# Moving from Household Structure to Living Arrangement Transitions: What Do We Learn?

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As concern about population aging and the well-being of the elderly has grown, so too has research focusing on the living arrangements of the elderly. Indeed, living arrangements, i.e., the proportion living in different household structures, has been one of the most widely used indicators of elderly well-being. There is good reason for this given that appropriate measures are often available from censuses and large-scale surveys, and in traditional societies there is a presumption that the elderly will be cared for by children and other kin. The relative wide availability of household structure measures, such as the proportion living with children or married children, permit comparison across countries, groups within countries, and the study of trends.

There are, however, sociological and formal reasons why such measures should be used with caution. From a sociological perspective, focusing solely on structure confuses "form with function." That is, knowing who lives with whom does not inform as to the content of household activities and intra-household resource allocation. The assumption, at least in developing country research, is typically that coresidence benefits older family members and that support flows from younger to older generations. However, with changing socioeconomic conditions there is evidence that older people increasingly are a source of support for their children through meal preparation, grandchild care, etc. When measures of coresidence with children include married and unmarried children, there is even more ambiguity as to the direction of support. In

addition, studies of the characteristics of those coresiding show strong selection for adverse factors like widowhood or low education, as shown below.

From the formal measurement aspect, prevalence measures of the sort utilized (e.g., percent living alone, with spouse, with children, etc.) reveal nothing about the transitions that give rise to prevalence levels. Indeed, studying trends in prevalence may provide misleading inferences about the underlying transitions and this issue serves as the focus for the first part of the paper. Data from Taiwan between 1996 and 1999, for example, reveal that for women aged 77 to 81 years, the proportion coresiding with a married son declined over the period, although the proportion transitioning into coresidence during the period was almost twice the proportion transitioning out of coresidence.

With greater utilization of longitudinal panel studies it is possible to measure the level of transitions into and out of coresidence and to examine the factors associated with prevalence vs. those associated with transitions. As shown in Frankenberg et al. (2002), these factors are not necessarily one and the same.

The complexity of the transition rates in a country like Taiwan suggests that with changing cultural and socioeconomic developments, older people may experience periods of both coresidence with children and absence of children several times over their enhanced older life spans, due to both their life cycle needs and those of their children. Accordingly, we need to shift our focus to the entries and exits and the length of coresidence, rather than older individuals' living arrangements at any given time.

The objectives of this paper are two-fold. The first objective is to explicate the formal relationships between coresidence prevalence measures and transition levels to demonstrate the inherent ambiguity between them. The second objective is to examine transitions in coresidence,

with regard to their underlying rates, their implications for 'coresidence life expectancy' (i.e., the number of years older adults will spend coresident versus non-coresident during their later years), and the factors that predict transitions in living arrangements. To carry out these objectives, we utilize data from a panel survey of older adults in Taiwan.

**Prevalence Rates versus Transition Rates**

The proportion of the older population living with children, and trends in this measure, is one of the most widely used indicators of well-being in developing countries, on the assumption that this arrangement provides maximum support for the elderly and signals the persistence of traditional familial patterns. Though reliance on this measure can be misleading in a number of important respects—such as by implying an upward flow of support within the household from children to parents, and by overlooking the level of support from those outside the immediate household (see Hermalin, 2000 for additional discussion), its relatively wide availability from censuses and surveys makes it a closely followed indicator.

In recent years, increased survey research of the older population and the implementation of panel studies in several locales that follow up a cohort of respondents (Andrews and Hermalin, 2000) permits additional insight into the degree to which older people change their living arrangements over time. In this section of the paper, we explicate some basic relationships between the rates of change in household arrangements and the observed proportions in a given arrangement at each observation point. Awareness of these interrelationships can help avoid misinterpretations of the observed trends in living arrangements.

*Assumptions*

In the example which follows we assume we have individual-level data on living arrangements for a cohort of elderly at two points in time, obtained through successive surveys or other valid means. As a result, for each individual their residence status is known at each point, as well as whether there was a net move in the interim and the direction of that move. Given this information, the following relationships can be established for those who survive between the two time points.[1]

*Notation and Equations*

The relationships between transition rates and the observed changes in the overall proportions coresiding can be developed through the following notation and equations:

Let

$C_i$ = number of elderly coresiding with children at time i (i = 1, 2)

$A_i$ = number of elderly not coresiding with children at time i (i = 1, 2) (Includes living alone, with spouse only, with others excluding children.)

$r_{C\rightarrow C}$ = Proportion of $C_1$ who continue to coreside with children at time 2

$r_{C\rightarrow A}$ = Proportion of $C_1$ who are not coresiding with children at time 2 ($r_{C\rightarrow A} = 1 - r_{C\rightarrow C}$)

$r_{A\rightarrow C}$ = Proportion of $A_1$ who change from not living with children at time 1 to living with children at time 2

$r_{A\rightarrow A}$ = Proportion of $A_1$ who continue not to coreside at time 2 ($r_{A\rightarrow A} = 1 - r_{A\rightarrow C}$)

T = Size of total cohort under observation; $T = C_1 + A_1$ and $T = C_2 + A_2$

${}_{C}P_i$ = $C_i/(C_i + A_i) = C_i/T$ = Proportion coresiding at time i (i = 1, 2)

${}_{A}P_i$ = $A_i/(A_i + C_i) = A_i/T$ = Proportion not coresiding at time i (i = 1,2)

Then

(1) $C_2 = C_1 r_{C\to C} + A_1 r_{A\to C}$, and dividing by T

(2) ${}_{C}P_2 = {}_{C}P_1 r_{C\to C} + {}_{A}P_1 r_{A\to C}$

That is, the proportion coresiding at time 2 is a weighted average of the transition rates, with the weights equal to the proportions coresiding and not coresiding at time 1.

Equation (2) can also be written as

(2a) ${}_{C}P_2 = {}_{C}P_1 r_{C\to C} + (1 - {}_{C}P_1) r_{A\to C}$ since

$${}_{A}P_1 = 1 - {}_{C}P_1$$

(3) to ask under what conditions ${}_{C}P_2$ will exceed ${}_{C}P_1$, write

$${}_{C}P_1 r_{C\to C} + {}_{A}P_1 r_{A\to C} > {}_{C}P_1$$

$$r_{C\to C} + ({}_{A}P_1 / {}_{C}P_1)(r_{A\to C}) > 1$$

$$({}_{A}P_1 / {}_{C}P_1)(r_{A\to C}) > 1 - r_{C\to C}$$

$${}_{A}P_1 / {}_{C}P_1 > (1 - r_{C\to C}) / r_{A\to C} = r_{C\to A} / r_{A\to C}$$

that is, given transition rates $r_{C\to A}$ and $r_{A\to C}$, the operation of these rates will lead to an increase in the proportion coresiding from time 1 to time 2 (i.e., ${}_{C}P_i$ will increase) whenever the ratio ${}_{A}P_1$ to ${}_{C}P_1$ exceeds $r_{C\to A} / r_{A\to C}$

Conversely, the operation of the transition rates $r_{C\to A}$ and $r_{A\to C}$ will produce a decrease in the observed proportion coresiding whenever

$${}_{A}P_1 / {}_{C}P_1 < r_{C\to A} / r_{A\to C}$$

The ratio of the two transition rates $r_{C\rightarrow A}$ and $r_{A\rightarrow C}$ provide the tipping point for the ratio of ${}_AP_1 / {}_CP_1$ which will determine whether the operation of the given transition rates will produce an increase or decrease in the observed proportion coresiding.

*Numerical Illustration*

| Time 1 | Transition Rates |
|---|---|
| ${}_CP_1 = .75$ | $r_{C\rightarrow C} = .90;\ r_{C\rightarrow A} = .10$ |
| ${}_AP_1 = .25$ | $r_{A\rightarrow C} = .20;\ r_{A\rightarrow A} = .80$ |

In this situation, three quarters of the elderly respondents live with children at time 1. Over the observation period, 10 percent of those coresiding with children cease to live with children, and 20 percent of those not living with children, start to coreside. (These illustrative data are close to those observed empirically by Frankenberg et al. (2002) for Indonesia between 1993 and 1997 and for Taiwan between 1996 and 1999.)

As a result of these transition rates, the proportion coresiding at time 2 will be:

$${}_CP_2 = {}_CP_1\ r_{C\rightarrow C} + {}_AP_1 r_{A\rightarrow C}$$

$${}_CP_2 = .75\ (.90) + .25\ (.20) = .675 + .05$$

$${}_CP_2 = .725$$

Despite the fact that $r_{A\rightarrow C}$ (.20) is twice as high as $r_{C\rightarrow A}$ (.10), the overall proportion coresiding decreases over the period.

This comes about because

$${}_AP_1 / {}_CP_1 = .25/.75 = .333 \text{ is less than } r_{C\rightarrow A} / r_{A\rightarrow C} = .10/.20 = .5$$

At such point that ${}_AP_1 / {}_CP_1$ exceeds .5, the operation of the same transition rates would produce an observed increase in the proportion coresiding.

For example, if ${}_CP_1 = .60$ and ${}_AP_1 = .40$ so that ${}_AP_1 / {}_CP_1 = .667$, then

${}_CP_2 = {}_CP_1 r_{C\rightarrow C} + {}_AP_1 r_{A\rightarrow C}$ would be

${}_CP_2 = .60\ (.90) + .40\ (.20) = .54 + .08 = .62$

So that $P_i$ increases under the operation of the same transition rates.

*Implications*

One implication of the foregoing analysis is that in focusing on the proportion of elderly coresiding at different time points we are in effect looking at "crude rates" that do not take into account important compositional elements. In demography, standardization and decomposition are key tools for understanding the interrelationship between weights and rates and how they combine to produce a "crude rate." More specifically we can decompose many crude rates of interest as a sum of products of weights and rates in order to understand the effect of each component. (And the life table is in effect a technique to work only with rates in order to avoid the effect of composition.)

On topics like crude birth rates and death rates, we decompose the rate in question into a series of age-compositional weights and age-specific rates, defined as the frequency of the event (having a birth or dying) divided by the population at risk. But the age-specific rates are also transition rates—the proportion moving from one state to another (from not giving to birth to giving birth, or from living to dying), so that the meaning and structure of the decomposition is identical to that set forth in question (2).

When interest centers on certain prevalence measures—like the proportion of women using contraception or the proportion of older people coresiding as in the example presented above, there is a tendency to overlook the operation of the underlying transition rates and the effect they may have on observed trends. With regard to living arrangements, it is important to keep the relationship explicated in equations (2) and (3) in mind when tracing changes in the proportions coresiding, since the key weights in question (the proportions residing and not coresiding) vary considerably over time and between countries, and it is important not to confuse the observed changes in proportions with what is happening in terms of transition rates.

**Transitions in Coresidence with Married Children**

As noted in the above discussion, focusing on prevalence of coresidence and changes in prevalence over time does not reveal anything about the underlying transitions. The second objective of this paper is to examine transitions in coresidence, with regard to their underyling rates, their implications for 'coresidence life expectancy' (i.e., the number of years older adults will spend coresident versus non-coresident during their later years), and the factors that predict transitions in living arrangements. We focus specifically on coresidence with married children.

The data used for this paper come from the Study of Health and Living Status of the Middle-Aged and Elderly in Taiwan (Hermalin, Liang and Chang, 1989), a nationally representative panel survey of older adults in Taiwan. The original sample was comprised of 4,049 persons age 60 years or over at the start of the survey in 1989. To date, seven waves of interviews have been conducted, including in-person interviews in 1989, 1993, 1996, 1999, and 2003 and abbreviated telephone interviews in 1991 and 1995. In 1996, the sample was refreshed and expanded to include a new cohort of 2,130 individuals between the ages of 50 and 66.

Attached are results of preliminary analyses to illustrate the types of analyses we plan to cover in this paper. The preliminary analyses are based on data from the 1996 and 1999 waves of the Taiwan Survey of Health and Living Status of the Near-Elderly and Elderly and restricted to respondents who were age 60 years or over and had one or more living child in 1996. These analyses will be extended for the PAA paper to include data from all waves of the survey, conducted between 1989 and 2003.

*Transition Rates*

Table 1 presents transition rates in coresidence with married children between 1996 and 1999 for respondents age 60+ who have at least one living child and were interviewed in both years. Among this subset of respondents, the prevalence of coresidence with a married child is 54 percent in 1996 (column one). Columns two and three display the distribution of respondents in Wave 2, according to whether they coresided with a married child in Wave 1. Interestingly, the transition rates are very similar for movements in and out of coresidence. About two in every ten respondents who were coresiding in 1996 moved out of coresidence within the subsequent three years, and about two in every 11 respondents who were not coresiding in 1996 moved into coresidence by 1999. The prevalence of coresidence with married children declined slightly between waves, to 51 percent in 1999 (bottom row of column 2). Finally, the overall rate of transition in coresidence with a married child between 1996 and 1999 is 19 percent (column four). Taken together, these results from transitions observed over a relatively short period suggest that, although coresidence with a married child was stable for the majority of older adults, a non-trivial minority experiences changes in their coresidence status over time. When

we extend this analysis to cover a 14-year period, we may find a much larger proportion of individuals who experience such transitions.

*Multistate Life Table Analysis of Coresidence Transitions*

The finding that about one-fifth of Taiwanese elderly experience a transition in coresidence over a three-year period underscores the importance of considering coresidence as a fluid, rather than stable arrangement. Indeed, older people may experience multiple periods of both coresidence and non-coresidence during their later lives. This calls for a shift in focus from coresidence at a single point in time to the entries and exits and length of coresidence. Multistate life table techniques can be used to capture these movements.

Figures 1-4 present results of analyses that use a multi-state life table technique to partition overall life expectancy (at ages 60 and above) into the number of expected years that will be spent in versus out of coresidence with a married child (which we refer to as coresident and non-coresident life expectancy, respectively). Figure 1 plots total life expectancy (blue line), coresident life expectancy (green line), and non-coresident life expectancy (pink line) by age. Non-coresident life expectancy outweighs coresident life expectancy up to about age 80, where the two lines converge. Thus, up to about age 80, older Taiwanese can expect to spend a larger proportion of their remaining years non-coresident, but from age 80 on, they can expect to spend roughly equal numbers of years coresident and non-coresident. This is further illustrated in Figure 2, which presents the percent of remaining life spent coresiding with a married child for all respondents (blue line), and separately for respondents who were married (pink line) and unmarried (green line) in 1996. Focusing on the total sample, the percent of remaining life spent in coresidence is about 40 at age 60 and this increases slowly to 50 percent around age 80. The

pattern is fairly flat thereafter, with a slight drop starting around age 92. Married respondents exhibit a steady increase in the percent of remaining life spent coresident with age, whereas unmarried respondents hold steady at about 50 percent through the late 80s and then drop off somewhat thereafter.

Figures 3 and 4 present status-based estimates of coresident and non-coresident life expectancy. Figure 3 presents life expectancies for respondents who were not coresiding at Wave 1 (1996) and Figure 4 presents the same estimates for respondents who were coresiding at Wave 1. One finding of interest is that, although the overall life expectancies are similar for the two groups between ages 60 and 65 (comparing the blue lines in Figures 3 and 4), life expectancy for the coresident group drops more sharply with age after 65. By age 85, those who were coresident in 1996 have a life expectancy of only 6 years, whereas those who were non-coresident have a life expectancy of about 7.5 years. In addition, the coresident and non-coresident life expectancy patterns in these two figures reflect the fairly high degree of stability in coresidence over the period. That is, those who were not coresiding at the start of the interval are expected to spend most of their remaining lives non-coresident, whereas those who were coresiding at the start are expected to spend most of their remaining years coresident.

*Predictors of Coresidence Transitions*

The recognition of living arrangements as a dynamic process leads us to question the motivations that give rise to transitions in living arrangements. What factors predict transitions into and out of coresidence? This is the focus of the final part of the analysis, and preliminary results addressing this question are presented in Table 2. Results are presented in the form of odds-ratios for three separate models: the first predicting coresidence with a married child at

baseline; the second predicting transitions into coresidence between 1996 and 1999, among those non-coresident in 1996; and the third predicting transitions out of coresidence between 1996 and 1999, among those who were coresident in 1996.

Findings pertaining to the baseline model are consistent with those shown in previous studies for Taiwan and other Asian countries (Knodel and Ofstedal 2002). Widowed respondents, those with low levels of education, and those for whom one or more children are working are more likely than their respective counterparts to coreside with married children. In addition, Mainlander respondents, those who are working or whose spouse is working, and those with one or more children still in school are less likely to coreside with a married child.

Of central interest for this paper, however, are the factors that predict transitions in coresidence (models 2 and 3). Here we see very few significant effects among the factors examined here. Divorced or separated individuals are substantially less likely to move in to coresidence between 1996 and 1999 than are married respondents (though this should be interpreted with caution due to the small size of the divorced/separated group), and those with one or more working child are more likely than those for whom all children are not working to move in to coresidence. These findings suggest that the motivations for coresidence transitions are more subtle(?) and require us to look beyond the standard sociodemographic predictors that are used to understand living arrangements at a given point in time.

**Extensions**

These figures are intended to provide an illustration of the types of analyses we plan to conduct using multi-state life table techniques. As noted above, we plan to extend this analysis to make use of the full set of data from the Taiwan panel, covering a 14-year period. The

extension of these analyses to include a longer observation period will enable us to estimate 'life-time prevalence' of coresidence with married children and provide more stable estimates of coresident and non-coresident life expectancy. In addition, we will be able to compare the same age cohort at different points in time (e.g., those age 60-69 in 1989 versus those age 60-69 in 1999) to determine whether age patterns of coresidence and the factors affecting coresidence and transitions therein have changed over time. These extensions will allow us to gain a better understanding of the duration, frequency and age pattern of coresidence transitions in the later years of life for a Taiwanese parent.

**Footnote**

[1]Differential mortality between those residing and not coresiding can affect the actual percentage observed coresiding at time 2 and needs to be taken into account in tracing actual trends. Especially at the oldest ages, insofar as poor health is a factor leading to coresidence, differentials in mortality between those coresiding and not coresiding can be noticeable.

**References**

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Table 1. Coresidence with Married Child at Baseline and Over Time: Taiwan 1996-1999

| | Wave 1 (1996) Totals (1) | Wave 2 (1999) | | Rate of Transition (4) |
|---|---|---|---|---|
| | | Coresides (2) | Does not coreside (3) | |
| Wave 1 (1996) | | | | |
| Coresides | 54% → | 80% | 20% | |
| Does not coreside | 46% → | 18% | 82% | |
| % transitioning by Wave 2 | | | | 19% |
| Totals, Wave 2 (1999) | | 51% | 49% | |

**Figure 1. Life expectancy in total and by coresidence with a married child: Taiwan, 1996-1999**

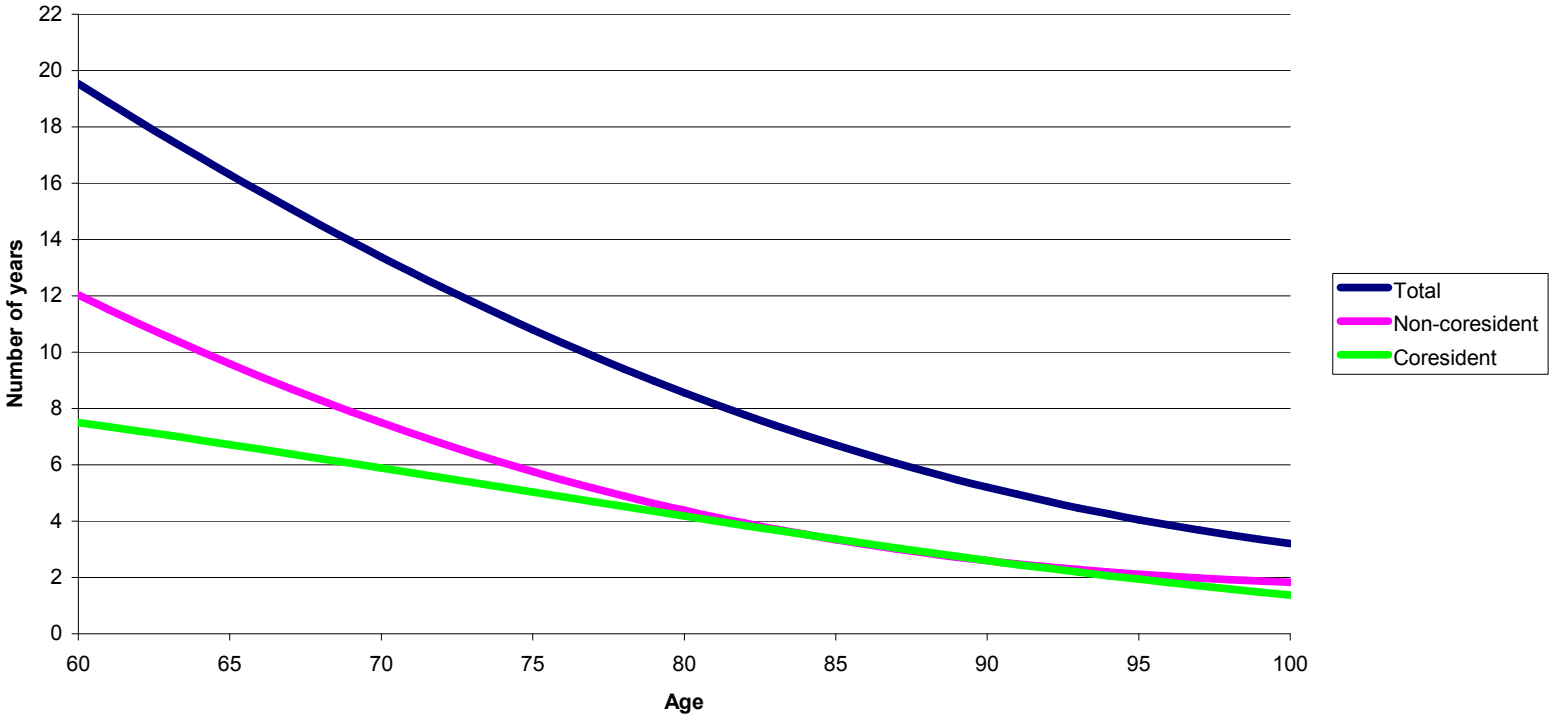

**Figure 2. Percent of remaining life spent coresiding with a married child, by age and marital status of respondent: Taiwan, 1996-1999**

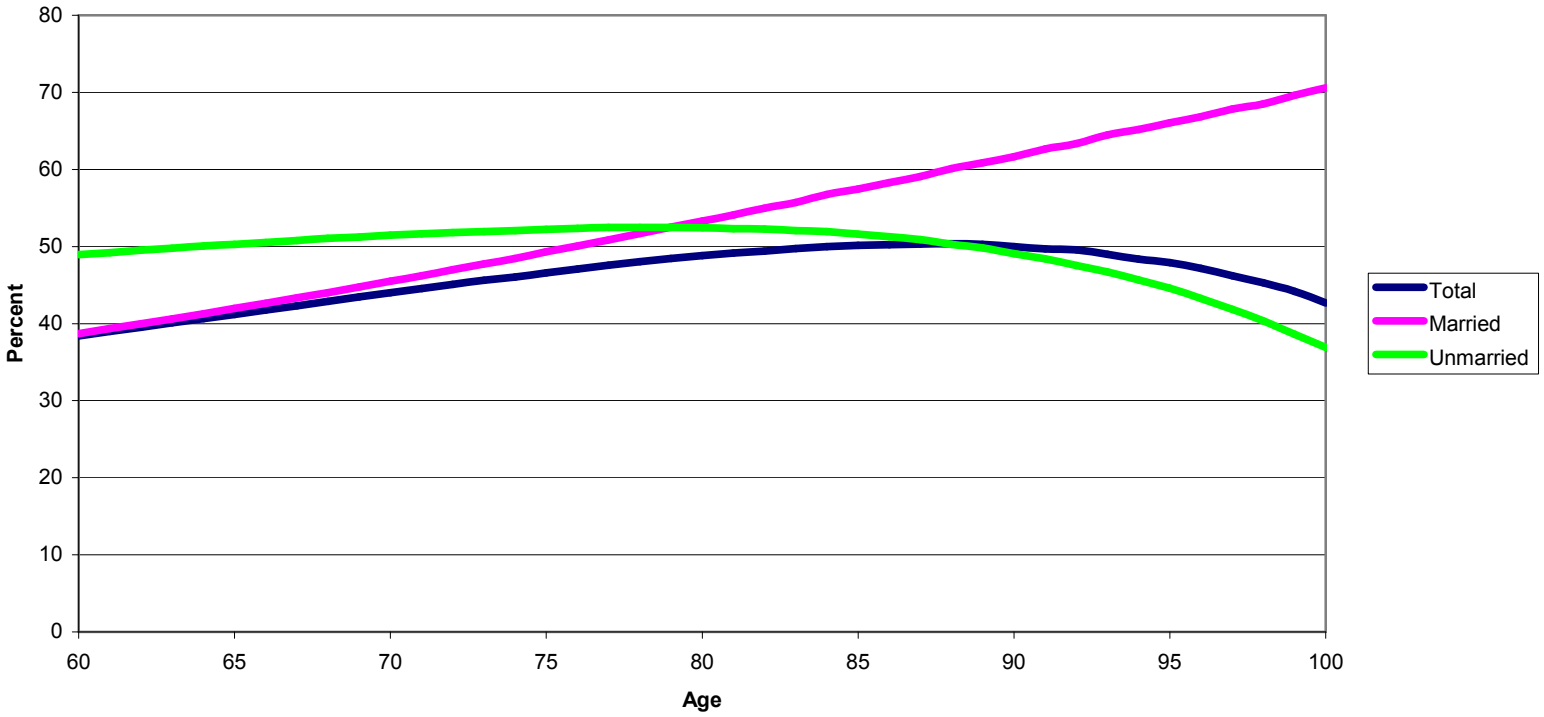

**Figure 3. Life expectancy by coresidence with married child, among those who are not coresiding at start of observation period: Taiwan, 1996-1999 (status based estimates)**

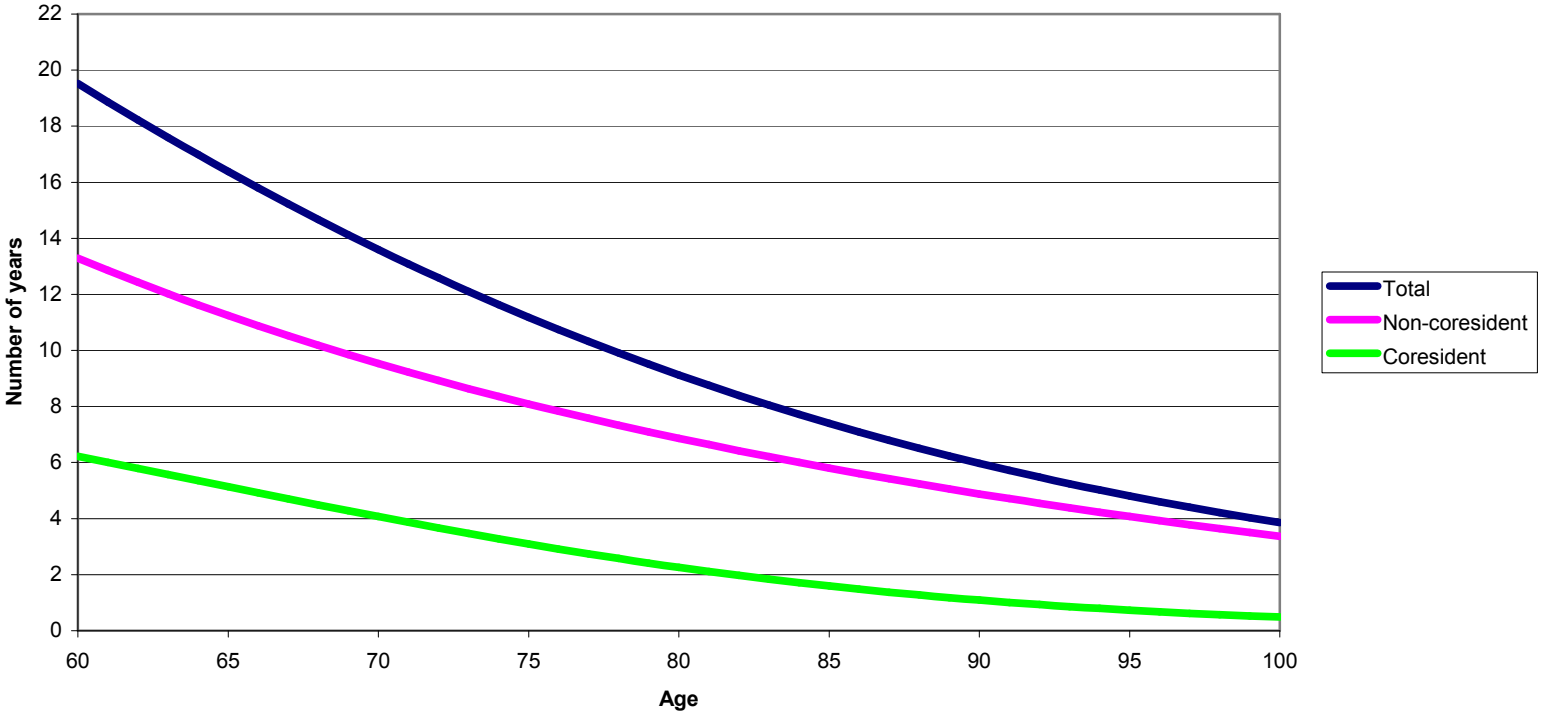

**Figure 4. Life expectancy by coresidence with married child, among those who are coresiding at start of observation period: Taiwan, 1996-1999 (status based estimates)**

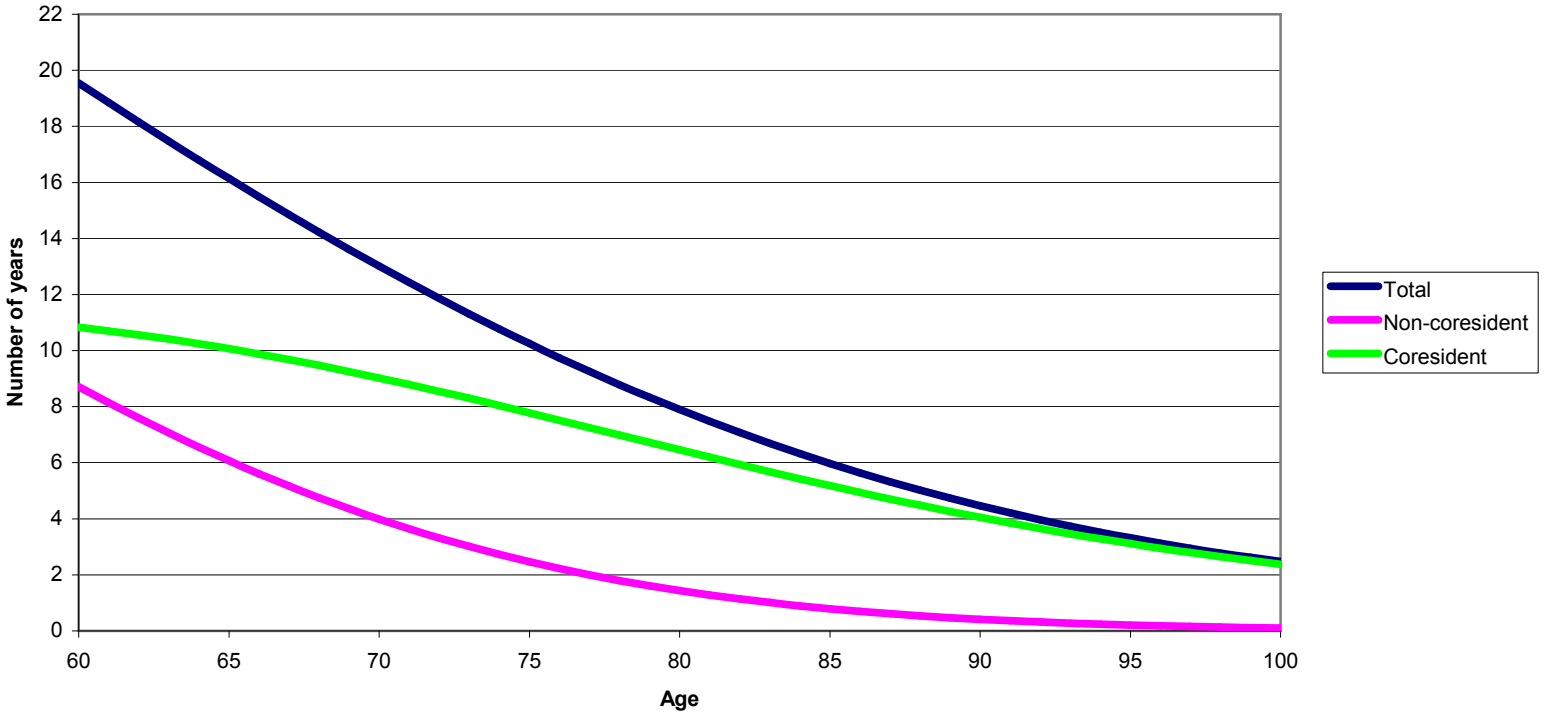

Table 2. Odds-Ratios from Logistic and Multinomial Logistic Regression Models Predicting Stability and Change in Coresidence with Married Children

| Covariate | | Baseline Model | Logistic Models of Transitions in Coresidence | |
|---|---|---|---|---|
| | | Coresident[a] (1) | Move In[b] (2) | Move Out[c] (3) |
| Sex | Male | 1.05 | 1.01 | 0.96 |
| Marital status (ref=married) | Widowed | 2.50*** | 0.87 | 0.40** |
| | Divorced/Separated | 0.85 | 0.13* | 1.57 |
| Age (ref=60-69) | 70-74 | 1.01 | 0.86 | 0.58** |
| | 75+ | 1.04 | 1.07 | 0.71 |
| Ethnicity (ref=non-Mainlander) | Mainlander | 0.46*** | 0.72 | 1.29 |
| Education (ref=Secondary+) | No education | 1.57*** | 1.15 | 1.09 |
| | Primary education | 1.43** | 1.09 | 1.05 |
| R's work status | Working | 0.72** | 0.69 | 1.31 |
| Self-rated health | Fair or poor | 0.93 | 1.33 | 0.91 |
| Spouse's age (ref=<60) | 60-69 | 1.50* | 0.86 | 0.72 |
| | 70+ | 1.30 | 0.79 | 0.82 |
| Spouse's work status | Working | 0.72* | 0.92 | 1.24 |
| Children's status | Any child in school | 0.44*** | 0.59 | 1.11 |
| | Any child working | 2.53*** | 2.17* | 0.76 |
| Model Chi-square (df) | | 309.19 (15) | 34.18 (15) | 57.61 (15) |

* p < .05 ** p < .01 *** p < .001

[a]Contrast category is non-coresident at baseline.
[b]Contrast category is non-coresident in both years.
[c]Contrast category is coresident in both years.