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## The effects of caregiving resources on the incidence of depression over one year in family caregivers of disabled elderly

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## Abstract

The purpose of the study was to investigate the over-time effects of physical, psychological and social resources on the incidence of depression in family caregivers of the disabled elderly. Data were collected twice at a one-year interval from 1,141 primary caregivers of a disabled older person in an urban area of Japan using a self-reported questionnaire survey. The questionnaire included physical health as an indicator of physical resources, caregiving satisfaction and intention to care as indicators of psychological resources, and instrumental and emotional support network and formal home care service utilization as indicators of social resources. The mental health outcome measure was the General Health Questionnaire 12-item version (GHQ-12). Complete data on 235 non-depressed female caregivers were separated into 3 groups according to the relationship type (wife, daughter and daughter-in-law) and analyzed separately. Multivariate logistic regression models controlling for duration of caregiving, care-recipient's gender, ADL dependency and behavioral problems demonstrated that significant predictors of depression were caregiving satisfaction and intention to care in wives, caregiving satisfaction in daughters, and physical health and emotional support network in daughters-in-law. Noteworthy, intention to care increased the risk of depression in wives, while decreasing the risk of depression in daughters-in-law. The findings indicate that the effects of caregivers' resources on mental health may differ by relationship type.

**KEYWORDS:** caregivers, kin relationships, caregiving resources, depression

Original Article

## The Effects of Caregiving Resources on the Incidence of Depression over One Year in Family Caregivers of Disabled Elderly

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The purpose of the study was to investigate the over-time effects of physical, psychological and social resources on the incidence of depression in family caregivers of the disabled elderly. Data were collected twice at a one-year interval from 1,141 primary caregivers of a disabled older person in an urban area of Japan using a self-reported questionnaire survey. The questionnaire included physical health as an indicator of physical resources, caregiving satisfaction and intention to care as indicators of psychological resources, and instrumental and emotional support network and formal home care service utilization as indicators of social resources. The mental health outcome measure was the General Health Questionnaire 12-item version (GHQ-12). Complete data on 235 non-depressed female caregivers were separated into 3 groups according to the relationship type (wife, daughter and daughter-in-law) and analyzed separately. Multivariate logistic regression models controlling for duration of caregiving, care-recipient's gender, ADL dependency and behavioral problems demonstrated that significant predictors of depression were caregiving satisfaction and intention to care in wives, caregiving satisfaction in daughters, and physical health and emotional support network in daughters-in-law. Noteworthy, intention to care increased the risk of depression in wives, while decreasing the risk of depression in daughters-in-law. The findings indicate that the effects of caregivers' resources on mental health may differ by relationship type.

**Key words:** caregivers, kin relationships, caregiving resources, depression

Caregiving for a disabled family member at home has been characterized as a stressful experience and is associated with an increased risk for depression in caregivers [1-3]. Identifying caregiving resources that help caregivers successfully

manage the caregiver role and minimizing the depressive effects of that role are subjects of growing research interest. Much of the research has described the importance of caregivers' resources, such as physical health [4-6], service use [7], social support [8, 9], a sense of mastery [10, 11] and efficacy [12], caregiving satisfaction [4, 13, 14] and so on, as factors that could prevent caregivers from becoming increasingly stressed over time.

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Despite the extensive efforts and accumulation of studies empirically examining the effect of caregivers' resources on their depression, the early research has several limitations. First, most studies of the effects of caregivers' resources on their mental health are cross-sectional in design. In recent years, longitudinal studies on caregivers' health have increased. However, these studies focused mainly on changes in the well-being of caregivers [15-17] or the impacts of care-giving stressors (*e.g.*, care recipients' ADL dependency and behavior problems) on caregiver health [15, 18, 19]. Second, few studies have addressed the longitudinal effects of formal care service use on health consequences after Japan's adoption of a national public long-term care (LTC) insurance system in April 2000. The introduction of the LTC system, which emphasizes community care rather than residential care, should have brought about increased public awareness and availability of community care services. Thus, patterns of service use may have changed dramatically, although a recent study reports that stress responses of caregivers are not reduced by the new system [20]. Third, most cross-sectional studies used heterogeneous samples as units, including spouses (wives and husbands), biological children, children-in-law and other relatives [14, 21]. Some recent careful investigations focusing on differences in caregivers' kin relationship with the care-recipient suggest that the associations between caregiver resources and their health may differ according to the kin relationship [4, 8, 15, 22].

The present study was intended to overcome the 3 above-mentioned limitations in previous research in this area, and aimed to examine the effects of caregiver's physical, psychological, and social resources on incidence of depression by kin relationships with a prospective longitudinal study design.

## Materials and Methods

**Study subjects.** The sample for the baseline survey was drawn from 5,189 family caregivers of the disabled elderly registered at the municipal offices as insured by the public long-term care insurance (LTC) in a large city of approximately 300,000 in rural Japan, where the older population aged 65 years and over numbered approximately 50,000 (17.0

%) in 2005. A self-administered questionnaire survey was conducted among 1,141 family members caring for older adults in 2002. Before administering the survey, we explained the purpose and procedures of the survey to the subjects and gave them the option to refuse participation; all participants gave their consent. Municipal care managers served as the survey staff, and they were asked to distribute and collect the survey questionnaires. The responses were anonymous. Consequently, all caregivers ( $n = 1,141$ ) returned the baseline questionnaires.

A follow-up survey with the same questionnaire was conducted in the 1,141 baseline respondents at an interval of approximately 1 year, in 2003. A total of 689 caregivers returned the follow-up questionnaires (a response rate of 60.3%). The drop-out rate due to care-recipients being dead (6.7%), ill or hospitalized (3.3%), refusal to answer the questionnaire (15.1%) and other reasons (14.6%) was relatively high (39.7%).

Of the 689 caregivers, 627 caregivers (91.0%) provided complete data on all assessments for both the baseline and follow-up questionnaires. Most of the respondents were female ( $n = 470$ ; 74.9%). In this study, we emphasized and used only the female caregiver sample for the following reasons. First, the sample size of the male caregivers was too small ( $n = 157$ ; 25.0%) to analyze by kin relationship. Second, in most studies, female caregivers are affected more negatively by the caregiving role than male caregivers [23], in part because female caregivers perform more personal care tasks for their care-recipients (*e.g.*, toileting and bathing), as well as more household chores [24]. Of the 470 female caregivers, 235 non-depressed caregivers (50.0%) were selected who scored lower than 3 on the General Health Questionnaire 12-item version (GHQ-12), which is the recommended cut-off score to distinguish clinically depressed individuals from those classified as non-depressed [25-28]. The kin relationship types in the non-depressed female caregiver sample included wife ( $n = 71$ ; 30.2%), daughter ( $n = 85$ ; 36.2%) and daughter-in-law ( $n = 79$ ; 33.6%).

**Measures.** The following measures were included as part of a broader questionnaire, as well as a socio-demographic questionnaire: care recipient's gender and age, care recipient's marital status, dura-

tion of caregiving, annual income of care-recipient household and whether they lived with care recipients in the same household.

**Physical resources.** Physical resources were represented by physical health. Physical health was measured by 3 subjective ratings of satisfaction with their physical condition, fitness and movement on the Lickert 3-point scale (0 = not satisfied, 1 = moderately satisfied, 2 = satisfied). The physical health score was obtained by summing the ratings on 3 items and scores ranged from 0-6. The alpha reliability coefficients of the scale among kinships ranged from 0.76 to 0.81.

**Psychological resources.** Psychological resources were represented by perceived caregiving satisfaction (also called "gain") in the caregiving role and intention to care for their care recipient.

Caregiving satisfaction is commonly defined as the positive stable affect that may accumulate over time, such as feeling useful, appreciating closeness to the care recipient, and experiencing pride in one's ability to handle crisis [14, 29]. Caregiving satisfaction was measured by 12 items from 2 subscales of the Positive Appraisal Scale (PAS): satisfaction in the caregiving role and caregiver's self-growth [14]. Responses to each subscale item were scored as follows: 0 = totally disagree, 1 = disagree, 2 = agree, and 3 = totally agree. A higher score on the scale indicated more satisfaction with their caregiving. The alpha coefficients of the scale were relatively high (0.89-0.93)

Intention to care was measured by the 2 items from the "intention to care" subscale of the PAS [14]. The items were "I'll take care for the disabled relative until he/she passes away", and "I'll actively care for the disabled relative in spite of emotional stress from caregiving tasks". Responses to each subscale item were scored as follows: 0 = totally disagree, 1 = disagree, 2 = agree, and 3 = totally agree. A higher score on the scale indicated a stronger intention in the caregiving. The alpha coefficients of the scale were relatively high (0.74-0.82)

**Social resources.** Social resources were represented by caregivers' informal support network and use of formal care services.

The support network was pragmatically defined as the web of social relationships that surrounds caregivers. Such a network would influence caregiving

performance and caregiver's health and well-being through the provision of support. Support provided through the network is typically divided into 2 types: instrumental and emotional support [9, 30]. Thus, the support network was measured by 6 items for the presence of a supporter who has provided family caregivers with instrumental and emotional support. The instrumental support network items were "Do you have a person who gives you financial help?", "Do you have a person you can ask a favor of?" and "Do you have a person you can share the caregiving role with?" The emotional support network items were "Do you have a person who gives counsel to you?", "Do you have a person who encourages you?", and "Do you have a person who worries about you?" Each item was scored on a 2-point scale (0 = no, 1 = yes), and possible total scores ranged from 0 to 6, with the high scores indicating that the support network size is large. The Kuder-Richardson Formula 20 (KR-20) reliability coefficients for instrumental and emotional support network scales were 0.51-0.65 and 0.68-0.77, respectively.

Use of formal services was measured by the number of public in-home care services that the care recipients and caregivers had used: in-home visit services (home-help), commuting in-facility care services (day-service) for care recipients, and respite care services for caregivers (short-stay). These are common services provided by municipal authorities enabling impaired elders to live in the community and reduce the caregiving burden of the caregivers.

**Depression.** As mentioned previously, depressive symptoms were measured by the GHQ-12 Japanese version [31]. In general, the GHQ focuses on 2 main classes of phenomena: inability to carry out one's normal healthy functions and emergence of new phenomena that are distressing. The GHQ item responses were scored by 0-0-1-1, known as the GHQ scoring approach [27], rating each mental health problem as present or absent, although each item was originally rated by the *frequency* categories (e.g., *Not at all*, *No more than usual*, *Rather more than usual*, and *Much more than usual*). Scores on the reversible items were reversed so that a low score indicated better mental health and a high score indicated poor mental health. The GHQ-12 demonstrated acceptable KR-20 reliability coefficients of 0.71-0.80.

A GHQ-12 cut-off score of 3/4 was recommended

to distinguish clinically depressed individuals from those classified as non-depressed [26]. Using a sample of Japanese clinical outpatients, Honda *et al.* [28] also concluded that the GHQ-12 cut-off score of 3/4 had reasonable sensitivity (78%) and specificity (57%) in screening for individuals with common mental disorders (clinical diagnoses by ICD-10).

**Caregiving stressors.** We focused on the degree of disability of the care recipients, which is also termed the objective burden. The degree of disability was represented by dependency of activities of daily living (ADL) and frequency of behavioral problems among the care recipients. The ADL dependencies were assessed by 6 items taken from the brief assessment tools of dementia syndromes [32]. Each ADL item was rated on a 2-point scale (0 = independent; 1 = dependent). Possible total scores ranged from 0 to 6, with the higher scores indicating more ADL dependency. The behavioral problems were measured by 13 items taken from the brief assessment tools of dementia syndromes [32]. The items were scored by scores for the 3 response frequency categories: 0 = not at all, 1 = sometimes, 2 = all the time. Possible total scores ranged from 0–26, with higher scores indicating a higher frequency of problematic behaviors. The reliability coefficients of the scales on ADL dependencies and behavior problems were reasonably good (0.76–0.81, and 0.78–0.81, respectively).

**Analytic methods.** Chi-square test and analysis of variance (ANOVA) with post-hoc Sheffé tests were performed to examine whether socio-demographic and caregiving characteristics significantly differed by kin relationship.

Next, a multiple logistic regression analysis was carried out to obtain the odds ratios (OR) and 95% confidence interval (CI). In the analysis, the predictive power of each of the resources on incidence of depression was tested individually in a model adjusted for caregiver age, duration of caregiving, care recipient ADL dependency and behavior problems. The analyses were stratified by kin relationship (wives, daughters, and daughters-in-law), because the resources may operate differentially based on the kin relationships.

## Results

**Respondent characteristics.** The characteristics of the caregivers and their care recipients are shown separately for wives, daughters and daughters-in-law in Table 1, as well as a composite for all subjects. In total, 60% of the care recipients were female, and averaged 81.9 years old (SD = 8.1). Half were married, while 56.2% were widowed. About 30% reported an annual income for the care-recipient household of less than ¥1,200,000, 38% ¥1,200,000 to ¥3,000,000, and 30% more than

**Table 1** Background characteristics of caregivers and the care recipients

	Total (n = 235)	Wife (n = 71)	Daughter (n = 85)	Daughter-in-law (n = 79)	P
Caregiver					
age (M ± SD)	59.6 ± 11.1	71.5 ± 6.9	54.6 ± 7.6	54.5 ± 9.1	W > D, DL***
Care recipient					
gender (% female)	60.0	–	82.3	89.4	***
age (M ± SD)	81.9 ± 8.1	75.9 ± 7.0	84.4 ± 7.1	84.6 ± 7.3	W < D, DL***
marital status (%)					
married	43.0	100.0	14.0	22.4	***
widowed	56.2	–	83.5	77.6	
separated/divorced	0.8	–	2.5	–	
annual income (%)					
< ¥1,200,000	31.0	13.9	31.5	43.9	***
¥1,200,000~3,000,000	38.1	41.5	38.2	35.4	
> ¥3,000,000	30.9	44.6	30.3	20.7	

Note: D, Daughter; DL, Daughter-in-law; M, Mean; SD, Standard deviation; W, Wife.

\*\*\* $p < 0.001$

¥3,000,000. The caregivers were on average 59.6 years old (SD = 11.1). Almost all caregivers were living with the care recipients.

***A comparison of the caregiving resources at baseline across kin relationships.*** Descriptive statistics for each of the caregiving characteristics are shown in Table 2. There were no statistically significant differences among kin relationships for duration of caregiving, physical health, instrumental and emotional support network, numbers of services utilized and depression scores on the GHQ-12. Statistically significant differences were found for the other 4 measures: ADL dependency, behavioral problems, caregiving satisfaction and intention to care.

Daughters-in-law reported more ADL dependencies and behavioral problems among their care recipients than other kinships. Wives and daughters reported higher caregiving satisfaction and intention to care than daughters-in-law.

***The effects of caregivers' resources on incidence of depression.*** Results of the multiple logistic regression analyses are summarized separately for the 3 caregiver groups in Table 3.

In wives, a significant negative association was

found between caregiving satisfaction and risk of depression (odds ratio (OR) = 0.83; 95% confidence interval (CI) = 0.71–0.97): wives reporting greater caregiving satisfaction had a significantly lower incidence of depression. On the other hand, a significant positive association was found between intention to care and depression (OR = 1.46; 95% CI = 1.55–11.90): wives with a higher intention to care had a significantly higher incidence of depression.

In daughters, a significant negative association was found between caregiving satisfaction and depression (OR = 0.90; 95% CI = 0.80–1.00): daughters reporting greater caregiving satisfaction had a significantly lower incidence of depression. Other associations yield no significance.

In daughters-in-law, significant negative associations were found between physical health and depression (OR = 0.68; 95% CI = 0.49–0.95), intention to care and depression (OR = 0.49; 95% CI = 0.28–0.86), and emotional support network and depression (OR = 0.42; 95% CI = 0.22–0.80): daughters-in-law with better physical health, higher intention to care and a larger emotional support network had a significantly lower incidence of depression.

Table 2 Caregiving characteristics by kin relationship to the care recipients

	Range	Wife (n = 71)		Daughter (n = 85)		Daughter-in-law (n = 79)		P
		M	SD	M	SD	M	SD	
Duration of caregiving (months) <sup>†</sup>	0–492	43.1	40.1	48.1	65.5	42.7	43.5	n.s.
CR ADL dependency <sup>†</sup>	0–6	2.3	1.8	2.5	2.2	3.4	1.8	W, D < DL **
CR behavior problems <sup>†</sup>	0–29	2.7	3.8	3.5	4.4	4.5	5.1	W, D < DL *
Physical health	0–6	2.7	2.1	3.0	1.9	3.0	1.8	n.s.
Caregiving satisfaction	0–36	22.0	7.6	20.5	7.1	16.8	5.7	W, D > DL ***
Intention to care	0–6	4.9	1.2	4.7	1.3	4.0	1.3	W, D > DL ***
Instrumental support network	0–3	1.4	1.1	1.4	1.1	1.4	1.0	n.s.
Emotional support network	0–3	2.3	1.0	2.1	1.1	2.2	1.0	n.s.
Number of service utilization	0–3	0.6	0.6	0.8	0.8	0.7	0.7	n.s.
home help (use %)		29.6		36.7		21.2		n.s.
day service (use %)		29.6		34.2		43.5		n.s.
short stay (use %) <sup>‡</sup>		0		10.1		7.1		*
Depression (follow-up) <sup>†</sup>	0–11	2.0	2.3	2.8	2.6	2.3	2.4	n.s.
GHQ score ≥ 4 (%)		26.8		31.6		24.7		n.s.

Note: CR, Care recipient; D, Daughter; DL, Daughter-in-law; M, Mean; SD, Standard deviation; W, Wife.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

<sup>†</sup>Kruskal-Wallis ANOVA with post-hoc test was used to compare the groups.

<sup>‡</sup>Fisher's exact test in a cross table was calculated.

## Discussion

The focus of the study was the over-time effects of physical, psychological and social resources on depression in the family caregivers of disabled persons. The main strength of our study was the prospective design, which enabled us to examine the association between physical, psychological and social resources and depressive symptoms over a one-year follow-up. This marks an improvement over previous cross-sectional studies of caregivers' resources and caregiving stress responses. Second, our broader and comprehensive assessment of the caregiving resources possessed by female caregivers allowed us to test the effects of specific domains of caregivers' resources on mental health. Finally, our study focused on differences by relation type of female caregivers and analyzed data separately. Potential confounding factors were controlled by stratification and by a logistic regression model.

The study subjects had about the same numbers of wives, daughters, and daughters-in-law. Not surprisingly, the results revealed that the wife caregivers were older than the daughter and daughter-in-law caregivers. The care recipients for whom daughters and daughters-in-law cared were older than those for whom wives cared, and most were female and widowed. In addition, the care recipients for whom daughters and daughters-in-law cared were reported to have more ADL dependency and behavioral problems than those for whom wives cared. Although

depressed caregivers at baseline were excluded from our data set, these characteristics resemble profiles of caregivers and care recipients reported in other studies [4, 8].

Our multivariate logistic regression models controlling for duration of caregiving, care-recipient's gender, ADL dependency and behavioral problems indicated that caregivers' resources decreasing the risk for incidence of depression differed essentially by kinship. We will discuss the implications of this finding separately for each type of resource.

**Physical health.** It is expected that age-related health problems make caregiving increasingly more difficult especially in wife caregivers, because they are older than adult child caregivers. Our results revealed unexpectedly that there were no significant differences in physical health across kin relationships. However, this finding must be interpreted with caution. Our study subjects were recruited from non-depressed caregivers providing care for disabled elders at home. In addition, our study subjects did not include caregivers who institutionalized their care recipients. The finding, therefore, may be self-selected and biased regarding the level of caregivers' physical health.

The logistic regression model showed that physical health was negatively associated with risk of depression in daughters-in-law, but not in wives and daughters. This result for daughters-in-law is consistent with previous cross-sectional studies suggesting that poor physical health puts caregivers at risk for

**Table 3** Associations of caregivers' physical, psychological and social resources with incidence of depression

Independent variables	Wife		Daughter		Daughter-in-law	
	OR <sup>†</sup>	95%CI <sup>‡</sup>	OR	95%CI	OR	95%CI
<i>Physical resources</i>						
Physical health	0.85	0.64-1.12	0.82	0.56-1.19	0.68*	0.49-0.95
<i>Psychological resources</i>						
Caregiving satisfaction	0.83*	0.71-0.97	0.90*	0.80-1.00	0.97	0.85-1.10
Intention to care	1.46**	1.55-11.90	1.12	0.64-1.96	0.49*	0.28-0.86
<i>Social resources</i>						
Instrumental support network	0.67	0.44-1.69	0.76	0.44-1.28	1.66	0.88-3.16
Emotional support network	1.56	0.72-3.41	1.16	0.68-1.98	0.42**	0.22-0.80
Number of service utilization	1.02	0.33-3.09	0.71	0.35-1.43	0.99	0.48-2.07

Notes: <sup>†</sup>Odds ratio per one-point increase; <sup>‡</sup>Confidence interval; \* $p < 0.05$ ; \*\* $p < 0.01$

Care recipient age, gender, annual income, ADL dependency, behavior problem and duration of caregiving were controlled.

Dependent variable: Depression (0 = non-depressed, 1 = depressed).



psychological morbidity [4-6]. The reason for the inconsistent result found in wives and daughters is the same as we have mentioned in the prior paragraph. Therefore, our study result may underestimate the true associations of physical health with depression in female caregivers of disabled elders. Future study is required to replicate and extend our findings using both samples of caregivers who continue care in the home and those who place care recipients in institutional care. In addition, the causes and meaning of differences in associations of physical health with depression across kinships need to be addressed in future research.

**Psychological resources.** Consistent with previous studies [21, 33], the present study supports the findings that wife and daughter caregivers reported higher satisfaction in their caregiving role and intention to care than daughters-in-law did. This result suggests that, especially for wives and daughters, caregiving can be an opportunity to reciprocate love to their parent or partner, to increase closeness to the care-recipients, and feel satisfaction at fulfilling their responsibility.

According to our results, higher caregiving satisfaction was associated with decreased risk for depression in wives and daughters, but not in daughters-in-law. Previous cross-sectional research conducted by Lawton [4] found that caregiving satisfaction was effective in reducing the risk of depression through reducing the caregiving burden both in spousal and adult children caregivers [4]. In Japan, Sakurai [14] reports the moderating effects of caregiving satisfaction on the associations between caregiving stressors (dementia syndromes) and one aspect of burden, although they did not consider the kin relationships of the caregivers [14]. The evidence shows the association between caregiving satisfaction and depression.

In wife caregivers, a higher intention to care was significantly associated with higher risk for depression. This is a new and unique result. To our knowledge, there are few studies investigating intention to care and mental health in family caregivers. Many previous studies conceptualized intention to care as an outcome rather than caregiving resource [22, 33]; thus, little is known about the role of caregivers' intention to care in the burden of caregivers. As shown in Table 2, wives had a high intention to care.

In their attempt to become perfect caregivers, they may fail to take time for themselves, to practice health-promoting behaviors (e.g., exercise), to engage in social activities, to seek assistance from other relatives, or to use formal services for a change. Accordingly, wives with very high intention to care are at higher risk of depression than those without.

On the contrary, in daughters-in-law, a higher intention to care was associated with lower risk for depression. In Japan, daughters-in-law are commonly the primary caregiver, in the case that the older person who needs care is unmarried, widowed, has an ill spouse or has no adult daughter. Daughters-in-law are more likely to express a relatively low degree of intention to care because of their lower degree of close and affectionate relationships with parents-in-law [33]. In spite of these factors, the result suggests that a higher intention to care could motivate them to take the initiative in care of parents-in-law and allow them to consider their caregiving role as challenging rather than burdensome. Daughters-in-law with a higher intention to care are disproportionately less stressed and at lower risk of depression, although the caregiving situation is more stressful than in other kinships.

Although daughters' intention to care was equal to or higher than that of other kinships, it had no significant effect on risk of depression. This result indicates the need to specifically examine the underlying mechanism that could possibly explain the results in daughters. Unfortunately, there is little understanding of the pathway for intention to care leading to decreased risk for depression, because intention to care has been conceptualized as an outcome rather than caregiving resource [22, 33]. Intention to care may have indirect rather than direct effects through improving the quality of care provided for care-recipients and quality of relationship with care recipients, increasing use of stress-coping strategies, and lessening a sense of role captivity, all of which were associated with depression. In a future study, a path analytic approach is needed to understand the pathway that may underlie the associations between intention to care and incidence of depression.

**Social resources.** Our logistic regression analysis demonstrated that a larger emotional support network was significantly associated with decreasing the risk for depression in daughters-in-

law. This confirms the findings of previous studies of caregivers' social network and support [8]. In the present study, daughters-in-law cared for elders with severer ADL dependencies and more behavior problems than other kin groups. In such a situation, daughters-in-law are at greater risk of experiencing high levels of burden and, therefore, may benefit from emotional support, which could minimize the negative effects of their caregiving role on their mental health through promoting positive acceptance of their caregiving role as coping strategies. They may also benefit from support group programs in which they are encouraged to share their experience and feelings, to empathize with each other's situations, and to acknowledge and affirm each other's caregiving efforts.

Except for the above mentioned results, the instrumental and emotional support network was not associated with risk for depression among kinships. There is a clear lack of consensus regarding whether there are any preventive effects of support networks and support. Several studies revealed that a larger support network and a greater number of supports received were partially associated with fewer mental health problems [8, 9]. Although our study results did not replicate these findings, we cannot conclude that an instrumental support network and support have no effect on mental health of caregivers. Their effects on mental health may differ depending on the type of source (*e.g.*, spouse, children, other relatives and friends), perceived or actually support available and type of support (*e.g.*, instrumental, emotional and informational support). In addition, the present study did not take into account the inadequate or negative aspects of social support. Caregivers who have a larger support network and receive more support have more opportunities to receive inadequate or negative supports (*e.g.*, interference, conflict, and unwarranted charges) during the caregiving process [8]. Such negative aspects of a support network and supports may diminish the positive effects of support networks and support on caregivers' health. Further research is needed to examine the potential differences in the effects on mental health of various types of social network and support from specific support resources.

In general, the numbers of formal services care-recipients and caregivers used were relatively low.

Daughters and daughters-in-law were more likely to make use of short-stay service than wives, whereas there was no difference in the percentage of use of home help and day-service across kinships. Wives used fewer formal services than other kin groups. It is possible that wives are more reluctant to use the formal care services because they exhibit full commitment to their caregiving role.

It is notable that there was no association between formal service use and depression. This result was consistent with the findings drawn from the previous studies conducted before the introduction of the national LTC insurance system [14, 20]. Several possible interpretations for these findings exist. The immediate interpretation is that these findings showed that the quality and quantity of the home care services for the caregivers may not be sufficient even after the introduction of the LTC insurance system. As pointed out by Sugihara *et al.* [15], use of the present formal service may end up having only a temporary effect and hence be ineffective in reducing caregiving burden and depression. Second, use of formal service may produce new stresses such as guilt, loss of control, financial worries, role change and isolation, and reduce the effect of formal service on depression. These stresses may diminish the effects of formal service use on mental health. Third, a methodological issue in the measurement of formal service use may exist. A dichotomized measure of formal service use may not have been feasible to detect the service effect on mental health. The timing and duration of use of formal service should be taken into consideration. Finally, these results may not be generalized to caregivers and care-recipients residing in other areas and across the nation, even though the associations between informal service use and depression are accepted. Service availability and affordability differ according to the area in which caregivers live and influence patterns of service use. Taken together, the study results are suggestive rather than conclusive, such that further examination on the effects of service utilization on mental health is required.

**Limitation and future research.** The most critical limitation of our prospective longitudinal study is that our study is limited to family caregivers who gave consent to the survey. The participants in the survey may be healthier than those who rejected

participation. In addition, there was high rate of dropouts at the follow-up. Such a high rate of dropouts may have influenced any sample statistics in the study sample. Therefore, the study results should be interpreted with caution. Another limitation is that this research is limited to 2 waves of observations over a relatively short time period. Since the negative impact of chronic stressors such as caregiving may accumulate rather gradually [15], some changes in patterns in caregiver's depression may not have emerged. More frequent follow-up is necessary to capture changes in mental health and exposure status in caregivers.

Whereas the present study has the above-mentioned limitations, it contains important implications for future research and practice. In conclusion, our results suggest that the effects of caregiving resources on mental health may differ by relationship type. Understanding the longitudinal effects of various caregiving resources on incidence of depression is an important issue for researchers, practitioners, and policymakers in this area. Further studies using longitudinal or experimental design should be conducted to confirm our results.

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