Social Inequalities in Men and Women's Stature in Sweden, 1960-2020

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Short abstract: 239/250 words
Stature is an indicator of the population living standard, and strong increases over the past century and a half in average stature have been linked to a lower impact of disease and improvements in nutrition and fetal health. However, there is evidence that even in contemporary populations with a high standard of living, social inequalities in stature persist. We examine the trend in social inequalities in stature in Sweden and elsewhere in Europe and evaluate mechanisms that may contribute to the persistence of social inequalities in stature over time.
We use Swedish register data, including conscript records – which contains men's stature – and the medical birth registers which contain infant length and women's stature. The data is linked to parents' socioeconomic background. Moreover, we use European survey data from the Generations and Gender Survey (GGS) wave 2, for 8 European countries, for comparative purposes. Results show that there is a persistence of a social gap in stature for both men and women in Sweden similarly sized as in other European countries. Differences already exist at birth, indicating that possibly the intrauterine environment is a contributing factor. Moreover, father's stature but not mother's stature largely explains the social differences in stature. Taken together, this evidence suggests that social differences in stature, indicative of individuals' health, are shaped by social and health processes in early life and by intergenerational processes, including genetics.

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Introduction and background

Stature differences between populations have been used as an indicator of the population standard of living. Increases in average stature have been argued to indicate improvements in the living standard, and socioeconomic differences have been taken to be indicative of differences in the living standard within populations – a marker of inequality (Steckel 1995). But both in historical societies, currently developing populations, and in highly developed social welfare states with favorable living environments, a high standard of living there is evidence for a social gap in stature. We contribute on the literature on social differences in health by investigate long-term developments in the social gap in stature in Sweden. We use detailed data over several generations and for both men and women and fathers and mothers, as well as an international comparative perspective using survey data. We investigate the mechanisms that contribute to social differences in stature by investigating the social gap in length at birth and maternal smoking behavior during pregnancy.

We use a combination of historical and contemporary register data which provides us with a unique combination of mother, father and child stature for birth cohorts 1950s-1990s. Occupations are used as indicators of the socioeconomic status (SES) of individuals' households of origin. Men's stature is taken from conscript records (age 18-19), and medical birth records with women's stature when they have their own children. Not all women have children and there is selection into reproduction. We therefore use survey data from the Generations and Gender data to evaluate robustness of our results. This data is also used to evaluate whether the social gap in stature in Sweden is comparable to the social gap in stature elsewhere in Europe (Austria, Danmark, Finland, Germany, Netherlands, Norway, and the UK). Finally, we evaluate mechanisms that may contribute to the social gap in stature, including maternal smoking during pregnancy and genetic factors.

There is previous evidence of a social gap in stature for a wide range of countries, including Swedish cohorts. For example, Muller et al. (2014) show in a comparative study of European countries with representative survey data that there are educational differences in self-reported stature. Education is here defined as one's own education; given that growth is shaped in childhood, measuring socioeconomic characteristics in the family of origin – whether education, social class, income or occupation – appears of a more direct relevance. Using socioeconomic status of the household of origin in Sweden, there is evidence for a persistent social gap in stature at conscription (men), until the 1950s, although the gap was shrinking (Nyström Peck & Vågerö 1987; Nyström Peck & Lundberg 1995; Kihlbom & Johansson 2004). A few studies report smaller differences for later birth cohorts (Lindgren 1976; Cernerud 1994; Floud et al 1990). Few studies have explored social differences up to a later date, and the trend across birth cohorts has not been established in a consistent manner. Finally, while for adult men research has used the conscript records for nationwide representative research, little is known about the trend in women's stature.

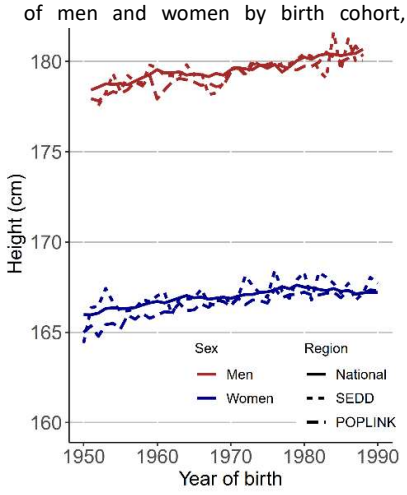
Data

We use Swedish register data linked to historical data to capture the social background of individuals over two generations. The base sample consists of individuals residing in two regions in Sweden: one area in Scania, Southern Sweden, including 5 rural parishes and the town of Landskrona, and one area in Northern Sweden, including the town of Umeå and

Skellefteå. Descendants of individuals residing in these areas are followed nationwide in the period 1967-2022. Moreover, partners and their parents have also been added if they are found in the register data for this period. The benefit of the historical data is that we can study the socioeconomic background of individuals even for the early cohorts, when the parents' socioeconomic status is not available in the contemporary register data.

Stature information is taken from conscript records (> 350.000 men) and medical birth records (>400.000 women). Regarding the conscript records, universal conscription existed in Sweden until 2007 – covering the birth cohorts to 1989. Women's stature is taken from the medical birth records. While the conscript records contain men's conscription records upon reaching adulthood, women commonly give birth at a later age. The medical birth records therefore contain stature of women covering a wide range of birth cohorts. For the birth cohorts from about 1970, fertility is incomplete and especially for women born after 1995 (under 27 years of age in 2022 when observations end) it can be assumed that women present in the medical birth records are, on average, negatively selected on social class of origin, as higher class and higher educated women tend to have their children at a later age in contemporary Sweden. For a subsample of individuals, stature of both fathers and mothers is available (>28.000 individuals with mothers who gave birth between 1983 and 2020 and fathers who were conscripted between 1967 and 2007). This subsample is used for a set of analyses addressing the relation between stature and socioeconomic status of origin accounting for father's stature. Moreover, for >90.000 men born after 1973, own length at birth is available in this data.

Figure 1. Developments in average stature of men and women by birth cohort,



Parent's socioeconomic status is based on registered occupation in the parish registers (before 1968) and from 1968 in the contemporary Swedish registers on census and occupational registers. We convert socioeconomic status to HISCLASS, which is designed to measure socioeconomic status over long periods of time. We distinguish nonmanual workers from skilled and unskilled workers, with unskilled workers as the reference category.

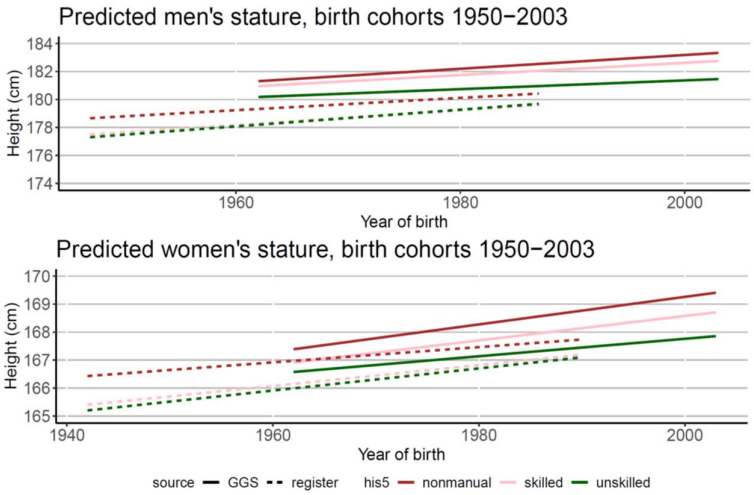
Generations and Gender Survey

While the register-based data contain a unique combination of women and men's stature over a long period, the data are selective for men for birth cohorts from the 1990s and for women for all birth cohorts as they rely on them having a child in a Swedish hospital. We therefore supplement our analyses of the long-term development in social inequality in stature with data from the Generations and Gender Survey (GGS) round 2 (GGS-II), Wave I. The GGS contains a cross-sectional sample, in which individuals self-report their stature and height. The Swedish data was collected by Statistics Sweden using an online and mailed-out survey. 30.000 individuals were sampled nationwide, covering the ages 18-59 (SUDA 2022). The response rate was fairly low at 26%, with a lower response among younger individuals (below 35) and older individuals (over 44), among men, and individuals with low education (Löfgren 2021). In the sample we only include individuals born in Sweden, with Swedish-born individuals, reducing the number of included individuals to 6,771. We also compare findings for Sweden to those of

Austria, Danmark, Finland, Germany, Netherlands, Norway and the UK. For each sample we select the non-migrant respondents.

Socioeconomic status is measured using the ISCO-08 coded occupation of the father at age 15. We use mother SES if the father's SES is unavailable. We choose the father's socioeconomic status to create measurements that are comparable over time and as these are most complete in the data. For recent birth cohorts, mother's occupation is as relevant as father's occupation and in a robustness check we find a similarly-sized gap in stature by socioeconomic status using mother's social status rather than father's social status. We group the socioeconomic stature measurements into nonmanual workers (ISCO-08 codes 99 to 299); skilled workers (300-799) and unskilled workers (800-1000). Unskilled workers are the reference category. We also use the ISCED-coded highest education of the mother, grouped into primary and lower secondary education (group 0-2), secondary education (group 3-4) and tertiary education (group 5-8).

Figure 2. The social gap in stature in Sweden over time (predicted values)



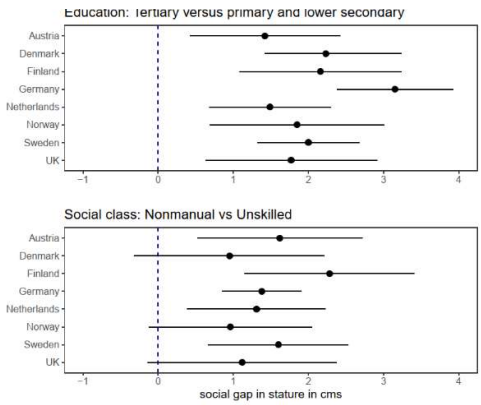
Results

We use linear regression models to analyze the social gap in stature. Results from both the register data and the GGS show a persistent gap in final stature by SES of the household of origin. The gap is estimated at about 1 cm for both men and women in both registers and the GGS. Predicted values from regression models are shown in Figure 2. From an international comparative perspective, the social gap in stature in Sweden appears to be relatively averagely sized (GGS, Figure 3).

Mechanisms

The inclusion of mother's stature explains part of the socioeconomic differences in stature, while after inclusion of father's stature SES differences in stature are no longer statistically significant.

Figure 3. Social class and educational differences in stature in Europe



Contextual factors are related to similarities between relatives. Brother pairs are more similar than father-son pairs and become more similar over time (results not shown here). Father-son pairs are more similar if the father is a white-collar worker, and sons of white-collar workers outgrow their father less. The last birth cohorts studied here may have approached the stature ceiling and social differences in stature could decline in the next decades.

Differences at birth Analyzing length at birth (95,000 men observed also as infants) shows that adulthood social class differences are already present at birth. Moreover, maternal smoking in early pregnancy – a strongly SES-related behavior – during any birth, indicated in the medical

birth records, explains part of the social gap in stature. Maternal tobacco use could be related to other health behaviors during pregnancy besides smoking alone.

Planned work

It is somewhat surprising that the social gap in stature is so persistent in a modern welfare state like Sweden, where disease load is low, nutrition plentiful and antenatal care available without cost. We therefore plan to address possible reverse causality – selection of taller men and women into higher socioeconomic positions and into marriage with taller and higher socioeconomic individuals. We use family fixed effects and data containing socioeconomic status and stature indicators over different generations to address these issues.

Conclusions

The social gap in stature in Sweden and elsewhere in Europe is persistent. Differences in body length already exist at birth, so that the social differences are shaped during pregnancy or in the previous generation and are enlarged during childhood. Part of these differences in stature is explained by maternal tobacco use, indicating that lifestyle factors and fetal health conditions play an important role. Another important factor is intergenerational (genetic) transmission of heights at the individual level, which tends to produce height differences by SES origin since taller fathers also have higher SES on average. The explanations for the link between height and SES attainment (e.g. earnings) are primarily connected to skill formation early in life and factors like self-esteem, social dominance and discrimination (e.g. Case and Paxson 2008; Lundborg et al. 2014).

We add to the literature on social differences in stature as we are able to study men, women and parents, and are able to include mother and father social background and own length at birth. Moreover, we include controls for parental stature and include grandparental socioeconomic status, allowing us to study the dynamics of social inequalities in stature of several generations over the entire life course. The results of the study contribute to the debate about current developments in population health inequalities.

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