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ABSTRACT

This paper uses a new data set to study the choice of living arrangements of some 3000 Massachusetts elderly between 1982 and 1986. The data have a number of unique features; they are longitudinal and combine detailed information on health with information on economic status and family relations. This paper considers the influence on living arrangements of alternative measures of health (subjective versus functional abilities versus diagnosed condition), incomes and marital status of parents, and the number and sexes of children. It also examines the extent to which changes in health and the death of a spouse trigger changes in living arrangements and how rapidly such changes occur.

The main findings of the paper are:

Functional ability indices are very good predictors of living arrangements.

Subjective health reports are poor predictors of living arrangements.

The probability of institutionalization declines rapidly with the income of the elderly.

In the cases of the older old daughters are much more likely than sons to share living quarters.

Living arrangements are fairly stable. When changes in living arrangements occur they are often triggered by changes in health status or the death of a spouse.

When deterioration in health status or the death of a spouse leads to a change in living arrangements, such changes typically occur within a year of the triggering event.

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1. Introduction[1]

The choice of a living arrangement — the choice among living as an independent household, living with adult children or other related or unrelated persons, and living in an institution — has many implications for the well-being of an elderly person. Changes in living arrangements, such as moving in with children, are likely to be associated with changes in the level of care and assistance received by the elderly. Changing living arrangements, if it involves sale of homes by the elderly, may also affect the liquid wealth of the elderly.[2] Living arrangements may also affect the elderly's eligibility for certain types of government assistance, such as food stamps and supplemental social security.

This paper analyses the choice of the elderly to live in one of three different living arrangements: living independently, living together with relatives or others, and living in an institution. The paper explores the roles of different health measure (subjective rating versus functional ability versus actual conditions), income, marital status, and the number and sexes of children in determining living arrangements. The paper also examines factors that trigger changes in living arrangements and the length of time between such triggering events and the change in living arrangements.

The paper continues a line of research on determinants of living arrangements of the aged. Schwartz, Danziger and Smolensky (1984) employ the Retirement History Survey (RHS) to estimate a binary choice model between living independently and dependently, that is, living in another household, most commonly that of children. In spite of the size of this data set, their empirical results were mixed, and neither health nor income

effects are very strong. The poor results on health variables reflect the very limited health information available in the RHS. Boersch-Supan (1988a) estimates a multinomial logit model of living arrangements using data from the Annual Housing Survey (AHS) that distinguish several dependent living arrangements. However, as in the paper by Schwartz, Danziger and Smolensky, the data preclude an analysis of institutionalization. In contrast, Garber (1988) concentrates on the determinants of institutionalization and its length using the Channeling Demonstration. He emphasizes the importance of functional ability measures, income, and the existence of children when measuring the risk of institutionalization. Kotlikoff and Morris (1987, 1988) analyze the importance of family links. They stress the role of "supply side variables" that characterize the children in addition to the commonly employed attributes of the elderly.

Papers by Ellwood and Kane (1988) and Boersch-Supan (1988b) represent more comprehensive analyses of living arrangements that include both institutionalized and non-institutionalized elderly. Their papers use the Panel Study of Income Dynamics (PSID) and draw similar conclusions. Male and non-white elderly are more likely to live with children than female or white elderly. They also find a significant income-sensitivity against nursing homes. Despite very different dynamic econometric models, both papers detect an increasing isolation of the elderly with the proportion of elderly living alone or living in nursing homes increasing through time.

Except for the papers by Garber and Kotlikoff and Morris, studies of living arrangements suffer from a less than satisfactory description of health. This paper is based on a data set that is quite limited in terms of geographic scope — it is restricted to Massachusetts elderly — but it

has advantages not shared by other data sets commonly used in research on elderly, such as the PSID, the AHS, and even the RHS. In addition to being longitudinal, it combines a wide array of health information with data on economic status, household characteristics, and family relations.

The main questions addressed in this paper are:

What are typical sequences of living arrangements in old age?

How often do elderly transit between their home, their children, and an institution?

Which events precipitate changes in living arrangements?

What are the dynamics of living arrangements after the death of a spouse or a deterioration of health?

What is types of health information are most valuable for predicting living arrangements?

Is the economic status of the elderly an important determinant of their living arrangement?

Is the probability that the elderly move in with their children greater if the child (children) are female?

The main findings of the paper are:

Functional ability indices are very good predictors of living arrangements.

Subjective health reports are poor predictors of living arrangements.

The probability of institutionalization declines rapidly with the income of the elderly.

In the case of the older old daughters are much more likely than sons to share living quarters.

Living arrangements are fairly stable. When changes in living arrangements occur they are often triggered by changes in health status or the death of a spouse.

When deterioration in health status or the death of a spouse leads to a change in living arrangements, such changes typically occur within a year of the triggering event.

The paper is organized as follows. We first describe the data, explain the construction of the certain explanatory variables, particularly health variables, and present basic sample characteristics. Next, in Section 3, we provide a descriptive analysis of living arrangement choices in our sample. The presentation includes the frequencies of living arrangements in each wave of the panel as well as the frequencies of the choice sequences over time. Section 4 is devoted to cross-sectional analysis and to an assessment of alternative health variable as explanatory variables. In Section 5, a dynamic analysis characterizes the determinants leading to certain living arrangement sequences and their lead and lag structure. Section 6 investigates cohort effects, Section 7 considers the difference between elderly with and without children, and Section 8 discusses differences between the younger and the oldest old. The final section summarizes and draws conclusions.

2. Data, Variable Definitions, and Basic Sample Characteristics

The paper uses data from the Survey of the Elderly collected by the Hebrew Rehabilitation Center for the Aged (HRCA). This survey is part of an ongoing panel survey of elderly in Massachusetts that began in 1982. Initially, the sample consisted of 4040 elderly, aged 60 and above. In addition to the baseline interview in 1982, reinterviews were conducted in 1984, 1985, and 1986. The sample is stratified and consists of two populations. The first population represents about 70 percent of the sample and was drawn from a random selection of communities in Massachusetts. This first subsample is in itself highly stratified to produce an overrepresentation of the very old. The second population that comprises the remaining 30 percent is drawn from elderly participants of

the 27 Massachusetts home health care corporations. In the second population the older old are also overrepresented. The sample selection criteria, sampling procedures and exposure rates are described in more detail in Morris et.al. (1987) and Kotlikoff and Morris (1987).

Although the 1982 sample did not include institutionalized elderly, subsequent surveys have followed the elderly as they moved, including moves into and out from nursing homes. This gives us the opportunity to estimate a quite general model of living arrangement choice including the process of institutionalization. However, care is necessary in estimating such a model. In a study of living arrangements that includes the choice of institutionalization, the first-period sampling of only non-institutionalized elderly considerably complicates the statistical analysis because sample selection is endogenous with respect to institutionalization. In cross-section analysis, we therefore employ estimation methods that are robust against bias from choice-based sampling; in longitudinal analysis, we condition on not being institutionalized in the first period.

We use several working samples. Our basic working sample consists of all elderly with completed interviews in 1982 and with completed interviews or deceased in 1986. Sample attrition between 1982 and 1986 was about 25 percent, not counting deaths, resulting in a basic working sample of 3077 elderly. Of these, 746 died between 1982 and 1986. Not all of these elderly have completed interviews in between these years; particularly, in 1985, only about half of the elderly were re-interviewed. In addition, living arrangements could not be ascertained for all elderly. Thus, most of our longitudinal analysis relies on a much smaller sample of 1196 elderly.

In addition to basic demographic information collected in the baseline interview, each wave of the HRCA panel contains questions about the elderly's current marital status, living arrangements, income, and number and proximity of their children. The surveys pay particular attention to health status, recording the existence and of diagnosed conditions and determining an array of functional (dis-)abilities.

Table 1 presents the age distribution of the elderly at baseline in 1982. The average age is 78.5, 78 percent are age 75 or more, and 20 percent are age 85 or more. In the U.S. noninstitutionalized population 60 and over, the fraction age 75 or more is .279, while the fraction over age 85 is .055. The overrepresentation of the oldest old in our sample is indicated by the impressive number of 8 centenarians in our sample! Because the sample overrepresents the very old, it is also characterized by a very large proportion of women. In 1982, 68.7 percent of the interviewed elderly were female; in 1986, this percentage had risen to 70.7 percent.

The lower part of Table 2 gives some impression about family relationships and the isolation of some of the elderly. In 1982, 32.9 percent of the elderly in the HRCA baseline sample were married, 55.0 percent widowed. Four years later, 26.7 percent of the surviving elderly were married and 61.4 percent were widowed. As of 1986, 41.4 percent of the elderly report no children, 15.2 one, 17.8 two, 12.7 three, and 12.8 percent four or more children. Because the elderly in the sample are quite old, some of their children are elderly themselves, and some children may even have died earlier than their parents. 47.0 percent of the elderly have siblings who are still alive. 25.5 percent of all elderly report that they have no relatives alive at all, and 39.3 percent report that they have no friends.

Average yearly income rises between 1984 and 1986 from $8,750 to $10,500. This 20 percent increase is larger than the concomitant growth in average income for the general population which was only 13.2 percent. It is interesting to note that elderly without children have a significantly lower income ($7,500) than elderly with at least one child ($9,500) in 1984, although in 1986, this difference becomes much smaller ($9,700 as opposed to $10,750).

One of the major strengths of the HRCA survey is its detailed information on the health status of the elderly. Three kinds of health measures are coded: a subjective health index, an array of actual conditions, and an array of functional ability measures. The subjective health index (SUBJH) is coded "excellent" (1), "good" (2), "fair" (3), or "poor" (4).

Seven actual health conditions are reported (cancer, mental illness, diabetes, stroke, heart disease, hypertension, and arthritis). Three states are scored as: "not present" (0), "present but does not cause limitation" (1), and "present and causes limitation" (2). These conditions are condensed in two summary measures, ILLSUM and ILLMAX:

ILLSUM = CANCER+MENTAL+DIAB+STROKE+HEART+HYPERT+ARTHR

ILLMAX = max(CANCER,MENTAL,DIAB,STROKE,HEART,HYPERT,ARTHR)

Finally, six measures are being used to describe functional ability. In addition to a dummy variable that indicates whether a person is unable to walk, three ADL's (MEDS: can take own medications, PCARE: can do own personal care, and BLADD: can control bladder) and two IADL's (MEALS: can prepare own meals, and HOUSW: can do normal housework) are reported. These

variables can attain five values, representing "could do on own", "needs some help sometimes", "needs some help often", "needs considerable help", and "cannot do at all" with associated codes from 0 to 4, except for the variable BLADD that has only four categories ("intact","limited control", "needs helper", and "incontinent") coded from 0 to 3. From these six indicators, two summary measures of functional ability, ADLSUM and ADLIND, were constructed:

ADLSUM = WALK + HOUSW+MEALS + MEDS+PCARE+BLADD

and

ADLIND = 1 if ADLSUM = 0

2 if ADLSUM ≥ 1 but none of the following applies:

3 if ADLSUM ≥ 1 and both IADL's in worst category
or ADLSUM ≥ 2 and only one IADL in worst category
or ADLSUM ≥ 3 and at least one IADL not intact

4 if ADLSUM ≥ 1 and at least two ADL's not intact
or ADLSUM ≥ 4 and only one ADL not intact

5 if ADLSUM ≥ 1 and at least two ADL's in worst category
or ADLSUM ≥ 3 and only one ADL in worst category

Table 2 presents sample averages of the health measures for those elderly who stayed in the sample from 1982 through 1986.[2] Almost all conditions show an increasing incidence, particularly so the group of mental illnesses. The deterioration of actual health is also reflected in the functional ability indexes and in the ADL and IADL indicators. However, it is quite remarkable to note that the subjective health index stays virtually unchanged from 1982 to 1986. This is in sharp contrast to the deterioration of health as indicated by the condition variables, most clearly displayed by the summary measure ILLSUM.

In order to further investigate the three kinds of health measures, Table 3 displays chi-square tests of the correlations among the various health measures. The null hypothesis of these tests is that the two health measures are independent. In the Table a value larger than the critical value in parentheses indicates a significant correlation. The first two rows show that the two variants of the index for actual conditions (ILLMAX and ILLSUM) and the two variants of the functional ability index (ADLSUM and ADLIND) are very closely associated. A tight correlation also exists between the indexes for functional ability and actual condition. However, no statistically significant correlation can be found between the subjective health index (SUBJH) and the indexes for functional ability as well as the indexes for actual conditions. This result appears to provide a rather strong warning against the use of subjective health evaluations as proxies for actual health status.

3. *A Descriptive Analysis of Living Arrangements*

The main dependent variable in this paper is the choice of living arrangements. In this section, we define the living arrangement categories used in the analysis and describe the observed frequencies of living arrangements. We present these frequencies for each of the survey waves as well as longitudinally in form of a tabulation of observed choice-sequences.

Although the sample was initially drawn from the non-institutionalized population, subsequent surveys have followed the elderly as they moved, including moves into and out from institutions. The kind of institution was very carefully recorded in the survey instrument. In addition, in each wave the non-institutionalized elderly were asked who else was living in

their home. With this information, four categories of living arrangements can be distinguished:

- Independent living arrangements: the elderly's household does not contain any other person beside the elderly individual and his/her spouse, if any (living arrangement type 1).

- Shared living arrangements: the elderly's household contains at least one other adult person beside the elderly individual and his/her spouse. Two cases can be distinguished:

  - - The household contains only the elderly, his/her spouse, and the immediate family of his or her children, including a child-in-law (living arrangement type 2).

  - - The household contains at least one other related or unrelated person (living arrangement type 3).

- Institutional living arrangements: This category includes elderly who are living on a permanent basis in a health-care related facility (living arrangement type 4). This living arrangement category comprises the entire spectrum from hospitals and nursing homes to congregate housing and boarding houses. Living arrangements are reported as of the day of interview — therefore, temporary nursing home stays are not recorded unless they happen to be at the time of interview. Rather, most nursing home stays represent permanent living arrangements.[3] It is important to keep this in mind when comparing the frequency and risk of institutionalization in this paper with numbers in studies that focus on short-term nursing home stays.

Table 4 presents the distribution of living arrangements in all four waves of the HRCA panel. The frequencies in this table are strictly cross-sectional and are based on all elderly who were living at the time of each cross-section and whose living arrangements were known for this cross-section.

Most remarkable is the decreasing, but very high proportion of elderly living independently in spite of the very old age of most of the elderly in the sample. About every sixth elderly shares a household with his or her own children, whereas very few elderly share a household with distantly or unrelated persons. The dramatic increase over time in the proportion of institutionalized living arrangements reflects two effects that must be

carefully distinguished. Institutionalization increases because the sample ages and health deteriorates as it became obvious from Table 2. But this effect is confounded by the way the sample was drawn. In 1982, the sample is non-institutionalized by design. Only a few elderly happened to become institutionalized between the time of sample design and the actual interview. Four years later, more than one fifth of the surviving elderly live in an institution, almost all in a nursing home. Section 6 will present a separation of these two effects. As of 1986, very few elderly live in the "new" forms of elderly housing, such as congregate housing or continuing care retirement communities.

For a longitudinal analysis, we extract from the working sample those elderly who were interviewed in all 4 waves and whose living arrangements could be ascertained in all waves or who deceased. Table 5 enumerates all living arrangement sequences that are observed among the 1196 elderly in this longitudinal sample. Many sequences are very rare.

A little less than half (47.8 percent) of the elderly maintain the same living arrangement from 1982 through 1986. Another 21.0 percent died before 1986 without an observed living arrangement transition. This stability confirms the results by Boersch-Supan (1988b) and Ellwood and Kane (1988).

About 40 percent of the sampled elderly lived independently from 1982 through 1986. Another 15.6 percent stayed lived independently until they died prior to 1986. Another 24.6 percent lived for at least some time with their children, and 21.1 percent experienced at least one stay in an institution.

The most frequently observed transition is from living independently to being institutionalized (sequences IIIN, IINN, INNN, IIND, INND, and

INDD). These sequences are observed for 42.4 percent of all elderly who change their living arrangement at least once. Only 13.7 percent change from living independently to living with their children (sequences IIIC, IICC, ICCC, IICD, ICCD, and ICDD).

It should be emphasized once more that these frequencies are not representative for the elderly population as a whole. The sample is not random: it represents only those elderly that were not institutionalized at the time of designing the sample, and it overrepresents the very old.

4. Cross-Sectional Analysis of Living Arrangements

This section presents cross-sectional estimates 1984, 1985 and 1986 of the probability of selecting one of the four living arrangement categories defined above as functions of demographic characteristics, income, and health. We are interested in the answer to three questions:

(1) Which health measure is the best predictor of living arrangements?

(2) How income-sensitive is the choice of living arrangements?

(3) How does the presence of children affect the choice of living arrangements? And is there a difference between daughters and sons?

We present five sets of estimation results, each referring to one of the five health measures introduced in Section 2 (SUBJH, ILLSUM, ILLMAX, ADLIND, ADLSUM). We apply multinomial logit analysis:

$$P(i/1) := \log\left(\frac{\text{Prob}(i)}{\text{Prob}(1)}\right) = \mu_i + X'\beta_i, \quad i=2,..,4$$

where we regress the log-odds ratio of all three dependent living arrangements versus living independently on a constant μ_i and on a vector X

that contains sex, age, the number of male and female children, marital status, health, and income of the elderly.

One advantage of the multinomial logit functional form is its robustness against bias from self-selection.[4] As was pointed out in Section 2, the sample is choice-based because it excludes institutionalized elderly at baseline and therefore overrepresents the non-institutionalized population throughout the sample period, although to a decreasing degree. The inclusion of a set of alternative-specific constants μ_i insures that the estimated coefficients β_i are consistent in spite of the endogeneity of the sampling process.

Table 6 reports the results. Performance is indicated by one minus the likelihood at the estimated parameter values divided by the likelihood at zero parameter values (RHO = 1-LIK/LIK0) and by the percentage of correct predictions (denoted by PCP). Asymptotic t-statistics are reported in parentheses.

Our first finding is the poor performance of the subjective health index as a predictor for living arrangement choice. SUBJH is insignificant in all three choices in all four waves. The measures of fit, RHO and PCP, for these logits are the lowest across all specifications. This result is not too surprising in light of the lack of variation in SUBJH over time (Table 2) and its poor correlation with actual health as indicated in Table 3.

A more important result, however, is the superior performance of the functional ability indexes as opposed to summary measures of the presence and severity of actual health conditions. Best results in terms of performance (RHO and PCP) and significance can be achieved by using the summary measure ADLSUM that was defined by simply adding up the severity

codes of 6 ADL's and IADL's, Table 6 (e). If ADLSUM is included in addition to either ILLSUM or ILLMAX, the coefficients of ADLSUM become even larger and only slightly less significant, whereas the variables indicating actual health conditions remain insignificant.

The probability of institutionalization is strongly affected by a deterioration of health and functional ability. Functional disability also has a strong effect in favor of living with children, less so with other relatives. However, neither institutionalization nor living with children is fully determined by health and functional ability. Income has a clear negative influence on institutionalization, though this influence becomes less pronounced the stronger is the health variable. Two important conclusions follow. First, one should be careful in interpreting income elasticities of institutionalization as long as health is not carefully controlled for. Second, it appears that institutionalization is an inferior living arrangement. Low income also increases the likelihood of living with children, though this effect is less pronounced than the effect on institutionalization.

The demographic characteristics perform as expected. Old age per se has little influence on living arrangements once health is properly taken into account. If not, age works as a proxy for bad health and therefore decreases the likelihood of living independently (for example in Table 6 (a) where health is measured by subjective rating).

Male elderly are more likely to live with their children whereas female elderly appear to prefer living independently. There is no clear gender effect on institutionalization, although the coefficients of FEMALE, when significant, are most often negative, indicating that all other things equal male elderly are more likely to be institutionalized than female

elderly. Marital status is an important predictor of living arrangement choice even after correcting for age, sex, and health. Being single strongly increases the odds against living independently.

The final variable of interest is the number of children. This is the only "supply variable" included in the regressions. One effect is rather trivial: the larger the number of children, the more likely is the probability of living with one of them. There is some difference, however, in the coefficients on the number of daughters and sons . When the difference between the coefficient on the number of male and female children is statistically significant (this is the case in the 1986 cross-section), both the coefficient and the significance level are larger for daughters. This may reflect a preference of the elderly to live with their daughters rather than with their sons, or a greater willingness by daughters to live with their elderly parents.

5. Longitudinal Analysis of Living Arrangements

One of the advantages of the data set employed is its panel nature. It enables us to study transitions and living arrangement sequences in addition to the cross-sectional description and analyses of living arrangements, and it makes it possible to identify cohort effects.

We next estimate a multinomial logit model where the dependent variables are the more common choice sequences of Table 5 (such as IIII or IIIC) and the independent variables are time-independent characteristics of the elderly person (sex, age, number of children, income at baseline) as well as a set of variables that describe changes in marital and health status. Table 7 reports the results. In the Table MARRX1 is coded one (zero otherwise)if the elderly person experienced the loss of a spouse

between periods 1 and 2, MARRX2 is coded one (zero otherwise) if this event took place between period 2 and 3, and MARRX3 is coded one (zero otherwise) if this event took place between period 3 and 4.

In the first panel of Table 7 health is measured by actual conditions (variable ILLSUM, its changes denoted by ILLX1-ILLX3); in the second panel, health is described by functional ability (variable ADLSUM, its changes denoted by ADLX1-ADLX3).

As in the cross-sectional analysis, measuring health in terms of functional ability yields a considerably better description of living arrangement choices than using actual conditions. Changes in functional ability have particularly strong effects on the risk of becoming institutionalized, both when originally living independently (sequences IIIN, IINN, INNN) and when living with own children (sequence CCCN). The effect is less pronounced when measuring health as the sum of actual conditions, but the relative pattern corresponds both in terms of magnitude and significance.

The longitudinal analysis nicely identifies the lag structure of the responses to health changes. In Table 7 (a), the contemporary effects exceed the lagged or anticipated effects. Comparing the three sequences IIIN, IINN, and INNN, that represent living arrangement transitions from living independently to becoming institutionalized after the third, the second and the first waves of the panel, respectively, we see that the third health change variable (ILLX3), the second (ILLX2), and the first (ILLX1) is largest in IIIN, IINN, and INNN,respectively, and that the coefficients of the lagged and anticipated effects decrease as the time between living arrangement change and health change increases. The same

effect holds for the functional ability index ADLSUM, except for the INNN sequence, Table 7 (b).

Similarly, the probability of being taken in by adult children is strongly affected by changes in functional ability: sequence IIIC by ADLX3, sequence ICCC by ADLX1 and ADLX2. The parallel effects in the condition index ILLSUM are less pronounced. Also here, the lag and lead structures appear to indicate immediate responses to health changes rather than lagged or anticipated reactions.

The loss of a spouse — the predominant change in marital status — is indicated by the set of MARRX1-3 variables. The results are as expected: the loss of a spouse increases the probability of moving to the children and, to a lesser degree, into institutions. Unfortunately, the evidence on lag and lead structures is too weak to warrant reliable conclusions.

Elderly with higher incomes are unambiguously more likely to remain independently for longer periods. This is indicated by the negative signs of all income effects. The largest absolute income coefficients are on long stays in nursing homes, sequences IINN and in particular sequence INNN.

The variables FKIDS and MKIDS that permit living arrangement 2, living with children, show clearly positive supply effects: a larger number of children strongly increases the probability of long stays in this living arrangement (sequences CCCC and CCCN). As in the cross-sectional analysis, the number of daughters has a stronger impact on the likelihood of living with children than the number of sons. In conjunction with the larger probabilities of male elderly than female elderly of joining the household of children (as indicated by the negative signs of the variable FEMALE if significant), this is evidence that elderly fathers are most likely to be

taken in by their daughters, even after controlling for health, age, and marital status.

Unlike in the cross-sectional analysis, old age per se decreases the likelihood of living independently. There are two reasons for this. First, since the longitudinal analysis employs only change-variables for health, age may pick up the initial state of health. Second, age may also pick up cohort differences. As we now demonstrate, the first effect appears to dominate.

6. Cohort Effects

We now turn to the question of cohort effects. Has the risk of institutionalization at a given age increased between 1982 and 1986? Has the probability of being taken in by adult children decreased during this time? Analyses using very long panel data answer these questions in the affirmative (Boersch-Supan, 1988b; Ellwood and Kane, 1988).

Analyzing cohort effects is not straightforward in this sample because institutionalized living arrangements are underrepresented. Moreover, the degree of underrepresentation differs among waves and is therefore confounded with cohort membership. An example will explain this point. Cohort 1902 is sampled in the baseline year 1982 at age 80. Due to the sampling rules, only the non-institutionalized are included. However, Cohort 1906 will be interviewed at the same age 80 in year 1986, that is, four years later than baseline, and hence include at least those elderly that became institutionalized between 1982 and 1986. This will still underrepresent the proportion of institutionalized elderly of cohort 1906, but to a lesser extent than that of cohort 1902. Hence, if we compare the proportion of institutionalized elderly at age 80 of cohort 1902 with that

of cohort 1906, we cannot attribute the difference to a cohort effect since it is at least partially due to sample selection.

However, two cohort effects can theoretically be identified in spite of the sample selection problem. Table 8 looks at the distribution of non-institutionalized living arrangements by different cohorts at the same age. Because the sample of the non-institutionalized population is exogenous, this avoids the above-mentioned identification problem, at the cost of preventing an analysis of whether institutionalization became a substitute for family support as suggested by Boersch-Supan (1988a, 1988b). Indeed, Table 8 reveals no clear cohort effect in the choice of living independently versus with children or other persons, conditional on not becoming institutionalized.

A second way to avoid confusion with sample selection is to study transition probabilities conditional on the initial state. Here, we compare, say, the probability of a transition from being independent to becoming institutionalized among different cohorts at the same age. The problem with this approach is the small number of transitions observed, as was shown in Table 5. This prevents simple cross-tabulations such as in Table 8. Instead, we construct a sample of transitions from living independently to the same or some other living arrangement. Starting from the basic longitudinal working sample of 1196 elderly, we arrive at a sample of 1800 transitions of elderly who initially live independently. Some elderly experienced more than one transition. In this case, we assume that the transitions are statistically independent from each other. We then regress the probability of choosing a destination living arrangement as functions of calendar year, controlling for age, sex, number of children, health and income.

Table 9 presents the results. None of the cohort effects is statistically significant, though the negative sign and the magnitude of the coefficients is the same as in Boersch-Supan (1988b). The probability of living with children or other related or unrelated persons decreases with time relative to the probability of becoming institutionalized, and, even more, relative to the probability of living independently, the excluded category. The statistical insignificance may be due to the short length of the panel (four years). In addition, the sample is dominated by stayers: only 10.9 percent of the 1800 transitions represent actual changes to another living arrangement; this decreases the precision of the estimates.

7. Number and Sex of Children

The HRCA survey includes two variables that represent the supply of shared housing: the number and sex of own children. This information is available for all elderly whether they live with children or not. This is in contrast to most other surveys (e.g., the Panel Study of Income Dynamics; Boersch-Supan, 1988b) where the existence of adult children can only be inferred when elderly parents actually live together with their children.

In order to assess whether the omission of this supply variable biases the estimation results, we perform two tests. First, we stratify the cross-sectional logit estimations by whether the elderly have children or not (41.4 percent of the elderly in the sample have no children, 58.6 percent have at least one child); second, for those elderly who have children, we run the logits with and without the variables FKIDS and MKIDS that count the number of children by sex.

Table 10 reports the results. The corresponding values of the loglikelihood function are as follows:

	Variables FKIDS and MKIDS Excluded			Included
	Without Children	With Children	All Elderly	With Children
Column:	(a)	(b)	(c)	(d)
Health-ILLSUM	-211.43	-1098.40	-1407.63	-1082.82
Health-ADLSUM	-165.59	- 952.04	-1214.62	- 931.98

The two strata are indeed significantly different. The hypothesis that pooling the strata (column c) yields the same likelihood as the sum of the separate strata (columns a and b) is clearly rejected: the likelihood ratio tests for the two health variables are 195.6 and 193.98, respectively, and exceed the critical value of 26.22 (12 degrees of freedom, 99 percent confidence). Moreover, inclusion of the supply variables FKIDS and MKIDS results also in a statistically significant improvement of the likelihood value, the respective likelihood ratio statistics are 31.16 and 40.12, exceeding the chi-squared critical value of 9.21 (2 degrees of freedom, 99 percent confidence).

However, the coefficient estimates of the other common variables are surprisingly close. Although the numbers of sons and daughters is a statistically significant and a numerically important determinant for the choice of living arrangements — increasing the probability of living with one of these children and decreasing the likelihood of institutionalization — their omission leaves the coefficients of the other variables virtually unchanged. Moreover, there is little difference between the two strata of

elderly with and without children, particularly so in the more reliable model that includes functional ability as health measure.

The result is surprising insofar as the number of children may very well be correlated with health and income of the elderly. However, this correlation turns out to be very small, hence, omission of the number-of-children variables reduces the fit of the regression, but does not bias the other coefficients.

There are many other "supply variables" that are left out in the logit regressions of Table 6. The children are characterized only by number and sex, but not by income, housing situation and family size of the adult children. Evidence that these variables matter is indicated in Kotlikoff and Morris (1988). In addition, high housing prices may induce earlier household dissolution. Evidence to this effect is reported in Boersch-Supan (1986) and Boersch-Supan (1988a). Finally, cost and availability (local availability, waiting lines, congestion) of nursing homes may be an important factor in the probability of institutionalization.

8. The Oldest Old

The sample was stratified in order to include a larger than proportional share of the oldest old. Do these elderly behave differently than the younger old? Table 11 presents estimates which correspond to Table 6, parts (c) and (e), but stratify by two age groups: those elderly who were less than age 80 at baseline, and those who were of age 80 or older.

There are some important differences. First, the oldest old appear more sensitive to changes in income and health. The respective coefficients are numerically larger and more significant for this

subsample. Second, there is a much more pronounced difference between very old male and female elderly than among younger elderly: the oldest male elderly have a very strong preference for living in the household of their children. Furthermore, the distinction between daughters and sons that was already detected in Table 6 appears to be driven by the oldest old; among younger elderly this distinction is statistically insignificant. Finally, becoming widowed affects the behavior of the oldest old much more than the younger old, strongly increasing the chances of the oldest old moving in with their children.

9. Implications and Conclusions

The most frequent choice of living arrangement, even for the very old, is to live independently. This finding confirms those of Boersch-Supan (1988b) and by Ellwood and Kane (1988). Very few elderly move more than once between 1982 and 1986. This includes "natural" sequences such as independent-with children-nursing home or independent-nursing home-with children. Among the 21.2 percent who changed their living arrangement within the four years of the panel, the most frequent transition is from living independently to a nursing home; this transition is about three times as frequent as changing from independent living to living with children.

The most important health information needed to predict living arrangement changes is the functional ability of the elderly person. A simple sum of six ADL and IADL measures performs quite well. The existence and severity of actual health conditions are less successful as predictors, and subjective health ratings are very poor instruments for the analysis of living arrangements. There is a high correlation between functional

ability and actual illnesses, but no statistically significant correlation between these measures and subjective health evaluations.

The death of a spouse or the deterioration of health has important consequences for the choice of living arrangements. These events, if they trigger changes in living arrangements, do so quite rapidly; if a change of living arrangement is precipitated by one of these life-events, the change typically takes place in the same year. This finding accords with that in Boersch-Supan (1988b) which uses quite different data and econometric methodology.

The economic status of the elderly is an important determinant for the choice of living arrangement. Institutionalization is viewed as an inferior living arrangement, as is living with children. This result confirms the many studies on the income-sensitivity of the propensity to live alone, as well as the work by Garber (1988) on income-sensitivity of institutionalization. This result holds even after correcting for health in a satisfactory fashion as has not been possible in most earlier studies.

The inclusion of variables that account for the supply of dependent living arrangement is important in terms of fit and prediction. This result is in line with the research by Kotlikoff and Morris (1987, 1988). However, omitting the number and sex of children does not appear to bias the measured influence of other living arrangement determinants such as income or health. The number of children is particularly important for the oldest old. For this group, those with daughters are more likely to live with their children.

There is ample room for further research that would include more data on the characteristics of children and on housing and nursing home prices. The construction of housing and nursing home price indices is a project on

its own as is the collection of longitudinal data on the characteristics of children. Fortunately, the HRCA panel is ongoing, and further waves may include more supply-side information.

FOOTNOTES

1. We are indebted to Dan Nash at the Hebrew Rehabilitation Center for the Aged and Stefan Boedeker at the University of Dortmund for their valuable research assistance.

2. Because the variable BLADD is not available for 1982, the index for functional ability is reported only for 1984-86. Changes in functional ability such as those used in Section 5 have been calculated for 1982-84 on the basis of the data available in both periods.

3. Garber presents evidence on the distribution of lengths of stay in a nursing home.

4. McFaddent (1984), p. 1438; Manski and Lerman (1977).

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Table 1: DEMOGRAPHIC CHARACTERISTICS

(1) AGE DISTRIBUTION AT BASELINE 1982

	60+	65+	70+	75+	80+	85+	90+	95+	100+
Count	212	233	231	985	826	400	150	32	8
Percent	6.89	7.57	7.51	32.01	26.84	13.00	4.87	1.04	0.26

(2) MARITAL STATUS

	1982	1984	1985	1986
Married	32.89	29.28	28.57	26.71
Widowed	55.03	58.76	59.41	61.36
Never Married	8.20	8.09	8.19	8.29
Divorced/Sep.	3.89	3.74	3.74	3.57

(3) NUMBER OF CHILDREN IN 1986

NUMBER OF CHILDREN:

	0	1	2	3	4	5	6	7	8
Count	1275	468	549	392	189	87	51	31	35
Percent	41.4	15.2	17.8	12.7	6.1	2.8	1.7	1.0	1.1

(4) ISOLATED ELDERLY

Percentage of Elderly in 1986 without ...

Children	Siblings	Children or Siblings	Any Relatives	Friends	Any Relatives or Friends
41.4	53.0	31.2	25.5	39.3	24.5

Source: HRCA Survey of the Elderly, Working Sample of 3077 Elderly

Table 2: SAMPLE AVERAGES OF HEALTH MEASURES

	1982	1984	1985	1986
(1) Conditions				
CANCER	0.0952	0.0970	0.1044	0.1192
MENTAL	0.1557	0.2304	0.3987	0.4995
DIABETES	0.1699	0.2016	0.2062	0.2044
STROKE	0.1751	0.2995	0.2369	0.2747
HEART	0.6186	0.6058	0.6606	0.6870
HYPERTENSION	0.6352	0.5712	0.5295	0.7842
ARTHRITIS	1.0817	1.0954	1.1508	1.1344
ILLMAX	1.7645	1.7765	1.8423	1.8224
ILLSUM	3.9571	4.1347	4.9291	5.3333
(2) Functional Ability Indexes				
WALK		0.2987	0.3277	0.4438
BLADD		0.3520	0.5332	0.7030
MEDS		0.5456	0.7686	1.0875
PCARE		0.7976	0.9429	1.1048
MEALS		1.1690	1.4681	1.6217
HOUSW		2.2633	2.2397	2.2833
ADLIND		3.0152	3.1983	3.3784
ADLSUM		5.4696	6.2628	7.1746
(3) Subjective Health Index				
SUBJH	2.5916	2.5961	2.5967	2.6097

Source: HRCA Survey of the Elderly (Elderly surviving at least until 1986)

Note: Functional ability indexes in 1982 not reported here because they are not comparable to those in 1984–86.

Table 3: CORRELATION AMONG HEALTH MEASURES
(Chi-squared statistics, critical values in parentheses)

Health Measures:	1982	1984	1985	1986
ILLMAX, ILLSUM:	1520.93*	1469.55*	1459.38*	1454.97*
	(48.3)	(43.0)	(48.3)	(48.3)
ADLIND, ADLSUM:		2707.65*	2895.55*	3057.42*
		(121.8)	(112.3)	(112.3)
ILLMAX, ADLIND:		115.36*	153.58*	268.93*
		(20.1)	(20.1)	(20.1)
ILLMAX, ADLSUM:		130.63*	179.28*	296.34*
		(63.7)	(63.7)	(63.7)
ILLSUM, ADLIND:		142.98*	239.32*	361.17*
		(73.7)	(83.5)	(83.5)
ILLSUM, ADLSUM:		584.20*	467.56*	625.47*
		(320.4)	(338.0)	(338.0)
SUBJH, ILLSUM:	24.57	21.33	29.10	24.01
	(48.3)	(43.0)	(48.3)	(45.6)
SUBJH, ILLMAX:	5.38	3.17	3.91	5.87
	(13.3)	(13.3)	(13.3)	(13.3)
SUBJH, ADLIND:		5.19	6.90	8.90
		(20.1)	(20.1)	(20.1)
SUBJH, ADLSUM:		34.82	27.05	37.43
		(63.7)	(63.7)	(63.7)

Source: HRCA Survey of the Elderly (Elderly surviving at least until 1986)

Note: Chi-squared statistics calculated under the null hypothesis of independence of the two health measures. Critical values in parentheses refer to 99 percent confidence and $(m_1-1)*(m_2-1)$ degrees of freedom, where m_i denotes the number of categories which health measure i can attain. An asterisk denotes significance at the 1 percent level.

Table 4: LIVING ARRANGEMENTS OF THE ELDERLY
(Percentages)

Living Arrangement:	1982	1984	1985	1986
Alone:	56.8	51.2	50.5	46.4
With Spouse:	18.5	14.0	11.9	10.8
Living Arrangement Type 1:	75.3	65.2	62.4	57.2
Alone With Kids:	16.6	17.4	15.7	13.7
With Spouse and Kids:	1.4	1.7	1.8	1.8
Living Arrangement Type 2:	18.0	19.1	17.5	15.5
Other Relatives or Nonrelatives Present:	5.9	5.9	5.7	5.1
Living Arrangement Type 3:	5.9	5.9	5.7	5.1
Convent, Rectory, CCRC, Congregate Housing, or Retirement Home:	0.0	0.2	0.7	0.6
Foster Home, Community or Domestic Care:	0.0	0.2	0.2	0.3
Nursing Home (ICF):	0.2	5.4	8.0	11.6
Nursing Home (SNF):	0.0	2.9	3.5	7.0
Rest Home (level IV):	0.0	0.4	0.7	1.3
Hotel, Boarding or Rooming House:	0.6	0.3	0.3	0.2
Hospital:	0.0	0.4	1.1	1.2
Living Arrangement Type 4:	0.8	9.8	14.5	22.2
Number of Observations:	3070	2965	1130	2331

Source: HRCA Survey of the Elderly (cross-sectional subsamples of elderly with completed interviews)

Table 5: LIVING ARRANGEMENT SEQUENCES 1982, 1984, 1985, 1986

Sequence	IIII	IIIC	IIIO	IIIN	IIID	IICI	IICC	IICN	IIOI
Count	474	17	6	40	3	1	8	2	2
Percent	39.63	1.42	0.50	3.34	0.25	0.08	0.67	0.17	0.17
Sequence	IIOO	IION	IINI	IINN	IIND	IIDD	ICII	ICIN	ICCC
Count	1	3	1	42	1	110	1	1	20
Percent	0.08	0.25	0.08	3.51	0.08	9.20	0.08	0.08	1.67
Sequence	ICCN	ICOO	ICNN	ICDD	IOII	IOIO	IOCN	IOOI	IOOO
Count	2	1	4	6	1	1	1	3	6
Percent	0.17	0.08	0.33	0.50	0.08	0.08	0.08	0.25	0.50
Sequence	IONN	IODD	INCC	INNO	INNN	INND	INDD	IDDD	CIII
Count	2	4	1	1	47	2	26	74	3
Percent	0.17	0.33	0.08	0.08	3.93	0.17	2.17	6.19	0.25
Sequence	CIIC	CIIO	CIDD	CCII	CCCI	CCCC	CCCO	CCCN	CCCD
Count	1	1	1	6	6	87	4	18	1
Percent	0.08	0.08	0.08	0.50	0.50	7.27	0.33	1.51	0.08
Sequence	CCNN	CCDD	CODD	CNII	CNNN	CNDD	CDDD	OIII	OINN
Count	8	36	1	1	12	7	11	6	1
Percent	0.67	3.01	0.08	0.08	1.00	0.59	0.92	0.50	0.08
Sequence	OCCC	OCCN	OCNN	OCDD	OOIN	OOCI	OOCC	OOCO	OOCN
Count	2	1	2	1	1	2	1	11	2
Percent	0.17	0.08	0.17	0.08	0.08	0.17	0.08	0.92	0.17
Sequence	OOOO	OOON	OONI	OONN	OODD	ONNN	ONDD	ODDD	NIII
Count	7	1	1	6	9	4	3	7	1
Percent	0.59	0.08	0.08	0.50	0.75	0.33	0.25	0.59	0.08
Sequence	NICC	NICN	NIDD	NCNN	NNNN				
Count	1	1	1	1	4				
Percent	0.08	0.08	0.08	0.08	0.33				

Source: HRCA Survey of the Elderly (1196 Elderly, excludes elderly not interviewed or without ascertained living arrangement in at least one wave)

Notes: Living Arrangements are denoted by:
I=Lives Independently, C=Lives with Children, O=Lives with Other Relatives or Nonrelatives, N=Lives in Nursing Home, D=Dead.

Table 6: CROSS-SECTIONAL LOGIT ANALYSIS OF LIVING ARRANGEMENT CHOICE

	Wave 2 (1984)			Wave 3 (1985)			Wave 4 (1986)		
	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)
(a) HEALTH MEASURE: SUBJH									
CONST	-2.370	-3.093	-11.588	-6.212	-2.678	-8.999	-2.167	-3.220	-11.845
	(-2.5)	(-1.9)	(-6.4)	(-3.6)	(-1.0)	(-4.4)	(-1.9)	(-1.7)	(-6.9)
FEMALE	-0.314	-0.160	0.270	-0.202	-0.685	-0.285	-0.233	-0.251	0.472
	(-1.8)	(-0.5)	(0.9)	(-0.6)	(-1.4)	(-0.7)	(-1.1)	(-0.7)	(1.5)
AGE	0.021	0.021	0.120	0.054	0.014	0.102	0.011	0.021	0.120
	(2.1)	(1.2)	(6.3)	(3.0)	(0.5)	(4.6)	(0.9)	(1.0)	(6.7)
FKIDS	0.133	-0.422	-0.132	0.267	-0.325	0.036	0.384	-0.325	0.056
	(2.2)	(-2.5)	(-1.1)	(2.9)	(-1.5)	(0.3)	(5.6)	(-1.9)	(0.6)
MKIDS	0.193	-0.464	-0.257	0.227	-0.546	0.086	0.276	-0.334	0.054
	(3.0)	(-2.5)	(-1.7)	(2.4)	(-2.2)	(0.7)	(4.0)	(-1.9)	(0.5)
MARRIED	-0.553	-2.871	0.165	-0.513	-11.399	-0.461	-0.438	-10.730	-0.275
	(-2.8)	(-3.8)	(0.4)	(-1.2)	(-0.2)	(-0.9)	(-1.8)	(-0.3)	(-0.7)
SUBJH	-0.033	0.001	0.073	0.222	0.350	0.124	0.059	0.035	0.107
	(-0.4)	(0.0)	(0.5)	(1.4)	(1.3)	(0.7)	(0.5)	(0.2)	(0.8)
INCOME	-0.018	0.012	-0.168	-0.012	0.058	-0.116	-0.043	0.024	-0.085
	(-1.7)	(0.7)	(-4.3)	(-0.5)	(2.6)	(-2.7)	(-2.7)	(1.2)	(-2.8)
	RHO=.397, PCP=68.84			RHO=.315, PCP=62.14			RHO=.371, PCP=65.37		
(b) HEALTH MEASURE: ILLSUM									
CONST	-3.132	-2.624	-11.113	-7.402	-3.248	-9.336	-2.285	-3.681	-11.584
	(-4.0)	(-2.0)	(-7.4)	(-5.1)	(-1.6)	(-5.1)	(-2.5)	(-2.4)	(-7.9)
FEMALE	-0.371	-0.249	0.000	-0.487	-0.581	-0.268	-0.360	0.040	-0.060
	(-2.6)	(-1.0)	(0.0)	(-1.8)	(-1.5)	(-0.8)	(-2.0)	(0.1)	(-0.2)
AGE	0.027	0.016	0.107	0.076	0.027	0.096	0.014	0.020	0.114
	(3.1)	(1.1)	(6.7)	(4.9)	(1.1)	(4.9)	(1.4)	(1.1)	(7.4)
FKIDS	0.221	-0.375	-0.227	0.251	-0.402	-0.021	0.378	-0.211	-0.005
	(4.6)	(-2.7)	(-1.9)	(3.4)	(-2.2)	(-0.2)	(6.7)	(-1.6)	(-0.1)
MKIDS	0.210	-0.443	-0.274	0.297	-0.273	0.057	0.297	-0.282	-0.046
	(4.0)	(-2.9)	(-2.0)	(3.7)	(-1.5)	(0.5)	(5.2)	(-2.0)	(-0.5)
MARRIED	-0.728	-2.994	-0.378	-0.568	-3.151	-0.423	-0.573	-15.312	-0.563
	(-4.3)	(-4.9)	(-1.2)	(-1.7)	(-2.8)	(-0.9)	(-2.8)	(-0.3)	(-1.7)
ILLSUM	0.071	-0.026	0.199	0.139	0.013	0.234	0.042	-0.020	0.288
	(2.9)	(-0.6)	(5.2)	(3.4)	(0.2)	(4.9)	(1.5)	(-0.4)	(8.3)
INCOME	-0.017	0.017	-0.075	-0.051	0.047	-0.153	-0.033	0.032	-0.080
	(-1.8)	(1.4)	(-2.7)	(-1.9)	(2.6)	(-3.8)	(-2.6)	(1.8)	(-2.9)
	RHO=.421, PCP=70.25			RHO=.357, PCP=66.40			RHO=.404, PCP=67.52		

Table 6: CROSS-SECTIONAL LOGIT ANALYSIS OF LIVING ARRANGEMENT CHOICE (cont'd)

	Wave 2 (1984)			Wave 3 (1985)			Wave 4 (1986)		
	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)
(d) HEALTH MEASURE: ILLMAX									
CONST	-3.175	-2.963	-11.475	-7.093	-3.160	-7.606	-2.433	-4.095	-11.494
	(-4.2)	(-2.3)	(-8.0)	(-4.9)	(-1.5)	(-4.5)	(-2.7)	(-2.6)	(-8.2)
FEMALE	-0.313	-0.272	0.061	-0.396	-0.491	-0.371	-0.358	0.050	0.090
	(-2.2)	(-1.2)	(0.2)	(-1.5)	(-1.3)	(-1.2)	(-2.0)	(0.2)	(0.4)
AGE	0.028	0.023	0.112	0.073	0.026	0.094	0.015	0.025	0.111
	(3.2)	(1.6)	(7.2)	(4.8)	(1.1)	(5.2)	(1.5)	(1.4)	(7.5)
FKIDS	0.219	-0.404	-0.209	0.270	-0.393	-0.005	0.390	-0.222	0.064
	(4.6)	(-2.9)	(-1.8)	(3.7)	(-2.2)	(0.0)	(7.0)	(-1.6)	(0.8)
MKIDS	0.202	-0.440	-0.289	0.303	-0.280	0.082	0.302	-0.294	-0.034
	(3.8)	(-2.9)	(-2.2)	(3.8)	(-1.5)	(0.8)	(5.3)	(-2.1)	(-0.4)
MARRIED	-0.731	-3.011	-0.352	-0.541	-3.125	-0.641	-0.594	-16.058	-0.568
	(-4.4)	(-5.0)	(-1.1)	(-1.6)	(-2.8)	(-1.4)	(-2.9)	(-0.3)	(-1.7)
ILLMAX	0.078	-0.145	0.456	0.237	-0.007	-0.018	0.112	-0.054	0.851
	(0.9)	(-1.0)	(2.5)	(1.1)	(0.0)	(-0.1)	(1.0)	(-0.3)	(4.3)
INCOME	-0.018	0.016	-0.077	-0.055	0.045	-0.157	-0.032	0.035	-0.094
	(-1.9)	(1.3)	(-2.9)	(-2.0)	(2.6)	(-4.2)	(-2.5)	(2.0)	(-3.4)
	RHO=.414, PCP=70.19			RHO=.337, PCP=64.99			RHO=.391, PCP=67.36		
(d) HEALTH MEASURE: ADLIND									
CONST	-2.682	-2.622	-10.250	-6.731	-3.321	-8.442	-1.872	-3.715	-9.275
	(-3.5)	(-2.1)	(-7.3)	(-4.8)	(-1.6)	(-4.9)	(-2.1)	(-2.4)	(-6.2)
FEMALE	-0.329	-0.293	0.068	-0.455	-0.520	-0.699	-0.417	0.002	-0.449
	(-2.3)	(-1.3)	(0.3)	(-1.7)	(-1.3)	(-2.0)	(-2.4)	(0.0)	(-1.6)
AGE	0.013	0.010	0.076	0.060	0.016	0.042	0.006	0.014	0.055
	(1.5)	(0.6)	(4.9)	(3.8)	(0.7)	(2.1)	(0.6)	(0.8)	(3.4)
FKIDS	0.234	-0.390	-0.154	0.224	-0.431	-0.158	0.382	-0.236	-0.023
	(4.8)	(-2.8)	(-1.3)	(3.0)	(-2.4)	(-1.5)	(6.8)	(-1.7)	(-0.3)
MKIDS	0.224	-0.412	-0.177	0.330	-0.264	0.216	0.299	-0.298	-0.044
	(4.2)	(-2.7)	(-1.3)	(4.1)	(-1.4)	(1.8)	(5.3)	(-2.1)	(-0.5)
MARRIED	-0.757	-3.050	-0.559	-0.600	-3.075	-1.166	-0.597	-17.611	-0.860
	(-4.5)	(-5.0)	(-1.7)	(-1.8)	(-2.8)	(-2.4)	(-2.9)	(-0.4)	(-2.4)
ADLIND	0.280	0.197	0.697	0.382	0.312	1.460	0.164	0.163	1.294
	(6.1)	(2.7)	(8.5)	(4.4)	(2.3)	(9.9)	(3.0)	(1.7)	(12.3)
INCOME	-0.011	0.020	-0.050	-0.044	0.044	-0.114	-0.029	0.041	-0.056
	(-1.2)	(1.8)	(-2.0)	(-1.7)	(2.4)	(-2.9)	(-2.3)	(2.3)	(-2.0)
	RHO=.431, PCP=70.15			RHO=.395, PCP=68.92			RHO=.439, PCP=70.11		

Table 6: CROSS-SECTIONAL LOGIT ANALYSIS OF LIVING ARRANGEMENT CHOICE (cont'd)

	Wave 2 (1984)			Wave 3 (1985)			Wave 4 (1986)		
	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)
(e) HEALTH MEASURE: ADLSUM									
CONST	-1.969	-2.075	-8.980	-5.154	-2.269	-4.718	-1.098	-3.039	-4.933
	(-2.5)	(-1.6)	(-6.3)	(-3.6)	(-1.1)	(-2.4)	(-1.2)	(-1.9)	(-2.8)
FEMALE	-0.317	-0.291	0.037	-0.514	-0.540	-0.993	-0.449	-0.002	-0.450
	(-2.2)	(-1.3)	(0.1)	(-1.9)	(-1.4)	(-2.5)	(-2.5)	(0.0)	(-1.3)
AGE	0.007	0.004	0.072	0.046	0.007	0.022	-0.002	0.005	0.013
	(0.7)	(0.3)	(4.5)	(2.9)	(0.3)	(1.0)	(-0.2)	(0.3)	(0.7)
FKIDS	0.248	-0.368	-0.112	0.196	-0.448	-0.176	0.383	-0.256	-0.170
	(5.0)	(-2.7)	(-1.0)	(2.5)	(-2.5)	(-1.4)	(6.7)	(-1.9)	(-1.6)
MKIDS	0.262	-0.380	-0.078	0.329	-0.259	0.313	0.296	-0.287	-0.011
	(4.8)	(-2.5)	(-0.6)	(4.0)	(-1.4)	(2.4)	(5.2)	(-2.0)	(-0.1)
MARRIED	-0.861	-3.140	-0.825	-0.833	-3.111	-1.695	-0.666	-18.664	-1.689
	(-5.0)	(-5.1)	(-2.4)	(-2.4)	(-2.8)	(-3.1)	(-3.2)	(-0.4)	(-3.9)
ADLSUM	0.104	0.082	0.181	0.147	0.139	0.395	0.091	0.116	0.398
	(9.3)	(4.7)	(11.3)	(7.5)	(4.7)	(12.4)	(5.8)	(4.5)	(15.7)
INCOME	-0.009	0.021	-0.044	-0.034	0.042	-0.098	-0.025	0.045	-0.016
	(-1.0)	(1.8)	(-1.8)	(-1.3)	(2.1)	(-2.3)	(-2.1)	(2.6)	(-0.5)
	RHO=.443, PCP=70.42			RHO=.453, PCP=71.44			RHO=.495, PCP=73.48		

Notes:

Dependent variables:
P(i/1)=log(Prob(i)/Prob(1)), i=2,..,4

Independent variables:
- FEMALE: 1 if male, 2 if female
- AGE: age in years at baseline (1982)
- FKIDS: number of female children
- MKIDS: number of male children
- MARRIED: 1 if married, 0 if widowed, divorced, separated, or never married
- INCOME: yearly gross income in $1000
- SUBJH: subjective health index, see Section 2
- ILLSUM, ILLMAX: indexes of actual conditions, see Section 2
- ADLSUM, ADLIND: indexes of functional ability, see Section 2

Performance:
- RHO: likelihood ratio: RHO = 1 - LIK(μ,β)/LIK(0,0)
- PCP: percent correctly predicted

Table 7: LONGITUDINAL LOGIT ANALYSIS OF LIVING ARRANGEMENT SEQUENCES
(Asymptotic t-statistics in parentheses)

(a) HEALTH MEASURE: ILLSUM

	Probability of a choice-sequence .... rather than IIII:							
	IIIC	IIIN	IINN	ICCC	INNN	CCCC	CCCN	OOOO
CONST	2.577	-10.902	-12.711	-9.769	-9.846	-9.292	-17.965	-0.362
	(0.8)	(-3.9)	(-4.1)	(-2.5)	(-3.1)	(-4.9)	(-4.1)	(-0.1)
FEMALE	-1.562	0.301	0.384	-0.388	-0.835	-0.122	-0.542	-1.052
	(-2.6)	(0.5)	(0.6)	(-0.6)	(-1.7)	(-0.4)	(-0.8)	(-1.8)
AGE	-0.039	0.093	0.113	0.074	0.118	0.091	0.185	0.000
	(-1.0)	(3.1)	(3.4)	(1.7)	(3.4)	(4.2)	(3.8)	(0.0)
FKIDS	0.287	-0.195	0.073	0.301	-0.070	0.406	0.320	-0.889
	(1.3)	(-1.1)	(0.4)	(1.5)	(-0.4)	(4.3)	(1.6)	(-2.0)
MKIDS	0.054	-0.114	0.117	0.425	-0.105	0.204	0.304	-0.906
	(0.2)	(-0.6)	(0.7)	(2.2)	(-0.5)	(2.0)	(1.6)	(-1.9)
INCOME	-0.111	-0.016	-0.118	-0.035	-0.253	-0.022	-0.115	-0.021
	(-1.4)	(-0.3)	(-1.8)	(-0.6)	(-3.3)	(-0.8)	(-1.4)	(-0.4)
MARRX1	-9.034	-0.302	1.050	2.017	-0.119	-1.014	-9.375	0.666
	(-0.1)	(-0.3)	(1.2)	(2.5)	(-0.1)	(-1.0)	(-0.1)	(0.6)
MARRX2	3.644	1.793	2.798	-8.197	3.662	-9.425	-7.374	-6.766
	(3.6)	(1.5)	(2.8)	(-0.1)	(3.5)	(-0.1)	(0.0)	(-0.1)
MARRX2	-8.573	2.069	-8.927	-8.164	1.740	-9.967	-8.486	-8.811
	(0.0)	(1.9)	(0.0)	(0.0)	(1.3)	(0.0)	(0.0)	(0.0)
ILLX1	-0.094	0.085	0.233	0.356	0.342	0.056	0.342	0.044
	(-0.6)	(0.8)	(2.0)	(2.3)	(2.8)	(0.8)	(2.2)	(0.3)
ILLX2	-0.064	0.202	0.387	0.284	0.296	-0.008	0.291	-0.031
	(-0.4)	(2.0)	(3.6)	(2.0)	(2.5)	(-0.1)	(2.0)	(-0.2)
ILLX3	-0.083	0.436	0.069	-0.127	0.058	-0.011	0.163	-0.197
	(-0.5)	(4.6)	(0.7)	(-1.0)	(0.6)	(-0.2)	(1.3)	(-1.4)

Goodness of Fit: RHO=0.483, PCP=64.31

Source: HRCA Survey of the Elderly (Longitudinal sample)

Table 7: LONGITUDINAL LOGIT ANALYSIS OF LIVING ARRANGEMENT SEQUENCES (cont'd)
(Asymptotic t-statistics in parentheses)

(b) HEALTH MEASURE: ADLSUM

	Probability of a choice-sequence .... rather than IIII:							
	IIIC	IIIN	IINN	ICCC	INNN	CCCC	CCCN	OOOO
CONST	4.909 (1.2)	-11.750 (-2.8)	-12.786 (-2.6)	-3.381 (-0.7)	-11.543 (-2.5)	-10.360 (-4.5)	-21.318 (-3.5)	-6.041 (-1.6)
FEMALE	-2.238 (-3.3)	-0.919 (-1.2)	-0.442 (-0.4)	0.389 (0.3)	-1.916 (-2.4)	-0.515 (-1.3)	-1.113 (-1.2)	-0.843 (-1.3)
AGE	-0.042 (-0.9)	0.107 (2.4)	0.121 (2.2)	-0.014 (-0.3)	0.142 (2.7)	0.110 (4.3)	0.222 (3.5)	0.070 (1.6)
FKIDS	0.170 (0.6)	-0.011 (0.0)	0.079 (0.3)	0.094 (0.3)	0.110 (0.5)	0.472 (4.4)	0.288 (1.1)	-2.227 (-2.3)
MKIDS	-0.196 (-0.6)	-0.605 (-2.1)	-0.148 (-0.6)	0.172 (0.6)	-0.400 (-1.4)	0.083 (0.7)	0.060 (0.2)	-0.888 (-1.8)
INCOME	-0.271 (-2.2)	-0.014 (-0.2)	-0.237 (-2.2)	-0.168 (-1.5)	-0.315 (-2.9)	-0.015 (-0.4)	-0.127 (-1.2)	-0.030 (-0.4)
MARRX1	-9.106 (-0.1)	0.124 (0.1)	0.438 (0.3)	2.190 (2.3)	-0.104 (-0.1)	-0.915 (-0.8)	-8.839 (-0.1)	-9.294 (-0.1)
MARRX2	4.129 (3.2)	4.076 (2.3)	-6.490 (0.0)	-6.877 (0.0)	4.584 (2.5)	-8.695 (0.0)	-5.075 (0.0)	-4.924 (0.0)
MARRX2	-7.155 (0.0)	4.649 (1.6)	-6.250 (0.0)	-6.623 (0.0)	5.449 (1.9)	-7.293 (0.0)	-6.714 (0.0)	-4.994 (0.0)
ADLX1	-0.005 (-0.1)	0.306 (3.9)	0.432 (4.9)	0.335 (3.5)	0.485 (5.6)	-0.031 (-0.7)	0.403 (3.8)	-0.122 (-1.5)
ADLX2	0.066 (0.7)	0.436 (5.9)	0.524 (6.8)	0.288 (3.3)	0.602 (7.6)	-0.015 (-0.3)	0.232 (2.5)	-0.182 (-1.6)
ADLX3	0.149 (1.6)	0.624 (8.1)	0.249 (2.9)	0.075 (0.8)	0.248 (3.0)	0.004 (0.1)	0.484 (5.6)	-0.248 (-1.9)

Goodness of Fit: RHO=0.608, PCP=70.76

Source: HRCA Survey of the Elderly (Longitudinal sample)

Table 8: COHORT-EFFECTS IN THE CHOICE OF LIVING ARRANGEMENTS

AGE 80:	Independent	With Children	With Others
Cohort 1906	80.89	12.74	6.37
Cohort 1904	73.27	17.33	9.41
Cohort 1902	80.60	15.42	3.98
AGE 81:	**Independent**	**With Children**	**With Others**
Cohort 1905	77.91	13.37	8.72
Cohort 1903	78.47	15.31	6.22
Cohort 1901	77.65	15.88	6.47
AGE 82:	**Independent**	**With Children**	**With Others**
Cohort 1904	71.43	18.63	9.94
Cohort 1902	77.08	17.71	5.21
Cohort 1900	70.35	22.11	7.54
AGE 83:	**Independent**	**With Children**	**With Others**
Cohort 1903	78.95	15.13	5.92
Cohort 1901	75.80	17.83	6.37
Cohort 1899	75.41	15.57	9.02
AGE 84:	**Independent**	**With Children**	**With Others**
Cohort 1902	78.91	16.33	4.76
Cohort 1900	65.19	27.62	7.18
Cohort 1898	72.22	19.84	7.94
AGE 85:	**Independent**	**With Children**	**With Others**
Cohort 1901	76.36	17.27	6.36
Cohort 1899	71.56	22.02	6.42
Cohort 1897	65.96	22.34	11.70
AGE 86:	**Independent**	**With Children**	**With Others**
Cohort 1900	65.85	29.27	4.88
Cohort 1898	65.66	25.25	9.09
Cohort 1894	73.64	21.82	4.55

Source: HRCA Survey of the Elderly (includes only non-institutionalized population)

Table 9: ESTIMATION OF TRANSITION PROBABILITIES

	Probability of a transition from living independently to .... rather than staying.		
	With Children	With Others	Insti-tution
CONST	4.540 (0.3)	-2.332 (-0.1)	-6.912 (-0.6)
YEAR	-0.074 (-0.4)	-0.078 (-0.3)	-0.020 (-0.2)
AGE	0.001 (0.1)	0.036 (1.1)	0.084 (4.9)
FEMALE	-0.849 (-2.5)	0.760 (1.1)	-0.202 (-0.7)
FKIDS	0.197 (1.7)	0.116 (0.6)	0.050 (0.6)
MKIDS	0.165 (1.3)	-0.415 (-1.6)	-0.030 (-0.3)
MARRX	0.902 (3.6)	1.040 (3.0)	0.457 (1.8)
ADLX	0.114 (3.7)	0.101 (2.2)	0.152 (7.3)
INCOME	-0.154 (-2.9)	0.044 (1.6)	-0.170 (-4.4)

Goodness of Fit: RHO=0.7175, PCP=89.33

Source: HRCA Survey of the Elderly (sample consists of 1800 transitions from living independently)

Table 10: CHILDREN-VARIABLES: CROSS-SECTIONAL ESTIMATES 1986

	Without Children		Elderly With Children					
	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)
(a) HEALTH MEASURE: ILLSUM								
CONST	-3.101	-6.402	-1.346	-4.308	-13.140	-1.865	-4.479	-13.257
	(-1.3)	(-2.4)	(-1.5)	(-2.0)	(-7.6)	(-2.0)	(-2.0)	(-7.6)
FEMALE	0.958	-0.320	-0.282	-0.519	0.037	-0.328	-0.526	0.069
	(1.5)	(-0.6)	(-1.6)	(-1.3)	(0.1)	(-1.8)	(-1.3)	(0.2)
AGE	-0.007	0.066	0.015	0.031	0.129	0.016	0.031	0.131
	(-0.3)	(2.3)	(1.5)	(1.2)	(7.1)	(1.5)	(1.2)	(7.1)
FKIDS	—	—	—	—	—	0.238	0.096	-0.060
						(4.1)	(0.6)	(-0.6)
MKIDS	—	—	—	—	—	0.163	0.026	-0.088
						(2.7)	(0.2)	(-0.9)
MARRIED	-9.563	0.176	-0.611	-17.940	-0.757	-0.653	-18.064	-0.726
	(-0.2)	(0.3)	(-3.0)	(-0.4)	(-1.9)	(-3.2)	(-0.4)	(-1.8)
ILLSUM	0.054	0.208	0.033	-0.046	0.295	0.029	-0.047	0.302
	(0.7)	(2.8)	(1.2)	(-0.6)	(7.6)	(1.0)	(-0.6)	(7.6)
INCOME	0.004	-0.168	-0.032	0.041	-0.057	-0.032	0.041	-0.059
	(0.1)	(-2.6)	(-2.5)	(2.0)	(-1.9)	(-2.5)	(2.0)	(-2.0)
	RHO=0.442, PCP=77.10		RHO=0.384, PCP=65.11			RHO=0.3931, PCP=65.27		
(b) HEALTH MEASURE: ADLSUM								
CONST	-3.048	-0.881	-0.093	-3.570	-5.587	-0.677	-3.731	-6.183
	(-1.2)	(-0.3)	(-0.1)	(-1.6)	(-2.7)	(-0.7)	(-1.6)	(-2.9)
FEMALE	1.242	-0.845	-0.391	-0.644	-0.316	-0.428	-0.642	-0.282
	(1.6)	(-1.2)	(-2.2)	(-1.6)	(-0.8)	(-2.3)	(-1.6)	(-0.7)
AGE	-0.020	-0.025	-0.003	0.016	0.015	-0.001	0.017	0.025
	(-0.7)	(-0.7)	(-0.2)	(0.6)	(0.7)	(-0.1)	(0.6)	(1.1)
FKIDS	—	—	—	—	—	0.240	0.060	-0.265
						(4.0)	(0.4)	(-2.2)
MKIDS	—	—	—	—	—	0.166	0.017	-0.067
						(2.8)	(0.1)	(-0.5)
MARRIED	-9.648	-1.317	-0.697	-21.136	-1.636	-0.731	-21.293	-1.736
	(-0.2)	(-1.6)	(-3.4)	(-0.4)	(-3.3)	(-3.5)	(-0.4)	(-3.4)
ADLSUM	0.129	0.360	0.095	0.092	0.400	0.090	0.093	0.415
	(3.5)	(7.5)	(6.0)	(2.5)	(13.8)	(5.5)	(2.5)	(13.6)
INCOME	0.014	-0.019	-0.023	0.053	-0.024	-0.024	0.053	-0.022
	(0.4)	(-0.3)	(-1.9)	(2.6)	(-0.6)	(-1.9)	(2.6)	(-0.6)
	RHO=0.561, PCP=81.92		RHO=0.472, PCP=71.71			RHO=0.4833, PCP=72.10		

Source: HRCA Survey of the Elderly, 1986 Cross-section.

Table 11: YOUNGER OLD AND OLDEST OLD: CROSS-SECTIONAL ESTIMATES 1986

	Age 64-83			Age 84+		
	P(2/1)	P(3/1)	P(4/1)	P(2/1)	P(3/1)	P(4/1)
(a) HEALTH MEASURE: ILLSUM						
CONST	0.507	-2.961	-11.956	-3.744	-13.791	-10.838
	(0.4)	(-1.2)	(-3.6)	(-1.4)	(-3.3)	(-4.0)
FEMALE	-0.244	0.028	-0.004	-0.600	0.078	-0.139
	(-1.1)	(0.1)	(0.0)	(-2.2)	(0.1)	(-0.4)
AGE	-0.032	0.021	0.112	0.042	0.123	0.111
	(-2.0)	(0.7)	(2.8)	(1.4)	(2.6)	(3.7)
FKIDS	0.281	-0.287	-0.151	0.500	-0.024	0.116
	(3.8)	(-1.5)	(-1.0)	(5.5)	(-0.1)	(1.1)
MKIDS	0.362	-0.419	0.086	0.188	-0.161	-0.133
	(4.8)	(-2.1)	(0.6)	(2.1)	(-0.7)	(-1.2)
MARRIED	-0.396	-11.994	-1.036	-0.923	-23.947	-0.266
	(-1.6)	(-0.2)	(-2.0)	(-2.3)	(-0.5)	(-0.6)
ILLSUM	0.049	-0.104	0.261	0.061	0.123	0.337
	(1.4)	(-1.5)	(4.9)	(1.4)	(1.5)	(6.9)
INCOME	-0.020	0.001	-0.010	-0.094	0.066	-0.169
	(-1.5)	(0.0)	(-0.3)	(-2.9)	(2.6)	(-3.9)
	RHO= 0.4830, PCP= 74.00,			RHO= 0.3200, PCP= 59.88		
(b) HEALTH MEASURE: ADLSUM						
CONST	1.288	-2.785	-7.829	-0.523	-8.936	3.164
	(1.0)	(-1.1)	(-2.0)	(-0.2)	(-2.1)	(0.8)
FEMALE	-0.306	0.026	-0.495	-0.714	0.056	-0.577
	(-1.3)	(0.1)	(-0.9)	(-2.5)	(0.1)	(-1.2)
AGE	-0.042	0.011	0.049	0.003	0.063	-0.073
	(-2.5)	(0.3)	(1.0)	(0.1)	(1.3)	(-1.7)
FKIDS	0.309	-0.288	-0.407	0.473	-0.129	-0.028
	(4.1)	(-1.5)	(-2.1)	(5.1)	(-0.6)	(-0.2)
MKIDS	0.354	-0.413	0.203	0.195	-0.231	-0.154
	(4.7)	(-2.1)	(1.1)	(2.1)	(-1.0)	(-1.0)
MARRIED	-0.425	-11.994	-2.214	-1.164	-25.515	-1.372
	(-1.7)	(-0.2)	(-3.4)	(-2.8)	(-0.4)	(-2.2)
ADLSUM	0.077	0.037	0.375	0.107	0.176	0.453
	(3.4)	(0.9)	(9.8)	(4.5)	(4.7)	(11.8)
INCOME	-0.019	0.008	0.020	-0.079	0.071	-0.170
	(-1.5)	(0.3)	(1.9)	(-2.4)	(2.7)	(-3.0)
	RHO= 0.5419, PCP= 76.66,			RHO= 0.4628, PCP= 70.57		

Source: HRCA Survey of the Elderly, 1986 Cross-section.