives of the care recipients, the care recipients' need for assistance in self-care and activities of daily living (ADL), and positive feelings toward care-giving. In the structural equation model established by Kumamoto, Arai and Zarit (2006), four latent variables were identified that were significantly associated with care-giver burden: ADL deficits (corresponding observed variables: hours of care-giving, Barthel Index and age of care recipients); severity of dementia (Short Memory Questionnaire, Troublesome Behaviour Scale for demented people and age of care recipients); support from care-giver family members; and the utilisation of care services. With these earlier studies in mind, the authors decided to include ADL deficits, behavioural disturbances and cognitive impairment of people with dementia, support of secondary care-givers, and demographic variables such as age and gender of care-givers and care recipients, as well as the utilisation of care services.

The factor 'hours of care-giving' was not included in the present study. In reviewing a number of recordings of care-giving experiences published in Japan as non-academic books, it was revealed that many care-givers felt the burden of being constantly vigilant of their care recipients, regardless of whether they actually did something for the care recipients or not. It was obvious that these care-givers would be puzzled if they were asked how many hours they provided care in a day. For this reason, we decided not to include this question. One respondent's appraisal of the questionnaire seemed to support the validity of this decision: 'I was impressed by how the person who established the questionnaire understands care-giving, because the questionnaire did not ask how many hours the respondents provide care.'

Additionally, questions concerning the positive aspects of care-giving and the mental fatigue of care-givers were not included in the present study. Regarding the former, the psychometric properties of the scale adopted in Cohen, Colnantonio and Vernich (2002) was not reported and thus it was unclear if inclusion of this variable was indispensable. Regarding the latter, some items in the GHQ seemed to overlap with the CBI, and it was not clear whether these two scales measured distinct constructs. For example, the item 'Have you recently felt that life is entirely hopeless?' in GHQ seemed to be associated with the CBI item 'I feel that I am missing out on life'.

Japan's long-term care insurance scheme

In Japan's long-term care (LTC) insurance scheme, the municipal governments categorise impaired citizens over 65 years of age who require care into seven categories according to their degree of disability. This degree determines the extent of the amount of paid care services that can be utilised with the payment of only 10 per cent of the fee (the rest is covered by local governments). The provided services include adult day services, services in a day care centre, overnight respite care, home help, home rehabilitation services, home nurse visit, bathing services and allocation of care devices. The present study collected data of care-givers for older people categorised in any of the seven categories. Specifically, those who met all four conditions were included in the sample of the present study.

- Condition A: He/she has only one older family member who needs care in his/her house.
- Condition B: He/she is the only or primary person who provides care to the older family member.
- Condition C: The care recipient has dementia.
- Condition D: The municipal government has certified that the recipient requires care.

Method

Sample

Data were collected via an internet research company, Cross Marketing Inc. As of September 2010, this company had 1,428,846 registered members throughout Japan. Among them, 61,508 people who were more likely to meet the four conditions were identified in reference to its database, and invited by an email to participate in the preliminary survey. (The 61,508 people included 15,729 care-givers, satisfying Condition C, and randomly selected 45,779 people aged 40 years or older.) A total of 38,968 people agreed and participated in this preliminary survey, where they were asked if they met the above-mentioned four conditions. Condition C was verified by asking respondents whether the older family member had been diagnosed by medical doctors as suffering from dementia and by asking them to choose one of the two alternatives – 'Yes' or 'No'. Only those respondents who had selected 'Yes' were regarded as satisfying this condition. The response rate for this preliminary survey was 63 per cent, which was not lower than the 60 per cent minimum required by some biomedical journals in order to avoid several types of bias, such as non-response bias (Livingstone 2012).

A total of 339 people who met all of the four conditions were invited to participate in the main survey. These people were presented with information regarding (a) what the present survey was about, and (b) approximate time required to complete the questionnaire. People who agreed to participate in the survey logged on to the website of this company and electronically answered the questions. Although they were free to stop answering the questions at any stage, all 339 participants completed the main survey. The authors were provided with the collected data by the company in such a way that the identity of the participants was not known. All participants had agreed to this method of data utilisation when they became registered members of the company.

Measures

In the main survey, each care-giver was asked to complete a questionnaire regarding (a) care-giver characteristics, (b) care recipient characteristics, (c) care-giver burden and (d) utilisation of paid care services.

Care-giver characteristics

Care-givers were asked to answer questions on demographic and other variables, including (a) age and gender of care-giver, (b) relationship between care-giver and care recipient, (c) employment status of care-giver, (d) family income and (e) status of support by secondary family care-givers. With regard to (c), respondents were asked to choose one of the following three alternatives: 'Employed (full-time)', 'Employed (part-time)' or 'Unemployed'. With regard to (e), respondents were asked to choose one of the following three alternatives: 'No support', 'Irregular support' or 'Regular support' (*i.e.* regular support of other care-giver family members who play specific roles in care-giving).

Care recipient characteristics

Care-givers were also asked about the characteristics of care recipients including (a) age and gender of care recipient, (b) degree of care needs according to the LTC insurance system, (c) Troublesome Behaviour Scale (TBS; Asada *et al.* 1999), (d) Short Memory Questionnaire (SMQ; Koss *et al.* 1993) and (e) original observer-rated version of Physical Self-Maintenance Scale (PSMS; Lawton and Brody 1969).

TBS, developed by Asada *et al.* (1999), consists of questions assessing the observed frequency of 13 abnormal behaviours that people with dementia may have demonstrated in the preceding month (scale: 1 = never to 5 = once or more daily). The mean Cohen's kappa value of all the items for test–retest and inter-rater reported in Asada *et al.* (1999) were 0.72 and 0.66, respectively. This scale was originally developed in Japanese. SMQ, developed by Koss *et al.* (1993), is a scale used to assess memory problems. It consists of 14 questions, such as 'Does he/she always remember where he/she put his/her own keys?' (scale: 1 = never to 4 = always). The Cronbach's alpha coefficient reported in Koss *et al.* (1993) was 0.85. In their study, the scores ranged between 14 and 41 for the group of people with dementia, and between 41 and 55 for the control group. The original SMQ was translated into Japanese by Maki *et al.* (1998).

PSMS, developed by Lawton and Brody (1969), assesses independent living skills and comprises six sub-scores related to toilet, feeding, dressing, grooming, physical ambulation and bathing. In Lawton and Brody (1969), although the sub-scores are measured by a five-point scale, they took the value of 1 or 0. For example, regarding use of the toilet, the scales were from '1 = Cares for self at toilet completely, no incontinence' to '5 = No control of bowels or bladder'; those who selected '1' were allocated with one value for the toilet sub-score. Thus, the total score ranged between 1 and 6. The inter-rater coefficient reported in their study was 0.87. However, it is often the case that the five-point scales are directly used as sub-scores. In this case, each sub-score ranges between 1 and 5, and the total score ranges between 6 and 30. The present study adopted this rating method. Lower PSMS scores implied greater independent living skills.

Care-giver burden

A modified CBI by Novak and Guest (1989) was employed to assess the care-givers' sense of burden. The original inventory featured five subscales. They assessed (a) time-dependent burden (burden due to restrictions on care-givers' time, determined by items such as 'I have to watch my care receiver constantly'); (b) developmental burden (care-givers' feelings of being 'off-time' in development with respect to their peers, assessed by items such as 'I feel that I am missing out on life'); (c) physical burden (chronic fatigue and damage to physical health, determined by items such as 'My health has suffered'); (d) social burden (feelings of role conflict, assessed by items such as 'I don't get along with other family members as well as I used to'); and (e) emotional burden (care-givers' negative feelings towards their care receivers, indicated by items such as 'I feel embarrassed by my care recipient's behaviour'). The number of items in each subscale was five, five, four, five and five, respectively. Thus, this inventory had a total of 24 items. However, two items were later removed, and 22 items were employed for this study for the following reasons. First, as it was expected that a certain percentage of respondents were unemployed, it seemed inappropriate to include the fourth item in (d) social burden – 'I don't do as good a job at work as I used to do' – in the questionnaire. Survey results indicated that 51.9 per cent of the respondents were indeed unemployed. Second, the fifth item for assessing (e) emotional burden in the original inventory – 'I feel angry about my interactions with my care receiver' – was removed in order to enhance internal consistency: the reason for removing this item was that while this item corresponded to the guilty feeling of care-givers, the other four items in the same subscale corresponded to embarrassment/anger. Further, earlier studies on the Zarit Burden Interview (Zarit, Reever and Bach-Peterson 1980) found that they are distinct constructs (Knight, Fox and Chou 2000; Siegert *et al.* 2010).

The original Cronbach's alpha coefficients for the five burden components reported in Novak and Guest (1989) were 0.85, 0.85, 0.86, 0.73 and 0.77. The mean values of the five subscales were 6.98, 7.08, 5.47, 2.54 and 2.02. The original questionnaire was translated into Japanese by the authors of the present paper.

Utilisation of paid care services

The official websites of several Japanese municipal governments provide details of the services provided under Japan's LTC insurance system. On the basis of these websites, as well as of the typology of care-giving tasks by Montgomery, Gonyea and Hooyman (1985), a list of 14 tasks was established that can be provided by formal care-givers in Japan. The amount of each task was measured by the frequency of the family care-giver receiving benefits from the task, either per week or per month. This list is shown in Table 1 along with the method for measuring the amount of each service in the survey. The 14 variables were then aggregated in order to define a single variable. Specifically, the 14 variables were divided by their maximum possible values and were summed. For example, assume that a respondent utilised only Task A (DIAPER) and Task J (CLEAN) and that the amount of tasks performed by formal care-givers was 3 (*i.e.* three times per week) and 2 (*i.e.* twice per week), respectively. Then the value allocated to this respondent became $3/10+2/4=0.83$ because these two tasks were measured on scales of 0 to 10 and 0 to 4, respectively. This new variable ranges from 0 and 14.

Data analysis

In order to identify the groups of care-givers among whom these services are significantly associated with a lesser sense of burden, the following procedure was followed for each of the five burden components

TABLE 1. *List of formal care service tasks and definitions of the amount of received tasks*

		Amount of task											
Task		0	1	2	3	4	5	6	7	8	9	10	11
A	DIAPER (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
B	EGESTION (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
C	REPOSITION (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
D	CLOTHES (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
E	WIPE (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
F	COPRACRASIA (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
G	INCONTINENCE (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
H	EVACUATION (per week)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–11 times	> 11 times	–	–
I	BATH (per month)	0 time	1 time	2 times	3 times	4 times	5 times	6 times	7 times	8–10 times	>10 times	–	–
J	CLEAN (per week)	0 time	1 time	2 times	3 times	⩾ 4 times	–	–	–	–	–	–	–
K	WASH (per week)	0 time	1 time	2 times	3 times	⩾ 4 times	–	–	–	–	–	–	–
L	SHOP (per week)	0 time	1 time	2 times	3 times	⩾ 4 times	–	–	–	–	–	–	–
M	EAT (per week)	0 time	1–2 times	3–4 times	5–6 times	7–8 times	9–10 times	11–12 times	13–14 times	15–16 times	17–18 times	19–20 times	>20 times
N	COOK (per week)	0 time	1–2 times	3–4 times	5–6 times	7–8 times	9–10 times	11–12 times	13–14 times	15–16 times	17–18 times	19–20 times	>20 times

Notes: DIAPER: changing diapers or bladder control pads. EGESTION: assistance in egestion in toilet or using portable toilet. REPOSITION: repositioning of a patient for avoiding bedsores. CLOTHES: changing clothes. WIPE: wiping the body of a patient. COPRACRASIA: cleaning rooms, beds or clothings after copracrasia. INCONTINENCE: cleaning rooms, beds or clothings after incontinence. EVACUATION: Assistance in evacuation of stool or enemas. BATH: assistance in bathing. CLEAN: assistance in cleaning rooms. WASH: assistance in washing clothes. SHOP: assistance in shopping. EAT: assistance in eating. COOK: preparing meals for the patient.

(*i.e.* time-dependent, developmental, physical, social and emotional burden components).

Step 1: Multivariate logistic regression analysis of the entire sample

Multivariate logistic regression analysis was applied to the entire sample in order to explain the burden subscale in terms of the amount of services and the 11 variables: (i) gender of care-giver, (ii) gender of care recipient, (iii) age of care-giver, (iv) age of care recipient, (v) employment status of care-giver, (vi) support by secondary family care-giver, (vii) family income, (viii) PSMS, (viv) TBS, (x) SMQ, and (xi) utilisation of paid care services.

In multivariate logistic regression analysis, objective variables must be binary. Therefore, a dichotomous variable of high burden was created and defined as a score of greater than or equal to the median *versus* low burden. Such an approach has often been adopted in previous studies when burden scores did not have a theoretically or empirically defined threshold for high burden (Garlo *et al.* 2010; Higginson and Gao 2008).

Regarding explanatory variables, (viii) PSMS, (viv) TBS, (x) SMQ and (xi) the utilisation of paid care services were regarded as continuous and included in the models. For the other seven variables, dummy variables were defined and included in the models. According to each of the seven variables, the entire sample was divided into several subsets and dummy variables corresponding to these subsets were defined, except the subsets regarded as reference groups. Specifically, a single dummy variable was defined and included in the models for each of the four variables – (i), (ii), (v) and (vi). This dummy variable takes a value of 1 if a respondent belonged to the subsets CR_MALE (comprising care-givers to male care recipients), CG_MALE (comprising male care-givers), EMPLOYED (comprising care-givers with full-time or part-time jobs) and WITH_HELP (comprising care-givers who received regular or irregular support from secondary care-givers), respectively, and 0 otherwise. For variable (iii), two dummy variables were defined, which take a value of 1 if a respondent belonged to the subset CR_AGE $\leqslant$ 80 (comprising care-givers to family members aged 80 years or below) and CR_AGE 81–86 (comprising care-givers to family members aged 81–86 years), and 0 otherwise. Similarly, for variable (iv), two dummy variables were defined, which take a value of 1 if a respondent belonged to the subsets CG_AGE $\leqslant$ 49 (comprising care-givers aged 49 years or below) and CG_AGE 50–56 (comprising care-givers aged 50–56 years), and 0 otherwise. For variable (vii), two dummy variables were defined, which take a value of 1 if a respondent belonged to the subsets INCOME 400–799 (comprising care-givers with 4.00–7.99 million yen of annual family income) and INCOME $\geqslant$ 800 (comprising care-givers with 8.00 million yen or more annual family income), and 0 otherwise. The following six subsets were regarded as reference groups: CG_FEMALE (comprising female care-givers), CR_FEMALE (comprising care-givers to female care recipients), CR_AGE $\geqslant 87$ (comprising care-givers to family members aged 87 years or older), CG_AGE $\geqslant 57$ (comprising care-givers aged 57 years or older), UNEMPLOYED (comprising care-givers without jobs), WITHOUT_HELP (comprising care-givers who received no support from secondary care-givers). The program for logistic regression analysis was written on Mathematica Version 6.0 (Wolfram Research Inc.).

Step 2: Multivariate logistic regression analysis of the subsets

In Step 1, the seven variables, (i) gender of care-giver, (ii) gender of care recipient, (iii) age of care-giver, (iv) age of care recipient, (v) employment status of care-giver, (vi) support by secondary family care-giver, and (vii) family income, defined a total of 17 subsets. To each of these 17 subsets, the same multivariate logistic regression analysis was applied. By doing so, subsets were identified in which a specific burden component was significantly negatively associated with the amount of paid care services. Regarding the selection of explanatory variables, if a variable took a single value in a subset, then the variable was excluded as an explanatory variable. For example, in the analysis of the subset CG_MALE, gender was excluded as an explanatory variable because the value of this variable is constant in this subset.

Step 3: Identification of care-givers whose sense of burden is alleviated by paid care services

While Step 2 indicated only one subset in which a specific burden component is negatively associated with the amount of paid care services at the significance level of 0.05, it was concluded that the paid care services were effective in alleviating the burden component only in this subset. By contrast, when Step 2 revealed two subsets that were not exclusive of each other, it was deemed inappropriate to conclude that the union of these subsets is valid for this study's aims, since it might be that the paid care services were effective in one subset only because the two subsets were overlapping. In such a case, a measure is required to further specify the care-givers in the union of these subsets whose sense of burden is alleviated by paid care services. However, as shown later in the paper, the number in such a subset was always one or less, regardless of the burden component, so such a measure was not required.

In Step 2, although the first inclination was to include all 11 explanatory variables in the regression models, it turned out that it was impossible to simultaneously include (iv) age of care recipient and (vi) support by

TABLE 2. *Characteristics of the sample*

Variables	N	%	Mean	SD
Care-giver characteristics:				
Age of family care-giver (years)			51.3	9.5
Gender of care recipient:				
Male	65	19.2		
Female	274	80.8		
Relationship of care recipient to family care-giver:				
Spouse	5	1.5		
Parent	234	69.0		
Parent-in-law	75	22.1		
Others	25	7.4		
Family income[1]			5.6	3.1
Employment status of family care-giver				
Employed (full-time job)	112	33.0		
Employed (part-time job)	51	15.0		
Unemployed	176	51.9		
Care recipient characteristics:				
Age of care recipient (years)			82.8	7.0
Gender of family care-giver				
Male	97	28.6		
Female	242	71.4		
Degree of care needs in Japan's LTC scheme				
Degree 1 (the mildest degree)	10	2.9		
Degree 2	22	6.5		
Degree 3	71	20.9		
Degree 4	72	21.2		
Degree 5	95	28.0		
Degree 6	62	18.3		
Degree 7 (the severest degree)	38	11.2		
Status of support by a secondary family care-giver:				
No support	128	37.8		
Yes (irregularly)[2]	150	44.2		
Yes (regularly)[3]	61	18.0		

Notes: N = 339. SD: standard deviation. LTC: long-term care. 1. Range = 1–12; category 5 = 5–5.99 million yen; category 6 = 6–6.99 million yen. 2. Irregular support by a secondary care-giver. 3. Regular support by a secondary care-giver who plays a particular role in care-giving.

secondary care-givers. The reason was that these two variables were strongly dependent on one another and the maximum likelihood estimators did not converge. In fact, among care-givers with family members aged 87 or more, none were employed.

Results

Demographic characteristics

The characteristics of the care-givers and the care recipients are summarised in Table 2, which shows that the mean age of the care-givers and care

TABLE 3. *Care recipient variables*

Variables	Mean	SD	Min	Max	Cronbach's alpha
TBS (range 13–65)	24.0	9.9	13	61	0.88
SMQ (range 14–64)	20.0	7.2	14	50	0.90
PSMS (range 6–30)	16.6	6.3	6	30	0.80
CBI:					
Time-dependent burden (range 5–25)	17.7	3.8	7	25	0.82
Developmental burden (range 5–25)	16.7	4.5	5	25	0.77
Physical burden (range 4–20)	12.2	4.1	4	20	0.89
Social burden (range 4–20)	10.2	3.9	4	20	0.87
Emotional burden (range 4–20)	12.1	3.6	4	20	0.92
Total score	68.9	14.7	26	110	–

Notes: SD: standard deviation. Min: minimum. Max: maximum. TBS: Troublesome Behaviour Scale. SMQ: Short Memory Questionnaire. PSMS: Physical Self-Maintenance Scale. CBI: Caregiver Burden Inventory.

recipients was 51.3 years (standard deviation (SD) = 9.5) and 82.8 years (SD = 7.0), respectively. Most of the family care-givers (91.1%) provide care for their parents. Approximately 9 per cent (2.9 + 6.5) of the care recipients indicated that a relatively small extent of nursing care was required (*i.e.* either degree 1 or 2 according to the LTC insurance system), and approximately 91 per cent of the recipients indicated that a relatively large extent of nursing care was required (*i.e.* degree 3, 4, 5, 6 or 7 according to the LTC insurance system). As mentioned earlier, all care recipients suffered from dementia.

Care recipient characteristics

Cronbach's alphas of the five burden subscales, PSMS, TBS and SMQ were 0.80, 0.88, 0.90, 0.82, 0.77, 0.89, 0.87 and 0.92, respectively. It was confirmed that these scales had sufficient levels of internal consistency (Table 3).

Utilisation of paid care services

The average score was 1.72 (SD = 1.50) for the amount of paid care services, which had values between 0 and 7.16.

Multivariate logistic regression analysis

First, for each burden component, logistic regression analysis was applied to the entire sample. The results are summarised in Table 4. It was found that each burden component had two to four correlates, but none of the five components were significantly associated with the amount of paid care

TABLE 4. *Results of multivariate logistic regression analysis of the entire sample*

	Objective variables									
	Time-dependent burden		Developmental burden		Physical burden		Social burden		Emotional burden	
Explanatory variables	*B*	SE	*B*	SE	*B*	SE	*B*	SE	*B*	SE
CG_MALE[1]	−0.02	0.33	−0.04	0.28	0.08	0.28	0.05	0.27	−0.57*	0.28
CR_MALE[2]	0.02	0.36	0.31	0.31	0.31	0.31	−0.28	0.30	0.00	0.3
CG_AGE 50–56[3]	0.31	0.35	−0.25	0.29	0.00	0.28	−0.73*	0.29	−0.17	0.29
CG_AGE ⩾ 57[3]	0.35	0.37	−0.24	0.31	0.50	0.31	−0.49	0.30	0.05	0.31
EMPLOYED[4]	−0.49	0.35	−0.23	0.29	−0.30	0.29	−0.66*	0.29	−0.19	0.29
WITH_HELP[5]	−0.33	0.37	0.01	0.32	−0.36	0.32	−0.56	0.32	0.38	0.32
INCOME 400–799[6]	−1.00**	0.31	0.50	0.26	0.14	0.26	0.47	0.26	0.14	0.26
INCOME ⩾ 800[6]	0.59	0.31	−0.57*	0.25	−0.15	0.25	−0.23	0.25	−0.36	0.26
PSMS	0.24**	0.03	0.08**	0.02	0.09**	0.02	0.07**	0.02	−0.01	0.02
TBS	0.03	0.01	0.08**	0.01	0.06**	0.01	0.07**	0.01	0.08**	0.01
SMQ	−0.03	0.02	−0.01	0.02	0.00	0.02	0.02	0.02	0.00	0.02
Amount of paid care services	0.12	0.1	−0.08	0.08	−0.09	0.08	−0.1	0.08	−0.08	0.08

Notes: SE: standard error. CG_MALE: male care-givers. CR_MALE: male care-recipients. CG_AGE 50–56: care-givers aged 50–56 years. CG_AGE ⩾ 57: care-givers aged 57 years or older. EMPLOYED: care-givers with full-time or part-time jobs. WITH_HELP: care-givers who received regular or irregular support from secondary care-givers. INCOME 400–799: care-givers with 4.00–7.99 million yen of annual family income. INCOME ⩾ 800: care-givers with 8.00 million yen or more annual family income. PSMS: Physical Self-Maintenance Scale. TBS: Troublesome Behaviour Scale. SMQ: Short Memory Questionnaire. 1. Reference group: CG_FEMALE (female care-givers). 2. Reference group: CR_FEMALE: female care-recipients. 3. Reference group: CG_AGE ⩽ 49 (care-givers aged 49 years or below). 4. Reference group: UNEMPLOYED care-givers without jobs. 5. Reference group: WITHOUT_HELP (care-givers who received no support from secondary care-givers). 6. Reference group: INCOME ⩽ 399 (care-givers with 3.99 million yen or less annual family income).

Significance levels: * $p<0.05$, ** $p<0.01$.

services. Specifically, the time-dependent burden was significantly negatively associated with income, and positively associated with PSMS. The developmental burden was negatively associated with income and positively associated with PSMS and TBS, as was the physical burden. The social burden was significantly associated not only with PSMS and TBS but also with two demographic variables: care-giver age between 50 and 56 as compared to age less than 50, and employment status. The emotional burden was associated with care-giver gender and TBS.

Second, the same analysis was individually applied to the 17 subsets of the entire sample. Only the regression coefficients representing the associations between the five burden components and the amount of paid care services are summarised in Table 5, due to the page limitation. The results of the entire sample are shown again in the first row, and the results of the 17 subsets are shown from the second to the last row. This table shows that when logistic regression analysis was applied to the entire sample, no burden component showed a significant negative association with the amount of paid care services, and the effectiveness of the services was not detected. In contrast, when the same analysis was applied to each of the 17 subsets, the associations became significantly negative in some subsets. Specifically, it was found that only in subset 'CG_MALE', that comprises 97 male care-givers, was the emotional burden significantly negatively associated with the amount of paid care services. The regression coefficient was -0.44. As the standard deviation of the amount of paid care services was 1.64, the adjusted odds ratio corresponding to one SD increase in the value of this variable was calculated as $\exp(-0.44 \times 1.64) = 0.48$. It was also found that only in subset 'CG_AGE $\leqslant$ 49', that comprises 126 care-givers aged 49 or less, was the social burden component significantly negatively associated with the amount of paid care services. The regression coefficient was -0.32, and the adjusted odds ratio corresponding to one SD increase was $\exp(-0.32 \times 1.64) = 0.59$. In the remaining 15 subsets, none of the five burden components was significantly negatively associated with the amount of paid care services.

Discussion

We sought to identify the characteristics of care-givers and recipients under which the care-givers' sense of burden was negatively associated with the amount of paid care services, which were measured by the frequency of tasks that were provided by formal care-givers according to the LTC insurance system in Japan. Logistic regression analysis of the entire sample showed that, among the five burden components, none of them had a significant negative association with the amount of paid care services received, as expected from

TABLE 5. *Results of multivariate logistic regression analysis of the entire sample and its 17 subsets (only the coefficients representing the associations between the five burden components and the amount of care services are shown)*

		Time-dependent burden		Developmental burden		Physical burden		Social burden		Emotional burden	
Subset name	N	*B*	SE	*B*	SE	*B*	SE	*B*	SE	*B*	SE
Entire sample	339	0.11	0.10	−0.09	0.08	−0.10	0.08	−0.09	0.09	−0.09	0.08
CG_MALE	97	0.07	0.24	−0.18	0.17	−0.01	0.18	0.09	0.18	−0.44*	0.19
CG_FEMALE	242	0.15	0.12	−0.04	0.10	−0.13	0.10	−0.13	0.10	0.01	0.10
CR_MALE	65	−0.23	0.28	−0.05	0.21	−0.03	0.21	0.11	0.24	0.03	0.20
CR_FEMALE	274	0.20	0.12	−0.08	0.09	−0.14	0.10	−0.14	0.09	−0.13	0.09
CG_AGE ⩽ 49	126	0.16	0.17	0.00	0.13	−0.09	0.13	−0.31*	0.14	0.02	0.13
CG_AGE 50–56	112	0.11	0.16	−0.15	0.14	−0.17	0.14	0.06	0.14	−0.16	0.14
CG_AGE ⩾ 57	101	0.35	0.32	−0.13	0.19	−0.02	0.20	0.00	0.19	−0.15	0.21
CR_AGE ⩽ 80	108	0.25	0.17	−0.09	0.14	−0.15	0.14	−0.18	0.14	−0.27	0.15
CR_AGE 81–86	124	−0.10	0.18	−0.10	0.16	−0.16	0.15	−0.15	0.15	0.01	0.15
CR_AGE ⩾ 87	107	0.26	0.25	−0.13	0.17	0.00	0.18	0.00	0.17	−0.04	0.16
EMPLOYED	163	0.08	0.13	−0.04	0.12	−0.20	0.12	0.02	0.12	−0.20	0.11
UNEMPLOYED	176	0.18	0.17	−0.06	0.11	0.00	0.12	−0.18	0.13	0.07	0.13
WITH_HELP	211	0.04	0.17	−0.02	0.11	−0.18	0.11	−0.14	0.11	−0.11	0.11
WITHOUT_HELP	128	−0.02	0.18	−0.18	0.14	0.05	0.14	0.02	0.13	0.01	0.14
INCOME ⩽ 399	105	0.23	0.19	−0.20	0.15	−0.04	0.15	−0.24	0.15	0.08	0.15
INCOME 400–799	130	0.05	0.17	−0.13	0.14	−0.13	0.14	−0.13	0.14	−0.15	0.14
INCOME ⩾ 800	104	0.06	0.23	−0.11	0.18	−0.22	0.18	0.08	0.18	−0.15	0.20

Notes: SE: standard error. CR_AGE ⩽ 80: care-recipients aged 80 years or below. CR_AGE 81–86: care-recipients aged 81–86 years. CR_AGE ⩾ 87: care-recipients aged 87 years or older. *See* Table 4 for other subset names.
Significance level: * $p<0.05$.

previous researches (Chappell and Reid 2002; Gallicchio *et al.* 2002; Miller *et al.* 2001). Regarding other explanatory variables, four results are noteworthy in this analysis. First, low independent living skills and frequent abnormal behaviours related to dementia are positively associated with four of the five burden components. This seems to be consistent with earlier studies. For example, Nagatomo *et al.* (1999) found that care-giver burden was positively associated with frequent behavioural disturbances in demented people with low ADL performance, such as bathing and dressing. Second, male care-givers are negatively associated with emotional burden. This result is also consistent with earlier studies that have repeatedly found that female care-givers tend to experience significantly more subjective burden than male care-givers (*e.g.* Cohen, Colantonio and Vernich 2002; Donaldson, Tarrier and Burns 1998). Third, higher income was negatively associated with the time-dependent and developmental burden components. Although few empirical research studies investigate the association between care-giver burden and finances, the findings of the present paper seem to be consistent with the conceptual framework developed by Schene (1990), in which the financial position of a family may deteriorate if care-givers are forced to give up their jobs, and this in turn leads to a degraded subjective burden of family members.

The failure to identify a statistically significant association between the burden components and the amount of paid care services in the analysis of the entire sample is caused by averaging data over the entire sample. This method underestimates the effectiveness for specific types of care-givers, while overestimating the effectiveness for other types of care-givers. In fact, our next analyses of samples with specific characteristics showed that the services did alleviate two out of five burden components, provided the subsets to which the analyses were applied were appropriately defined. Specifically, the social burden component was effectively alleviated when the care-givers are aged 49 or younger. The emotional burden component was effectively alleviated when the care-givers are male. These findings demonstrate that specific characteristics of the care-givers strongly determine whether the tasks provided by formal care-givers will alleviate the care-givers' sense of burden (in other words, whether care-givers are 'sensitive' to paid care services).

These findings suggest several specific scenarios. First, paid care services alleviate the emotional burden component of male care-givers. It is often reported that male care-givers frequently experience aloneness and loneliness (Parsons 1997; Siriopoulos, Brown and Wright 1999). For example, Siriopoulos, Brown and Wright (1999) reported in a qualitative study that a husband who provided care to his wife with dementia stated that before the onset of dementia, his wife was the one who initiated contact with friends and that now there were no friends around him. Parsons (1997) also reported that male care-givers of family members with Alzheimer's disease experienced intensified feelings of being alone and lonely as the care recipients became progressively worse. It might be that male care-givers appreciate paid care services more than female care-givers because these interactions with formal care-givers, such as home helpers, effectively alleviate their loneliness and enable them to maintain their mental health.

Second, paid care services were shown to effectively alleviate the social burden component of care-givers aged 49 or younger. Among 126 care-givers (aged 49 or younger), 24 were providing care to their grandparents. In contrast, among the remaining 213 care-givers (aged 50 or older), only one care-giver was providing care to his/her grandparent. It might be that paid care services effectively alleviate a social burden component (*i.e.* feelings of role conflict) of care-givers to grandparents. The reasons for this should be investigated by future research.

Practical implication

This study's results have implications for policy makers. First, this paper revealed that the amount of paid care services alleviates the sense of burden more effectively among some care-givers than others. Therefore, if Japan's LTC insurance system is changed so that 'sensitive' care-givers are able to utilise greater amounts of formal care services, then this change effectively brings about a benefit. For policy makers who aim to increase the cost–benefit ratio of Japan's LTC insurance system, the information provided in this paper serves as important evidence. Second, the results also imply that greater amounts of paid care services are unlikely to alleviate the sense of burden among care-givers in other categories. Policy makers need to consider alternative means, other than paid care services, to alleviate the sense of burden among these care-givers.

Limitations

There are several important limitations of this study. The first is concerned with the recruitment strategy. We collected data via an internet research company. As older people are less likely to access the internet, our sample might be biased to some extent. The over-representation of adult children care-givers in this study (91.1%) might be due to this reason. It is important for future research to assess the generality of the findings. Second, although the present paper focused only on the amount of tasks provided by formal care-givers, there are additional ways through which paid care services can impact care-givers' sense of burden. For example, if one investigates the impact of respite care services, it might be appropriate to measure the amount of paid care services by the frequency of usage or hours of service. In this sense, the present paper examines only a specific facet of paid care services. The present study's failure to identify the effects of paid care services on the alleviation of the time-dependent, developmental and physical burden components might be due to this limitation. Second, the number of covariates considered in the present paper is limited. In fact, although some earlier studies found that psychological factors, such as positive feelings toward care-giving, are significant correlates of care-giver burden, they were not included in the present paper, as mentioned in the Introduction. Thus, it is important in the future to determine whether the conclusions hold true even after controlling for these variables.

Conclusion

By applying multivariate logistic regression analysis to individual subsets of care-givers, the present study found two subsets, *i.e.* young care-givers aged 49 or below and male care-givers, among those for which the sense of social and emotional burden components, respectively, were alleviated by the use of paid care services. The failure to identify the effectiveness of paid care services when the same analysis is applied to the entire sample indicates that it would be invalid to assume that the effectiveness of paid care services is homogeneous across an entire sample of care-givers; this assumption inevitably causes underestimated levels of effectiveness for specific categories of care-givers. This may partly explain why some earlier studies failed to identify the effectiveness of paid care services.

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