



# Concordance of health states in couples: Analysis of self-reported, nurse administered and blood-based biomarker data in the UK Understanding Society panel



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## ABSTRACT

We use self-reported health measures, nurse-administered measurements and blood-based biomarkers to examine the concordance between health states of partners in marital/cohabiting relationships in the UK. A model of cumulative health exposures is used to interpret the empirical pattern of between-partner health correlation in relation to elapsed relationship duration, allowing us to distinguish non-causal correlation due to assortative mating from potentially causal effects of shared lifestyle and environmental factors. We find important differences between the results for different health indicators, with strongest homogamy correlations observed for adiposity, followed by blood pressure, heart rate, inflammatory markers and cholesterol, and also self-assessed general health and functional difficulties. We find no evidence of a “dose–response relationship” for marriage duration, and show that this suggests – perhaps counterintuitively – that shared lifestyle factors and homogamous partner selection make roughly equal contributions to the concordance we observe in most of the health measures we examine.

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## 1. Introduction

Research on the health of couples is sparse relative to research on individuals, twins and siblings (Meyler et al., 2007). Existing evidence includes cross-section analysis of the spousal associations of incidence for a range of diagnosed diseases (Hippisley-Cox et al., 2002; Banks et al., 2013) and prospective studies which have found concordance in some specific health domains, including psychiatric disorders (Joutsenniemi et al., 2011), alcohol dependency (Leadley et al., 2000), obesity (The NS and Gordon-Larsen, 2009; Wilson, 2012) and smoking behavior (Banks et al., 2013). Many studies are based exclusively on self-reported health indicators or focus on specific health conditions or indicators; few studies are able to separate initial selection effects from subsequent duration effects (Di Castelnuovo et al., 2009).

To understand the health of couples, it is important to distinguish homogamy (a tendency for people to choose partners similar

to themselves) and causal concordance (correlation of health states caused by lifestyle and environmental influences shared within the marriage).<sup>1</sup> The economic theory of the marriage market (Becker, 1973, 1974) predicts that complementarity of partners' traits in the marriage production function leads to homogamy in the form of positive assortative mating. Empirical evidence suggests that matching processes are multidimensional and not driven by a single individual characteristic (Chiappori et al., 2012). Although health (more particularly, observable health dimensions) may be a matching criterion itself, it is more likely that health selection arises from indirect selections through other characteristics, such as behaviours, age, education and socio-economic position (Chiappori et al., 2012; Clark and Etilé, 2006).

Homogamy and shared lifestyle/environmental influences are not necessarily unrelated. For example, if initial attraction rests partly on a shared love of overeating, then that preference may contribute to a shared diet that damages health. In this example,

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<sup>1</sup> For economy of language, we use the terms marriage and partnership interchangeably to denote any domestic partnership, whether or not it has legal marital status.

homogamy both generates a correlation in the pre-marital health states of the couple and contributes to establishing the subsequent shared lifestyle and home environment, so homogamy and marital lifestyle need not be statistically or causally independent. Nevertheless, it is the actual diet that damages health, not the love of food *per se*. In this paper we aim to distinguish between homogamy in the specific sense of correlation between health states of partners at the start of their union and shared lifestyle/environment in the sense of common factors that influence health through marriage, however those factors arise.

In the wider context of the debate on contagion *versus* homophily in health behaviors and obesity (Christakis and Fowler, 2007), experimental research has achieved some results (Centola, 2011); however, marriage is not amenable to randomized experimental control and the importance of homogamy as a factor in couples' health outcomes remains uncertain.

There are two main reasons for an interest in the association of morbidities of marital partners. One is that this analysis may tell us something about the causal processes generating health outcomes in adult life. If homogamy is found not to be a significant source of spousal health concordance, this focuses attention on a wide range of possible theoretical mechanisms including household production, peer effects, marriage market effects and various kinds of contagion (see Section 2). On the other hand, if shared adult environment and lifestyle effects are unimportant, the well-established positive association between marriage and health (Rendall et al., 2011) may not be causal, and the argument for environmental exposures in the foetal and infancy stages as the dominant influences on the risk of disease much later in life (Almond and Currie, 2011; Barker, 1991) is strengthened.

The second motivation relates to public policy and the capacity of couples to absorb adverse shocks. Even if health selection occurs at the time of partnership formation, a causal effect of the shared environment is necessary for health concordance to persist or increase through time. This matters for policy because persistent concordance may result in wider health inequalities across couples and any tendency for disability and morbidity to become more concentrated within couples also affects the social cost of disease. For example, the market value of informal care supplied to disabled people in the UK in 2015 is estimated at £132bn, comparable to the total cost of the National Health Service (Buckner and Yeandle, 2015), with much of that cost met by the domestic partners of disabled people (Pickard et al., 2007). This is a system of informal insurance through the pooling of risk within couples but, if disability affects both partners simultaneously, their capacity to provide care for each other may be impaired – reducing the effectiveness of pooling and self-insurance, increasing dependency on external care services, and raising the cost of social care. Separating homogamy from causal concordance may be also relevant for public health prevention programs. Although homogamous health selection is largely immune to policy, evidence on causal effects of shared environment and lifestyle may provide a basis for screening programmes and other interventions that exploit information on the health of one partner to identify elevated risks for the other partner (Di Castelnuovo et al., 2009).

A key difficulty is the absence of definitive data. The ideal would be a prospective study that samples individuals early in life, tracking them through marriages with other sample members, observing health outcomes in later life. No such study exists on a representative basis. Consequently, most research on couples has been cross-sectional or short-range longitudinal, with the sample of partners selected at a point after marriage. Retrospective recall data have been used (Booker and Pudney, 2013), but there are doubts about recall accuracy and the limited health indicators available.

A further difficulty is the multi-dimensional nature of the concept of health and the difficulty of measuring health in general-population surveys. We exploit the availability of an unusually wide range of health indicators in the UK *Understanding Society* household panel.<sup>2</sup> They are of four types: self-reported subjective assessments; self-reported existence of diagnosed conditions; indicators derived from nurse-administered measurements; and biomarkers derived from analysis of blood samples.

We make two main contributions to the literature on spousal concordance of health. First, we use a statistical model, which captures formally the theory of cumulative exposures that is highly influential in lifecourse epidemiology (Riley, 1989; Power et al., 2013) to show that the variation of the intra-couple health correlation with elapsed marriage duration is informative about the relative importance of homogamy and shared environment and lifestyle as influences on long-term health outcomes. But we also show that the correlation-duration profile needs careful interpretation: in particular, a constant or even declining correlation does not necessarily imply that shared exposures are unimportant. We find empirically that homogamy is an important source of concordance in certain dimensions of health, particularly adiposity and also cardiovascular health and inflammation which are known to be related to adiposity. We also find that the correlation between partners' health states is essentially unrelated to the elapsed duration of marriage, which, under reasonable assumptions, implies – perhaps counter-intuitively – that shared factors are of approximately equal importance to homogamy as a source of health concordance. We show that these results are robust to a range of potential difficulties, including survival bias, age at marriage effects, time variation in homogamy, the effect of medication, and other features of our research design.

A second contribution is to extend the literature on health concordance by using a wide range of health indicators. Unlike many studies that rely on self-reported health measures or focus on specific indicators (Banks et al., 2013; Meyler et al., 2007; Monden, 2007; Wilson, 2012), we use a large set of complementary subjective and objective health measures. Subjective indicators (such as self-assessed general health or functional disability) have been shown to be predictive of future morbidity (Idler and Benyamini, 1997) but are subject to misreporting (Bago d'Uva et al., 2008) which may result in spurious health concordance because of interactions between partners in the survey interview setting. Reports of diagnosed conditions may be similarly interdependent – for example, a woman's diagnosis of diabetes may prompt her husband or their GP to call for a test for him. Objective biomarkers are free of this type of cross-contamination but are designed to be sensitive to specific dimensions of health, so a range of measures should be considered.

## 2. Theories of health concordance in couples

There are at least six plausible causal mechanisms that could lead to causal health concordance in long-established partnerships. The most obvious rests on household production theory (Becker, 1965), which emphasizes the cost advantages of communal production within the home of basic commodities like nutrition and some physical activity. A large body of evidence linking diet and physical exercise to health outcomes (Willett, 1994; Haskell et al., 2007) supports this theory. Second, despite advances in public health, biological contagion remains a possible source of concordance, for example in older couples where both partners may have relatively weak immune systems. Third, research on the human

<sup>2</sup> Our analysis excludes Northern Ireland, where the full range of health measures was not collected.

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