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Elderly widowhood in China

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Abstract

A large group of elderly widowed individuals is emerging in China with the acceleration of population aging. In this article we employed 2010 census data to simulate widowhood indices. We found that the probability of elderly widowhood is 0.32 for males and 0.68 for females, with no difference between urban and rural areas. An average marriage in China lasts 47.55 years. After the death of a spouse, the average duration of widowhood is 11.24 years for males and 14.68 years for females. Spousal age

difference has a relatively significant impact on widowhood indices. The probability of widowhood is also noticeably different for urban and rural areas. Rural populations have the shortest marriage duration and the youngest widowhood age, but longer widowhood duration.

Keywords: widowhood, life table, marriage duration, widowhood age, widowhood duration

INTRODUCTION

The rapid aging of the Chinese population not only means an increase in the proportion and number of elderly people, but also has a major impact on population development and, consequently, on social advancement. One of the consequences of the rapidly increasing aging population in China is that a large number of elderly people will experience widowhood in the coming decades. In 2000, there were 12.21 million widowed men and 29.02 million widowed women over age 60, while in 2010, there were 14.19 million widowed men and 33.45 million widowed women over age 60, accounting for 26.89 percent of all over-60s (PCO, 2002, 2012). China's total widowed elderly population (60 years and older) is predicted to reach 118.40 million by 2050, with 23.91 million widowed elderly men and 94.49 million women (Wang and Ge, 2013a).

In China, a number of relevant indicators of widowhood, such as age and duration of widowhood, have not received sufficient attention. There are differences in certain widowhood indicators between genders. For example, the population of widowed women is larger than the population of widowed men, and the consequences of widowhood are also different between women and men. For elderly women, widowhood often means losing the main source of income or even certain types of social and familial status. Elderly widowed fathers are often more isolated from the outside world and have lower levels of emotional communication with their children (Zuo, 2011). There are also differences in certain widowhood indicators between urban and rural areas. For example, in rural areas of China, spouses are an especially

important source of social support, and social security is not well established; thus, the impact of widowhood duration is different for the urban and rural elderly.

Most recent research concerning the widowed elderly population focuses on the phenomenon of elderly widowhood in terms of accommodation arrangements and psychological well-being and health, and uses approaches from demography, sociology and gerontology (Korinek et al., 2011; Zhang and Li, 2011; Zuo, 2011). Previous studies on widowhood in China have also focused on analyzing factors such as health (Krochalk et al., 2008; Li et al., 2011), co-residence (Korinek et al., 2011), and depression (Zhang and Li, 2011; Li et al., 2005). Several studies of widowed elderly in China have focused on economic factors, education, and poverty (Liu, 2011; Wei, 2011; Lin, 2007). China's 2010 census data only provide the total number of widowed individuals, and the individual records are not open to the public. Thus, marriage matching cannot be performed to directly obtain information such as the duration of widowhood. In a survey on senior citizens in Shanghai, Peng (2011) investigated the age at which widowhood began; however, those widowed elderly lost their spouses as long as 10 or 20 years ago, and the survey only provided genderless age data.

Some large datasets such as the Chinese Longitudinal Healthy Longevity Survey provide information on age at first marriage and marriage dissolution age. They may provide information about the age of widowhood, but the data are not detailed enough to estimate gender-age-rural/urban specific widowhood rate, and widowhood duration is not provided. A multi-state nuptiality table could provide relevant information about

widowhood. However, this kind of nuptiality table requires a large amount of information and has not been generated with recent data in China.

Myers (1959), Goldman and Lord (1983), and Keyfitz & Caswell (2005) employed life tables to simulate widowhood indices. Using the methods which they developed, here we employ demographic methodology to simulate the indices of widowhood probability, and the average age and duration of widowhood in China. The article is organized as follows. First, we introduce the simulation method, and then we describe the data and present the results. The paper will conclude with a discussion of the main findings.

METHOD

If large-scale retrospective survey data were available, it would be possible to derive figures such as age and duration of, widowhood but such data are not available in China, and there are no effective tools available such as multi-state nuptiality tables which include widowhood information. In this paper, we therefore adopt a simulation method. Myers (1959) used discrete age variables to simulate the life cycle of a marriage. On this basis, Goldman and Lord (1983) used continuous age variables to simulate the widowhood index and examine couples' age-match patterns. In a further refinement of this methodology, Keyfitz & Caswell (2005) introduced methods for analyzing not only widowhood and related indicators, but also kinship relationships with life-tables, as we shall explain.

If a male at the age of x marries a female at the age of y , $l^m(t)$ and $l^f(t)$ denote

the possibility of survival from birth to the age of t . $u^m(t)$ and $u^f(t)$ denote the relevant risks for the male and female, respectively, who will die at the age of t , in which $u(t) = -l'(t)/l(t)$. The probability for a female to outlive her spouse is the probability of her living her life for t years after her marriage and her spouse's incidental death t years after the marriage. P is used here to denote this probability.

The expression of P is as follows:

$$P = \int_0^w \frac{l^m(x+t)}{l^m(x)} \frac{l^f(y+t)}{l^f(y)} u^m(x+t) dt \quad (1)$$

In which w is the time span from marriage to the upper limit of one's life age.

The superscripts m and f denote male and female respectively.

As far as the probability of male widowhood is concerned, the above $u^m(x+t)$ is replaced with $u^f(y+t)$.

The number of years for which a husband and wife live together is denoted e_{xy} .

Goldman and Lord (1983) used the following formula as their expression.

$$e_{xy} = \int_0^w t \frac{l^m(x+t)}{l^m(x)} \frac{l^f(y+t)}{l^f(y)} \{u^m(x+t) + u^f(y+t)\} dt \quad (2)$$

In fact, if the two-sex problem were not taken into account, then males and females live together for the same number of years, and the following expression would be sufficient (Keyfitz & Caswell, 2005).

$$e_{xy} = \int_0^w \frac{l^m(x+t)}{l^m(x)} \frac{l^f(y+t)}{l^f(y)} dt \quad (3)$$

As such, the average male widowhood age is $x + e_{xy}$, and the average female

widowhood age is $y + e_{xy}$. The number of years of survival after the death of a spouse is $e_x - e_{xy}$ for a male and $e_y - e_{xy}$ for a female, in which e_x and e_y respectively denote the life expectancy for a male at the age of x and for a female at the age of y .

It must be noted that this article concerns only the elderly widowed population. We do not have to start our calculation of formula (1) from the time of marriage, but can instead start the calculation from a certain age, such as $x = 60$. What this equation actually measures is the probability of spousal death, which only occurs after one has become elderly. However, such a calculation method ignores the fact that the spouses of many elderly people die before they become elderly. Therefore, the results of the analysis detailed in this article are derived by basing the calculation on the age of marriage. The scenario of spousal bereavement exists as soon as a couple is married. Although the age-specific probability relating to post-marriage widowhood and cumulative probability have been calculated, this article only lists and analyzes data after age 60.

DATA

Life table

The data used in this article include life tables and marriage information from China's 2010 census.

To generate life tables, we used data on population size, population structure and age-specific death rates. In the 2010 census, the post-enumeration survey indicates an

underestimate of 0.12 percent in the census enumeration (PCO, 2012). The underestimation rate seems reasonable and acceptable, but the census data are not perfect. The 2010 population corresponding to individuals aged 0-10 in 2000 census was 17.46 greater than the number originally registered in 2000. Specifically, there were 6.6 million more males and 10.86 million more females (PCO, 2002, 2012). Tao and Zhang (2013) point out that in the 2010 census, the size of population aged 16-21 is abnormally greater than that counted in the 2000 census and that registered by the Ministry of Public Security, indicating an over-registration (PERHAPS larger than expected figures for) of young people aged 16-21.

In the 2010 census, the infant mortality rate was calculated as 3.805 per 1000 live births (male: 3.72; female: 3.906). Such low infant mortality rates are generally an underestimate caused by underreporting of infant deaths. China's National Bureau of Statistics adjusted the infant mortality rate to 13.6 per 1,000 live births (Cai, 2013). Huang and Zeng (2013) determined the infant mortality rate to be 17.27 per thousand after adjusting the relevant census data, and the underreporting rate for infant mortality in the census was determined to be 78%. Using the Brass Logit life table techniques to measure death underreporting in the 2010 census, it is found that death underreporting in the youngest population is very serious, the rate exceeding 60%, and the underreporting of male infant deaths is particularly serious. The average rate of death underreporting for the elderly population has also exceeded 5%, with the rate for the total population reaching 20% (Wang and Ge, 2013).

However, we cannot adjust the census data as there are no other reliable sources

for such an adjustment. So we employed the census data to generate life tables directly. The life tables used in the research include those concerning the total population as well as those concerning only the population in cities, towns and villages, and the countryside grouped by sex. In total, there are eight life tables.

Marriage age

Marriage registration in China is managed and controlled by departments of civil affairs. However, for statistical reasons, the existing data only cover the total annual figures of first marriages, remarriages and divorces. Marriage registration information grouped by age and sex is unavailable. According to the Marriage Law promulgated in 1980, the legal minimum age for marriage is 22 for men and 20 for women. As shown in Table 1, although the age of first marriage fluctuated from 1980 to 2010, it only increased by one year. In 1980, the average age for first marriage was 24.72 for men and 22.88 for women, and in 2010, the average age of first marriage had increased to 25.86 for men and 23.89 for women. In the total population who married between 1980 and 2010, the average age of first marriage was 24.55 for men and 22.76 for women.

The current elderly population (over age 60 in the 2010 census data) were mostly married before 1980. The population married since 1980 will gradually become elderly. Taking into account the above marriage ages, the average marriage age used in this article is 25 for men and 23 for women. The marriage age is normally higher in cities than in towns, and the countryside has the lowest marriage age. To form a

comparison across cities, towns and the countryside, town figures were selected to represent the national average. The marriage age increases by one year for cities and decreases by one for the countryside.

Table 1: The Changing Trend of Average Age of First Marriage in China

Year	Average Age at First Marriage		
	Male	Female	Total
1980	24.72	22.88	23.78
1990	23.57	22.02	22.79
2000	25.11	23.17	24.14
2010	25.86	23.89	24.85
Average of 30 years (1980-2010)	24.55	22.76	23.64

Data Source: 2010 census data

RESULTS

1. Widowhood Probability

Figure 1 shows the age-specific widowhood probability (multiplied by 1000 for convenience) for the elderly population, assuming that the husband was 25 and the wife was 23 at the time of their marriage. Age-specific widowhood probability is

lower for a woman than it is for a man for two reasons: 1). There is an age difference between husband and wife. When the wife is 60, her husband is already 62. When the husband is 60, the wife is only 58. 2) A woman has a survival advantage over a man. The probability of her death is lower than that of a man of the same age and significantly lower than that of an older man. Due to differences in health between the sexes, the elderly female population is much more likely to be widowed (Poston & Min, 2008).

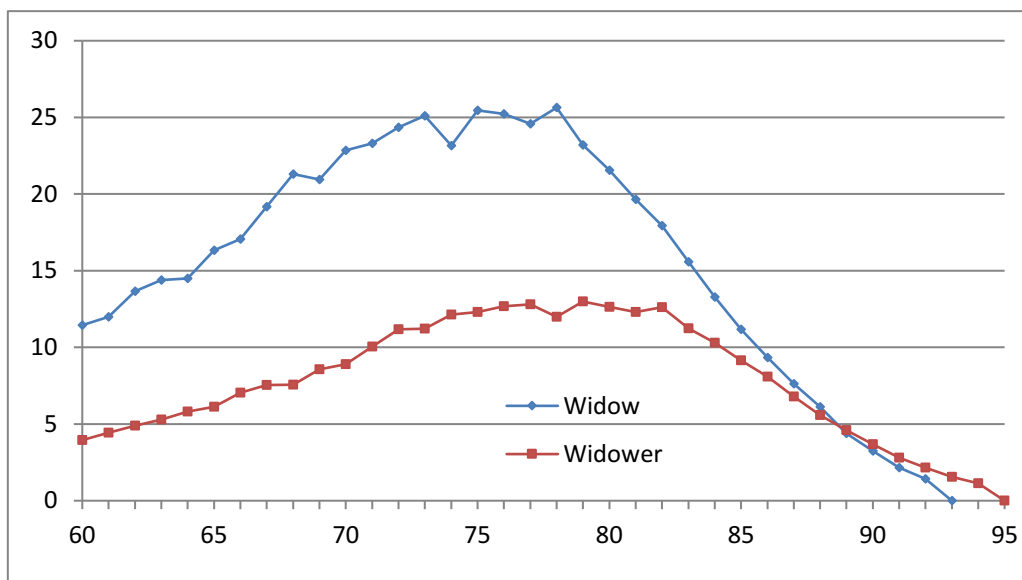


Figure 1: Age-specific Widowhood Probability (probability*1000) in China

Figure 2 shows that the accumulated widowhood probability increases with age. When a woman reaches the age of 60, her widowhood probability approaches 0.15. In other words, her spouse has a 0.15 likelihood of dying before she reaches 60. However, this figure is only 0.05 for a man. A woman's final widowhood probability

is 0.67. For a man, this figure is 0.33. This also explains why widows are more numerous than widowers among elderly people who have lost their spouses.

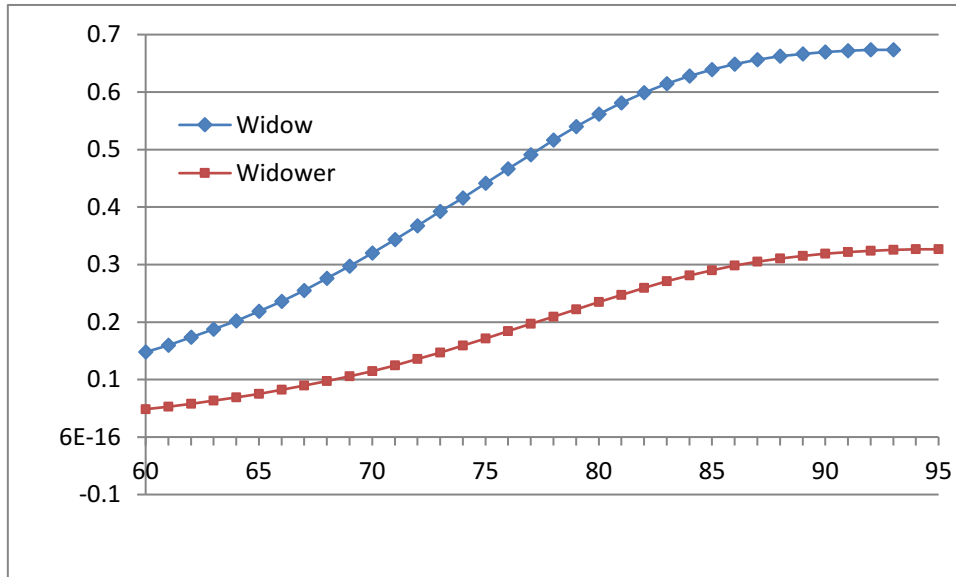


Figure 2: Cumulative Widowhood Probability by age in China

1. The Impact of Marriage Age on Widowhood Indices

If the age difference in China's average couple remains unchanged, an increase in marriage age has a minimal impact on the widowhood probability. The later in life a couple marries, the shorter the marriage duration is. However, there is only very slight variation in terms of widowhood age and duration. For couples married at ages 25 (male) and 23 (female), men lost their spouses at an average age of 72.55 and lived an additional 11.24 years, and women lost their spouses at an average age of 70.55 and lived an additional 14.68 years.

Table 2: The Impact of Change in Age of Marriage on Widowhood Indices in China

Marriage Age		Widowhood		Marriage	Widowhood		Widowhood	
		Probability		Duration	Age		Duration	
Man	Woman	Man	Woman		Man	Woman	Man	Woman
21	19	0.32	0.68	51.35	72.35	70.35	11.36	14.82
23	21	0.33	0.67	49.44	72.44	70.44	11.31	14.76
25	23	0.33	0.67	47.55	72.55	70.55	11.24	14.68
27	25	0.32	0.68	45.65	72.65	70.65	11.18	14.61
29	27	0.33	0.67	43.76	72.76	70.76	11.11	14.53
31	29	0.33	0.67	41.87	72.87	70.87	11.06	14.46

Peng (2011) estimated that the average widowhood age for the oldest elderly people is 65.52 (for those who lived alone at the time of the survey) or 65.85 (for those who did not live alone at the time of the survey) based on a survey of the oldest elderly people (aged 80 and above) conducted in 2008 in Shanghai. It should be noted that bereavement for this widowhood age had happened on average at least 15 years before, as those respondents were over 80 years when interviewed in 2008. With the 2010 census data, we can see that the age of widowhood has increased dramatically.

1. The Impact of Spousal Age Difference on Widowhood Indices

Table 3 indicates that spousal age differences have a marked impact on the widowhood index. Assuming females are married at a constant age of 23, a 25-year-old man who marries a 23-year-old woman has a 0.67 probability of dying before his wife. A 30-year-old man who marries a 23-year-old woman only has a 0.22 probability of dying after his wife. In other words, his probability of dying before his wife is 0.78. If he marries at 40, the probability of him dying before his wife is 0.91.

Table 3: The Impact of Spousal Age Difference on Male Widowhood Indices in China

Marriage Age		Widowhood		Marriage	Widowhood		Widowhood	
		Probability		Duration	Age		Duration	
Man	Woman	Man	Woman		Man	Woman	Man	Woman
20	23	0.44	0.56	49.34	69.34	72.34	13.21	13.43
25	23	0.33	0.67	47.55	72.55	70.55	11.24	14.68
30	23	0.22	0.78	44.19	74.19	67.19	10.31	17.21
35	23	0.15	0.75	40.39	75.39	63.39	9.67	20.29
40	23	0.09	0.91	36.31	76.31	59.31	9.19	23.77

Table 3 also shows the impact of spousal age gap on marriage duration, age and duration of widowhood. If a woman's average marriage age remains unchanged,

while a man's average marriage age increases from 20 to 40, the number of years an average marriage lasts decreases from 49.34 to 36.31. The widowhood age for males increases from 69.34 to 76.31, whereas the age of widowhood for females decreases from 72.34 to 59.31. The number of years a surviving spouse lives after the death of his or her spouse decreases from 13.21 to 9.19 for males and increases from 13.43 to 23.77 for females.

The probability of widowhood is higher for women than for men, as Chinese marriage patterns show that men are typically older than women at the time of marriage, and women have a survival advantage over men. As the spousal age difference increases, the probability of widowhood for the wives also increases. Even if a husband is 3 years younger than his wife, the probability of widowhood is still higher for the wife than for the husband.

1. Urban and Rural Differences in Widowhood Indices

Table 4 shows almost no difference in the probability of widowhood among cities, towns, and rural areas for men or women. However, the table shows that marriages within the urban population tend to last longer, though urban individuals marry relatively late in their lives. In cities, marriage lasts 1.51 years longer than in towns and 6.10 years longer than in the countryside. In cities, men lose their spouses at an

average age of 76.37; in towns, the average age of men is 73.86, and in rural areas, the average age is 68.27. Thus, men in urban areas lose their spouses 8 years later than do men in rural areas. Compared to populations in towns and urban areas, rural populations have shorter life expectancies; however, rural populations also have the longest widowhood durations. Widowed women in rural areas survive 16.95 years after their husbands die, and widowed men survive 12.95 years of widowhood.

Table 4: Urban and Rural Differences in Widowhood Indices in China

Area	Marriage		Widowhood		Marriage Duration	Widowhood		Widowhood	
	Age		Probability			Age		Duration	
	Man	Woman	Man	Woman	Man	Woman	Man	Woman	
City	26	24	0.33	0.67	50.37	76.37	74.37	10.64	13.56
Town	25	23	0.33	0.67	48.86	73.86	71.86	11.22	14.45
Countryside	24	22	0.33	0.67	44.27	68.27	66.27	12.95	16.95

Discussion and Conclusions

We have used life tables and probability analysis to simulate and measure such indices as the probability of widowhood, marriage duration, age of widowhood, and widowhood duration in China. We found that an average marriage in China lasts 47.55 years. The widowhood age is 72.55 for males and 70.55 for females. After being widowed, the average man lives for another 11.24 more years and the average

woman survives 14.68 years. Rural populations have the shortest marriage duration and the youngest age of widowhood. However, they tend to live more years after they are widowed than their urban counterparts.

Our data on a number of widowhood indicators allow us to address concerns regarding social security and healthcare among the widowed elderly population, and we can provide information about social security for this group. The 2010 census data show that 61.32% of China's widowed elderly depended on family support for living, and only 14.35% relied on their working income; in rural areas, 69.93% of the widowed elderly relied on family support, and 19.72% relied on their working income (PCO, 2012). The average family size in China is decreasing as the number of children decreases, which will result in decreasing levels of family support for the widowed elderly. The widowed population is a relatively frail group with a passive lifestyle, poor health, and low economic status (Lin, 2007; Ye and He, 2008). Most widowed elderly individuals have a low economic status and can only maintain a low standard of living; some elderly individuals live below the poverty line and become marginalized within society (Wei, 2011). The average age of widowhood is 72.55 years for males, and 70.55 for females. As bodily functions begin to decline at advanced ages, individuals lose their ability to work. Thus, during a widowhood of more than 10 years, the widowed elderly population urgently requires financial support, daily care, and emotional support. These additional needs can place a heavy burden on the family and society.

The present study has some limitations. As noted in the data section, there are

some quality issues with China's 2010 census data. Specifically, the death data that were used for the present study were underreported in 2010. The extent of underreporting cannot be determined at present, so the life table cannot be improved. This inevitably has an effect on the results that we have obtained. We knew that spousal age differences took in a wider range, but in this study we adopted an average marriage age instead of taking the age distribution. This would simplify our analysis, but might bias the results. Moreover, as no data for widowhood duration is currently available, we could not test our results. So the results could be used as a point of reference, but caution should be employed when interpreting them.

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