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Social mobility in the early middle ages☆

Nicholas J. Meinzer

Eberhard Karls Universität Tübingen, Germany

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ABSTRACT

Estimates of inequality of living standards based on average height differences between socioeconomic strata are likely biased if the social status of some individuals changed during their lifetime. Height differences estimated from skeletal remains, reflecting living standards during childhood and adolescence, are probably too small if social status is inferred based on grave goods which are associated with the individuals' social status at the time of their death. The higher the level of social mobility, the more distinguished individuals will not have had a privileged childhood and, therefore, have the biological characteristics of the disadvantaged group. In a newly assembled sample of individual level anthropometric data from 26 early medieval row grave cemeteries in south-western Germany, men buried with a long sword in their grave were on average about 3 cm taller than the others. In a simple model of the mechanics of the social-mobility bias, this height difference, together with parameters from the literature, implies a level of social mobility typical of small-scale agricultural or pastoral societies.

1. Introduction

Ever since the neolithic revolution, elites in hierarchical societies have often successfully managed to redirect resources to themselves and their families, with lasting results (Boix and Rosenbluth, 2014). While for most of this time neither the underlying social and economical differences nor the resulting unequal outcomes were recorded in writing, other sources of data are available. Mortuary evidence, such as skeletal remains which can be used to estimate body heights and accompanying grave goods which are likely to have reflected social status, is available for long periods of the past.

Nutrition and health conditions during childhood are a major influence on average heights of populations (Bogin, 2001). The children of the elite tend to grow up into, on average, taller adults due to their advantageous material condition. This inequality of living standards is reflected in an average-height difference between people with elite and ordinary background.

Analysing social gradients of adult heights in a British cohort study, Power and Manor (2002) stress that social mobility introduces a bias into such measures of inequality. If children from poorer homes rise into the ranks of the elite later in life, the average height of the elite will be lower than it would have been otherwise. The shorter average heights of socially upwardly mobile people reduce the average height of all adults with elite status taken together. Conversely, the ordinary people will be on average (ever so slightly) taller if some children of the elite cannot retain their social status as adults.

Only in a rigidly ranked society would the average height differences reflect the true underlying inequality of living standards. In a society with maximum social mobility, where all children have a similar chance to rise to the top, there would be no measurable differences in heights between the (adult) elite and the others, regardless of differences in childhood health and nutrition.

Like many other historical sources, the mortuary evidence from the Early Middle Ages analysed below represents the state of

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E-mail address: nicholas.meinzer@uni-tuebingen.de.

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things as they were at one point in time. As potential markers of social status are not directly related to childhood circumstances, between-group differences are likely biased, while the actual level of social mobility cannot be measured directly. Making assumptions about underlying height differences based on the literature, a simple model of the mechanics of the social-mobility bias can be used to obtain ballpark estimates of the level of social mobility, or vice-versa.

The next section presents a model of average heights in a society with two social strata, spelling out the effects of social mobility. A third section reviews relevant literature on average height differences between members of various social strata, gives some background information on south-western Germany in the 5th to 8th centuries, and argues that some grave goods deposited during burial, namely large swords and objects made of precious metals, can be used to tentatively identify an individual's social standing. The fourth section introduces a new dataset of 926 adult individuals excavated from 40 cemeteries. Before coming to a conclusion, another section discusses the observed difference of almost 3 cm between the men buried with special grave goods and the others and applies the simple model presented in the second section to the dataset. Assuming an underlying height difference of 4 cm, the model implies that between 58 and 95 percent of the individuals who received an elite burial grew up under privileged conditions.

2. A simple model of social mobility and heights

Consider two generations of people in a society with two social strata, ordinary people and an elite. The elite has preferential access to resources and generally enjoys a higher standard of living. Children growing up in households of the elite enjoy the higher living standard of those households and grow up to be on average b centimetres taller than those who grew up in ordinary households. The heights of children of the elite, h_e, and ordinary people, h_o, are distributed normally

$$h_o \sim \mathcal{N}(\mu_h, \sigma^2) \tag{1}$$

$$h_e \sim \mathcal{N}(\mu_h + b, \sigma_e^2) \tag{2}$$

Over the courses of their lives, some m people born and raised in ordinary households somehow become members of the n_E people strong elite stratum. Conversely, m people born to elite parents move down the social ladder so that the numbers of the elite remain constant. How and why specific individuals maintain or gain their elite status cannot be observed, therefore, it is sensible to treat the process as exogenous for reasons of parsimony. People then die and are buried according to the rites applicable to deceased of their status, i.e. from the social stratum they belonged to when they died. The expected height of people buried as members of the elite μ_{h_E} is a function of the average height of ordinary people μ_h, the height benefit b of people raised in elite homes and the share of members of the elite who retained their childhood status.

$$\mu_{h_E} = \mu_h + \frac{n_E - m}{n_E} b \tag{3}$$

Assuming further that the outcomes, having an elite childhood and becoming part of the elite as an adult, are drawn from two correlated Bernoulli distributions, the fraction of individuals who were not socially mobile in formula (3) can be regarded as the conditional probability of a successful draw from the second distribution given a successful draw from the first. In the most simple case, where the probability of success p is the same for both outcomes with a correlation coefficient ϕ between growing up in an elite household and becoming an elite adult, this conditional probability, corresponding to the fraction f of members of the elite who have retained their childhood status, is

$$f = \frac{n_E - m}{n_E} \xrightarrow{p} \phi + p - \phi p \tag{4}$$

The second panel of Fig. 2 depicts the outcome of such a simple mixing model, using the parameters estimated from the data or assumed below.[1] While the distribution of the ordinary adults has been shifted to the right only ever so slightly, the downward bias for the adult elite is more pronounced.

3. Background and literature review

3.1. Status differentials and intergenerational correlation

In a rigidly stratified society, the share of socially mobile people among elite dead approaches zero. A low estimate of the share of socially mobile people in actual societies is implicit in Clark's recent finding of “a universal constant of intergenerational correlation of 0.75” for “income, wealth, education and longevity” (Clark, 2014, p. 12) relying on his innovative surname method. However, other methods produce lower intergenerational correlations for a number of outcomes. Borgerhoff Mulder et al. (2009), for example, find an intergenerational transmission coefficient of 0.59 for material wealth and 0.36 for an importance-weighted average of “embodied,” “relational” and “material wealth” (Borgerhoff Mulder et al., 2009, p. 685) in “small-scale agricultural societies” and 0.61 and 0.43, respectively, in “small-scale pastoral societies.”

The height benefit, designated b in the model, is hard to pin down for the early middle ages. Data on height differentials between

[1] Random numbers from correalted Bernoulli distributions can be drawn using Coveney (2007) ‘OVBD: Stata module to generate correlated random binomial data’ for most of the parameter space, except the edges. The graph shows cumulative results of 10,000 trials. For more details and simulations, see the stata do-file.