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Short Communication

Marital status and 5-year mortality: A population-based prospective cohort study

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ABSTRACT

Objectives: The aim was to investigate the association between baseline marital status and mortality using survival (Cox-regression) analysis.

Study design: This is a prospective cohort study.

Methods: The public health survey by Scania in 2008 was linked to the Swedish cause of death register. This prospective cohort study includes 12,245 men and 14,969 women aged 18–80 years, and 538 men and 362 women of them died during the 5.3-year follow-up.

Results: Unmarried, divorced, and widowed men had significantly higher hazard rate ratios (HRRs) of all-cause mortality than married/cohabitating men. For women, the HRRs of these groups did not significantly differ from those of the married/cohabitating reference group.

Conclusions: The results are in accordance with a previous study that only compared those living alone with those cohabitating.

It is found in most studies that married people have lower mortality than unmarried. This may partly be due to a selection effect regarding who enter marriage, but there is most likely also a protective effect of marriage.[1] Marital status has often been regarded as a marker of social support, which also entails more economic resources, social support,[2] higher quality of life, healthier lifestyle and behaviors,[3] and better medical treatment[4] than the unmarried. In Sweden, as in many other western countries, an increasing part of the population cohabitate with a partner although they still remain unmarried. Many previous studies have found differences between married and unmarried, but have not been able to find differences between unmarried participants living alone and unmarried ones living with a partner. This may have resulted in underestimation of the increased mortality rate of those living alone.[1] Most studies have shown lower mortality for married participants than for unmarried[5] and for those who are married and cohabitating than for those who are unmarried and living alone.[1]

A previous Swedish study has shown that single-living men had higher total mortality than married/cohabitating men, whereas no such differences were observed between single

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and married/cohabitating women.[6] We wanted to investigate whether these patterns could be reproduced for all the single-living categories, unmarried, divorced, and widows/widowers.

The aim was to investigate the association between baseline marital status, including married and cohabitating, and mortality using Cox proportional hazard (survival) analysis, adjusting for age and socio-economic status (SES) and stratifying by sex.

Study population

The public health survey by Scania in 2008 is cross sectional and based on a stratified sample of the register population aged 18–80 years in Scania, the southernmost part of Sweden. A postal invitation letter including a questionnaire was sent, and later, three reminders were sent to initial non-respondents. It was also possible to answer the questionnaire online. A total of 28,198 responded, yielding a 54.1% participation rate.

The present study, connecting the baseline 2008 survey with more than 5-year prospective mortality data, was approved by the Ethical Committee in Lund (No. 2010/343).

Dependent variable

Mortality was followed up prospectively from August 27–November 14 (registration date of individual answers) until December 31, 2013 (on average 5.3 years later), death (946 respondents of 28,062 at follow-up), or loss to follow-up (136 respondents of the 28,198 were not included in this study because they could not be traced). A total of 12,245 men and 14,969 women were included in the present study because 373 men and 475 women were internally missing due to missing values. Correspondingly, 538 men and 362 women who died during the five-year period were included in this study because 23 men and 23 women among the 946 diseased were internally missing. The ten-digit personal number system in Sweden enables the connection of the baseline study data from the 2008 public health survey with the Swedish national cause of death register (*Dödsorsaksregistret*) kept by the Swedish National Board on Health and Welfare (*Socialstyrelsen*) by a third party (the private company Tieto). The ten-digit person numbers were deleted before delivery to the research group.

Independent variables

Marital status was assessed using four alternative items including married/cohabitating (partnership), unmarried, divorced, and widow/widower.

The survival (Cox) regression analyses were stratified by sex.

Age was analyzed as a continuous variable.

SES (by occupation and relation to labor market) comprises the employed categories, which include non-manual employees in higher positions, in medium level positions, and in lower positions; skilled and unskilled manual workers; and self-employed/farmers. The categories outside the workforce comprise unemployed, students, early retired (before age 65 years), long-term sick leave, pensioners older than 65 years, and unclassified.

Prevalence (%) of marital status was calculated and sex-stratified (not shown in tables). Distribution (%) of age and SES according to marital status was calculated (not shown in tables). Hazard rate ratios (HRRs) with 95% confidence intervals (95% CIs) of mortality according to marital status at baseline were calculated in survival (Cox) regression models. In model 1, adjustments were conducted for age and stratified for sex. In model 2, adjustments were conducted for age and SES and stratification for sex (Table 1). Calculations were performed using SPSS software, version 23.0.

Among men, 73.5% were married or cohabitating, 18.2% unmarried, 6.3% divorced, and 2.0% widowed. In the 2008 survey, among women, 69.2% were married/cohabitating, 15.7% unmarried, 9.2% divorced, and 5.8% widowed (not shown in Table 1).

The proportion (%) of all men who were married or cohabitating was 18.6% in the age interval 18–24 years, 67.6% in 25–34 years, 77.3% in 35–44 years, 75.8% in 45–54 years, 76.2% in 55–64 years, and 76.5% in 65–80 years. Less than 0.3% were widowers in the age range 18–54 years, 1.5% in the age group 55–64 years, and 8.0% in the age group 65–80 years. A 79.8% proportion of self-employed men were married or cohabitating, 81.0% among non-manual employees in higher positions, 80.7% in medium positions, 75.4% among non-manual employees in low positions, 71.9% among skilled manual workers, 66.7% in the unskilled, 52.4% in the early retired, 41.8% in the unemployed, 23.9% in students, 76.6% in retired and aged 65 years and older, 59.0% on long-term sick leave, and 51.2% in unclassified. The proportion (%) of women who were married or cohabitating was 30.2% in the age interval 18–24 years, 72.0% in 25–34, 78.6% in 35–44, 74.9% in 45–54, 71.2% in 55–64, and 55.5% in 65–80. Less than 0.4% were widows in the age range 18–44, 1.5% in the age group 45–54, 5.4% in the age group 55.64, and 24.4% in the age group 65–80 years. Eighty-three percent of self-employed women

Table 1 – Hazard rate ratios with 95% confidence intervals (HRRs, 95% CI) of 5-year mortality 2008–2013 according to marital status. The public health survey in Scania 2008. N = 12,245 men and N = 14,969 women, aged 18–80 years.

	Model 1[a] [HRR (95% CI)][a]	Model 2[b] [HRR (95% CI)][b]
Men		
Married/cohabitating	1.00	1.00
Unmarried	2.07 (1.58–2.71)	2.00 (1.53–2.63)
Divorced	1.84 (1.40–2.42)	1.82 (1.38–2.38)
Widowers	1.74 (1.27–2.38)	1.73 (1.26–2.37)
Women		
Married/cohabitating	1.00	1.00
Unmarried	1.25 (0.82–1.90)	1.20 (0.78–1.84)
Divorced	1.20 (0.88–1.63)	1.19 (0.88–1.62)
Widows	1.28 (0.97–1.67)	1.28 (0.98–1.67)

[a] Model 1 adjusted for age.
[b] Model 2 adjusted for age and socio-economic status.

were married or cohabitating, 75.4% of non-manual employees in higher positions, 76.4% in medium positions, 75.2% in low positions, 72.3% among skilled manual workers, 67.2% among unskilled manual workers, 57.9% among early retired, 59.8% among unemployed, 39.5% among students, 56.7% among retired and aged 65 years and older, 62.1% on long-term sick leave, and 63.0% among the unclassified. Among retired men aged 65 years and older, 8.6% were widowers, and among retired women aged 65 and older, 23.5% were widows (not shown in Table 1).

Table 1 shows that the HRRs (95% CI) of mortality were 2.07 (1.58–2.71) for unmarried, 1.84 (1.40–2.42) for divorced and 1.74 (1.27–2.38) for widowers among men adjusted for age in model 1, all compared to married/cohabitating men. After adjustment for age and SES in model 2, the HRRs essentially remained at the same levels for men, 2.00 (1.53–2.63), 1.82 (1.38–2.39), and 1.73 (1.26–2.37), respectively. Table 1 also shows that the HRRs (95% CI) of mortality were 1.25 (0.82–1.90) for unmarried women, 1.20 (0.88–1.63) for divorced women, and 1.28 (0.97–1.67) for widows adjusted for age in model 1, all compared with married/cohabitating women. Adjustments for age and SES in model 2 yielded the corresponding HRRs 1.20 (0.78–1.84), 1.19 (0.88–1.62), and 1.28 (0.98–1.67), respectively.

The results show that unmarried, divorced, and widowed men all have higher HRRs than married/cohabitating men. For men, the higher mortality risk previously observed for single as opposed to cohabitating men hold for all three groups of single-living men compared with married/cohabitating men. For women, the HRRs of unmarried, divorced, and widowed women did not differ from those of women in the married/cohabitating reference category to any statistically significant extent. The higher total mortality for single as opposed to cohabitating previously observed[6] was thus extended to all three single-living categories.

The observation that unmarried, divorced, and widowed men have significantly higher total mortality than married/cohabitating men while no such corresponding patterns are observed for women is in accordance with the previous Swedish study that only compared those living single with all cohabitating.[6] A recent international review also showed lower total and cardiovascular mortality for married persons, with the generally poorest results for single men. Moreover, being married was also associated with lower exposure to risk factors and better health, even after adjustments for multiple confounders.[7] Marital status also seems to influence not only cardiovascular incidence and mortality but also the prognosis after cardiovascular disease.[8] Even in the latter study, single men in the widowers group were more likely to develop stroke.[8]

This study is a large population-based prospective cohort study. Still, even larger studies are needed to estimate diagnosis-specific survival according to marital status. The representativity of social and demographic categories such as age, sex, and education was satisfactory in the 2008 public health survey, and the risk of selection bias thus limited.[9] Mortality patterns and levels according to age and sex are in accordance with the general Swedish population in the early 2010s (results not published). The demographic age and sex variables originate directly from the Swedish national population register with a very high validity, and this also holds for the Swedish national cause of death register. The fact that married and cohabitating are collapsed is a strength compared to previous studies, where cohabitation was hard to discern from other groups of unmarried people who were living alone.[5,10] Age, sex, and SES were adjusted for as confounders/covariates in the survival analyses and the results stratified by sex.

Unmarried and divorced men, as well as widowers, have significantly lower 5-year survival than married/cohabitating men. Higher HRRs were also observed for unmarried and divorced women, as well as widows, than for married/cohabitating women, but the effect measures were considerably lower and consistently not statistically significant. Analyses of diagnosis-specific survival will be conducted when 10-year follow-up has been constructed.

Author statements

Ethical approval

The study was approved by the Ethical Committee (*Etikprövningsnämnden*) in Lund (No. 2010/343).

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Competing interests

None declared.

REFERENCES

1. Franke S, Kulu H. Cause-specific mortality by partnership status: simultaneous analysis using longitudinal data from England and Wales. *J Epidemiol Commun Health* 2018;**72**:838–44.
2. Lindström M. Social capital, economic conditions, marital status and daily smoking: a population-based study. *Publ Health* 2010;**124**:71–7.
3. Gritz ER, Demark-Wahnefried W. Health behaviors influence cancer survival. *J Clin Oncol* 2009;**27**:1930–2.
4. Merrill RM, Johnson E. Benefits of marriage on relative and conditional relative cancer survival differ between males and females in the USA. *J Cancer Surviv* 2017;**11**:578–89.
5. Ben-Schlomo Y, Smith GD, Shipley M, Marmot MG. Magnitude and causes of mortality differences between married and unmarried men. *J Epidemiol Commun Health* 1993;**47**:200–5.
6. Carlsson AC, Starrin B, Gigante B, Leander K, Hellenius ML, de Faire U. Financial stress in late adulthood and diverse risks of incident cardiovascular disease and all-cause mortality in women and men. *BMC Public Health* 2014;**14**:17.
7. Manfredini R, De Giorgi A, Tiseo R, Boari B, Cappadona R, Salmi R, Gallerani M, Signani F, Manfredini F, Mikhailidis DP, Fabbian F. Marital status, cardiovascular diseases, and cardiovascular risk factors: a review of the evidence. *J Wom Health* 2017;**26**(6):624–32.

8. Wong CW, Kwok CS, Narain A, Gulati M, Mihalidou AS, Wu P, Alasnaq M, Myint PK, Mamas MA. Marital status and risk of cardiovascular diseases: a systematic review and meta-analysis. *Heart* 2018;**104**(23):1937–48.
9. Lindström M, Fridh M, Rosvall M. Economic stress in childhood and adulthood, and poor psychological health: three life course hypotheses. *Psychiatr Res* 2014;**215**:386–93.
10. Berntsen KN, Kravdal O. The relationship between mortality and time since divorce, widowhood or remarriage in Norway. *Soc Sci Med* 2012;**75**:2267–74.