



Long-term changes of socioeconomic differences in height among young adult men in Southern Sweden, 1818–1968



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ABSTRACT

The study explores the long-term trends in socioeconomic differences in height among young adult men. We linked information from conscript inspections to a longitudinal demographic database of five parishes in Southern Sweden. Detailed information on the occupation and landholding was used to investigate the differences in height. Even if there is indication of a reduction in the magnitude of the differences in height over time the reduction is neither dramatic nor uniform. The most systematic and consistent difference is that sons of fathers with white collar occupations were taller than others. They were 4 cm taller than the sons of low-skilled manual workers in the first half of the 19th century, and almost 2 cm taller in the mid-20th century. This difference is much smaller than those found between elite and destitute groups historically, in for example Britain, but comparable to that found in other studies on 19th century populations using information on family background. Most of the reduction in the socioeconomic differences in height was a result of reduced height penalty and premium for small disadvantaged and privileged groups. Changes in the distribution of income and the economic structure are plausible explanations for the changes in socioeconomic differences in height.

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1. Introduction

Socioeconomic differences in height are found almost universally in studies covering different populations and historical periods (Meredith, 1984; Bielicki, 1986; Komlos and Baur, 2004; Subramanian et al., 2011). The differences indicate the influence of environmental factors on growth,

such as nutrition, disease, work and other living conditions (Cole, 2003; Silventoinen, 2003). It is well established that elite groups were much taller than disadvantaged groups historically (Komlos, 2007). Differences found within (almost) complete cross-sections of 19th century populations are most often larger than those found in the 20th century but much smaller than between the elites and destitute groups.¹

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¹ Studies investigating socioeconomic differences within complete cross-sections, representative samples or similar approaches have found differences in height of 1–8 cm between the shortest and tallest group. Komlos (1994, 495) reports that students at the École Polytechnique were about 4 cm taller than conscripts (who were largely representative of the young adult male population) in France in the early 19th century. Baten (1999, Table 6.4) finds that sons of middle and upper class fathers were about 1.3 cm taller than sons of fathers with lower class professions in early 19th century Bavaria. Lantzsch and Schuster (2009, Table 5) also investigate data from early 19th century Bavaria and find that sons of fathers who were high ranking officials or had white collar occupations were about 4 cm taller than sons of low-skilled workers and craftsmen. Twarog (1993, Fig. 7.26 and Table 7.13) finds that sons of fathers with upper white collar occupations were 4–8 cm taller than sons of fathers who were unskilled manual workers in late 19th century Württemberg. Wilson and Pope (2003) find only small (1 cm) height differences among recruits to the Union Army in mid-19th century USA depending on the occupation of the father. De Beer (2004, Table 2) reports that sons of elite fathers were almost 10 cm taller than sons of unskilled workers in Utrecht around 1860. The men had not reached their final adult height at these inspections so some of this height difference is therefore likely to be due to differences in growth tempo. De Beer thinks that the difference in height in adulthood amounted to about 5–6 cm.

Despite the large number of studies, few explore long-term changes in socioeconomic height differences. Most studies investigate only parts of the 19th or the 20th century (Åkerman et al., 1988), and long-term changes are generally inferred from different samples (Floud et al., 2006 [1990]; Costa and Steckel, 1997; Sunder, 2013) or age groups within cross-sections (Peck and Vågerö, 1987; Kuh et al., 1991).² The impression from previous studies on the long-term development of socioeconomic differences in height is of declining differences from the 19th to the 20th century. The socioeconomic differences in height found in present day populations also never amount to the 16 cm height differences found between poor and privileged 13-year-old boys in England in the 18th and 19th centuries³ (Floud et al., 2006 [1990]; Komlos, 2007), or the 9 cm difference Rowntree found between 13 year old boys living in the poorest and most prosperous areas in York in 1899 (Hatton, 2011, 953).⁴ Height differences have also been shown to have declined over the 20th century in some present-day high-income countries, especially those with welfare state redistribution policies (Norway: Brundtland et al., 1980; Sunder, 2003, Britain: Kuh et al., 1991; Li et al., 2004; Li and Power, 2004, Sweden: Peck and Vågerö, 1987; Cernerud, 1993, see also Rona, 2000).

The long-term decline of socioeconomic differences could be the result of a declining level of inequality in the distribution of resources affecting growth, such as nutrition and disease exposure, over time. It has also been suggested in some of the previous writings on socioeconomic differences in height that the extent of the differences will decline with rising income levels, also with constant levels of inequality (Eveleth and Tanner, 1990; Moradi, 2006; Subramanian et al., 2011). The height of different groups could converge with rising income levels and improving living conditions because of the diminishing marginal product of nutrients and other environmental influences on growth (Martorell and Habicht, 1986; Steckel, 2008). This would cause a general improvement of conditions influencing growth to increase the height of disadvantaged groups more than the height of privileged groups.⁵

But a direct effect from the average income level on the extent of socioeconomic differences in height gains no support in some empirical tests (Schmitt and Harrison, 1988; Van de Poel et al., 2008). There are also many studies that find persistent (Cavelaars et al., 2000; De Beer, 2004; Singh-Manoux et al., 2010), or even increasing (Lindgren

and Cernerud, 1992; Costa and Steckel, 1997; Sunder, 2013), differences in height despite rising average height and average level of income. A study on Swedish urban schoolchildren born in 1955 is one of a few examples where no socioeconomic differences in height were found (Lindgren, 1976). It is less known that significant differences in height reemerged again among boys in cohorts born in 1963 (2.5 cm) and 1981 (0.8 cm) (Lindgren and Cernerud, 1992; Cernerud, 1994). Others have also shown that the lack of socioeconomic differences in height among Swedes born in the early 1950s was limited to urban populations (Otto, 1976, 51; Kihlbom and Johansson, 2004). Varying socioeconomic differences in height over time indicate that the magnitude of the differences is also affected by, for example, the level of inequality in the society (Quiroga and Coll, 2000; Monteiro et al., 2010).

Rising income levels have been paralleled with the expansion of redistributive welfare systems in Sweden as well as other countries. This makes it difficult to separate the effect on socioeconomic differences in height from improving living conditions from that from reductions of inequality. A monotonous decline of the socioeconomic differences in height over time would support an effect from improving living conditions in general while height differences that vary over time lend support to an influence from the level of inequality and distribution of resources in society.

This study presents the long-term trends in socioeconomic differences in height among young adult men in southern Sweden. A very long period of time is covered, making it possible to trace the socioeconomic differences in height from the early 19th century pre-industrial setting to the industrialized society with an expanding social security system in the mid-20th century. We can therefore investigate whether the trends in socioeconomic differences in height are dominated by long-term decline or if they vary over time.

Height is influenced by the nutritional status of the mother and by living conditions during childhood and adolescence (Komlos, 1989; Uljaszek, 2006). To study differences in 'biological standard of living', as reflected in heights, it is therefore preferable to use information on the socioeconomic status of the family in which the person grew up. In most historical studies the measured individual's own occupation is used to divide them into social classes (Åkerman et al., 1988; Komlos, 1989, 1994; Alter et al., 2004). The socioeconomic differences found when using the measured individual's own status are not only a result of differences in standards of living during childhood and adolescence but also include selection effects and influences from living conditions during the late adolescent growth.

Socioeconomic status is measured by the occupation and landholding of the father at the birth of the conscripts. The socioeconomic differences in height investigated in this study are therefore mostly a result of differences in living conditions during childhood even if it is also possible that differences in living conditions of previous generations influence differences among the men (Golden, 1994; Young et al., 2008; Özaltin et al., 2010). Growth tempo is also affected by environmental conditions during growth. I cannot separate the effects from achieved growth and

² A recent collection of results on social differences in mortality indicates that conclusions on long-term trends based on studies of different samples and populations are not always upheld when tested longitudinally within populations (Bengtsson and van Poppel, 2011).

³ The differences were even larger, 22 cm, at age 16 years (Komlos, 2007).

⁴ The 16 cm height difference corresponds to a difference in height of 2.1 standard deviations for 13-year-old boys (World Health Organization, 2007). This corresponds to a height difference of about 15.5 cm among adults when adjusting for differences in the standard deviation of height at different ages. Using z-scores does not control for how much of the social differences in height that are the result of growth tempo effects.

⁵ For an examples of this see Cernerud and Elfving (1995) or Fig. 2 in Li et al. (2004).

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