



Marital status, gender and cardiovascular mortality: Behavioural, psychological distress and metabolic explanations[☆]

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ABSTRACT

The intermediate processes through which the various unmarried states can increase the risk of subsequent cardiovascular disease mortality are incompletely understood. An understanding of these processes and how they may vary by gender is important for understanding why marital status is strongly and robustly associated with subsequent cardiovascular disease. In a prospective study of 13,889 Scottish men and women (mean age 52.3, Standard Deviation: 11.8 yrs, range 35–95, 56.1% female) without a history of clinically diagnosed cardiovascular disease, we examined the extent to which health behaviours (smoking, alcohol, physical activity), psychological distress (General Health Questionnaire-12 item) and metabolic dysregulation (obesity levels, and the presence of hypertension and diabetes) account for the association between marital status and cardiovascular mortality. There were 258 cardiovascular deaths over an average follow up of 7.1 (Standard Deviation = 3.3) years. The risk of cardiovascular mortality was greatest in single, never married men and separated/divorced women compared with those that were married in gender stratified models that were adjusted for age and socio-economic group. In models that were separately adjusted, behavioural factors explained up to 33%, psychological distress explained up to 10% and metabolic dysregulation up to 16% of the relative change in the hazard ratios in the observed significant associations between marital status and cardiovascular mortality. Behavioural factors were particularly important in accounting for the relationship between being separated/divorced and cardiovascular mortality in both men and women (33% and 21% of the relative change in the hazard ratios, respectively). The findings suggest that health behaviour, psychological distress and metabolic dysregulation data have varying explanatory power for understanding the observed relationship between cardiovascular disease mortality and unmarried states.

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Introduction

There is good evidence that structural aspects of an individual's social relationships can predict all cause mortality (House, 2001; House, Landis, & Umberson, 1988) and mortality from a range of clinical conditions across adulthood (Kaplan & Kronick, 2006), particularly conditions relating to cardiovascular disease (Brummett et al., 2001; Lett et al., 2005). This has been clearly demonstrated in the literature examining the relationship between marital status and health outcomes (Kiecolt-Glaser & Newton,

2001). All of the various unmarried states (being single never married, being separated/divorced and being widowed) have been associated with elevated mortality risks (Ikeda et al., 2007; Johnson, Backlund, Sorlie, & Loveless, 2000; Manzoli, Villari, Pirone, & Boccia, 2007).

The two main explanations that have been proposed in accounting for these observations are social selection and social causation theory (Joung, van de Mheen, Stronks, van Poppel, & Mackenbach, 1998). Although these are non-mutually exclusive explanations with respect to marriage and health, social selection usually refers to the selection of healthier individuals into marriage and unhealthy persons into unmarried states whereas social causation refers to the social/economic resources, sometimes referred to as the protective or social support consequences of marriage, and better health behaviours (this can also be a selection effect through assortive mating) that can accompany the married state and promote health and the harmful consequences of bereavement or marital dissolution experienced by widowed

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persons and the separated or divorced. Although social selection and social causation represent contrasting accounts at an ultimate level of explanation (Tinbergen, 1963), the proximate bio-behavioural mechanisms are likely to be shared in social selection and social causation e.g. health behaviour, psychological distress, stress-related pathophysiological responses.

A range of studies have demonstrated that behavioural (Molloy, Perkins-Porras, Strike, & Steptoe, 2008; Umberson, 1992), psychological distress (Kessler & Essex, 1982; Umberson, Wortman, & Kessler, 1992) and pathophysiological mechanisms (Uchino, 2006) that can influence morbidity and mortality from cardiovascular disease are associated with various states of social isolation. In comparison with the other leading causes of mortality (e.g. cancer, respiratory conditions, infectious disease and external causes) theoretical models linking marital status with processes that are known to directly influence cardiovascular disease mortality have been more completely outlined and tested e.g. cardiovascular reactivity (Kiecolt-Glaser & Newton, 2001). However there are few reliable estimates and comparisons of the extent to which these mechanisms can potentially explain the association between each of the unmarried states and risk of cardiovascular disease mortality. The present study uniquely addresses this gap in this literature. This type of analysis is required to move our understanding of marriage and its role in the pathogenesis of cardiovascular disease forward, as there are potentially differing mechanisms, which may be more or less important in the various unmarried states (Kiecolt-Glaser & Newton, 2001). Although these three classes of mechanisms are clearly interdependent, a comparison of the separate explanatory power of these could inform what intervention strategies might be most effective in reducing the risk associated with being unmarried i.e. behaviour change, psychotherapy and biomedical intervention.

One of the strongest recurrent findings in this literature on marital status and health has been the presence of gender differences in the relationship between marital status and health outcomes (Umberson, 1992). Being married is associated with greater protection for men compared to women, therefore gender stratified analysis have become commonplace in much of this work (Kaplan & Kronick, 2006; Scafato et al., 2008). Various explanations have been proposed for observed gender differences in the marriage–health relationship, namely gender differences in the social control of health behaviour, with women being more likely to control others health behaviour (Umberson, 1992) and the qualitative differences between men and women's support networks, with men more likely to rely on wife or partner as the main source of support, whereas women may have several close confidants. To date, the extent of the differences between the intermediate processes between marital status and cardiovascular disease mortality in men and women has not been well characterised. Therefore the analysis also aimed to examine gender differences in cardiovascular disease mortality and potential intermediate mechanisms according to marital status.

We analysed data from the Scottish Health Survey (The Scottish Government Statistics, 2008) to address the following questions: (i) How much of the association between marital status and cardiovascular mortality can be explained by behavioural, psychological distress and metabolic dysregulation (ii) Does the relative contribution of behavioural, psychological distress and metabolic processes vary across the marital status categories i.e. being single never married, being separated/divorced and being widowed. In this study we eliminated individuals with previously clinically diagnosed cardiovascular disease in order to assess the relationship between marital status and cardiovascular mortality in a population that were free from clinically confirmed cardiovascular disease at baseline.

Methods

Sample

The Scottish Health Survey is a periodic survey (typically every 3–5 years) that draws a nationally representative sample of the general population living in households. The sample was drawn using multistage stratified probability sampling with postcode sectors selected at the first stage and household addresses selected at the second stage. Different samples were drawn for each survey. The present analyses combined data from the 1995, 1998 and 2003 Scottish Health Survey in adults aged 35 yrs and older. The overall response rate ranged between 60 and 76% for the different survey years (The Scottish Government Statistics, 2008). Participants gave full informed consent to participate in the study and ethical approval was obtained from the London Research Ethics Council. Out of a total of 16,144 we excluded 1094 participants (7%) with a previous clinical history of cardiovascular disease or cancer. There were 1151 participants with incomplete data (7%), therefore there was complete data available for 13,889 participants. This sample comprised the dataset for the present analysis.

Baseline assessment

Survey interviewers visited eligible households and collected data on demographics and health behaviours (physical activity, smoking, alcohol intake). There were 5 possible categories for marital status: 1. married and living with husband/wife, 2. married and separated from husband wife, 3. divorced, 4. widowed and 5. single and never married. For the purpose of this study 4 marital status categories were created namely 1. Married, 2. Single, never married, 3. Separated/divorced and 4. Widowed. On a separate visit nurses collected information on medical history, and took anthropometry variables (height, weight, waist circumference) from consenting adults. Detailed information on the survey method can be found elsewhere (The Scottish Government Statistics, 2008). The Scottish Health Survey datasets are available through the UK data archive for bona fide researchers who wish to examine the dataset in more detail (<http://www.data-archive.ac.uk/>).

Predictor and outcome variables

Current psychological distress was assessed from the 12 item version of the General Health Questionnaire (GHQ-12), which is a measure of psychological distress devised for population studies. The questionnaire comprises twelve questions, asking informants about their general level of happiness, experience of depressive and anxiety symptoms, and sleep disturbance over the last four weeks. Interpretation of the answers is based on a four point response scale scored using a bimodal method (symptom present: 'not at all' = 0, 'same as usual' = 0, 'more than usual' = 1 and 'much more than usual' = 1). The GHQ-12 is a highly validated instrument and has been strongly associated with various psychological disorders such as depression and anxiety (Goldberg et al., 1997). We used a score of ≥ 4 to define possible 'caseness' of psychological distress according to studies validating the GHQ-12 against standardised psychiatric interviews (Goldberg et al., 1997). Existing hypertension and diabetes was confirmed from self reported doctor's diagnosis, which is generally considered as being reliable (Colditz et al., 1986). Obesity was defined as a body mass index ≥ 30 kg/m². Health behaviours were measured using self-report questionnaires. Physical activity questions inquired about participation in the four weeks prior to the interview. Frequency, duration, and intensity of participation was assessed across three domains of activity: leisure time sports (e.g. cycling, swimming, running, aerobics, dancing, and

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