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Original Article

How does marriage affect length of life? Analysis of a French historical dataset from an evolutionary perspective

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ABSTRACT

There are broadly two explanations for why human longevity appears to be extended by marriage. First, there is the social explanation, whereby the companionship, division of labour and the economic support that marriage offers is thought to extend life. Second, there is a selective explanation, whereby those individuals with high potential longevity are more attractive to the opposite sex and therefore more likely to get married. Here we analyse the "TRA" dataset from 19th century France, using an evolutionary approach to address the question of why marriage is linked to longevity, focussing particularly on sex differences. The dataset is based on death and marriage records from all of France between 1798 and 1901 and includes information on age at death, marriage and wealth for individuals whose surnames began with the letters TRA. We find that marriage is positively associated with longevity, particularly for men. In part, this is related to the higher rate of deaths for single males during marriageable age, as compared to a higher rate of deaths for females during marriage. There is a positive association between wealth (at death) and longevity for individuals who were single or married at death, with a stronger effect for singles. Analysis of the effect of spousal age gap on duration of survival after first marriage indicates that men who were married to younger women lived longer, whereas the longevity of women was not associated with the spousal age gap. We put forward an evolutionary perspective on marriage and longevity, hypothesizing that there is an important role for sexual selection in the association between marriage and longevity, with women selecting on characteristics associated with longevity, whilst men select on characteristics associated with reproductive potential.

1. Introduction

Evidence from a number of studies has shown that married persons, and particularly men, tend to live longer than their unmarried counterparts (e.g. Hu & Goldman, 1990; Lillard & Waite, 1995; Tucker, Friedman, Wingard, & Schwartz, 1996) but the reasons for this are not completely clear. A review and meta-analysis of those studies which have examined the issue, conducted by Rendall, Weden, Favreault, and Waldron (2011), reached the following conclusions: (1) There is a survival advantage of marriage for men and women, when comparing all married categories (married, widowed, divorced) with the unmarried group. (2) There is a greater overall marriage advantage for men than for women (controlling for employment and earnings), which tapers off for men into older age. (3) The protective effect of marriage attenuates with age, and the gender difference in survival disappears; however, the use of household survey data may confound this, because it misses those elderly in nursing homes. (4) The claims of differences between married groups (married, widowed, divorced) are based on weak statistical evidence, with explicit tests between the groups almost always absent, whilst hypotheses to explain higher mortality of one or other married category are inconsistently applied.

There are broadly two theories that have been put forward to explain survival differences between married and non-married individuals:

The first of these theories is that marriage, in itself, has a protective effect on survival, which results in enhanced longevity; this idea usually takes into account the socio-economic benefits that come along with marriage. On one hand, marriage has traditionally been the socially desired institution for cohabitation of couples, causing people to be accepted in a society and to possess certain rights. On the other hand, marriage may be associated with better economic circumstances and better living conditions, which positively affect survival.

The second theory is that there is selection into marriage of individuals who are most likely to live longer. In other words, those individuals who are better equipped to survive into old-age are more likely to marry. In fact, this was suggested as long ago as 1858 by William Farr in a study of marriage and mortality in France (Farr, 1858). He suggested that those with mental and physical disabilities were less likely

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to marry, whilst also being less likely to live long lives, whereas those who were healthy were not only mutually attracted to each other, but their union in marriage was promoted and supported by society.

According to Goldman (1993), the relationship between marital status and longevity is inextricably linked to the process of selection into marriage. In the modern debate, the notion of selection relates to the preference for 'high quality' partners on the marriage market, which may be indicated by social status, health, beauty and behaviors which are positive for health and longevity, because these 'quality-traits' are indicative of higher survival prospects (e.g. Livi-Bacci, 1985). The greater success of individuals with these "quality-traits" in attracting partners and getting married, results in those with better survival prospects being better represented in the married group, whilst those with lower survival prospects are better represented in the single group.

It has been difficult to disentangle the evidence for a protective effect of marriage with that for selection into marriage, in relation to longevity, and it is possible that both processes are occurring (Murray, 2000). The ability of individuals to move from the single into the married group, then from the married group into widowed and divorced groups, means that any attempts to make distinctions between the groups are fraught with difficulty (Bernard, 1982; Goldman, 1993). For example, using a longitudinal survey from the United States, Liu (2009) identified the widowed as a group which is particularly vulnerable, exhibiting a higher mortality rate. It follows, therefore, that marriage may not only have a protective effect for those that are married, but a detrimental effect for those who are married and then lose their spouse. It has similarly been found that divorcees show the highest mortality rates among the unmarried groups, though this may be due to the destabilizing effect of becoming divorced, rather than being due to the loss of the protective effect of marriage (Hu & Goldman, 1990; Tucker et al., 1996). Indeed, Joung, van de Mheen, Stronks, van Poppel, and Mackenbach (1998) found that where individuals had previously reported health problems, this was a significant factor in individuals becoming divorced, which suggests that there is not a simple cause and effect relationship, where we can say that being either divorced or married is a determinant of survival prospects, but survival prospects may also affect marital status.

The interest in marriage as a factor in human longevity has mostly been studied within the social sciences, for the obvious reason that marriage is a social phenomenon, which plays an important role in the demographic constitution of a population. The topic has not been addressed to any significant extent from an evolutionary perspective, although the concept of selection is central to the study of evolutionary biology and, as mentioned, many authors have argued that selection is central to the interaction between marriage and longevity. In this study, we add an evolutionary perspective to the topic, focussing on the concepts of selection and biological resource allocation. We conduct an analysis of a French historical dataset (see Bourdieu, Kesztenbaum, & Postel-Vinay, 2014b), which has not previously been used to investigate this topic, and which is quite unusual among historical data sources, in that it contains information on age and marital status at death for a representative national sample, including individuals who did not marry. It predominantly covers the nineteenth century, and is known as the "TRA" dataset, because it is constructed from death and marriage records of individuals whose surnames began with the letters TRA. In particular, we focus on the difference between the sexes, to gain an understanding of how the social and selective forces related to marriage may affect longevity.

First of all, we look at the association between marital status at death and longevity, we test whether being ever-married or never-married was related to lifespan in nineteenth century France, and whether this differed for men and women.

Second, we test whether any association between marital status at death and longevity was related to wealth, which in the TRA data we are able to observe in terms of financial assets, real estate value and transferable securities, which is aggregated into an overall measure of wealth at death in francs.

Third, we test whether the spousal age gap (husband's age – wife's age) had any influence on either male or female longevity. It has been shown in contemporary Danish data that there is a survival advantage to men of marrying younger women and a disadvantage to both sexes of marrying an older spouse (Drefahl, 2010). However, these findings are somewhat contradictory to those of Kemkes-Grottenthaler (2004), who showed with historical German data that women who married a younger man lived longer, whereas men lived longer when married to a younger or older woman, but shorter when married to a woman of similar age. There are other studies which have shown a longevity advantage for men of marrying younger women (Foster, Klinger-Vartabedian, & Wispe, 1984; Fox, Bulusu, & Kinlen, 1979; Rose & Benjamin, 1971) or an advantage to women of marrying younger men and disadvantage of marrying older men (Klinger-Vartabedian & Wispe, 1989). However, a limitation with these earlier studies is that they did not take the duration of marriage into account or accurately measure the spousal age gap, because the age of spouses was only available in 5 year cohorts (Drefahl, 2010). It can also be argued that marriage age and marriage order (i.e. first marriage, second marriage, etc.) needs to be taken into account, because these may be important factors for selection into marriage. The social or biological basis of longevity differentials related to spousal age gap is not yet understood; we therefore wanted to test for the phenomenon in an altogether different study population, in which we have detailed information about age at marriage, remarriage and longevity.

Finally, we discuss our findings within the framework of evolutionary biology, considering the different aspects to selection as they relate to marriage and longevity, with an aim to formalizing an evolutionary perspective on this topic.

2. Data and methods

2.1. The dataset

The TRA dataset was acquired from the digital media included with the book: *L'enquête TRA, histoire d'un outil, outil pour l'histoire* (Bourdieu, Kesztenbaum, & Postel-Vinay, 2014a). It was produced by a project that began in the 1980s, aiming to reconstitute the genealogies of 3000 French couples, one of whom had a surname beginning with the letters TRA. It was then extended to study the wealth of individuals with such surnames across the whole of France during the 19th century, using the "Tables de Successions et Absences" (TSA) [Tables of Deceased and Missing Individuals], and "Registres de Mutations par Décès" (RMD) [Registers of Transfers by Death], which were available from local fiscal administration offices throughout the country. It became law in 1799 to notify the fiscal administration of every death, and also personal wealth at death, because this was seen as vital for the principle of universal taxation, which had been established by the French revolution.

It is unlikely that all deaths were registered in all administrative regions, but the fact that the legal requirement existed is important from the perspective of using the TRA data for a historical demographic study, because it gives us some confidence that the sample is representative of the population, and that the characteristics of those who died do not only represent a specific sub-sample. In genealogical data, for example, we see that deaths in childhood are under-represented, whilst those who married and had children are over-represented (Hacker, 2010; Zhao, 2001). However, the TRA dataset does not suffer from these problems. It is unbiased with respect to wealth, age, sex and marital status, which means that the data is well suited for addressing our research questions.

There are two primary types of record in the TRA dataset: death records and marriage records. The death records include name, year of birth, year of death, age at death, marital status at death, town of residence at death, place of birth, profession at death, succession value (including transferable securities, real estate values and financial