Mary Beth Ofstedal, Zachary Zimmer, Grace Cruz, Angelique Chan,
and Yu-Hsuan Lin

Self-Assessed Health Expectancy Among Older Asians: A Comparison of Sullivan and Multistate Life Table Methods

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Comparative Study of the Elderly in Asia

This series of research reports deals with the status of the elderly in several Asian countries. The series was initiated in 1989 under a broad project sponsored by the U.S. National Institute on Aging (Grant No. AG07637) and directed by Albert I. Hermalin.

This particular report presents research that was conducted under a parallel R01 grant from the National Institute on Aging, A Comparative Study of Aging and Health in Asia (AG20063-01 and AG20072-01). This is a multi-country collaborative study whose overall goal is to describe and analyze health transitions and health care utilization patterns in four Asian countries undergoing rapid population aging and social and economic change. The project uses existing longitudinal survey data from five Asian settings: Taiwan, the Philippines, Singapore, Indonesia, and China.

Organizations collaborating in this research include the Population Council, New York; the Population Institute, University of the Philippines; the Department of Sociology, National University of Singapore; the Bureau of Health Promotion, Department of Health, Taichung, Taiwan; the Beijing Geriatric Clinical and Research Center, Beijing, China; and the Nihon University Population Research Institute, Tokyo, Japan.

For additional information on this research project, please visit the project website: http://aha.psc.isr.umich.edu or contact the Principal Investigator: Mary Beth Ofstedal, Population Studies Center, University of Michigan, PO Box 1248, Ann Arbor, MI 48106-1248, USA.

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Population Studies Center, University of Michigan
PO Box 1248, Ann Arbor, MI 48106-1248 USA

Self-Assessed Health Expectancy Among Older Asians:

A Comparison of Sullivan and Multistate Life Table Methods

Mary Beth Ofstedal, Population Studies Center, University of Michigan

Zachary Zimmer, Population Council

Grace Cruz, Population Institute, University of the Philippines

Angelique Chan, Department of Sociology, National University of Singapore

Yu-Hsuan Lin, Bureau of Health Promotion, Department of Health, Taiwan

Abstract:
Self-assessed health has been found to be a strong predictor of changes in health and of mortality and has been included in many surveys of health and aging around the world. In this paper, we estimate expectancies in self-assessed health and compare these among older adults across four Asian settings (the Philippines, Taiwan, Singapore and Indonesia), making use of data from several national panel surveys conducted in the mid to late 1990s. All of these societies are undergoing rapid population aging and social and economic change, and there is much concern among policymakers about of the potential implications for future disease burden and associated informal and formal care demands. Yet, very little health expectancy research has been conducted in these settings. This paper is the first of a series of planned health expectancy analyses based on these panel surveys that will focus on alternative indicators of physical and mental disability. In the current analysis, self-assessed health is dichotomized into categories reflecting negative health ratings (e.g., poor/not good at all) versus positive or neutral health ratings (excellent to good/average/fair). In the first stage of the analysis we calculate health expectancy using the Sullivan method based on data from a single wave of each survey to compare trends in self-assessed expectancies by age and sex across settings. In the second stage we take advantage of the panel data by calculating health expectancy using multistate life table methods and compare these estimates with the Sullivan estimates. Results suggest that despite differences in the proportion reporting negative health across settings, patterns by age and sex are similar. Sullivan and multistate estimates also compare closely, except for Singapore, where there are very large transition rates from favorable to negative self-assessed health over the survey period.

Datasets used:

- Philippine Survey of the Near Elderly and Elderly, 1996-2000
- National Survey of Senior Citizens in Singapore, 1995-1999
- Indonesian Family Life Survey, 1993-1997
- Taiwan Survey of Health and Living Status of the Middle-Aged and Elderly, 1996-1999

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Introduction

In this paper, we make use of data from national panel surveys of older adults in several Asian settings (the Philippines, Taiwan, Singapore and Indonesia) conducted in the mid to late 1990s to estimate expectancies in self-assessed health and compare these across settings. The aims of this comparison are threefold: 1) to estimate in a general way the years of life older adults in the four Asian societies can expect to live in self-assessed healthy and unhealthy states; 2) to assess whether patterns in self-assessed health expectancies by age and sex are similar across the four settings, and; 3) to evaluate the usefulness of self-assessed health as a measure for comparative studies of health expectancy.

Comparative analyses are the basis of much gerontological research on health. Most often comparisons are made across subgroups within a given population. For instance, it is common for researchers to compare health across subgroups defined by age, sex, race/ethnicity and other factors that are considered to be important for differentiating across groups. Another type of comparative analysis focuses on comparisons across countries or populations, although these are less common in the literature. The value of cross-country comparisons for understanding the variations in older adult health across socio-demographic characteristics was recognized decades ago (Burgess, 1960; Cowgill, 1972), but the lack of such analyses over time has led to a reemphasis of its importance in a number of more recent publications (Albert and Cattell 1994; Bengtson et al. 2000; Chi, Chappell and Lubben 2001; National Research Council 2001). These publications have underscored several advantages to comparative research, which include enhancing our ability to understand variations in underlying dynamics of aging, improving the sense of generalizability of observations made in specific national contexts, and raising questions about the universality and alternatively the uniqueness of the aging experience. A number of hypotheses relating to associations between age, gender and socioeconomic status on one hand and health on the other, are often assumed to be universal without rigorous testing across environments. In the current study, we examine whether self-assessed health expectancies decline with age, as would be expected with most health measures, and whether the age patterns and gender differences in these patterns are consistent across the different settings.

One of the reasons for the lack of cross-country research on health and aging is that it is rare to find data that are comparable across countries. In particular, surveys that collect information on the health of older adults in developing settings are not abundant. Researchers who are interested in health and aging in developing societies need often rely on surveys that have been conducted at different time points, by separate research organizations, and using different ways of measuring health. In the current study we draw on a set of surveys of older persons in several Asian societies that were conducted at similar points in time, several of which were designed collaboratively. All of the surveys included a measure of self-assessed health, though there are some differences in question wording that may result in differences in interpretation and/or reporting. In addition, the comparability of the self-assessed health measure across cultures has not been adequately investigated, and there may be cultural variation in the interpretation of the question and response categories, as well as in how people evaluate their health (Ferraro and Kelley-Moore, 2001; Jylha et al., 1998; Su and Ferraro, 1997). For these reasons, our focus in this paper is on age and sex patterns of self-assessed health and how these patterns compare across settings, rather than on a comparison of specific levels of self-assessed health across settings.

All of the settings we examine in this study, like most in East and Southeast Asia are undergoing rapid population aging (Kinsella, 2000). This has caused concern among policymakers about of the potential implications for future disease burden and associated informal and formal care demands (Hermalin, 1995; Philipps, 2000). Some estimate that that demand for health care is

likely to escalate at an unprecedented pace in countries that are aging most rapidly, placing a burden on the health infrastructure, as well as on government resources and ultimately society (Mayhew, 1999). By providing estimates of the years that individuals can expect to spend in healthy and unhealthy states, health expectancy research can be valuable for estimating the demands for future care. Yet, little research of this type has been conducted in the rapidly aging societies of Asia, particularly using a comparative perspective.

Most studies of active life expectancy or health expectancy have focused on fairly objective measures of health, such as impairment or disability in functional tasks, or presence of a specific chronic disease. Self-assessed health is a much more global and subjective measure of health status, incorporating aspects of cognitive and emotional health, as well as physical health status. Yet, self-assessed health can provide valuable insights into the needs of an aging society. Perceptions of health, such as those that are obtained in self-assessed health survey items, may be as much, if not more of an impetus for help seeking, be it from a health professional or assistance at home from a relative or friend. Hence, self-assessed health may be a particularly important indicator of the potential demand for health services and long-term care needs of the elderly population. Furthermore, despite its subjective nature, self-assessed health has been found to be strongly associated with other more objective physical health indicators in many settings around the world, including those under study (Idler and Benyami, 1997; Jylha et al., 1998; Zimmer et al. 2000). Self-assessed health has also been shown to be a strong predictor of mortality, even controlling for physical health (Idler and Angel, 1990; Idler and Benyamini, 1997).

The subjective nature of the measure presents both advantages and disadvantages for cross-country comparisons. On one hand, self-assessed health may be less prone to problems of comparability due to differing levels of knowledge or awareness of specific health conditions than other health measures used in surveys (e.g., reports of chronic conditions, which often require physician diagnosis). On the other hand, the subjective nature of the measure opens up room for differences in question interpretation (what is the meaning of 'health' and/or what aspects of health are taken into account in an individual's rating?), as well as referent groups that are used as the basis for rating one's own health.

The major advantage of self-assessed health for comparative analysis is that it is one of the most widely used measures of health in surveys around the world. Although the exact wording of self-assessed health questions may differ, most can be divided into categories that represent poor health and those that represent better than poor health, and this allows for at least some measure of comparison across very diverse settings. Hence, self-assessed health provides a good starting point for comparisons of health expectancies across settings for which previous research of this nature has not been conducted.

Methods

Data

The data used in this paper come from panel surveys of older adults in each of the four settings. These surveys represent the first longitudinal surveys of the older population in these settings. Indonesia, Singapore and Taiwan data are nationally representative, and Philippine data is representative of two sizable regions, the greater Manila area and a large rural region in the north (Visayas).

Table 1 provides information on the survey names, dates, age range and size of the sample for each of the surveys. All four span a period of at least 3-4 years during the mid to late 1990s and, with the exception of Taiwan, have conducted two waves of interviews. The numbers in parentheses

in the second row for Taiwan indicate that the Taiwan panel extends back in time for part of the cohort. Specifically, those who were age 67 or older in 1996 were part of the original panel study that began in1989 with a cohort of then 60-plus year olds. In 1996 the original panel was refreshed and expanded to include a new group of respondents age 50-66. In this analysis we use data from the 1996 and 1999 waves of the Taiwan survey. The analyses focus on respondents aged 55 or older in the four settings.

This paper is the first of a series of planned health expectancy analyses based on these Asian panel surveys. Others will focus on alternative indicators of physical and mental impairment and disability. The current analysis uses a survey item for each setting that asked respondents to rate their overall health at present on a scale (either 4-point or 5-point) ranging from excellent or very good to poor. The precise wording and response categories used in each setting differed slightly. Table 2 shows the English translation of the questions and response categories. We dichotomized the self-assessed health measure into two broad categories that reflect positive or neutral health ratings (excellent to good/average/fair) versus negative health ratings (e.g., not good/poor). (Categories used to define the positive or neutral ratings are highlighted in bold in Table 2.) We hereafter refer to the positive or neutral ratings as healthy self-assessments, and the negative ratings as unhealthy or poor self-assessments.

Analysis

The main part of the analysis uses the Sullivan method for determining the years expected to be spent in self-assessed healthy and unhealthy states. The Sullivan method partitions expected life expectancy into different states of health based on the distributions within a population at a single point in time (Sullivan, 1971). Therefore, the Sullivan method reflects the current health of a real population adjusted for mortality levels (Jagger, 1999). Here, we use age and sex-specific distributions of self-assessed health from the baseline survey waves to calculate healthy versus unhealthy self-assessed health expectancy for each setting. Age is collapsed into 5-year groups from age 55-59 through the top category of 85+. Age has a strong linear effect on self-assessed health in each setting. Our figures that plot results by age use midpoints of age groups for point estimates and smooth plotted lines between midpoints. We also smoothed the distributions on the self-assessed health measure prior to calculating the Sullivan health expectancies. Life expectancy estimates used in the Sullivan method calculations come from abridged life tables for each setting for the baseline survey year or, in the case of the Philippines, the closest year available (1990). (See Appendix for sources and details on estimation methods for life expectancies and predicted probabilities of healthy and unhealthy self-assessed health for use in Sullivan calculations.)

In the last stage of the analysis we draw on the panel data and use a multistate life table method for calculating health expectancies. The specific program we used is 'Maximum Likelihood Computer Program using Interpolation of Markov Chains' (ImaCH), which was developed by Nicholas Brouard and colleagues (Brouard and Lièvre, 2002) using methodologies pioneered by Laditka and Wolf (1998). We use the same dichotomized measure of self-assessed health and add mortality as a possible outcome at wave 2. Thus, there are three possible transitions from each state of origin, for a total of six transitions: healthy to healthy, unhealthy, and dead; unhealthy to healthy, unhealthy, and dead.

Because IMaCH assumes that the transition rates for non-respondents are proportionate to those for respondents who are observed at both waves (based on age, sex and origin state), we imputed self-assessed health status for Wave 2 for non-respondents *who were known to be alive at follow-up*. This assured that these non-respondents would not be assigned a non-zero probability of dying during the interval. For Indonesia and Singapore it was necessary to impute a date of death (we used

half the average interval length as the time to death) and for Singapore exact dates of interview were not recorded, so we used the mid-point of the field period for each wave. (See Appendix for more information on use of IMaCH and the multistate technique.)

Results

Baseline and follow-up self-assessed health reporting across settings

Table 3 presents the percent of respondents who report negative self-assessed health at baseline for each sample. The results here indicate that there is a fair degree of difference in responses across the settings. For example, for the total population, the proportion of Taiwanese elderly who report negative self-assessed health is twice as high as that of Philippine elderly. The reason for the variation across settings is not easy to determine, but there are several possible explanations. First, despite our attempt to use broad categories, there are differences in wording that could result in variation in the percent reporting poor health across surveys. We consider this a likely possibility. In addition, there are other potential explanations, including cultural differences in how individuals respond to survey questions, differences in population distributions, such as age and sex, and real differences in health across societies. As noted earlier, we are less interested in differences in the percentage who report poor health than we are in associations of self-assessed health with age and sex and how these associations compare across settings.

Despite differences in baseline levels reporting poor self-assessed health, Table 4 shows that in each setting follow-up status is very much dependent upon baseline status. For instance, the percent that have poor health at follow-up is much higher among those reporting poor health at baseline. In addition, the percent that die in every setting is at least twice as high for those reporting poor health at baseline compared to those reporting good health. For instance, in the Philippines, 19 percent of those reporting healthy self-assessed health and 41 percent of those reporting unhealthy self-assessed health at baseline died before the follow-up. On the other hand, there is a substantial amount of movement between these health states, indicating some instability to the measure. For instance, the percent reporting poor health at time 1 who then report good health at time 2 is as high as 43 percent in Indonesia.

In Singapore, the overall proportion reporting poor health increased substantially over time, and the increase was much more marked than in the other settings. In Indonesia, the Philippines and Taiwan, the percent reporting poor health, if one eliminates those who died, increased by about 3 to 4 percentage points. We naturally expect some increase in poor health between the baseline and followup waves since the sample is aging. In Singapore, however, the proportion increased from 18 to 42 percent, an increase that seems quite high, especially in comparison to the other settings. Furthermore, of those reporting good health at baseline in Singapore, a full one-third report poor health at follow-up. The reason for this dramatic increase in poor self-assessed health is unclear, but the result may suggest some instability in the measure.

Life and health expectancies across settings

Figure 1 compares expectations using published reports for life expectancy and using Sullivan calculations to estimate years spent healthy and unhealthy across the four settings. Life expectancies across the four settings range between 20 and 25 years for those aged 55, with Taiwan and Singapore having higher life expectancies than Indonesia and the Philippines. Despite differences in the proportion reporting unhealthy self-assessed health across settings, healthy life

expectancy at age 55 far outweighs unhealthy life expectancy in all settings. While the former declines steadily with age, the latter remains stable across the settings. The result is that in each setting, those who live to about 80 or older can expect to live almost equal amounts of time with healthy and unhealthy self-assessed health. These patterns are quite similar to those observed in previous studies using measures of physical functioning and disability (Lamb, 1999).

Age and gender comparisons

Figure 2 compares the years of healthy life remaining for males and females by age across settings. There is a small amount of variation in healthy years across settings at age 55, ranging from about 15 to 19 for males and from about 17 to 21 for females. The declines in healthy years by age are consistent across settings, and by age 80 and older very little variation remains. By age 85, the expectation is for about 3 years of self-assessed healthy life for both men and women in all four settings.

Figure 3 shows the percent of remaining life that is expected to be spent in a healthy self-assessed health state. The results show substantial declines by age in all four settings. At age 55, men are expected to live between 79 percent (Taiwan) and 93 percent (Philippines and Singapore) of their remaining life in a self-assessed healthy state. For women, the range is from 70 percent (Taiwan) to 89 percent (Philippines). By age 85 the percent ranges from a high of 72 for men in Singapore to a low of 49 for women in Taiwan. Declines in the proportion of life spent healthy by age are fairly consistent across settings.

In order to compare life expectancy, healthy life expectancy, and the percent of life spent healthy by gender, Table 5 lists female to male ratios for these statistics. Because women tend to live longer than men, life expectancy ratios are greater than 1.0 in all settings at all ages. The ratio is consistently about 1.1 to 1.2. In other words, at all ages in all settings, life expectancy is 10 to 20 percent higher for women than it is for men.

In general, the sex ratios for healthy life expectancy are a little lower. For instance, in Singapore, life expectancy ratios are about 1.2 until age 75, while health expectancy ratios until age 75 are about 1.1. Thus, women still have an advantage, but their advantage is greater for overall life than it is for self-assessed healthy life. The third ratio corresponds to the percent of life spent healthy. In all cases, except at older ages in the Philippines, these ratios are under 1.0, meaning that the advantage in percent of life in a self-assessed healthy state goes to men. The ratios are just under 1.0 in Indonesia and Singapore, and quite a bit under 1.0 in Taiwan. Hence, the male advantage is greatest in Taiwan.

In sum, women are advantaged relative to men with respect to overall years of life and health expectancy in all four settings. This advantage remains fairly stable as age increases. With respect to percent of remaining life spent in a self-assessed healthy state, however, men have the advantage, except in the Philippines where there is little difference by sex.

Comparison of Sullivan and multistate techniques

The results so far have utilized the Sullivan method, which determines healthy life expectancies using measures at a single point in time. The Sullivan method is 'proportional' in that the amount of time spent in various states is assumed to be equal to the proportion reporting being in those states at one stationary point in time. This assumption can be advantageous when dealing with cross-sectional data that does not allow estimates of transition probabilities, and dealing with an outcome that is unstable or prone to large fluctuations across measurements. Although we have prospective panel data on which we can draw, we have some concerns about the stability of the self-assessed measure given that it is subjective and may be influenced by small changes in health or

question wording. Table 2 above showed that there is substantial movement in and out of states of poor health when using this measure, and that this fluctuation is much greater in some settings than in others. Hence, it is possible that there is greater and less consistent movement over time than one would expect to find using other types of health measures, such as functional limitations or chronic conditions.

All of this suggests that the Sullivan method may be preferable over multistate methods that utilize transition probabilities to determine health expectancies based on self-assessed health. Nonetheless, in order to assess whether the Sullivan results are consistent with those obtained under an alternate method, we used the IMaCH program to estimate life and self-assessed healthy life expectancies across settings using a multistate life table technique. Results from both methods are presented in Figure 5.

Focusing first on results for Indonesia, the Philippines and Taiwan, it appears that the Sullivan and multistate techniques provide fairly consistent estimates. Total life expectancy is slightly higher using the multistate technique in Indonesia and Taiwan and slightly lower in the Philippines. (Note that multistate estimates of total life-expectancy will differ from published results because they are estimated from a sample rather than the entire population, and also because they are influenced by the observed transition rates in the health measure under study.) Both the number and proportion of years spent in a healthy (or unhealthy) self-assessed state are generally comparable across the two methods for Indonesia, the Philippines and Taiwan. The multistate life table method produces slightly larger estimates of time spent in an unhealthy state than the Sullivan method, but the estimates are quite close across most age groups. Finally, the years spent in a healthy self-assessed state declines fairly sharply with age in the three settings under both methods.

In Singapore, except for the 55 to 59 age group, life expectancy estimates using the two techniques are very similar. But, there are substantial differences in the healthy life expectancy estimates, which serve to highlight the difference in the two methods. The multistate technique produces substantially lower estimates of the amount of time spent in a self-assessed healthy state across all age groups. The reason for this discrepancy is that the proportion of the population reporting poor self-assessed health in Singapore increased dramatically between time 1 and time 2. Since multistate techniques are based on Markov chain transitions, the relative distribution of health at wave 2 has a large influence on the estimates of time spent in different states.

As noted above, the reason that the proportion with poor health ratings changes so dramatically in Singapore is still unclear. We are examining the possibility of a subtle change in question wording in one or more of the translations (Chinese, Malay, Indian) that was not reflected in the English translation, or to the way in which the item was administered (e.g., whether response categories were read aloud in one wave but not the other, or whether different probes were used). In any case, the results seen for Singapore illustrate the difficulty in using the multistate method for a measure that can be erratic over time.

Conclusion

In this paper we examined age and gender patterns in self-assessed health expectancy in four Asian settings and compared these patterns across the settings. We focused primarily on the Sullivan method for calculating health expectancies using data from a single wave (generally the baseline wave) of the panel surveys. However, for comparison purposes, we also made use of the panel data to calculate health expectancies by means of a multistate life table method.

The age and gender patterns in self-assessed health expectancy are quite similar across settings and are consistent with previous research in other societies based on different indicators of

health and morbidity. The similarity of patterns across settings is interesting given the striking variation in underlying levels of self-assessed health observed in Table 3 and more general concerns regarding the comparability of the measure across settings. In all settings there is a substantial decline with age in the number of years of life lived in a healthy state for both men and women, but little change in the number of years lived in an unhealthy state. In the youngest age group the proportion of remaining life that is expected to be spent in a self-assessed healthy state ranges from 70 percent to just over 90 percent depending on location and gender, and this proportion declines in a similar fashion across the settings by age. By age 85, the number of years expected to be spent in healthy states is similar in all settings.

At all ages, women live longer than men, and they also live longer in a healthy self-assessed state than men. If we consider the proportion of remaining life spent in a healthy state, however, men have the advantage. One exception to this is in the Philippines where there is essentially no difference by sex in the proportion of healthy life.

Expectancy estimates derived from Sullivan and multistate life table methods were quite similar for three of the four settings, both in terms of overall life expectancy and the amount of remaining life that is spent in a healthy versus unhealthy state. The exception is Singapore, for which there are dramatic differences in estimates between the two methods. This difference results from the extraordinarily high transition rate into unhealthy self-assessed health that occurred between the two survey waves. We are investigating possible reasons for this pattern, including subtle changes in question wording or administration between waves or a serious selectivity bias of the follow-up sample.

With respect to the question of the utility of self-assessed health for comparative studies of this nature, the results are encouraging. The patterns in self-assessed health expectancies by age and sex were both as expected and consistent across the diverse settings. In three of the four samples, the results were similar across calculation methods (Sullivan versus multistate), despite substantial differences in baseline levels of poor self-assessed health across the samples. As noted previously, self-assessed health is an effective summary measure of population health in that it has been shown to be highly predictive of mortality and other changes in health. It is also a widely used measure and one of few that is included in many surveys around the world, so the potential for comparative analysis is great.

Yet there are clearly limitations. The results for Singapore when comparing Sullivan and multistate methods point to the potential erratic tendencies of the measure, and this may be a result of the subjectivity and volatility of self-assessments in health. In addition, differences in question wording and response categories and potential cultural variation in the way health is viewed across settings makes comparisons of the *level* of health expectancy problematic. As a next stage in our analysis of health expectancy we plan to utilize more objective measures of health that are available in the surveys, such as functional limitation and chronic conditions, and compare patterns of health expectancy based on those measures with those based on the self-assessed measure.

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Table 1: Description of surveys

Survey	Interview years	Age range (baseline)	Sample size
Indonesian Family Life Survey	1993, 1997	50+ (senior sample)	2800
Philippine Survey of the Near-Elderly and Elderly	1996, 2000-2001	50+	710
National Survey of Senior Citizens in Singapore	1995, 1999	55+	4750
Taiwan Survey of Health and Living Status of the Middle-Aged and Elderly	1996, 1999 (1989, 1993)	50+ (60+)	4095 (4049)

Table 2: Self-assessed health question wording and response categories

Setting	Question text	Response categories
Indonesia	In general, how is your health at this time?	**1=Very healthy** **2=Somewhat healthy** 3=Somewhat unhealthy 4=Unhealthy
Philippines	How would you rate your health at the present time? Would you say it is:	**1=Excellent** **2=Very good** **3=Good** **4=Fair** 5=Poor
Singapore	How would you rate the state of your health at present? Would you say it is:	**1=Very good** **2=Good** 3=Not too good 4=Poor
Taiwan	Regarding the state of your health, would you say it is:	**1=Excellent** **2=Good** **3=Average** 4=Not so good 5=Poor

Table 3: Percent reporting negative health ratings at baseline by age, sex and setting

		Indonesia	Philippines	Singapore	Taiwan
Both sexes		23.1	17.1	14.8	30.0
	Age 55-64	20.0	12.1	10.4	26.6
	65-74	27.0	16.9	18.1	31.5
	75 +	32.9	29.8	22.4	36.3
Males		23.5	15.4	11.8	24.9
	Age 55-64	20.7	10.7	6.7	21.8
	65-74	26.1	14.5	17.7	26.8
	75 +	32.2	32.5	19.1	28.4
Females		22.8	18.3	17.4	35.8
	Age 55-64	19.3	14.0	14.0	31.5
	65-74	28.1	17.6	18.4	38.0
	75 +	33.7	28.0	24.7	44.9
N		2,800	710	4,750	4,095

Table 4: Follow-up self-assessed health status by originating status

		Follow-Up Status			
Setting	Baseline Self-Assessed Health	% Good	% Poor	% Died	Total
INDONESIA	Good (n=1,992)	72	20	8	100
	Poor (n=662)	43	36	21	100
PHILIPPINES	Good (n=522)	67	14	19	100
	Poor (n=104)	39	20	41	100
SINGAPORE	Good (n=2,681)	59	33	8	100
	Poor (n=576)	17	57	26	100
TAIWAN	Good (n=2,630)	73	21	6	100
	Poor (n=1,212)	38	48	14	100

Figure 1: Life and self-assessed health expectancies by age across settings

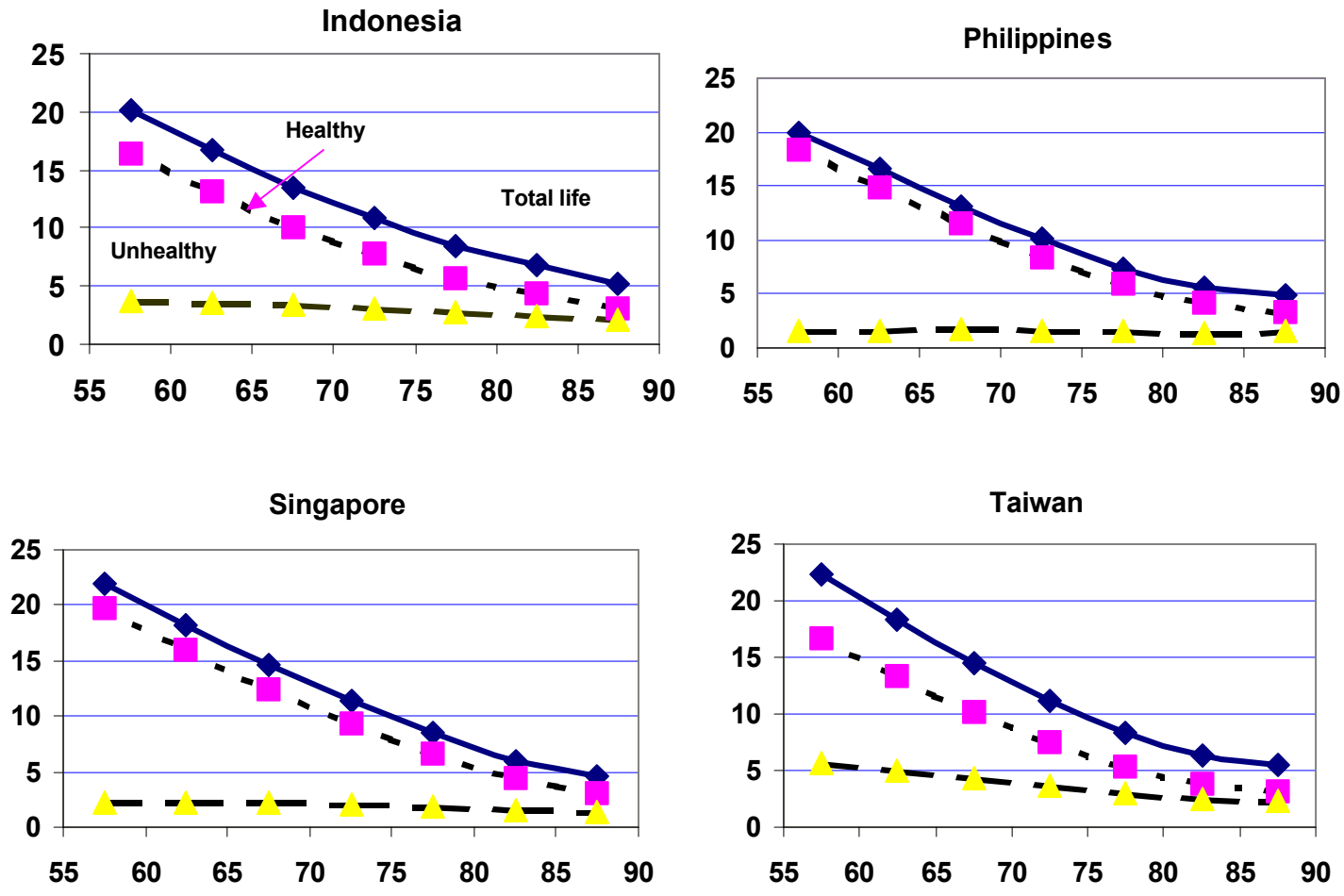


Figure 2: Expected self-assessed healthy years of life remaining for males and females across settings

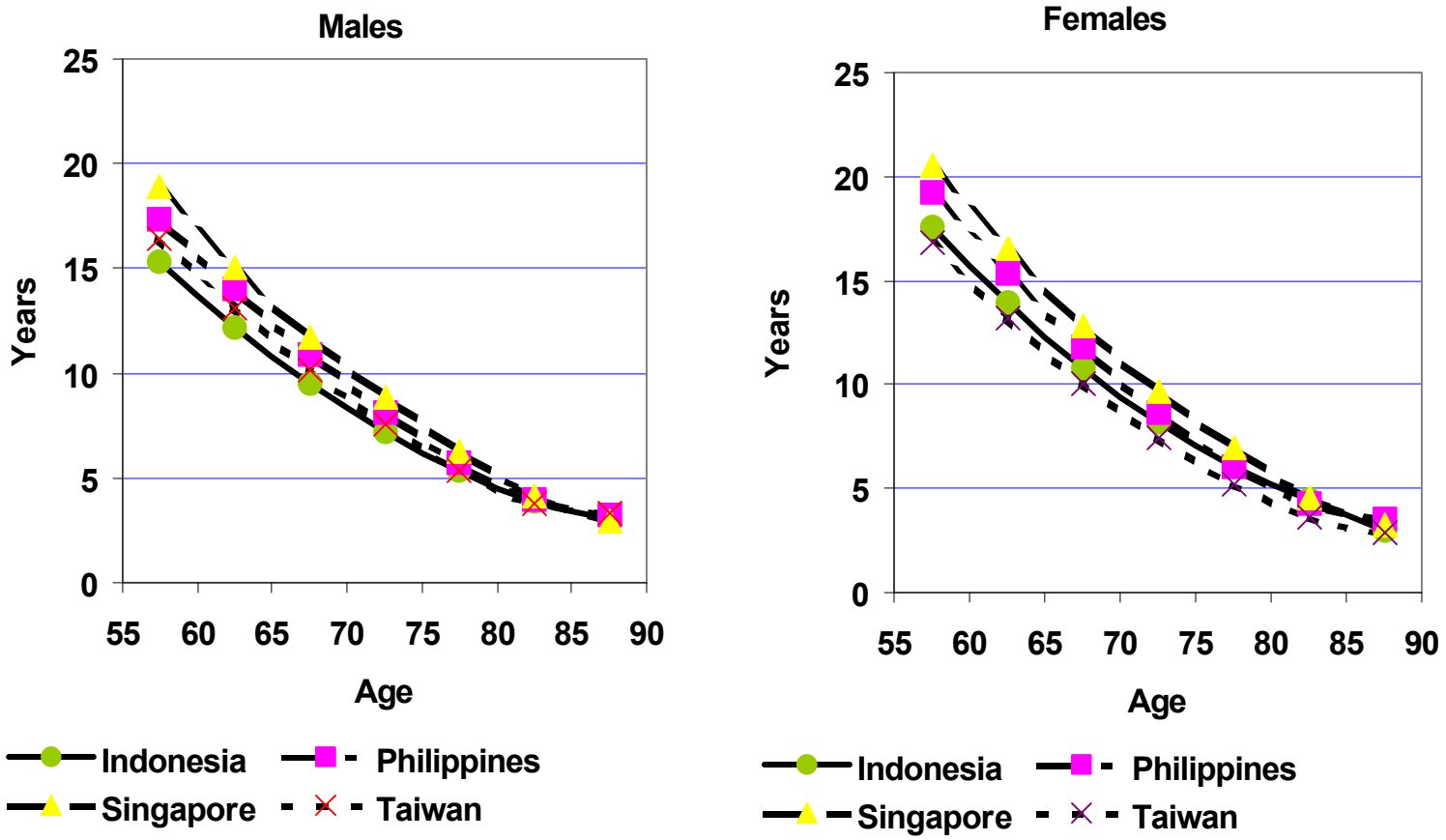


Figure 3: Percent of remaining life spent in healthy self-assessed state for males and females across settings

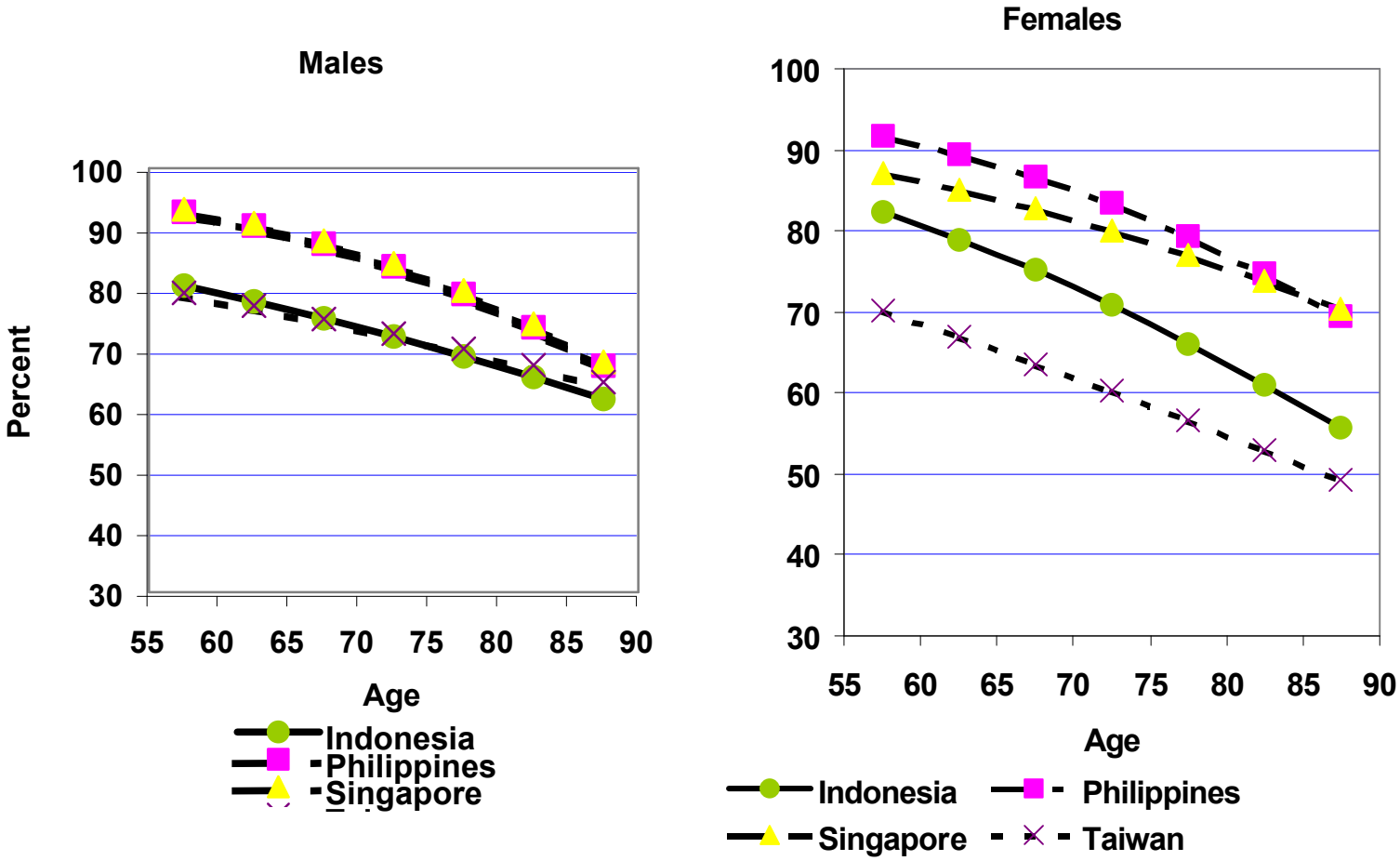
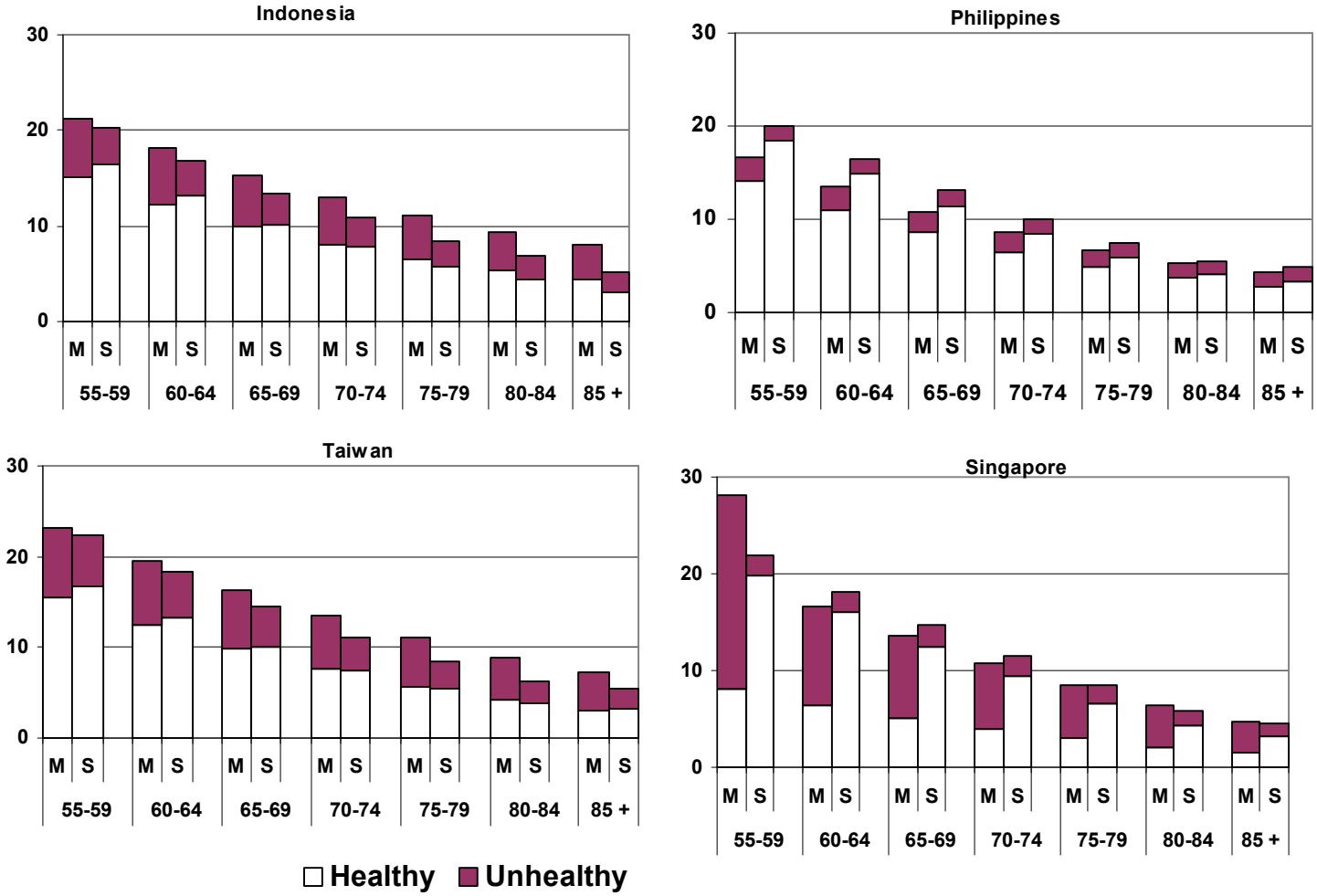


Table 5: Female to male ratios: Life expectancy, healthy years of life expected, and percent of years healthy

Setting	Measure	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85+
Indonesia	Life	1.12	1.13	1.14	1.16	1.19	1.22	1.10
	Healthy Life	1.15	1.12	1.12	1.13	1.15	1.16	1.04
	Percent Life Healthy	1.02	1.00	0.99	0.98	0.97	0.96	0.94
Philippines	Life	1.12	1.11	1.09	1.07	1.05	1.05	1.07
	Healthy Life	1.11	1.10	1.08	1.06	1.05	1.07	1.10
	Percent Life Healthy	0.99	0.99	0.99	1.00	1.00	1.01	1.03
Singapore	Life	1.16	1.17	1.17	1.16	1.15	1.10	1.05
	Healthy Life	1.09	1.10	1.10	1.10	1.11	1.09	1.08
	Percent Life Healthy	0.94	0.94	0.94	0.95	0.97	0.99	1.03
Taiwan	Life	1.16	1.16	1.17	1.19	1.22	1.21	1.12
	Healthy Life	1.02	1.01	0.99	0.99	0.98	0.95	0.85
	Percent Life Healthy	0.88	0.87	0.85	0.83	0.81	0.78	0.76

Figure 5: Comparing self-assessed life expectancies using multistate (M) and Sullivan (S) methods



Appendix

Life expectancy source data

Taiwan: Used sex-specific life expectancies for single years of age for 1996 (obtained from Taiwan Ministry of Interior). To obtain 5-year age grouping, took the simple average of life expectancy for each single age within the age group (e.g., $e_{55}+e_{56}+e_{57}+e_{58}+e_{59}/5$). To obtain life expectancy for both sexes combined for a given age group, took weighted average of male and female life expectancies for the age group, weighted according to the sex distribution as observed in the sample for that age group.

Philippines: Used sex-specific life expectancies for specific ages 55, 60, 65, 70, 75, 80, 85. Latest available life table with sufficient detail is from 1990 (Demographic Yearbook, 1999). To obtain estimate of life expectancy for 5-year age group, took the simple average of life expectancies for the two ages bordering the age group (e.g., for age 55-59 group: $e_{55}+e_{60}/2$). Life expectancy for the 85+ group is actually life expectancy at exact age 85 (this is all that was available in published sources). To obtain life expectancy for both sexes combined for a given age group, took weighted average of male and female life expectancies for the age group, weighted according to the sex distribution as observed in the sample for that age group.

Singapore: Used sex-specific life expectancies for specific ages 55, 60, 65, 70, 75, 80, 85 for the year 1995 (Demographic Yearbook, 1999). To obtain estimate of life expectancy for 5-year age group, took the simple average of life expectancies for the two ages bordering the age group (e.g., for age 55-59 group: $e_{55}+e_{60}/2$). Life expectancy for the 85+ group is actually life expectancy at exact age 85 (this is all that was available in published sources). To obtain life expectancy for both sexes combined for a given age group, took weighted average of male and female life expectancies for the age group, weighted according to the sex distribution as observed in the sample for that age group.

Indonesia: Used sex-specific life expectancies for age groups 55-59, 60-64, etc. from an abridged life table for the year 1993 (provided by the U.S. Census Bureau). To obtain life expectancy for both sexes combined for a given age group, took simple (unweighted) average of male and female life expectancies for the age group. There was no life expectancy estimate for those 85 and older, so these were estimated using model life tables for South East Asia (United Nations, 1982).

Predicting health expectancy proportions for Sullivan method

We smoothed proportions by predicting self-assessed health as a linear function of 5-year age group, first for the total population, then separately for males and females. Age heaping a problem in Indonesia, with heaping at decade and mid-decade years. The use of 5-year age groups helps alleviate this problem, but results may still be affected.

ImaCH calculations of health expectancy

Mortality information: Data on mortality was obtained exclusively through proxy-reports (of a family member, friend or neighbor) at the followup wave in Indonesia, the Philippines, and Singapore. Thus, for respondents who were not found or contacted at followup, their mortality status is unknown. In Taiwan, proxy reports of mortality are confirmed and vital status of other non-respondents is checked through the household registration system. Thus, persons who were not interviewed and not recorded as dead at followup are assumed to have been alive.

Imputation of Wave 2 self-assessed health: Self-assessed health at followup was imputed for Wave 2 non-respondents who were known to be alive. This affects all non-deceased non-respondents in Taiwan, and those in Singapore for whom the reason for non-participation at Wave 2 indicated an alive status (refusal by self or proxy, visiting overseas, too ill, etc.).

To impute Wave 2 status for these respondents we obtained age-sex-baseline health specific probabilities of reporting unhealthy self-assessed health (based on respondents who were observed in both waves). Wave 2 non-respondents with probabilities of .5 or higher were assigned 'unhealthy' SAH and those with probabilities less than .5 were assigned 'healthy' SAH.

Handling of missing information on dates: Input data needed include dates of birth, death, 1st and 2nd interview, in addition to sex, health status at each wave, and survey weight.

Taiwan and Philippines had requisite information for all dates (with minimal missing data).

Indonesia had dates of birth, 1st and 2nd interview, but no date of death. Deaths were assumed to occur halfway through the interval. The interval between interviews was 46 months on average. Thus, respondents who were reported to be dead at the follow-up wave were assigned a date of death 23 months following their first interview.

Singapore had date of birth only. Dates of the overall field period are known for the 1st and 2nd interviews, but not exact date of interview for individual respondents. All respondents were thus assigned the mid-point of these periods for their dates of interview. In 1995 the field period ran from April through September (with designated midpoint of 6/1995), and in 1999 from August through December (with designated midpoint of 10/1999). Date of death is handled as was done for Indonesia, by assigning a date of death halfway through the interval (8/1997). All respondents thus have the same date (month and year) of interview for each wave, and all deceased respondents have the same date of death.