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Inequality in mortality in Vietnam during a period of rapid transition

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ABSTRACT

Vietnam has experienced rapid economic growth following the transition, which began in the mid 1980s, from a planned agriculture based economy to a more market orientated one. In this paper, the associations between socioeconomic variables and mortality for 41,000 adults in Northern Vietnam followed from January 1999 to March 2008 are estimated using Cox's proportionally hazard models. Also, we use decomposition techniques to investigate the relative importance of socioeconomic factors for explaining inequality in age-standardized mortality risk. The results confirm previously found negative associations between mortality and income and education, for both men and women. We also found that marital status, at least for men, explain a large and growing part of the inequality. Finally, estimation results for relative education variables suggest that there exist positive spillover effects of education, meaning that higher education of one's neighbors or spouse might reduce ones mortality risk.

Introduction

The literature about socioeconomic inequality in health is large and growing (Balia & Jones, 2008; Charasse-Pouélé & Fournier, 2006; Wagstaff & van Doorslaer, 2004; Wildman, 2003). The problem has got even more attention since the Commission on Social Determinants of Health launched their final report in 2008 (Marmot, Friel, Bell, Houweling, & Taylor, 2008). The commission suggested three principles: improve the conditions of daily life, tackle the inequitable distribution of power, money and resources in general, and finally, measure the problem and evaluate actions (Marmot et al., 2008). This particular concern for health has been motivated by, among others, Amartya Sen: In any discussion of social equity and justice, illness and health must figure as a major concern (Sen, 2002, p. 659). There are many aspects on equity in health and health care, but we believe that Wagstaff and van Doorslaer were right when they argued that the most fundamental concern must be about the ultimate upstream variable – health, in this case measured as mortality (Wagstaff & van Doorslaer, 2000).

The majority of the literature about socioeconomic inequality in health is based on European and US data (Macintyre & Hunt, 1997). There is, however, also a growing literature of health inequality in Vietnam, including studies of the association between socioeconomic status and mortality (Huong, Minh, Janlert, Van, & Byass, 2006); mortality from cardiovascular diseases (Minh, Byass, & Wall, 2003; Minh, Huong, Wall, Chuc, & Byass, 2006); prolonged cough (Khe, Phorson, Hoa, Diwan, & Eriksson, 2004) and height-for-age (Wagstaff, van Doorslaer, & Watanabe, 2003). The mentioned studies used one or a few of the following measures of socioeconomic status: education, occupation and household income or expenditure.

Using Vietnamese data, Khe, Eriksson, Phuong, Höjer, and Diwan (2003) showed that different socioeconomic variables are correlated, but only weakly so. This tells us that different socioeconomic variables describe different aspect of socioeconomic status. That the socioeconomic variables are correlated also tells us that it is preferable to, at once, access the relationship between them and health, rather than separately analyzing the association between each aspect of socioeconomic status and health. Hence, the primary purpose of this paper is to study the associations between mortality and several socioeconomic measures, including education, occupation, income and also marital status. Marital status is neglected in the previous Vietnamese studies, but found to be related to mortality elsewhere (see e.g. Gardner & Oswald, 2004, and references therein).

Mortality is chosen as dependent variable since it is an objective measure. Objectivity is important since several studies have found evidence of state-dependent bias in subjective self-reported health measures, meaning that people in disadvantage groups generally over-estimate their health relatively to others (Charasse-Pouélé & Fournier, 2006, and references therein discuss this).

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Following Balia and Jones (2008) we calculate Gini coefficients as measures of inequality in mortality risks, and decompose them in order to show how large parts of the inequality that are explained by the different determinants of mortality. Similarly to Wildman (2003) we also study how the determinants' contribution to inequality has changed over time. We do this under the standard assumption that the slope coefficients remain constant, since we based on a Wald test cannot reject that this is true. The main effect of assuming that the slope coefficients remain constant is that it increases the precision of the estimates (Greene, 2003, chap. 4, discusses effects of including irrelevant variables, which this relates to). Our study is based on a sample of 41,000 adult men and women from the rural Bavi district in northern Vietnam, which are followed from January 1999 to March 2008. Ethical approval for the overall surveillance activities in the district, including collection on vital statistics, was given by the Research Ethics Committee at Umeå University (reference number 02-420) and local approval was given by the relevant authorities. Following Wildman, we concentrate on the results for the first and last year under study, since the time between these years are likely to show the largest changes.

As a result of a transition from a planned agriculture based economy to a more market oriented one, Vietnam has during the study-period experienced a rapid economic growth, making it especially interesting to study the development over time. The transition stared in 1986 when the party congress approved broad economic reforms (Doi Moi or renovation), including a greater role for markets and foreign investments (U.S. State Department, 2009). Vietnam became one of the Asian Tiger economies, and GDP grow annually with above 7% during the study-period. Agricultural production nearly doubled between 1990 and 2007, transforming Vietnam to the world's second largest rice exporter. This shift from a centrally planned economy to a more market oriented economy improved the living conditions for many Vietnamese. Per capita income rose from $ 220 in 1994 to $ 1024 in 2008.

Like most papers in this field, the purpose of this paper is a descriptive one; to describe the association between socioeconomic status and health, not to access the causal effect of one of them on the other. The motivations of this are twofold. First, this approach gives a clearer picture of the double burden of having both low socioeconomic status and poor health. Second, several econometric studies have demonstrated the limitations of the alternative approach, instrumental-variable regression. For example, Heckman, Urzua, and Vytlacil (2006) demonstrated the limitations when the independent variables might have heterogeneous effects on the dependent variable and Stock and Yogo (2005) showed that the instruments must indeed be quite strong in order to obtain good estimates using instrumental-variable regression.

A secondary purpose is to assess the importance of relative socioeconomic variables. We therefore estimate one specification including variables describing households' income in relation to the income in its cluster (village) and also corresponding measures for individuals' education. We also make an attempt to shed some light of the importance of gender-roles in explaining the well-known difference between men's and women's mortality. To this end, we in another specification include variables describing the individuals' age and education relative to their partner's dito. Our prior expectations were that these variables could serve as proxies for gender equality and those affect the mortality risk in different directions for men and women. This approach was inspired by Månsdotter, Lindholm, Lundberg, Winkvist, and Öhman (2006) who studied the association between gender equality and mortality and morbidity in Sweden.

It should be made clear that the approaches regarding our secondary purpose suffer from some weaknesses. The clusters (villages) do, of course, not exactly match with the groups that individuals in this area of Vietnam in reality compare themselves to, which reduces the possibilities of finding significant effects. Compared to using larger areas, there is, however, likely an advantage to use the clusters when creating these relative variables, since individuals have more interactions with those living close by and therefore probably are more affected by their status relative those, than their status relative others that they seldom or never interact with. The proposed proxies of gender equality are not perfect proxies since they might capture also other effects than those of gender equality itself. Still, we believe it is important to also report these results, since little is written about this, and so that our findings can serve a starting point for further research. Our results also demonstrate how the inclusion of these relative measures affects the estimates for the absolute variables.

Methods

In this section we first present the model used to estimate functions for mortality risk. We then discuss how the results from these estimations can be used to calculate and decompose Gini coefficients in order to reveal the importance of different socioeconomic variables for explaining inequality in individuals' predicted mortality risk.

Estimating mortality risk

Since mortality is censored by migration out of the Bavi district and by the length of the follow-up period, we use Cox's (1972) proportional hazard model to estimate the effect of the independent variables on mortality risk. The hazard rate at time t for individual i is written

$$h_i(t) = h_0(t)e^{X_{it}\beta}, \quad (1)$$

where X_{it} is a vector of covariates and β a vector of parameters. The first part of the function, $h_0(t)$, is called the baseline hazard and only depends on time in days from that the individual came under observation. The second part is a function of explanatory variables, which all are assumed to have the same proportional influence of the hazard irrespective of study time.

Measuring and decomposing inequality

We analyze inequality in predicted mortality risk, which gives sufficient degree of individual-level variation to use Gini coefficients as measures of socioeconomic inequality across individuals. In contrast to for example a concentration index (Van Doorslaer et al., 1997; Wagstaff, van Doorslaer, & Paci, 1989) it reflects also inequalities not associated with income. That Gini coefficients depend less on income than concentration indexes is an advantage in this study, since there is a risk that the incomes measures we use suffers from measurement errors. Still, the decomposing techniques allow us to relate the inequalities to income and also to other relevant socioeconomic factors.

For any measure of health a Lorenz curve plots the cumulative proportion of the population – ranked by increasing health – against the cumulative proportion of health. The Gini coefficient is defined as the ration of the area between the Lorenz curve and the uniform distribution line (the 45° line), to the area below the uniform distribution line (e.g. Le Grand, 1989; Wagstaff, Paci, & van Doorslaer, 1991). Thus, the Gini coefficient can take a value between 0 and 1, where 0 corresponds to perfect equality and 1 corresponds to perfect inequality. Lerman and Yitzhaki (1989) showed that the Gini coefficient can be expressed as