# Depressive symptoms trajectories over ten years among older men and women in Japan: does receiving support from sons, daughters and their spouses protect against depressive symptoms?

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**Objectives**

This research examines trajectories in depressive symptoms among older Japanese with adult children over ten years. The primary aim of this study was to determine whether receipt of informal support from children and their spouses protects elders from depressive symptoms. A secondary aim was to observe how contemporary patterns of coresidence affect reports of depressive symptoms.

**Method**

Five waves of datafrom the Nihon University Japanese Longitudinal Study of Aging (NUJLSOA) were used to fit growth curve models indicating intra-individual changes in depressive symptoms. Models were estimated using STATA 12 software.

**Results**

Elders experiencing dissatisfaction with their contact with children and less frequent community contact reported increased depressive symptoms across survey years. Among women, coresidence with sons and daughters correlated with reduced depressive symptoms, while there was no such effect among men. Widowhood correlated with significant increases in depressive symptoms and the effect was stronger among men than women.

**Conclusion**

Although most NUJLSOA respondents coresided with sons, the significance of coresidence with daughters and support from daughters suggest the changing context of coresidence in contemporary Japan. Future studies focused on social support in Japan should consider the importance of daughters for elder mental health.

**Keywords**

Depression, social support, cross-national/international studies, quality of life/wellbeing

## Introduction

Depressive symptoms have occupied the spotlight of the recent international literature on aging as general indicators of elder well-being against a backdrop of social welfare insolvency. Depressive symptoms are associated with functional declines among the elderly (Barry, Allore, Bruce, & Gill, 2009) and transitions in social roles such as marital dissolution (Lee & DeMaris, 2007) that weaken the ability of elders to cope with the deterioration of physical health and may accelerate morbidity. Depressive symptoms also point to social fault lines that can help inform health care practitioners about changing living conditions of the elderly and crucial areas to focus outreach efforts. Past studies have documented the gender gap in depressive symptoms, with women reporting more symptoms than men (Mirowsky, 1996; Mirowsky & Ross, 1992). Since this body of research proposes that gender differences in depressive symptoms are indicative of lifelong socialization processes, studies that focus on gender and depressive symptoms can help guide social policy reforms from a gendered standpoint.

Within the global aging context, Japan is central to international discussions on elder well-being as one of the fastest aging societies of the previous decades. In light of recent shifts in preferences towards independent living, versus multigenerational coresidence (Traphagan, 2003), studies focusing on household arrangements in Japan can advance discussions of expectations and burden on informal support providers as well as care recipients within families. However, despite the fact that many older parents and their children choose to live apart from one another, many households later reunify to meet the needs of the older generation (Takagi, Silverstein & Crimmins, 2007). Within the contemporary reality of extended life spans, social welfare insolvency and increased morbidity at older ages, Vern Bengstson's (Bengtson, 2001) assertion concerning the increasing importance of multigenerational bonds may be an

understatement. The conditions for conflict as well as reinterpretation of the generational contract are particularly ripe in a wealthy, yet aging Japanese population.

This study examined self-reported depressive symptoms from older Japanese with children, using a ten-year panel study; the Nihon University Japanese Longitudinal Study of Aging (NUJLSOA). The analyses examined associations between receipt of instrumental and emotional support from adult children, children's spouses and depressive symptoms. Marital status and coresidence were regarded as the fulcrum variables of these analyses since widowhood was expected to trigger filial obligations to care.

## Background

### *Multigenerational Coresidence and Informal Support*

In Japan, obligations to support elder parents are rooted in traditional Confucian ideals. Under what is typically referred to as the *ie* (household) system, eldest sons inherit financial responsibility for parents' homes and property, often coresiding within the same household, while the *yome* (daughter-in-law) is expected to assume caretaking responsibilities (Nonoyama, 2000; Therborn, 2004). This relationship may be viewed as an exchange of financial support from the elder generation for instrumental and emotional support in later life.

In recent years, filial obligations have come into question by wealthier and more independent younger and older generations that wish to live flexibly. Adult children and in particular, daughters-in-law, may regard caretaking responsibilities as a burden (Izuhara, 2002). Older parents are also increasingly reluctant to rely upon their children, not wishing to hinder the younger generation and hoping to maintain their independence (Takagi & Saito, 2012). Expectations for support from children and coresidence often go hand-in-hand within traditional

households, while less-traditional families may reinterpret the generational contract given caregiver availability, the health of the elder generation and socio-economic status of both generations (Takagi, 2006; Takagi, Silverstein, & Crimmins, 2007). More advantaged parents may assume responsibility for less independent children, opting for coresidence, while widowhood, financial strains and poor health may determine when parents move into children's households (Takagi & Silverstein, 2011). Given the changing characterization of filial piety in contemporary Japan, self-reported depressive symptoms can give researchers a sense of how living arrangements affect elders' quality of life.

*Marital Status*

Numerous international studies have reported widowhood and marital dissolution as a risk factor for physical and mental health decline, including elevated depressive symptoms (Hughes & Waite, 2009; Lee & DeMaris, 2007; Sugihara, Sugisawa, Shibata, & Harada, 2008). Gender differences in depressive symptoms due to widowhood, in particular, have been the focus of past research. For example, some North American studies document sharper increases in depressive symptoms among men prior to and following the deaths of spouses (Lee, DeMaris, Bavin, & Sullivan, 2001), while others state that recovery from bereavement is determined by the extent of dependence on spouses, rather than gender (Carr, 2004).

In Japan widowhood may be uniquely harmful to men, despite female longevity, since men tend to benefit from wives' social networks and support (Okabayashi, Liang, Krause, Akiyama, & Sugisawa, 2004). However, other studies have described marital status as an equally important correlate of depressive symptoms for both genders (Sugihara et al., 2008), or as inconsequential in terms of health and mortality (Nagata, Takatsuka, & Shimizu, 2003). At the

same time, it is clear that given the prominent role of filial piety within Japanese culture, changes in marital status should trigger latent support networks, beginning with adult children.

*Informal support, somatic health and depressive symptoms*

Having a family member or close friend on hand to provide instrumental and emotional support may buffer elders from depressive symptoms and ease discomforts associated with functional declines (activities of daily living, or ADLs, and instrumental activities of daily living, or IADLs). Although the relationship between functional limitations, comorbid health conditions and depressive symptoms is well established, until recently, few studies had examined the moderating relationship of social support, between health and depressive symptoms (Muramatsu, Yin, & Hedeker, 2010).

Previous studies in the United States have found that depressive symptoms are correlated with loss of mobility, disability and general functional decline (Barry, Murphy, & Gill, 2011). Research conducted in Japan has confirmed this relationship as well as the fact that functional decline may exacerbate preexisting depressive symptoms or induce their onset (Wada et al., 2004). Conversely, daily exercise, balanced diets and hobbies are correlated with reduced depressive symptoms (Aihara, Minai, Aoyama, & Shimanouchi, 2011). Maintaining an active lifestyle also implies greater social connectedness. Therefore elders with mobility problems face challenges in calling upon secondary social networks for emotional support.

Spouses provide the primary buffer against depressive symptoms, in assisting with all manner of daily living activities and providing emotional outlets. However, in a vertically organized society such as Japan, children may play a more significant role than in western societies in alleviating aging-related stressors. Contact with children is an important buffer against depressive symptoms among widowed, divorced and never-married elders (Sugisawa,

Shibata, Hougham, Sugihara, & Liang, 2002). In Japan, social support from children is generally associated with positive well-being, improved cognitive function and fewer depressive symptoms (Okabayashi, et al. 2004). In particular, the presence of an emotional confidant, independent of an assistant with daily living difficulties, is a crucial predictor of reduced depressive symptoms (Okamoto & Harasawa, 2011).

## Hypotheses

This study's primary hypotheses center on the buffering effect of informal family support on depressive symptoms. Given the previous literature, we expected that widowhood would predict increases in depressive symptoms and that the effect would be less prominent among women. This was due to the fact that men tend to have reduced social networks when compared to women and may rely on their spouses for social networking as well as caregiving. Next, coresidence with sons implies that traditional support relationships are in effect and as such, was expected to buffer elders from depressive symptoms. We expected a similar, albeit lesser effect among elders coresiding with daughters. Likewise, receiving instrumental support from children and their spouses was posited to buffer depressive symptoms. Emotional support from any child was also expected to buffer elders from depressive symptoms, since having a confidant indicates close family relationships. Finally, functional declines and presence of comorbid health conditions were posited to demonstrate strong associations with depressive symptoms.

## Methods and Measures

### *Data*

We used data from the Nihon University Japanese Longitudinal Study of Aging (NUJLSOA), a five-wave, nationally representative panel study conducted between 1999 and 2009 (Nihon University Center for Information Networking, 2013). Data was gathered from face-to-face interviews with respondents aged 65 years and over. The NUJLSOA employed a two-stage, stratified cluster design. Weights were provided for use with the survey that adjusted for oversampling of those aged 75 and over and attrition in later waves.

The baseline sample size was 4997 respondents. The number used in this analysis was reduced to 3807 respondents who answered all depressive symptoms-related items at baseline, including respondents who were lost to attrition after Wave 1. T-tests comparing the analytic sample (N=3807) to respondents who died and were otherwise lost to follow-up (N=2239) revealed significant differences in the means of a few primary study variables (See Table 1). These included depressive symptoms, physical health measures and widowhood, confirming that the survivors were healthier than respondents who were lost for various reasons. Ultimately, in order to maintain a larger sample and reduce the risk of under reporting depressive symptoms, we decided to analyze an unbalanced sample, i.e., individuals who were lost to follow-up were included in the analyses.

*Measures*

The dependent variable for this study is a summary scale of responses to 11 survey questions capturing the presence of depressive symptoms over the previous week. These items are comparable to those making up the short form of the CES-D as described by Kohout (1993), which was in turn based on Radloff's (1977) 20-item scale. Items were coded 0, indicating "rarely", 1 marking "sometimes", and 2 referring to "often". Both forms of the CES-D have been

used in Japan-based research for approximately three decades and found to be valid and reliable (Shima, Shikano, Kitamura, & Asai, 1985; Yokoyama, Kaneita, & Saito, 2008).

Health was captured by controlling for three variables in the analyses. First, a comorbidity index was generated based on positive responses to 16 items describing the presence of health conditions. These included tachycardia from myocardial infarction and angina, other heart diseases, cancers, cerebrovascular ailments, high blood pressure, respiratory illnesses, digestive illnesses, diabetes, renal/urinary tract ailments, ailments of the liver/gall bladder, arthritis, chronic back pain, fractures/fissures, other fractures, osteoporosis and dementia (summary scale=0-16). A dichotomous variable describing difficulties with activities of daily living was also added to the model (0=no ADLs; 1=at least 1 ADL). These functional limitations included problems with bathing, dressing, eating, standing, walking around the house and using the toilet. Finally a likert-type scale captured self-reported health (1=very unhealthy; 5=very healthy).

The models also controlled for demographic factors including age, gender (0=male; 1=female), widowhood (0=married/separated/divorced/never married; 1=widowed), educational attainment, logged income (Yen), and work status (0=not working; 1=working). The analyses focused on spousal death rather than marital dissolution since changes in marital status across survey waves were overwhelmingly due to widowhood. Between 1999 and 2009 the percentage of widowed respondents increased from 36 to 47 percent, while the percentage of all other non-married statuses decreased from just under four percent to about three percent. Educational attainment was a dichotomous variable representing high school graduation or not (0=less than high school; 1=high school graduation). The income variable represented couples' pre-tax wages, including bonuses. The original measure was transformed from categorical to continuous

by generating mid-points for each category and designating the top income as exactly 1 interval above the previous category (13 intervals in Yen: 1=250,000, 2=750,000, 12=13,500,000, 13=15,500,000). The outcomes were then logged to adjust for the possibility of a curvilinear relationship between income and depressive symptoms. Rural residence (0=urban resident; 1=rural resident) was also included in the models.

Social support characteristics were included in the analyses according to availability, receipt and expectations. Coresidence with adult children represented availability, declaring adult children as helpers with functional difficulties captured receipt, and dissatisfaction with support as well as perceptions of future support measured expectations. Coresidence was comprised of two variables; coresidence with sons (0=not coresiding with son; 1=coresiding with son), and coresidence with daughters (0=not coresiding with daughter; 1=coresiding with daughter). Next, instrumental support measured positive answers to seven items describing help from one of the previous family members with finances, preparing meals, housework, shopping, transportation and a category marked "other". Emotional support described regular companionship and having someone to consult with for advice. The support indexes were generated through a two-step process. First, eight variables were generated to indicate receiving any kind of instrumental or emotional support from sons, daughters, sons-in-law and daughters-in-law (0=no support; 1=received support). Then these items were summed as an index of intergenerational support from children (range=0-4). Next two dichotomous variables were generated to introduce measures of support expectations to the models. The first variable described dissatisfaction with contact with children (0=satisfied; 1=dissatisfied). The second variable captured expecting to rely on children for support at some point in the future (0=not expecting support/ never thought about it; 1=expecting support).

Social integration, or support availability from non-family members, was represented by a variable describing participation in community groups and organizations (range 0-11). Finally, the variables time and quadratic time measured years since the baseline survey wave.

*Statistical Analyses*

First a series of baseline analyses were run to test for collinearity among the variables (not presented in this paper) and to test for differences between the analytic sample and attrition sample using T-tests. Collinearity was low and within acceptable ranges among the independent variables. However, as expected the health-related items demonstrated moderate and significant correlations with each other as well as with the CES-D. T-tests also revealed that respondents who were lost to the survey in subsequent years due to death or other forms of attrition reported higher CES-D scores, more ADLs and comorbidity (See Table 1). These results provided a justification for controlling for survey attrition due to death and other causes as a way of accounting for health-related differences between the study sample and original baseline sample. The linear, mixed modeling approach used in this paper is capable of handling incomplete and unbalanced data (Fitzmaurice & Ravichandran, 2008; Vinkers, Gussekloo, Stek, Westendorp, & van der Mast, 2004).

We estimated a series of nested growth curve models in order to examine the relationship between receiving support from children and depressive symptoms from 1999 to 2009. In these analyses, occasions were nested within individuals. Occasions were measured as the number of years since the baseline survey. A variable capturing quadratic time was also added to the models to adjust for non-linearity. First, two random-intercept models were fit, displaying variation in the intercept between respondents. Model 1 controlled for demographic, support and health characteristics. Model 2 allowed for gender-based analyses, adjusting for interactions between

respondents who were female and receipt of support. Next, the random-coefficient model (Model 3) generated possibilities of examining variation in the slope of CES-D trajectories. Finally, we analyzed adjusted margins for the secondary effects of widowhood and coresidence by gender on depressive symptoms trajectories.

[Insert Table 1]

**Results**

Table 2 describes the characteristics of the baseline sample. 41 percent of respondents participated in all five survey waves. 34 percent of the analytic sample missed at least one subsequent wave and 24 percent died during the study period. There were more female than male responders (57 percent) and the average age at baseline was about 75.

Somewhat over a third (36 percent) of the sample was widowed at baseline. Over half coresided with children. Many more respondents coresided with sons (39 percent) than daughters (thirteen percent). The sample also received instrumental and emotional support from about one child. Although the sample reported their health to be better than average, most described at least one chronic health condition. However, physical functioning was good, with only nine percent of respondents reporting a functional limitation at baseline.

[Insert Table 2]

Table 3 presents intra-individual and between individual depressive symptoms trajectories from 1999 to 2009. Underscoring the findings from Table 1, there was a significant relationship between attrition due to death or being lost to follow-up ($p<0.001$) and increased depressive symptoms trajectories across models.

Several variables proved to be robust predictors of intra-individual changes in depressive symptoms across waves. Among the informal support indicators, status as widowed (Model 1 $p<0.01$) appeared to exacerbate CES-D scores and retained significance after adjusting for interaction terms in subsequent models. Conversely, participation in groups and organizations ($p<0.001$) protected elders from depressive symptoms in all three models, while expressing dissatisfaction with the amount of contact with children indicated more frequent symptoms ($p<0.001$). There was also a clear relationship between individuals' health and depressive symptoms. Comorbidity, poor self-reported health and the presence of functional limitations exacerbated depressive symptoms across waves and in all three models ($p<0.001$). Higher incomes also consistently predicted reduced CES-D trajectories ($p<0.001$).

[Insert Table 3]

After adjusting for interactions by gender in Model 2, the variable measuring coresidence with sons lost significance. However, the variable for female ($p<0.05$) and both coresidence interaction terms ($p<0.05$) were significant, suggesting that women derived greater benefits from coresidence than men. The random-intercept variances in Models 1 and 2 indicate that mean CES-D scores differed between individuals from the overall mean by about 1.62 and 1.59 units.

The random-coefficient model (Model 3) presents random slopes, specified according to years since the baseline survey wave. All predictors from the previous models retained significance. There was a strong negative relationship between the interaction term capturing female widowhood and depressive symptoms ($p<0.001$). Model 3 also demonstrated that among women, coresiding with daughters ($p<0.05$) and sons ($p<0.05$) buffered depressive symptoms. Mean CES-D scores varied between individuals from the overall mean by 1.75 units. The slopes themselves also displayed slight inter-individual variance ($b=0.04$). A likelihood ratio test

confirmed that the random coefficient model (Model 3) had a better fit than the previous random-intercept model. The noticeably lower log likelihood supports this result.

The gendered effects of intra-individual changes in depressive symptoms from 1999-2009 were captured through two-way interactions in Models 2 and 3 and are presented in Figures 1 to 3. Figure 1 demonstrates gender differences in the effects of widowhood on depressive symptoms. These significant interactions ($p<0.001$) demonstrated that widowed women reported fewer depressive symptoms than their widowed male counterparts. This is despite the fact that women reported more frequent depressive symptoms than men at the aggregate level (not presented in this paper).

[Insert Figure 1]

Figures 2 and 3 present interactions by gender and coresidence with sons and daughters. In Table 3 coresidence with sons (b=-0.34; B=0.14) and daughters (b=-0.43; B=0.20) demonstrated moderate to strong correlations with reduced depressive symptoms among women. Figures 2 and 3 clarify the fact that this household relationship buffers depressive symptoms among women, but that this is less the case among men. Surprisingly, men who coresided with daughters reported higher CES-D scores than men who did not.

[Insert Figure 2]

[Insert Figure 3]

**Discussion**

This paper asked whether social support from adult children and their spouses protected Japanese elders from depressive symptoms. The study analyzed NUJLSOA data from 1999 to 2009. The growth curve models emphasized gender since past research has reported disparate

mental and physical health outcomes among women and men (Inaba et al., 2005; Mirowsky 1996). At the same time, since multigenerational coresidence is becoming less standard in contemporary Japan (Nonoyama 2000), the models were fit by coresidence and support from children as well as children's spouses, allowing for dynamic relationships in regard to intergenerational support.

As hypothesized, widowhood correlated with gradual increases in depressive symptoms among men and women. Furthermore, the intra-individual trajectories in depressive symptoms demonstrated by the fixed effects portion of the growth curve models indicated that losing a spouse and coresidence with children were, in tandem, significant predictors of depressive symptoms. It is probable that transitions to widowhood triggered latent support networks between generations.

Gender matters in respect to depressive symptoms, household support relationships and the nature of received support in the NUJLSOA. First, widowhood demonstrated a reduced stressor effect on depressive symptoms among women after adjusting for the interaction terms. Conversely, coresidence with sons and daughters appeared to buffer women from depressive symptoms. There was less evidence that this was the case among men. Figures 2 and 3 illustrated that men reported slightly lower CES-D scores when coresiding with sons and higher CES-D scores when coresiding with daughters than non-coresiding men and women. One possible explanation for this result is that widowers who coreside with their children are doubly disadvantaged when compared to their married counterparts, regardless of the presence of children.

Since many more respondents indicated residing with sons than daughters (39 percent versus thirteen percent), the prominent impact of daughters in this study's results implies the

changing nature of informal support relationships in Japan. There may have been some preference for coresiding with daughters among women. At the same time, coresidence with daughters may reflect declining birthrates as well as the needs of older Japanese with comorbid health conditions and mobility problems (Takagi, Silverstein, & Crimmins, 2007).

Neither of the summary indexes capturing support from children and in-laws displayed significant correlations with depressive symptoms. This reinforces the idea that contemporary Japanese households do not reflect the traditional standard of three generation stem-families centered on a married couple. However, the models underscore that traditional notions of support and filial piety continue to exert their influence on perceptions of support and received care. For example, older individuals who were dissatisfied with the amount of contact they had with children reported more depressive symptoms than those elders who were satisfied. Furthermore, coresidence with either child protected women from depressive symptoms, while among men, coresidence with spouses may be optimal.

Although there was little evidence that declaring receipt of informal support from children buffered depressive symptoms, participation in community groups and organizations did seem to protect elders. At the same time, only the healthiest individuals would have reported involvement in multiple organizations, raising questions concerning the intensity and quality of community contact; information that cannot be gleaned from the survey.

## Conclusion

This study fills an important gap in the literature on aging in East Asia and Japan by examining social support relationships and their impact on depressive symptoms across a decade long period. Among men and women, coresidence with children may have indicated a

substitution for support from deceased or sick spouses. However, the models also revealed that older Japanese women benefitted from coresidence with children, while this was less the case among men. Concomitantly, widowhood was a less-significant stressor among women than men.

The analyses also provided evidence that traditional expectations for support impacted the expression of depressive symptoms. Elders who were dissatisfied with their contact with children reported increasing depressive symptoms across the ten years. In addition, coresidence with sons correlated with fewer depressive symptoms, although the effect was reduced among men.

This study was limited by the fact that it did not use a representative sample and thus, results cannot be directly extrapolated to the national population. However, after controlling for survey attrition in the growth curve models, the analysis sample was sizable enough to produce substantive results. This research was also limited by concerns surrounding time order. For example, the analyses did not directly examine when respondents first reported depressive symptoms or transitioned into support relationships with children. Receiving care from children and coresiding with children may have been a necessity arising from functional limitations, chronic health conditions and the loss of spousal support. However, intra-individual changes in dichotomous widowhood, support and coresidence across survey waves do register as transitions in the fixed effects portion of the analyses. Controlling for the first and subsequent changes in these statuses following baseline would help clarify issues centered on time order.

This paper focused on the position of elders with children since the primary research question was whether receiving support was a buffer for depressive symptoms. Future longitudinal studies could enrich this question by taking the opposite approach. Controlling for children's head-of-household status, children's income and children's educational attainment

could help shed light on how wealth and individual mastery moderate the relationship between health and depressive symptoms. Additional measures of social support outside of the family and health behaviors such as exercise and alcohol consumption would enhance causal explanations of depressive symptoms and provide more nuanced guidance for public policy aimed at improving the living conditions of the elderly.

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**Table 1. T-tests Comparing Baseline Means for CES-D Response vs. Non-response; and Survivor Sample vs. Attrition Sample**

| | Analytic Sample (N=3807)[a] | | Non-response (N=1190[b] | | Survivor Sample (N=1568)[c] | | Attrition Sample (N=2239)[d] | |
|---|---|---|---|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** | **Mean** | **SD** |
| CES-D (0-22) | 4.28 | 2.54 | NA | NA | 3.94*** | 2.33 | 4.51 | 2.65 |
| Widowed | 0.36*** | 0.48 | 0.43 | 0.49 | 0.31*** | 0.46 | 0.40 | 0.49 |
| Comorbidity (0-16) | 1.61*** | 1.39 | 1.93 | 1.58 | 1.5*** | 1.33 | 1.68 | 1.43 |
| ADLs (dichotomous) | 0.09*** | 0.29 | 0.39 | 0.49 | 0.05*** | 0.22 | 0.13 | 0.33 |
| Self-reported health[e] | 3.17*** | 1.07 | 2.60 | 1.18 | 3.32*** | 1.02 | 3.06 | 1.08 |

**Notes: *p<0.05; **p<0.01; ***p<0.001**

**[a]Answered all CES-D items at Baseline; [b]Did not answer all CES-D items at Baseline;**

**[c]Responded to Wave 5; [d]Missing CES-D items and lost to follow-up**

**[e]Self-reported health (1=very unhealthy; 5=healthy)**

**Table 2. Baseline Sample Characteristics (N=3807)**

| | Mean | SD |
|---|---|---|
| CES-D[a] | 4.28 | 2.54 |
| Age | 74.65 | 6.14 |
| Female | 0.57 | 0.49 |
| Widowed[b] | 0.36 | 0.48 |
| High school Diploma[c] | 0.38 | 0.49 |
| Income (¥ in 100 thousands) | 26.77 | 23.23 |
| Employed | 0.26 | 0.44 |
| Rural | 0.40 | 0.49 |
| HH Size | 3.25 | 1.83 |
| Coreside w/son | 0.39 | 0.49 |
| Coreside w/daughter | 0.13 | 0.33 |
| Comm contact (0-11)[d] | 1.20 | 1.30 |
| Dissatisfied w/child contact | 0.08 | 0.27 |
| Expect support from child | 0.47 | 0.50 |
| Gave care | 0.32 | 0.47 |
| Instrumental support (0-4) | 0.92 | 1.38 |
| Emotional support (0-4) | 0.66 | 1.23 |
| Comorbidity (0-16) | 1.61 | 1.39 |
| ADLs (dichotomous) | 0.09 | 0.29 |
| Self-reported health[e] | 3.17 | 1.07 |
| Survivor (to Wave 5) | 0.41 | 0.49 |
| Deaths (from Wave 1-Wave 5) | 0.24 | 0.43 |
| Missing (at least 1 wave) | 0.34 | 0.47 |

**Notes: [a]CES-D (0-22); [b]Not married (0=married, 1=widowed/divorced/separated/never married); [c]High school Diploma (0= less than HS; 1=HS graduate) [d]Community Contact (0-11 group memberships); [e]Self-reported health (1=very unhealthy, 5=healthy)**

**Table 3. Growth Curve Models Fitting CES-D Trajectories, 1999-2009**

| | Model 1 | | Model 2 | | Model 3[a] | |
|---|---|---|---|---|---|---|
| | **b** | **B** | **b** | **B** | **b** | **B** |
| Age | $2.72^{e-3}$ | $6.41^{e-3}$ | $3.59^{e-3}$ | 0.01 | $4.48^{e-3}$ | 0.01 |
| Female | -0.07 | 0.08 | 0.22* | 0.11 | 0.21* | 0.11 |
| Widowed | 0.24** | 0.08 | 0.65*** | 0.13 | 0.61*** | 0.13 |
| High school diploma | -0.06 | 0.07 | -0.05 | 0.07 | -0.04 | 0.07 |
| Income (Logged) | -0.17*** | 0.05 | -0.18*** | 0.05 | -0.19*** | 0.04 |
| Employed | -0.04 | 0.08 | -0.04 | 0.08 | -0.06 | 0.08 |
| Rural | 0.04 | 0.07 | 0.04 | 0.07 | 0.01 | 0.07 |
| Coreside w/son | -0.23** | 0.08 | -0.04 | 0.11 | -0.04 | 0.11 |
| Coreside w/daughter | -0.18 | 0.10 | 0.06 | 0.15 | 0.07 | 0.15 |
| Community contact | -0.12*** | 0.02 | -0.12*** | 0.02 | -0.11*** | 0.02 |
| Dissatisfied w/child contact | 0.44*** | 0.09 | 0.43*** | 0.09 | 0.42*** | 0.08 |
| Expect support from child | -0.05 | 0.06 | -0.05 | 0.06 | -0.05 | 0.06 |
| Gave care | 0.01 | 0.06 | 0.01 | 0.06 | 0.01 | 0.06 |
| Instrumental support | $4.55^{e-3}$ | 0.03 | -0.02 | 0.04 | -0.02 | 0.04 |
| Emotional support | -0.03 | 0.03 | -0.05 | 0.04 | -0.06 | 0.04 |
| Comorbidity (0-16) | 0.18*** | 0.02 | 0.18*** | 0.02 | 0.17*** | 0.02 |
| ADLs (dichotomous) | 0.77*** | 0.09 | 0.77*** | 0.09 | 0.76*** | 0.09 |
| Self-reported health (1-5) | -0.49*** | 0.03 | -0.49*** | 0.03 | -0.48*** | 0.03 |
| Attrited | 0.25*** | 0.07 | 0.25** | 0.07 | 0.25*** | 0.07 |
| Time | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Quadratic Time | $-1.98^{e-3}$ | $2.44^{e-3}$ | $-1.75^{e-3}$ | $2.44^{e-3}$ | $-1.33^{e-3}$ | $2.41^{e-3}$ |
| | | | | | | |
| Female X Widowed | | | -0.61*** | 0.16 | -0.58*** | 0.16 |
| Female X Coreside w/son | | | -0.36* | 0.14 | -0.34* | 0.14 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Female X Coreside w/daughter | | | -0.44* | 0.20 | -0.43* | 0.20 |
| Female X Instrum support | | | 0.05 | 0.05 | 0.04 | 0.05 |
| Female X Emotion supp | | | 0.03 | 0.06 | 0.04 | 0.06 |
| Constant | 7.72*** | 0.86 | 7.78*** | 0.86 | 7.79*** | 0.85 |
| **Random Effects Parameters** | | | | | | |
| Random Intercept Variance | 1.62*** | 0.10 | 1.59*** | 0.09 | 1.75*** | 0.14 |
| Covariance | | | | | -0.06*** | 0.02 |
| Slope Variance | | | | | 0.04*** | 0.01 |
| Log Likelihood | -18377.44 | | -18364.29 | | -18317.27 | |
| N | 3212 | | 3212 | | 3212 | |

**Notes: *p<0.05; **p<0.01; ***p<0.001**

**[a]Random coefficient model has signficantly better fit than random intercept model 2 (p<0.001)**

Figure 1. Depressive symptoms trajectories over ten years among older men and women in Japan: does receiving support from sons, daughters and their spouses protect against depressive symptoms?

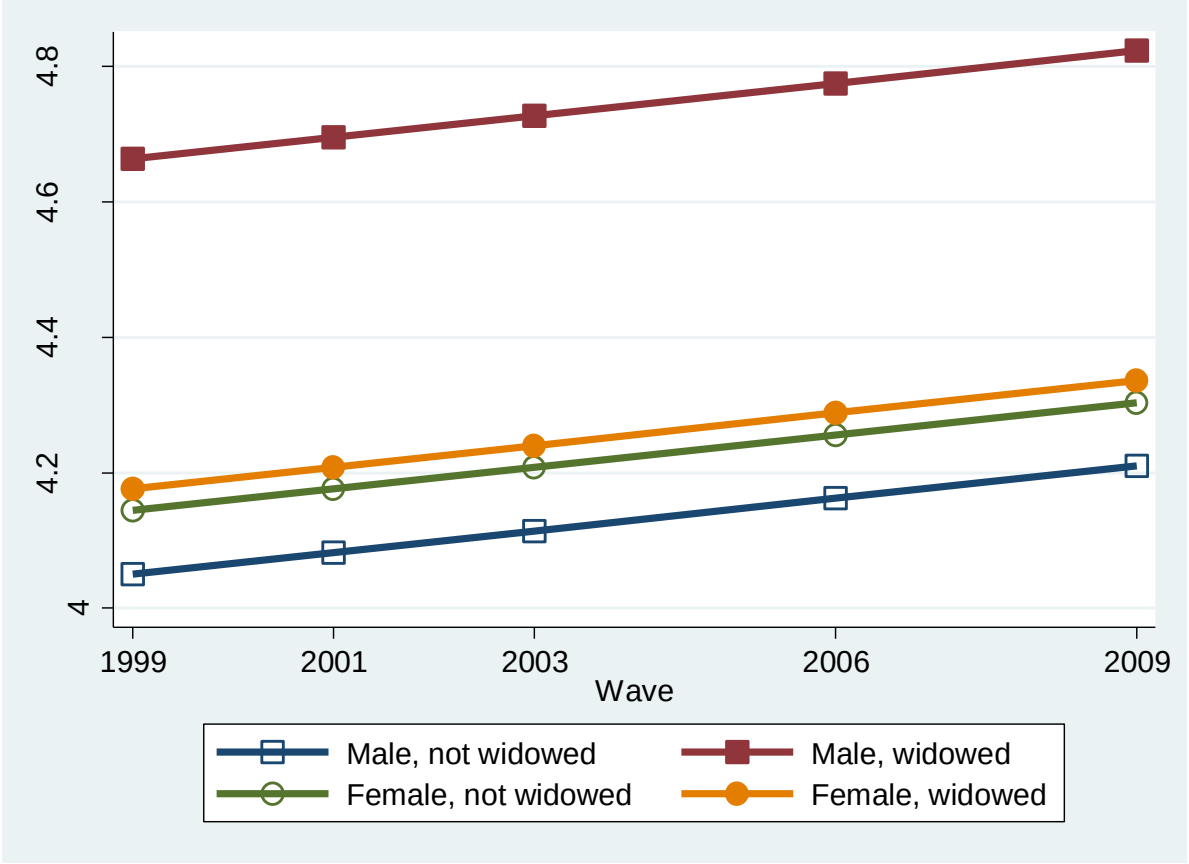


Figure 1. CES-D margins by survey year according to widowhood and gender. *Note.* Derived from Model 3, Table 3.

Figure 2. Depressive symptoms trajectories over ten years among older men and women in Japan: does receiving support from sons, daughters and their spouses protect against depressive symptoms?

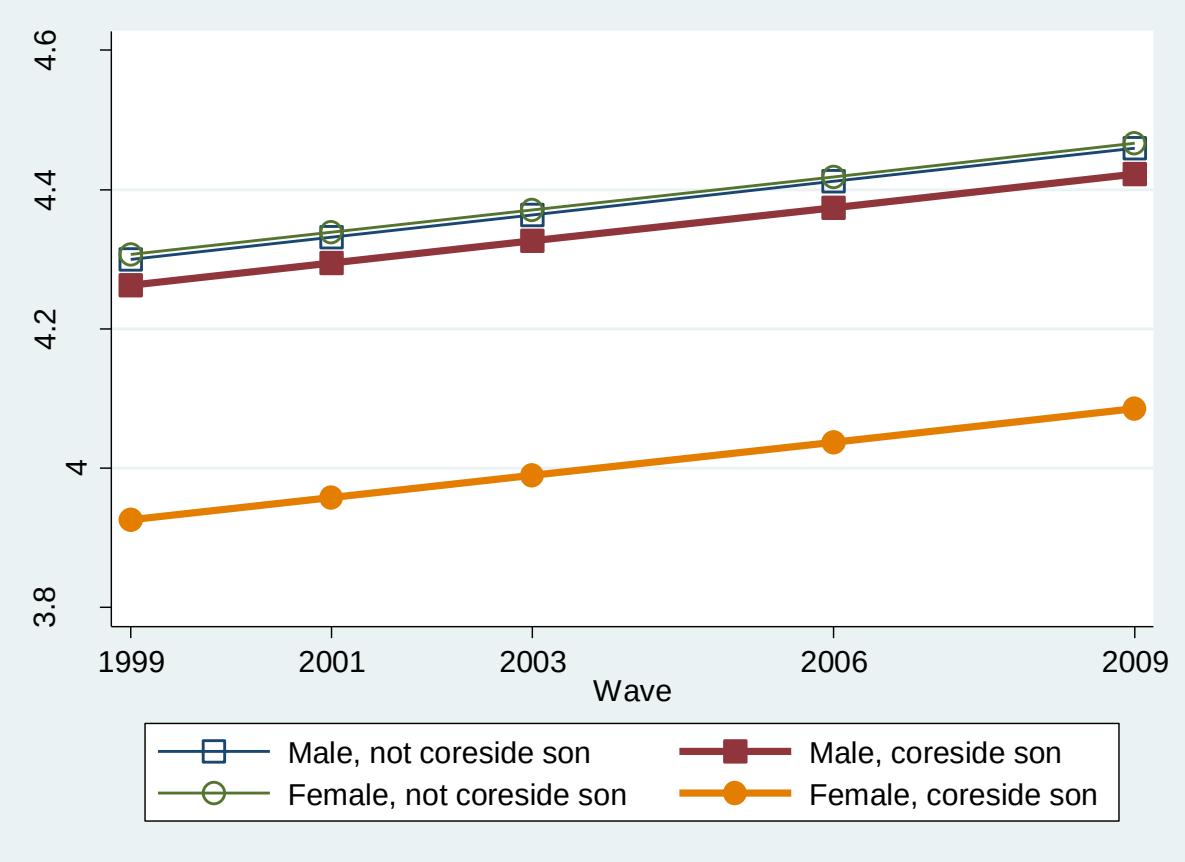


Figure 2. CES-D margins by survey year according to coresidence with sons and gender. *Note*. Derived from Model 3, Table 3.

Figure 3. Depressive symptoms trajectories over ten years among older men and women in Japan: does receiving support from sons, daughters and their spouses protect against depressive symptoms?

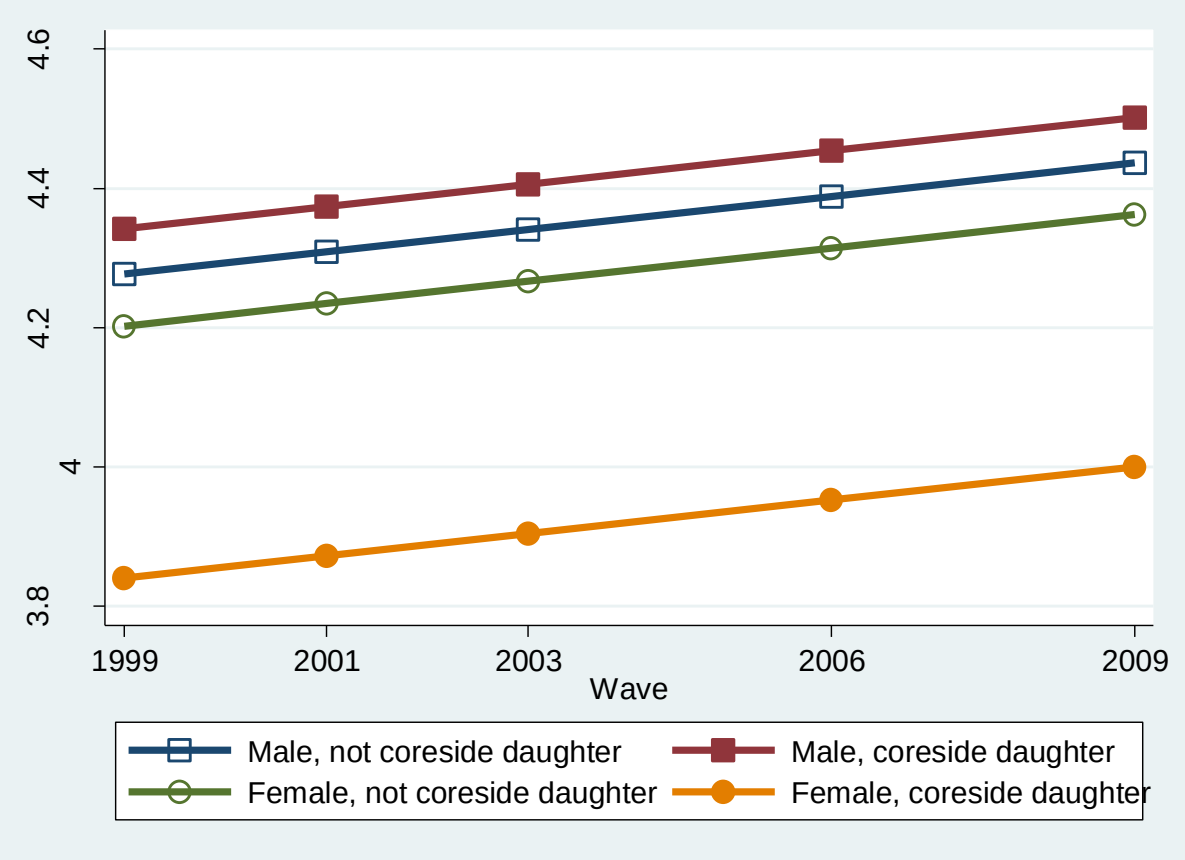


Figure 3. CES-D margins by survey year according to coresidence with daughters and gender. *Note.* Derived from Model 3, Table 3.