Economics and Human Biology 10 (2012) 154–173

Contents lists available at ScienceDirect

Economics and Human Biology

journal homepage: http://www.elsevier.com/locate/ehb

Social inequality and the biological standard of living: An anthropometric analysis of Swiss conscription data, 1875–1950

Tobias Schoch *, Kaspar Staub [1], Christian Pfister

Section of Economic, Social and Environmental History (WSU), University of Bern, Erlachstrasse 9a, 3000 Bern 9, Switzerland

ARTICLE INFO

Article history:
Received 22 December 2009
Received in revised form 2 May 2011
Accepted 2 May 2011
Available online 11 May 2011

JEL classification:
N33
N34
E32
I10
I30

Keywords:
Anthropometric history
Biological standard of living
Social inequality
Height cycles
Physical stature
Spectral analysis
Chest and arm circumference
Switzerland

ABSTRACT

We analyze the first representative series of individual measurements of the height of Swiss conscripts for the years 1875–1950. We find that average height followed a general upward time trend, but the economic downturn in the 1880s slowed down the increase in rural average-heights while the economic crisis subsequent to World War I had only a minor effect. Moreover, social-class affiliation was the most important determinant of differences in the biological standard of living, with class and regional disparities remaining constant, for the most part, during the observation period. Lower-class individuals' ability to overcome economic stress was limited, with the result that their biological standard of living, as reflected in the cyclicality of deviations from average height, was likely to be affected by cycles in economic activity.

1. Introduction

Scholars have long debated the evolution of living standards both during and after industrialization using traditional data, such as per capita income and real wages, but they have yet failed to reach a consensus. The traditional monetary measures of economic and social performance contribute to an understanding of levels and changes in well-being at the aggregate level but fail to capture several important aspects of the quality of life, such as socio-economic inequality and health in the broadest sense (Steckel and Floud, 1997; Engerman, 1997; Steckel, 1995; Komlos and Baten, 2004; Komlos, 1985). Stature and thus the biological standard of living, on the other hand, permit one to analyze the overall distribution of welfare and thus to discover patterns of inequality among and within groups. Anthropometry also provides the most widespread method for the assessment of nutritional conditions (Expert Committee, 1995). More specifically, by means of measurements not only of height

* Corresponding author. Present address: University of Applied Sciences Northwestern Switzerland, School of Business, Riggenbachstrasse 16, 4600 Olten, Switzerland. Tel.: +41 62 2860147; fax: +41 62 2860090.
E-mail addresses: tobias.schoch@fhnw.ch (T. Schoch), kaspar.staub@anatom.uzh.ch (K. Staub), christian.pfister@hist.unibe.ch (C. Pfister).
URL: http://www.wsu.hist.unibe.ch
[1] Present address: Centre for Evolutionary Medicine, Institute of Anatomy, University of Zurich, Winterthurerstrasse 190, CH 8057 Zurich, Switzerland.

1570-677X/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.ehb.2011.05.001

but also of chest and upper-arm circumference, one obtains a snapshot of biological well-being and of demographic behavior – for example, household formation and childbearing – cognitive development, and work capacity (Eveleth and Tanner, 1990; Bogin, 1999), and can thereby identify social groups at risk of functional outcomes in terms of morbidity and mortality (Fogel, 1994, 2004; Gorstein et al., 1994; Koch, 2011).

Our approach is to contrast findings established by traditional measures of human welfare with data related to the biological standard of living. We provide the first annual conscript height data for Switzerland at the individual level for the period 1875–1950.[2] We focus on secular trends and trace differences in the biological standard of living among social groups with regard to regional and temporal patterns.

We also analyze the additional anthropometric measurements of chest circumference and upper-arm circumference and establish a multidimensional representation of the human body. These measurements contribute to our understanding of socio-economic, environmental, and lifestyle factors on body proportions and thus on biological well-being. Finally, we turn to cycles in the average-height series, computed for socio-economic and regional populations separately, and analyze patterns of cyclical deviations from a time trend. These height cycles and their co-movement are explored with regard to two measures of business activity: real wages and GDP (Woitek, 2003; Sunder and Woitek, 2005; Brabec, 2005). We follow Bengtsson's (2004) suggestion that because the ability of lower-class individuals to overcome economic stress is limited, their biological standard of living is likely to be affected by business cycles.

2. Standard of living—measuring social performance

Most of the commonly used concepts of the standard of living focus on goods themselves or on the ability to access them, which is generally measured by income. However, both income and goods are inadequate as living-standard measures because needs and wants vary according to personal and societal characteristics (Sen, 1987, 1997). With such measures the distribution within the society and the family is unclear. A study of the biological standard of living in 19th- and 20th-century Switzerland offers the possibility of expanding our knowledge about a country whose anthropometric history has not been extensively studied (Komlos, 1994; Steckel, 1995; Staub, 2010; Kues, 2010).

2.1. The biological standard of living

Height not only serves as an indicator for nutritional well-being but also has been established as an important standard-of-living measure (Komlos, 1989; Komlos and Baur, 2004). Average height is conceptualized as the "biological standard of living", highlighting the distinction from common (usually monetary) concepts of the standard of living (Komlos, 1987, 1989, 1994). The average adult height of a population serves as a measure of the population's nutritional status from birth through adolescence (including episodes of deprivation and catch-up growth), reflecting environmental conditions (Eveleth and Tanner, 1990; Bogin, 1999; Steckel, 2008).[3] Nutritional status is defined as the balance among the intake of nutrients, the epidemiological environment, and claims on nutrient intake, which stem from the basic maintenance (metabolic rate), and from energy consumption for occupational and discretionary activities (Eveleth and Tanner, 1990; Kim, 2000). Genes determine approximately 80% of the variation of the height of an individual; yet differences in average height across most populations are widely attributable to environmental factors. The living environment limits the extent to which individuals exploit their genetic potential (Bogin, 1999; Cole, 2003; McEvoy and Visscher, 2009). Consequently, human growth is related to economic variables such as per capita income and food prices. Height has been found to increase with social status (Steckel, 1983; Komlos, 1994; Baten, 2000). Moreover, nutrition, infection, and immunity are closely related, and changes in one component affect the other two. For example, malnutrition is associated with decreased immunity and increased susceptibility to infections (Lunn, 1991; Cole, 2003). Stunted growth has functional implications for longevity, cognitive development, earnings and work capacity (Fogel, 2004). Physical stature is thus a useful supplementary indicator of well-being (not a substitute for conventional monetary indicators), providing a more nuanced, spatially and socially detailed view of the impact of dynamic economic processes on the quality of life than does income or GDP per capita. Moreover, it is sensitive to the distribution of income whereas GDP is not.

2.2. Anthropometric history of Switzerland

No comprehensive anthropometric study of the development of the biological standard of living in Switzerland has yet been published. Kues (2007) analyzed 2868 attestation records of the British Swiss Legion gathered by the British War Office in London between 1855 and 1856, during the Crimean War, but his sample was not representative of the Swiss population. Rühli et al. (2008) analyzed the 2005 Armed Forces census (birth years 1984–1986), covering approximately 80% of the birth cohort of the 19-year-old male Swiss population. They reported significant height variation both among the Swiss cantons and among occupational groups. Moreover, Staub et al. (2011a) report the findings of Eduard Mallet's 1835 published but today nearly forgotten study of the average height of Genevan conscripts. Mallet found that 20-years-old conscripts of Geneva, born between 1805 and 1814, were relatively tall for the time, being taller than those of France and Belgium. Staub et al. (2011b) show that in 2009,

[2] For the second half of the 20th century, see Kues (2010).

[3] Considerable attention has been paid to the first three years of life, deemed the most influential (Lunn, 1991; Steckel, 1983; Baten, 2000).