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A comparative assessment of mortality among the widowers and widows in Taiwan

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Abstract

This paper explores the impact of spousal death on estimated mortality between the widowers and widows among the middle aged and elderly in Taiwan. Subject data is obtained from the Survey of Health and Living Status of the Middle Aged and Elderly in Taiwan, a study conducted in 1996 that encompassed observations 50 years of age and older. Survey data was linked to 1996-2003 national death registry data. Cox proportional hazard model is used to determine the survival rates between the widowers and widows. Main empirical results confirm that the relatively higher mortality hazard associated with being widowhood groups regardless of widowers and widows. Nevertheless, widows face a higher mortality risk than widowers for who compared to their counterparts. In addition, the influences of family and social networks on mortality risk tend to be more important than health status.

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1. Introduction

Marriage has been indentified as an important social factor associated with health and mortality. Since the marriage protection effect (Lewis et al, 2004; Tucker, et al., 2004) and marriage selection approach (Murray, 2000; Ikeda et al., 2007), marriage could benefit adult's health and survival rate. Therefore, people are less likely to enjoy better health and more likely to die after their spouses pass away.

In Taiwan, most of the studies described survival issues of older peers based on socio-economic or demographic factors (Chen et al., 2007; Ho et al., 2009; Mete, 2005; Zimmer, et al., 2005). Little attention has been focused on the influence of spousal death on the surviving spouse's mortality. Indeed, the impact of a spousal death on the surviving spouse's mortality is qualitatively large. To fill this gap, this paper emphasizes the impact of spousal death on the widowhood, especially for the widowed elderly group in Taiwan. In addition, it is well known that women as a group enjoy a longer life expectancy than men. This paper wonders whether the relative advantage still hold true following the death a spouse? In other words, do widows face a relatively lower mortality risk than widowers?

In this study, diverse ranges of indicators, analyze separately or as a composite index, have been used to measure the effects of widowhood on mortality. Of these, socio-economic variables consist of age and education; the health relevant variables include self-rated health, depression, chronic disease, and physical functional limitations or difficulties. In addition, this study also adds family and social support network to investigate the association with survival rates for the widowed elderly in Taiwan.

2. Data

Data used in this research analysis are obtained from the Survey of Health and Living Status of the Middle Aged and Elderly in Taiwan (hereafter, SHLS). Initial interviews with more than 2,000 respondents aged 50 and over were held in 1996/7 (September 1996 to February 1997). Follow-up interviews were conducted in 1999 and 2003. By the end of the 7-year period, 278 original respondents had died. This study tracks survival of respondents over the 7-year period and analyzes the relative effects of spousal death on mortality for specific subgroups.

As mentioned earlier, this paper controls socio-economic variables, health relevant variables, family and social support networks to examine the surviving rate. As shown in Table 1, 5.0% of married men lose their wives and 18.9% of married women lose their husbands during the study period. Not surprisingly, the proportion of widowers is smaller than that of widows. The number of widows is nearly 3.8 times that of widowers, and this

ratio increases with age. Those with a higher education show a lower proportion of widowhood. Less than 5% (4.5%, $n = 6$) of survey respondents with university and higher educational levels lose spouses. In terms of health status, people with functional difficulties have the highest proportion of widowed rate that is 17.4% than other health relevant variables. Next, the proportions of widowed rate of poor self-rated health, depression and chronic disease variables are 15.1%, 14.6%, and 13.0% respectively. Furthermore, the widowed rates of family and social network variables are similar, which are between 10.3% and 11.8%. Approximately 5% of respondents submit missing information on the widowhood.

Table 1: Descriptive Statistics of Variables

	Married Samples	Widowed Samples	Widowed Rate (%)
Gender			
Male	1,169	58	5.0
Female	1,161	220	18.9
Age			
50~54	673	46	6.8
55~59	769	81	10.5
60~64	621	102	16.4
65 and over	267	49	18.4
Education			
Informal	685	116	16.9
Primary school	1,089	132	12.1
High school	423	24	5.7
University and over	133	6	4.5
Health Status			
SRH (Poor)	538	81	15.1
Depression	1,232	180	14.6
Chronic disease	1,305	170	13.0
Functional difficulties	449	78	17.4
Family & Social Network			
Having child	2,318	275	11.8
Living with family or others	2,265	234	10.3
Satisfied with social care	2,017	218	10.8
Participating in club/activity	931	110	11.8
Observations	2,330	278	11.9

3. Methods

In order to examine mortality for subjects included in this study, the authors use the Cox proportional hazard model to estimate mortality hazard. Following Cox (1972), this paper tries to compare mortality hazard in two or more groups with duration exposure. Widowers and widows face certain additional characteristics that may affect mortality hazard. In particular, the Cox proportional hazard model does not require the making of any assumptions about the shape of the baseline hazard function.[1] Therefore, the proportional hazard function can be defined as:

$$h_i(t;x_i) = h_0(t)\exp(\beta' x_i) \quad (1)$$

where $h_i(t;x_i)$ represents the mortality hazard at exact time t, $h_0(t)$ represents the baseline hazard function depending on t and not x_i, β' represents the parameter vector, (the prime mark (') denotes transposition) and x_i represents the covariate vector (e.g., socioeconomic factors, health relevant status, and family and social networks). The individual components of these vectors are listed in the descriptive statistics in Table 1.

As some measures may change over time, the Cox model used in this study includes time-varying covariates and employs the interaction with survival between 1996 and 2003 in order to examine the proportional hazards assumptions (Ho, 2008).

Because being married likely imposes different impacts between males and females in terms of mortality (Van Gelder et al., 2006; Liu, and Umberson, 2008; Parrado and Zenteno, 2002) and because the gender variable shows significance (p =.000) in our initial empirical test, this study uses the Cox model to examine the mortality hazard of widowhood by gender.

4. Results

Table 2 illustrates the analysis results obtained using three partial models and one full model. Model 1 contains only socioeconomic factors, Model 2 progressively adds health status to Model 1 parameters, Model 3 adds family and social networks to Model 1 parameters and Model 4 contains all the controls. Test results shown in the last columns of Table 2 for widowers and widows respectively; indicate significance ($p = .000$) among all four models. This suggests a firm rejection of the null hypothesis and the Cox proportional hazards model as a fitted object.

Regardless of the models specification, all estimated hazard ratios related to mortality risk are found to be larger than one for both widowers and widows. This illustrates that older

[1] As only the baseline function is specified parametrically.

adults who lose their spouses are more likely to die than those whose spouse are still alive. This result is similar to previous work done on the so-called ‘marriage protection effect’ (Lerman, 2002; Luoma and Pearson, 2002; Shkolnikov et al., 2007; Sibai et al., 2007).

Moreover, after controlling for socio-demographic factors, husbands are found to have a 26 percent greater risk of dying (hazard ratio = 1.26) following the loss of their wives (comparing to those whose wives are still alive), and wives are found to have a 68 percent greater risk (hazard ratio = 1.68) following the loss of their husbands (comparing to those whose husbands are still alive). Both vary significantly from the null hypothesis, which assumes a hazard ratio of 1.00 at conventional levels. This suggests that the hazard ratio of mortality for widower is lower than that for widow.

As shown in Model 2, mortality hazard increases when variables related to poor health are included (1.33 for widowers and 1.73 for widows respectively). Nevertheless, risk decreases after controlling for family and social networks in Model 3 (1.06 for widowers and 1.54 for widows respectively). Finally, the hazard ratios that contain all controls listed in Model 4 are shown between Model 2 (poor health relevant variables) and Model 3 (family and social networks). They are 1.21 for widowers and 1.62 for widow respectively. These estimated hazard ratios are slightly lower than the hazard ratios described in Model 1 for both widowers and widows. Findings provide suggestive evidence that widowhood correlates strongly with observed characteristics. Among these characteristics, family and social networks may be more important for surviving rates than variables related to health status.

Table 2: Mortality Estimation by Cox Hazard Models

Variable	Model 1			Model 2			Model 3			Model 4		
	Hazard. ratio	95% Confidence Interval		Hazard. ratio	95% Confidence Interval		Hazard. ratio	95% Confidence Interval		Hazard. ratio	95% Confidence Interval	
Married males												
Widowers	**1.261***	**0.978**	**1.898**	**1.335***	**1.009**	**1.895**	**1.061**	**0.837**	**1.737**	**1.215***	**0.959**	**1.700**
inclusive of												
Socioeconomics	yes			yes			yes			yes		
Health status				yes						yes		
Social network							yes			yes		
Log likelihood	-40.484			-38.737			-36.993			-35.329		
Log Likelihood ratio	$x^2(7)=66.52$***			$x^2(11)=70.02$***			$x^2(11)=57.52$***			$x^2(15)=60.84$***		
Married females												
Widows	**1.689****	**1.275**	**2.149**	**1.737****	**1.333**	**2.258**	**1.540***	**0.955**	**2.463**	**1.626****	**1.241**	**2.081**
inclusive of												
Socioeconomics	yes			yes			yes			yes		
Health status				yes						yes		
Social network							yes			yes		
Log likelihood	-53.627			-48.724			-44.027			-41.024		
Log Likelihood ratio	$x^2(7)=40.24$***			$x^2(11)=50.04$***			$x^2(11)=43.45$***			$x^2(15)=49.45$***		

Note:
1. 1,169 observations for males and 1,161 observations for female.
2. *, ** and ***denote statistical significance at 10%, 5% and 1% levels, respectively
3. Goodness of fit: the results of Log-likelihood ratio test can reject the hypothesis.

5. Conclusion

The purpose of this study is to examine the impact of spousal death on the surviving spouse's mortality hazards among the middle aged and elderly in Taiwan. A number of findings support previous research cited earlier, but several are less common. The empirical results illustrate that older adults who lose their spouses are more likely to die than those whose spouse are still alive regardless of widowers and widows. This result is consistent with the previous research (Lerman, 2002; Luoma and Pearson, 2002; Shkolnikov et al., 2007; Sibai et al., 2007).

Moreover, in terms of gender, the most salient findings are that hazard ratios of mortality for widowers are found to be lower than those for widows, while they compare to those whose spouses are still alive respectively. The findings provide suggestive evidence that females maybe face a higher risk of death than males after the death of a spouse. In general, age should have been an important variable on mortality. Table 1 show that the aged 50 to 54 is a baseline variable, including 30.69% of males and 30.19% of females in this study. In contrast, 69.31% of males and 69.81% of females are aged 55 and over respectively. Since the ages of females are older than males, the females demonstrate higher hazard ratios of mortality than males. Furthermore, according to a report published by the Taiwanese government[2], crude person-year death rates were about 3.5% for males between 1996 and 2003. Nevertheless, crude person-year death rates for females increased slowly from 2.15% to 2.32% during the same periods. Therefore, the hazard ratios of mortality for men are steady, but for women gradually increased in Taiwan. Finally, for the social attributes, older women are less likely to have been in the work force during adulthood than men in Taiwan. Widows might increase the risk of social isolation, and of economic vulnerability as a result of reduced access to financial resources. Thus, marriage could provide an important source of economic stability for women. The belief is that marriage for women might reveal more protective effect than men in Taiwan.

In addition, empirical findings from this study illustrate that family and social support networks are a more important influence on survival than health relevant variables for both widowers and widows. Hence, a first priority of an urgent welfare program for the widowhood (particularly for the widows) should be to provide social care and activity. In addition, widowed men and women should live with family or other relatives. Convenient and accessible services in nearby communities are encouraged to improve health and reduce mortality for widowed elderly in Taiwan.

Finally, due to data limitations, results may not be generalized for mortality associated

[2] See, http://ebas1.ebas.gov.tw/pxweb/Dialog/statfile9L.asp.

with widowers and widows following the death of a spouse in the general population. Indeed, marital status differences may be reflected in mortality risk variance among subjects. Therefore, this survival analysis of the study represents only a preliminary assessment to understand the relationship between widowed elderly and mortality risk. In the future, the authors plan to examine more carefully the influence of different marriage indicators on mortality risk.

References

Chen, L., Yip, W., Cheng, M.C., Lin, H.S., Lee, S.D., Chiu, Y.L., and Y.H. Lin, (2007). "The effects of Taiwan's National Health Insurance on access and health status of the elderly". *Health Economics* **16**, 223-242.

Cox, D. R., (1972). "Regression models and life-tables (with discussion)". *Journal of Royal Statistical Society*. Series: B34, 187-220.

Ho, S., (2008). "Survival analysis of living arrangements and health care utilization in terms of total mortality among the middle aged and elderly in Taiwan". *The Journal of Nursing Research* **16**, 160-168.

Ho, S. H., Li C. S., and C. C. Liu, (2009). "The influence of chronic disease, physical function, and lifestyle on health transition among the middle-aged and older person in Taiwan". *Journal of Nursing Research* **17**, 136-143.

Ikeda, A., Iso, H., Toyoshima, H., Fujino, Y., Mizoue, T., Yoshimura, T., et al. (2007, May 7). *Marital status and mortality among Japanese men and women: the Japan collaborative cohort study.* Retrieved May 22, 2010 from http://www.biomedcentral.com/1471-2458/7/73.

Lerman, R. I., (2002). *Marriage as a protective force against economic hardship*. The Urban Institute, Washington, D.C.

Lewis, M. A., Butterfield, R. M., Darbes, L. A., and C. J. Brooks, (2004). "The conceptualization and assessment of health-related social control". *Journal of Social Personal Relationships* **21**, 669-687.

Liu, H., and D. J. Umberson, (2008). “The times they are a changein’: Martial status and health differentials from 1972 to 2003”. *Journal of Health and Social Behavior* **49**, 239-253.

Luoma, J. B., and J.L., Pearson, (2002). “Suicide and marital status in the United States, 1991-1996: Is widowhood a risk factor?” *American Journal of Public Health* **92,** 1518-1522.

Mete, C., (2005). “Predictors of elderly mortality: Health status, socioeconomic characteristics and social determinants of health”. *Health Economics* **14**, 135-148.

Murray, J. E. (2000). “Marital protection and marital selection: Evidence from a historical-prospective sample of American men”. *Demography **37***, 511-521.

Parrado, E. A. and R. M. Zenteno, (2002). “Gender difference in union formation in Mexico: Evidence from marital search models”. *Journal of Marriage and Family* **64**, 756-773.

Shkolnikov, V. M., Jasilionis, D., Andreev, E. M., Jdanov, D. A., Stankuniene, V., and D. Ambrozaitiene, (2007). “Linked versus unlinked estimates of mortality and length of life by education and marital status: Evidence from the first record linkage study in Lithuania”. *Social Science and Medicine* **64**, 1392-1406.

Sibai, A. M., Kanaan, M. N., Chaaya, M., and OMR. Campbell, (2007). “Mortality among married older adults in the suburbs of Beirut estimates from offspring data”. *Bulletin of the World Health Organization* **85**, 482-486.

Tucker, J. S., Klein, D. J., and M. Elliott, (2004). “Social control of health behaviors: A comparison of young, middle-aged and older adults”. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* **59**, 147-150.

Van Gelder, B.M., Tijhuis, M., Kalmijn, S., Giampaoli, S., Nissinen, A., and D. Kromhout, (2006). “Marital status and living situation during a 5-year period are associated with a subsequent 10-year cognitive decline in older men”. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* **61**, 213-219.

Zimmer, Z., Martin, L. G., and H. S. Lin, (2005). “Determinants of old-age mortality in Taiwan”. *Social Science and Medicine* **60**, 457-470.