Transitions in Living Arrangements Among Elders in Japan: Does Health Make a Difference?

Joseph Winchester Brown,1 Jersey Liang,1,2 Neal Krause,1,2 Hiroko Akiyama,3 Hidehiro Sugisawa,4 and Taro Fukaya4

1School of Public Health and 2Institute of Gerontology, University of Michigan, Ann Arbor.
3Institute for Social Research, University of Michigan, Ann Arbor, and University of Tokyo, Tokyo, Japan.
4Tokyo Metropolitan Institute of Gerontology, Tokyo, Japan.

Objective. This research evaluates the hypothesis that poor health triggers a change in living arrangements among elderly adults in Japan.

Methods. Data came from a national probability sample of 2,200 Japanese people aged 60 or older. Four surveys of this sample were conducted over a period of 9 years, from 1987 to 1996. Multinomial logit regression analyses were used to analyze the effects of demographic characteristics, socioeconomic status, and health on changes in living arrangements.

Results. Living arrangements among the Japanese elderly people remained quite stable over the 9-year period. Physical and mental health conditions were found to exert both direct and indirect effects on transitions in living arrangements.

Discussion. Poor health does trigger changes in living arrangement. Both physical (i.e., chronic conditions and functional status) and mental (i.e., depressed affect) health conditions play a role in such transitions. Because health conditions are correlated with competing risks of mortality, attrition, and proxy interview, health effects on changes in living arrangement are likely underestimated.

Over the last 2 decades, a wealth of research has shed light on the determinants of living arrangements among elderly people. However, current research can be improved in a number of respects. First, what we know of living arrangements is largely based on cross-sectional data. As a result, long-standing issues of temporal ordering remain unresolved, such as whether transitions in elderly living arrangements are primarily triggered by the onset of poor health (e.g., Chappell, 1991). Second, our understanding of the effects of health on living arrangements of elderly adults is relatively limited. The onset of poor health is commonly defined in terms of functional status, even though surveys often include items covering multiple dimensions of physical and mental health. Finally, because much of the theory supporting this area of research is based on data collected from elderly adult persons living in the United States, its adaptability to non-Western societies is less clear. In particular, findings from Asia suggest a rich heterogeneity in the cultural underpinnings of elderly adults’ living arrangements (see, e.g., Hashimoto, 1991; Hermalin, Ofstedal, & Chang, 1996; Knodel & Saengtienchai, 1999; Martin, 1989). The external validity of current theory needs to be further evaluated.

This article aims to address the limitations identified above. We did so by taking the following three steps. Namely, we studied transitions in living arrangements with data gathered through four repeated observations over a 9-year period. We then explained these transitions by using a full complement of health measures. Finally, we based our study on data derived from a national probability sample of 2,200 elderly in Japan.

Longitudinal Analysis of Living Arrangements

Most studies of health effects on living arrangements are cross-sectional in design. Although the need for care (i.e., declining health) has been shown to consistently predict living arrangements, a potential endogeneity (or reverse causal direction) exists because health indicators were obtained contemporaneously with measures of living arrangements. This is a problem in making a valid causal interpretation (e.g., Soldo, Wolf, & Agree, 1990).

In recent years the availability of longitudinal data has made it possible to examine the relationship between health status and living arrangements over time. The use of these data, however, has focused on elderly adults’ mobility, excluding those transitions in which adult children relocate to the home of an elderly parent (e.g., Miller, Longino, Anderson, James, & Worley, 1999; Silverstein & Angelelli, 1998; Spitz, Logan, & Robinson, 1992). Furthermore, the majority of this research is limited to two waves of observations over a relatively short time period. This is a problem because transitions in elderly adults’ living arrangements are rare events, requiring a longer period of observation to effectively capture change (e.g., Speare, Avery, & Lawton 1991).

The role of declining health in prompting changes in living arrangements is best studied longitudinally, in which case temporal priority can be assigned to health variables. This is not to say that living arrangement has no influence.
over an elderly person’s health. Several studies suggest that the physical environment and social context of a household can affect individual health (Antonacci, 1990; Martin, 1990; Ueno et al., 1981). Taken as a whole, although further investigation is needed to determine the extent of reciprocal linkages in the health–living-arrangement relationship, we first sought to establish whether indeed a family “rearranges itself” to deal with sickness and disability among its members.

**The Central Role of Health in Changing Living Arrangements**

Current knowledge concerning the linkages between health and living arrangement can be substantially improved. Many studies on elderly persons’ living arrangements included no measures of health (see e.g., Frankenberg, Beard, & Saputra, 1999; Martin & Tsuya, 1991; Ogawa & Retherford, 1997). Although the exclusion of health variables in cross-sectional studies is often done to avoid endogeneity, the issue of misspecification remains. When health effects on living arrangements are considered, the focus is almost exclusively on functional status (Soldo et al., 1990). This makes sense because in the absence of a spouse to provide help, establishing coresidence with an adult child is considered the next best option to assure assistance with activity of daily living (ADL) or instrumental activity of daily living (IADL) tasks (Silverstein & Angelelli, 1998). Furthermore, ADL and IADL measures in fact capture, besides health conditions, elements of living environments and role expectations.

As research by Liang (1986) and others reveals, there are several ways other than functional status to assess physical health, including global self-ratings of health and the number of diseases. Because each measurement strategy captures a different facet of the illness process, each can tell us something different about the underlying relationship between physical health problems and changes in living arrangements. For example, although self-rated health is undoubtedly influenced by functional status, research reveals that this measure taps into a much broader set of health dimensions. In particular, there is some evidence that self-rated health reflects a preclinical awareness of health problems (Idler & Benyamini, 1997). In this sense, elders may elect to change their living arrangements before health problems become too debilitating. Acute and chronic conditions are also likely to be associated with functional status, although such conditions often require older adults to follow dietary or medication regimens that do not interfere with ADL/IADL functioning, but may nevertheless require the assistance of others.

In addition, an extensive body of research reveals that mental and physical health problems are often comorbid (Cohen & Rodriguez, 1995). This creates problems for research on living arrangements because a transition could be triggered by either physical health problems, mental health problems, or both. The only way to more clearly identify the underlying process at work is to include not only measures of physical health, but also measures of mental health in the same set of multivariate analyses. For example, cognitive impairment and depression are among the most prevalent mental health problems in late life, and both eventually compromise the ability to maintain independent living, especially cognitive impairment (Egleston, Rudberg, & Brody, 1999). Studies also suggest that providing care for a mentally ill person may have an especially pernicious effect on caregiver well-being (Ostwald, Hepburn, Caron, Burns, & Mantell, 1999). Consequently, the disabilities associated with mental health problems may inhibit coresidence with children, who are typically not well equipped to handle the behavioral and psychological problems associated with cognitive impairment and depression.

In summary, the dimensions of physical and mental health discussed here are related, yet they also reflect different needs and concerns that may influence the decision to coreside with children. To fully understand transitions in living arrangements in late life, it is therefore necessary to examine all dimensions simultaneously. Although several studies have included more than one health variable (Chappell, 1991; Colsher & Wallace, 1990; Silverstein & Angelelli, 1998; Speare et al., 1991; Waithe & Hughes, 1999), we were unable to locate any study that included a full range of measures.

**The Culture of Living Arrangements in Japan**

Because of its rather unusual cultural and social systems, Japan provides an ideal setting for further validation and elaboration of research based on Western developed nations. Although Japan has achieved levels of socioeconomic development that exceed those in Western countries, Japan has also retained the traditionally strong influence on society of family and kinship systems (Sugimoto, 1997). More specifically, despite evidence that norms of filial piety and care for the elderly are eroding (see Ogawa & Retherford, 1993), the expected reciprocity between adult children and their elderly parents appears to remain a dominant feature in contemporary Japan (e.g., Yamamoto & Wallhagen, 1997). Consequently, whereas we commonly view Western elderly persons as preferring to live independently (e.g., Fillenbaum & Wallman, 1984), we similarly view Japanese elderly persons as preferring intergenerational living arrangements.

This view of Japan is supported by ethnographic research. This is illustrated by Bethel’s (1992) study of a typical Japanese retirement home. She concluded that such institutionalization was widely viewed by the elderly residents as a failure to achieve the Confucian ideal of filial piety, or the ideal of living with a married son and receiving affection and care from the daughter-in-law (e.g., Lebra, 1976; Tsuya & Martin, 1992). Certainly among industrialized nations Japan has a uniquely high percentage of elderly adults who coreside with children. Up until the early 1980s over 70% of elderly people in Japan lived with children, compared with 20% of elders in the United States (Ogawa & Retherford, 1997). Our data show that in 1996, 52% of elderly Japanese coresided with their children (married or unmarried), compared with only 12% in the United States (Saluter, 1996).

Between 1950 and 2000, the proportion of the population older than age 65 increased by 237% in Japan compared with 49% in the United States. To offset the high costs of providing health benefits to elderly adults, Japan instituted
Because the analysis of changes in living arrangement was based on only surviving respondents who completed a personal interview at each wave of the survey, other competing risks including death, nonresponse, or proxy interview are explicited. This is because the probabilities associated with various competing risks are interdependent in that they must sum to 1. In other words, the occurrence of one type of event (e.g., death) removes the individual from the risk of all the other types of events (e.g., changes in living arrangement). When a given covariate is significantly associated with a transition in living arrangement as well as death, nonresponse, or proxy interview, its effect on changes in living arrangement needs to be interpreted by taking the competing risks into account.

**Physical and mental health.**—Living arrangements are hypothesized to be a function of physical and mental health conditions including morbidity, functional status, self-rated health, depressive symptoms, and cognitive impairment. As the rationale for the hypothesized health effects has been well documented in the introduction, it is not repeated here.

**Demographic and socioeconomic status.**—Living arrangements are also influenced by a number of demographic and socioeconomic characteristics. In addition to age, gender, and education, we focused on the effects of the elderly person’s marital status, family composition, urbanicity, and home ownership. Living arrangements are highly correlated with one’s marital status. Because for some arrangements (living with spouse only) marriage is a precondition, whereas for others (living alone) marital dissolution is the chief pathway, it is necessary to disentangle the effects of marital status from living arrangements. This is accomplished by stratifying the empirical analyses by marital status at the follow-up interview. An indicator of whether an older person’s marital status changed between waves of the survey is also included. This measure helps to isolate the health effects on living arrangements from that caused by a change in marital status.

![Figure 1. Conceptual method of transitions in living arrangements: Japanese elderly.](Image 312x78 to 551x249)
Family composition matters because nearly all studies incorporate a measure of kin availability (e.g., the number of living children by sex and/or marital status) to define an opportunity structure for living arrangements (see Ofstedal, 1995, for a review of these approaches). For example, the literature consistently shows that the probability of living with a child increases with the number of offspring (e.g., Soldo et al., 1990). Children’s geographic proximity also matters because the majority of older parents would rather move closer to an adult child than live with an adult child (Silverstein, 1995).

We control for the effects of owning a home because this has been associated with higher levels of functioning, satisfaction with one’s living situation, and the availability of privacy in late life (Hermalin, Roan, & Chang, 1997; Martin, 1989; Soldo et al., 1990; Waite & Hughes, 1999). In all these dimensions, owning a home reduces the odds of an elderly person moving closer to or in with children.

Finally, studies show that coresidence in non-Western countries is often highest in urban areas (DaVanzo & Chan, 1994; Frankenberg et al., 1999; Park et al., 1999). The internal migration patterns of many countries have resulted in large cohorts growing old in the cities to which they migrated as young workers. The housing in such cities is now so expensive that young families may opt to join the urban households of their parents in lieu of purchasing a place of their own. For these reasons we include a measure of urbanicity.

**METHODS**

**Sample and Data**

Data came from a four-wave panel study of a national sample of 2,200 Japanese aged 60 and older. The first wave was conducted in November 1987, and each successive wave occurred exactly 3 years after. A self-weighted, two-stage stratified probability sampling design was used. Significant efforts were made not only to follow up all those individuals who gave full interviews at baseline, but also to recover as much as possible those individuals who were previously lost to follow-up or from whom only proxy interviews were obtained. At Wave 1, a total of 2,200 interviews were completed successfully from the list of 3,288 names (see Jay, Liang, Liu, & Sugisawa, 1993, for a detailed analysis of nonresponse in this survey).

Table 1 shows how the sample size changes from one transition interval to the next. For example, in the first transition interval (Wave 1 to Wave 2) 1,671 direct interviews were completed out of the original 2,200, a difference of 529 respondents. Of this group, 163 died between 1987 and 1990, leaving 366 nonrespondents. A total of 152 of the nonrespondents were deleted because the respondent was living with others. The ratio-

<table>
<thead>
<tr>
<th>Baseline State</th>
<th>Self-Respondent</th>
<th>Proxy</th>
<th>Lost to Follow-up</th>
<th>Dead</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-respondent in 1987</td>
<td>1,671</td>
<td>152</td>
<td>214</td>
<td>163</td>
<td>2,200</td>
</tr>
<tr>
<td>Self-respondent in 1990</td>
<td>1,369</td>
<td>114</td>
<td>83</td>
<td>105</td>
<td>1,671</td>
</tr>
<tr>
<td>Self-respondent in 1993</td>
<td>1,166</td>
<td>137</td>
<td>102</td>
<td>127</td>
<td>1,532</td>
</tr>
<tr>
<td>Total</td>
<td>4,206</td>
<td>403</td>
<td>399</td>
<td>395</td>
<td>5,403</td>
</tr>
</tbody>
</table>

*The total of 1,671 excludes 152 persons who became proxy respondents in 1990, 214 who were lost to follow-up in 1990, and 163 persons who died between 1987 and 1990.*

*The total of 1,532 includes 1,369 self-respondents in 1993 plus 42 respondents who had proxy interviews in 1990 but were self-interviewed in 1993 and 121 who were lost to follow-up in 1990 but were self-interviewed in 1993.*

The working sample was then derived by excluding at each interval respondents who have no children as well as respondents who live with others (i.e., those who do not live alone, with spouse only, or with their children). The rationale for these exclusion criteria is discussed in the next section. A total of 293 observations were deleted because the respondent had no living children, and 232 observations were deleted because the respondent was living with others. These exclusions (n = 525) reduced the sample from the overall total of 5,403 shown in Table 1 to a total of 4,878. This reduced sample is the basis for all subsequent analysis.

**Measurement**

**Living arrangements.**—The dependent variable was constructed from the household roster of the questionnaire, which provided the age, gender, relationship with respondent (e.g., spouse, son, daughter-in-law, etc.), and headship status of all household residents. The term coresidence in this study refers to arrangements in which the respondent lives in a home with people other than his or her spouse. Because our substantive focus is on differentiating between independent living and living with children, we excluded respondents who may have been in a coresident arrangement (such as living with siblings, elderly parents, other relatives, or friends), but for whom such an arrangement did not include their own children.

To ensure that all respondents were subject to the risk of living with their children, we also excluded respondents who reported no living children. This was necessary in assessing the probability of making a transition to a particular living arrangement net of the opportunity structure as defined by kin availability.

**Demographic and socioeconomic factors.**—Age was measured in terms of the actual years of age at the time of
survey, whereas gender was defined as a dummy variable, with female coded as 1. Urbanicity was measured on a 4-point scale, on which 1 = residence in a place of fewer than 50,000 persons, 2 = between 50,000 and 199,000, 3 = between 200,000 and 999,000, and 4 = living in a city of 1 million or more people. In addition, we measured the total number of children and the number of children who live near the respondent. In this study, near is defined as a child located within 1 hour of the respondent's home. With reference to socioeconomic status (SES) attributes, education was measured in the number of years of formal schooling. Home ownership was taken from a dichotomous item asking whether the respondent owns his or her residence. Table 2 shows the means and standard deviations of explanatory variables.

**Physical health.**—Information on morbidity was derived from a checklist of the following conditions: high blood pressure, diabetes, heart disease, stroke, cancer, respiratory disease, bone fracture, arthritis, chronic back pain, liver or gall bladder diseases, cataract, glaucoma, other eye diseases, Parkinson's disease, anemia, phlebitis or disease of the vein, stomach or intestinal ulcers, kidney disease, thyroid disease, gout, tuberculosis, bedsores or ulcers of the feet, disease of the prostate gland, or other diseases. An index of serious diseases was constructed from this list by combining cancer, diabetes, heart disease, hypertension, and stroke. The remaining conditions were grouped as chronic conditions (Ferraro & Farmer, 1999). A respondent had poor functional status if he or she had any degree of difficulty in performing at least one of the following three activities: (a) bathing, (b) climbing two or three flights of stairs, or (c) walking about 200 to 300 meters or a few blocks (see Liu et al., 1995). Self-rated health was measured on a 5-point scale on which 1 = excellent, 2 = very good, 3 = good, 4 = fair, and 5 = poor.

**Mental health.**—Pfeiffer's (1975) Short Portable Mental Status Questionnaire was used to assess cognitive function, with minor modification to reflect cultural differences (Liang, Borawski-Clark, Liu, & Sugisawa, 1996). The Japanese version contains nine questions covering short- and long-term memory, orientation to surroundings, knowledge of current events, and ability to perform mathematical tasks. A score of 9 indicates that all items were incorrectly answered. Unanswered items were treated as errors (Fillenbaum, 1980).

Depressive symptoms were assessed with a seven-item version of the 20-item Center for Epidemiologic Studies Depression Scale (Radloff, 1977). Indicators in this shortened version were identified through previous research with elderly persons (Krause, 1986). Depressed affect was assessed with the following items: “I felt depressed,” “I felt lonely,” and “I felt sad.” Each item was scored as follows: 1 = hardly ever, 2 = sometimes, and 3 = often. Scores ranged from a low of 3 to a high of 9, with high scores reflecting greater depression. Internal consistency coefficients were .700 in Wave 1, .721 in Wave 2, and .730 in Wave 3. Somatic symptoms were assessed with four items: “I did not feel like eating—my appetite was poor,” “I felt that everything I did was an effort,” “My sleep was restless,” and “I could not get ‘going’.” Scores for somatic symptoms ranged from a low of 4 to a high of 12. Internal consistency scores were .669 at wave 1, .665 at Wave 2, and .723 at Wave 3.

**Data Analysis**

The analyses of changes in living arrangements are presented in three sections. First, we present a descriptive analysis by cross-tabulating the distribution of respondents by their baseline living arrangement with the distribution observed at the follow-up interview. This was repeated for each of the three time lags of the study (i.e., 1987–1990, 1990–1993, and 1993–1996). We then pooled these three
time lags to summarize the overall 9-year pattern of change. Second, to assess the direct and indirect effects of baseline covariates on the probabilities of changes in living arrangements, we used hierarchical multinomial logistic regressions to analyze a data set consisting of pooled time lags. This approach is equivalent to a discrete-time event history analysis with time-varying covariates (Allison, 1995, pp. 219–222). Third, competing risks for mortality, nonresponse, and proxy interviews, relative to survival, were estimated by multinomial logistic regression analysis.

To adjust for dependence among observations as a result of pooling the time lags, we obtained robust variance estimates by using the robust and cluster commands in conjunction with the multinomial logit regressions in STATA (Release 6; StataCorp, 1999). This is closely equivalent to using generalized estimating equation methods, in which a robust estimate of the variance is used to account for dependency within primary sampling units and between repeated outcomes derived from the same respondent (Miller et al., 1999; Rogers, 1993). We used the cluster command to adjust for this dependency as it related to the respondent’s unique identification number across all waves of the survey.

RESULTS

Descriptive Analysis

Table 3 shows a total pooled (1987–1996) sample of 4,878. Out of this total sample, there were 518 transitions in living arrangements (11%). Three hundred seventy-nine of these transitions represented a respondent’s only change in living arrangement over the 9-year study period. However, 68 transitions represented a second change in living arrangement for a respondent, and 1 person experienced three transitions. Clearly, the majority of elderly persons remained in the same living arrangement from one survey wave to the next, indicating remarkable stability over this time period. This is illustrated by the proportionately large size of the diagonal values in Table 3. In fact, the risk of changing living arrangements is in most cases lower than the risk of mortality.

Living with married children was the most stable arrangement during the 9-year period. Only 6% of those living with married children made a transition to another living arrangement over the course of the survey. By contrast, 17% of those living with unmarried children made a transition to another arrangement, followed by 14% of those living with spouse only, and 11% of those living alone. On the other hand, a total of 27% of those living alone at follow-up consisted of persons who had lived in other arrangements at baseline. This is substantially higher than the proportional growth of the other arrangements.

Taken as a whole, the table indicates the relatively high percentage growth of elderly persons living alone from 1987 to 1996 and the low growth of those living with married children. Table 3 also shows that the most common pathway to living alone is from having lived with spouse only and that the rate of nonresponse for those living alone is higher than for the other arrangements. Finally, Table 2 suggests that mortality is equal for all living arrangements, which is later confirmed in the competing risk analysis.

Multivariate Analysis

The multivariate analysis proceeded in two parts. First, multinomial logit regression was used to examine the determinants of current living arrangement. This was achieved by regressing living arrangement prospectively on the baseline demographic, socioeconomic, and health variables. Second, we analyzed the change in living arrangement by regressing current living arrangement on the same set of baseline demographic, socioeconomic, and health variables, with the additional inclusion of prior living arrangement.

The effects of health variables were evaluated by controlling various covariates hierarchically. For instance, the effects of demographic and SES characteristics on living arrangement were examined by themselves (e.g., Model 1,
Table 4. Relative Risk Ratios of Living With Spouse Only or With an Unmarried Child at Follow-up According to Status at Baseline: Elderly Persons in Japan Who Were Married at Follow-up
(N = 2,402)

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td></td>
<td>Spouse only</td>
</tr>
<tr>
<td>Age</td>
<td>0.97*** 0.93*** 0.97***</td>
</tr>
<tr>
<td>Female</td>
<td>0.98 0.85 0.98</td>
</tr>
<tr>
<td>Urbanicity</td>
<td>1.39*** 1.64*** 1.39***</td>
</tr>
<tr>
<td>No. children in baseline</td>
<td>0.83*** 1.22*** 1.22***</td>
</tr>
<tr>
<td>No. children nearby</td>
<td>1.27*** 0.75*** 0.75***</td>
</tr>
<tr>
<td>Years of education</td>
<td>1.12*** 1.11*** 1.12***</td>
</tr>
<tr>
<td>Homeowner</td>
<td>0.12*** 0.15*** 0.12***</td>
</tr>
<tr>
<td>Chronic conditions</td>
<td>1.01 0.86* 1.26*</td>
</tr>
<tr>
<td>Functional status</td>
<td>1.29 0.87 0.83</td>
</tr>
<tr>
<td>Self-rated health</td>
<td>0.97 1.18* 0.92</td>
</tr>
<tr>
<td>Cognitive function</td>
<td>0.94 0.95 0.91</td>
</tr>
<tr>
<td>Depressed affect</td>
<td>1.05 1.06 1.19*</td>
</tr>
<tr>
<td>Somatic symptoms</td>
<td>1.00 0.93 0.91</td>
</tr>
<tr>
<td>With married child</td>
<td>0.01*** 0.04***</td>
</tr>
<tr>
<td>With single child</td>
<td>0.18*** 18.43***</td>
</tr>
</tbody>
</table>

Wald $x^2$ (df)$^a$ 182.07 (14) 205.66 (28) 1369.96 (32)

$n$ 2,402 2,402 2,402

$^a$Reference category = living with a married child at follow-up. $^b$Standard errors are adjusted for clustering on respondent ID.

Table 4) first, then by controlling for measures of physical and mental health (e.g., Model 2, Table 4). Finally, prior living arrangement (at the baseline) was added to the equation (e.g., Model 3, Table 4). By analyzing the stability and change in the relative risk ratios across the hierarchical regressions, one may gain some insights concerning the direct as well as indirect effects of the predictors of living arrangement.

Determinants of current living arrangement.—Tables 4 and 5 contain the results from the hierarchical regression analyses for married and unmarried respondents respectively. In all models, the reference category is living with married children. The sample size of 2,402 in Table 4 is the sum total of 1,020 persons currently married at the follow-up interview for the first transition interval, 808 persons currently married at the follow-up interview for the second interval, and 574 persons currently married at the third. The sample size of 1,758 for Table 5 consists of 627, 532, and 599 persons who were unmarried at the follow-up interviews for the first, second, and third intervals, respectively. Combining 2,402 and 1,758 results in 4,160 observations. The difference between 4,160 and the overall sample size of 4,878 is accounted for by respondents who died ($n = 366$) and by respondents categorized as lost to follow-up ($n = 352$).

Results concerning the living arrangement for those married are presented first (Table 4). Similar to previous findings, demographic and SES variables are significant predictors of living arrangement. For instance, among those married, the probabilities of living with spouse only and with a single child decrease with age and home ownership (Model 1, Table 4). Urban residency and higher education tend to increase the likelihood of living with spouse only or with a single child. On the other hand, total number of children reduces the probability of living with spouse only whereas it increases the odds of living with a single child. However, the number of children living nearby leads to a greater probability of living with spouse only, but dampens the chances of having a single child in the same household. There are no significant gender differences in current living arrangement.

What are the effects of physical and mental health on living arrangement? Even with all demographic and SES attributes controlled, chronic conditions and self-rated health are significantly associated with current living arrangement. In particular, those with chronic conditions are more likely to live with a married child or with spouse only than they are to share the same household with a single child (relative risk ratio $[RRR] = .86$). Those who consider themselves in poor health are more likely to live with a single child ($RRR = 1.18$).

Similar to the findings from the married respondents, demographic and SES characteristics are significant predictors of living arrangement among those unmarried (Table 5). For example, the probabilities of living alone and living with a single child diminish with age and home ownership. In contrast, urban residency significantly increases the likelihood of living either alone ($RRR = 1.38$) or with a single child.
(RRR = 1.36). Recent widowhood also greatly increases the odds of living alone (RRR = 1.52). However, unlike those who are married, among the unmarried respondents, higher education does not lead to a greater probability of living alone or living with a single child.

With reference to the living arrangement among the unmarried, health status also matters. Specifically, cognitive impairment is negatively related to the probability of living with a single child (RRR = .89). Because the health determinants of living arrangement among the married respondents differ from those among the unmarried respondents, health and marital status clearly interact in affecting living arrangement.

Several conclusions can be drawn from the above results. First, given that longitudinal data are used to predict current living arrangement, we are able to avoid the problem of endogeneity that occurs when only cross-sectional data are available. In this regard, this research has provided further evidence concerning the causal effects of health status and other demographic and SES variables. Second, the effects of demographic and SES variables on living arrangement remain largely unchanged when physical and mental health conditions are included in the model. This suggests that estimates of the effects of demographic and SES attributes on living arrangement may be unbiased, even when health conditions are excluded from the equation. Third, the effects of health conditions on current living arrangement depend on the marital status. Health conditions, which predict living arrangements among married people, do not show the same effect among those who are not married. Further analysis of the underlying mechanism is certainly required.

Determinants of transitions in living arrangement.—To analyze the changes in living arrangement, we still used current living arrangement as the dependent variable, whereas we included living arrangement at the baseline as a covariate (Model 3 in Tables 4 and 5). Nevertheless, it should be noted that the conceptual focus was shifted to transitions in living arrangement over a period of 3 years.

Two key findings from the analysis of changes in living arrangement are that living arrangement is remarkably stable over time and that current living arrangement is strongly affected by prior living arrangement. Among the married respondents who lived with a married child at baseline, the likelihood of currently living with spouse only (RRR = .01) or with a single child (RRR = .04) is very small (Model 3, Table 4). On the other hand, those who lived with a single child at the baseline are 18 times as likely (RRR = 18.43) to remain living with their single children than are those who did not live with a single child 3 years before. In addition, their likelihood of living with spouse only is also very small (RRR = .18).

Relatively few covariates show a statistically significant effect on the changes in living arrangement. Among married respondents, urban residence increases the odds of changing to living with spouse only (RRR = 1.24) or with a single child (RRR = 1.21); (Model 3, Table 4). Those with more children have a greater chance of moving to living with a single child (RRR = 1.20). Furthermore, the number of chronic conditions increases the likelihood of changing to an arrangement of living with spouse only (RRR = 1.26) as does depression (RRR = 1.19).

With reference to unmarried respondents, women are much more likely than men to make the transition to living with a single child (RRR = 2.00); (Table 5). Moreover, home ownership reduces the probabilities of a transition to living alone (RRR = .51) and living with a single child (RRR = .53). The effects of health conditions are also significant in determining changes in living arrangement. Functional impairment reduces the likelihood of living alone (RRR = .62) and of living with a single child (RRR = .68), whereas being depressed decreases the probability of moving to an arrangement of living with a single child (RRR = .70).

It would seem reasonable to conclude that health conditions in conjunction with demographic and SES characteristics exert both direct and indirect effects on making a transition to other living arrangements among married respondents. For instance, among those who are married, self-rated health influences changes in living arrangement by increasing the odds of living with a single child at the baseline (Model 2, Table 4).

Marital status interacts with the effects of demographic and SES variables on transitions in living arrangements. For instance, among married respondents, urban residence increases the probabilities of changing to living with spouse only and with a single child, whereas those with more children have a greater chance of getting into an arrangement of living with a single child. In addition, with more children living nearby, a married person is less likely to change his or her living arrangement to living with spouse only or with a single child (Model 3, Table 4). In contrast, these variables exert no significant effects on changes in living arrangement among those who are unmarried (Model 3, Table 5). Instead, unmarried women are more likely than unmarried men are to change to an arrangement of living with a single child, whereas there are no gender differences in changes in living arrangement among those who are married. Moreover, home ownership increases the probability of living with a married child only among those who are not married.

Furthermore, the health effects on transitions in living arrangement differ depending on marital status. Married elderly persons with chronic conditions or depression are more likely to make a transition to living with spouse only (Model 3, Table 4). On the other hand, unmarried persons with more functional status are less likely to live alone, or with an unmarried child, whereas those who are more depressed have a smaller probability of changing to an arrangement of living with a single child (Model 3, Table 5). This is reasonable given the fact that although all respondents could potentially co-reside with children (childless respondents are excluded), married respondents tend to receive assistance from a spouse.

Competing risks.—In addition to changes in living arrangement, all respondents were subject to the risks of dying, becoming a nonresponder, or having a proxy interview. Briefly, a number of demographic, SES, and health
variables at the baseline are significantly associated with these competing risks (Table 6). For instance, age and gender both were important risk factors for mortality. Urban residence increased the probabilities of becoming a nonrespondent (RRR = 1.24). With reference to the effects of health conditions, functional status (RRR = 1.60), self-rated poor health (RRR = 1.31), and cognitive impairment (RRR = 1.20) were all significant predictors of mortality. Chronic conditions at baseline were inversely related to nonresponse 3 years later (RRR = .88), and poor self-rated health increased the probability of subsequent nonresponse (RRR = 1.19). Finally, poor functional status (RRR = 1.63), poor self-rated health (RRR = 1.25), and cognitive impairment (RRR = 1.21) all increased the propensity of having a proxy interview.

A key finding is that, controlling for demographic, socioeconomic, and health factors, prior living arrangement has no significant influence on the risk of mortality. However, it does affect the rate of nonresponse. Compared with those living with married children at the baseline, persons living alone were about 1.6 times as likely to become a nonrespondent.

Ideally competing risks were randomly distributed, and thus the transition probabilities associated with living arrangements would not be biased. However, the above findings suggest that respondents who were less healthy were more likely to be excluded from the risk set for changes in living arrangements. Therefore, the health effects on living arrangement in conjunction with those of other covariates are likely to be understated.

Bias due to the exclusion of proxy respondents was a concern in the current study. Therefore, to assess the possibility of such bias, the multinomial regression analyses (contained in Tables 4 and 5) were replicated by including 2,636 observations from self-respondents and proxy respondents from the second and third transition intervals of the survey. Because proxy respondents were not asked questions on number of children, proximity of children, home ownership, depressive symptoms, and cognitive impairment, the analysis was conducted without these measures. In addition, a dummy variable indicating whether a respondent was a self-respondent was included. Results from these analyses were nearly identical to those limited to the self-respondents only in that the roles of chronic conditions, functional status and self-rated health were confirmed. Finally, among those married, being a self-respondent at the baseline is significantly associated with the odds of living with spouse only. In contrast, among those unmarried, being a self-respondent is associated with a higher probability of living alone. However, this effect loses statistical significance when prior living arrangement is controlled. These results are available from the authors on request.

**DISCUSSION**

This research yields several important findings. First, living arrangement among the Japanese elderly appears remarkably stable. Out of a total 4,878 observations, only 11% (n = 518) of them consisted of a change in living arrangement. About 73% of the transitions involved the same person making more than one transition. Living with married children was the most common and stable arrangement over time. In contrast, fewer individuals lived alone, but the proportion increased steadily over a period of 12 years, more so than did the other three types of living arrangement.

The popularity of living with married children seems to reflect the traditional preference for living with a married, and often the eldest, son and for receiving care from the daughter-in-law. Frequently such households are formed early and remain intact for a long period of time. As suggested by Hashimoto (1996), Japanese expect to be vulnerable in old age, and they plan early in life to maximize the certainty of receiving support from adult children by living with them. The coresidence of a married child and the parents often began at the marriage of the adult child (Ogawa & Retherford, 1997).

Given this strong preference for coresidence with married children, does health have any influence on living arrangement? The answer is yes. Among married older persons, chronic conditions reduce the odds of living with unmarried children, whereas better self-rated health leads to a greater probability of living with unmarried children. Among those who are not married, cognitive impairment diminishes the likelihood of living with a single child. Health effects remained statistically significant even when demographic, kin availability, and SES variables were controlled.

Does poor health trigger any changes in living arrangement? The answer is again affirmative. Even with the control of prior living arrangement along with the other covariates at the baseline, chronic conditions and depressed affect increase the odds of making a transition to living with
spouse only as opposed to living with a married child. Among unmarried older persons, poor functional status reduces the probability of making a transition both to living alone and to living with an unmarried child, whereas depressed affect reduces the likelihood of making a change to living with an unmarried child.

With reference to the effects of demographic and SES variables on current living arrangement, our findings are similar to those reported previously. That is, among married respondents, age, urbanicity, numbers of living children and children living nearby, education, and home ownership are all significant predictors of current living arrangement (Models 1 and 2 in Table 4). Similar results were found among the unmarried respondents (Models 1 and 2 in Table 5). Furthermore, the effects of these variables appear to be largely unchanged even with health variables included in the model. This suggests that models excluding health variables are unlikely to bias the estimates of the impact of demographic and SES variables on living arrangement.

The effects of demographic and SES variables on transitions in living arrangement differ significantly. Among those who are married, the effects of age and SES on changes in living arrangement are largely mediated by prior living arrangement. On the other hand, among unmarried elderly persons, the effects of age, urbanity, kin availability, and level of education are mediated by prior living arrangement. One explanation for this interaction may be that the presence of a spouse has a very significant impact on one’s sense of the long term changes and stability in living arrangement. Given the longitudinal nature of our data, there existed several competing risks other than changes in living arrangement. These included mortality, loss to follow-up, and proxy interviews. Results concerning the health effects on changes in living arrangements must be interpreted within context of these competing risks. Because transitions in living arrangements share several common determinants with other competing risks, their effects, including those of health conditions on living arrangements, are likely to be underestimated. To further assess the consequences of excluding proxy interviews from our analyses of living arrangements, we undertook parallel analyses (as those contained in Tables 4 and 5) by including proxy interviews. Results from these analyses (not shown) were nearly identical to those contained in Tables 4 and 5, especially with respect to the roles of chronic conditions and functional status.

A major limitation of the present research is our inability to include more precise measures of kin availability. For instance, to predict the probabilities of living with married or unmarried children, one needs to incorporate information on the availability of each of these types of children. The opportunity structure (i.e., the size and attributes of the kin network) is important in determining variations in living arrangement. Many investigators have argued that living arrangement is a result of joint decision making by the elderly person and all his or her children. Hence, the inclusion of measures of children’s attributes (e.g., the age, gender, marital status, education, and occupation of each child) is critical (Ofstedal, 1995; Wolf & Soldo, 1988). However, there have been no precise quantitative estimates of the consequences that might occur if such attributes are not included, as in most studies of living arrangement.

In this study, the only measures of the opportunity structure are the total number of living children and number of children living nearby. We attempted to further refine these measures by excluding all respondents who reported no living children. Thus, all respondents would have an opportunity to live with their children, whether married or not. However, it remains true that an old person whose children are all unmarried would have no opportunity to live with a married child or vice versa.

What are the consequences of not including more precise measures of children’s attributes? We referred to an unpublished analysis of data on living arrangement of the Taiwanese elderly people in 1996 conducted by Mary Beth Ofstedal of the University of Michigan Institute for Social Research (Taiwan Provincial Institute of Family Planning, Population Studies Center and Institute of Gerontology, University of Michigan, 1996). Her analysis reveals that numbers of married and unmarried children are negatively correlated and that both have significant positive effects on the probabilities of living with married and unmarried children, respectively. The number of married children is posi-
tively correlated with the fact that a respondent is older, female, and widowed. Excluding children’s marital status is likely to lead to an overestimation of the effects of age, gender, and marital status of the older person. On the other hand, children’s attributes tend to suppress the effects of health variables on the choice of living arrangement. Hence the effects of health variables might be underestimated if children’s marital status is excluded.

The above analysis in our view provides a reasonable estimate of the extent of biases resulting from the exclusion of the numbers of married and unmarried children, if it could be generalized to our data collected in Japan. Within the context of the present research, the effects of misspecification are likely to be more pronounced in our prediction of baseline living arrangement (Models 1 and 2 in Tables 4 and 5). In the analysis of transition in living arrangement, such effects are much less consequential. This is because we have controlled for prior living arrangement, which itself contains information about the marital status of the child who lived with the elderly person (Model 3 in Tables 4 and 5).

Nevertheless, it should also be noted that implementation of joint–decision-making models that incorporate attributes of the children is subject to three major challenges. First, all current applications were based on cross-sectional data (Ofstedal, 1995; Wolf & Soldo, 1988). As noted by the authors, the effects of children’s attributes may be confounded by the problem of reversed causality. For instance, a child’s marital status or employment status may be endogenous with the baseline living arrangement. Moreover, it is not clear how longitudinal data such as ours can be handled within this framework. Second, many simplifying assumptions are required. In particular, investigators were often forced to assume that an older person would live with no more than one or two children. The opportunity structure is often assumed to consist entirely of living children, excluding other available kin such as grandchildren, siblings, and other relatives. Finally, joint-decision models are much more demanding in terms of the breadth of data concerning children’s attributes. Such data are often difficult and expensive to collect. Because extensive data on the children’s attributes are often based on the report of the elderly respondent, their validity and reliability remain to be seriously evaluated. These unresolved issues certainly constitute an interesting agenda for future research on the living arrangements of elderly people across the world.

Acknowledgments
This research was supported by Grant R37 AG154124 to Jersey Liang from the National Institute on Aging. The assistance of Joan Bennett is gratefully acknowledged. Kung-Yee Liang and Harold Pollack served as sounding boards for many analytical issues. Our special thanks go to Mary Beth Ofstedal for her generous assistance in additional data analysis and expert advice.

Address correspondence to Joseph Winchester Brown, Department of Health Behavior and Health Education, University of Michigan School of Public Health, 1420 Washington Heights, Ann Arbor, MI 48109-2029. E-mail: winbrown@umich.edu

References


S220

BROWN ET AL.


Received August 25, 2000

Accepted July 3, 2001

Decision Editor: Fredric D. Wolinsky, PhD