

On British Pygmies and Giants: the Physical Stature of British Youth in the 18th and 19th Centuries

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Abstract:

We re-examine the trend and cross-sectional patterns in the height of lower- and upper-class English youth and compare them to their European and North American counterparts. The hiatus between rich and poor was the greatest in England, reaching an amazing 22 cm at age 16. Poor English children were shorter for their age than any other European or North American group ever discovered, while the English rich were the tallest group in their time, and only a 2.5 cm shorter than today's US standards. Height of the poor declined in the late-18th century, and again in the 1830s and 1840s conforming to the standard European pattern, while the height of the wealthy tended rather to increase until the 1840s and then tended to remain constant.

A significant advantage of anthropometric history is the insight it affords into the living conditions of segments of a population for whom conventional economic indicators are frequently – or even generally - unavailable. Important such groups include children and youth, who were, in the main, not part of the labour force, and whose welfare depended upon overall family socio-economic circumstances as well as upon resource allocation within the family. To what extent family income benefit the children of the household is not at all clear even in contemporary societies; in a historical context such evidence is even more tenuous to obtain. The standard economic assumptions pertaining to the relationship between income and welfare does not hold easily for dependent groups, i.e., for those who do not have a personal source of income. As a consequence, anthropometric records on children and youth are of considerable value, particularly since these can be often decomposed by social status, gender, and age.

We review the evidence on the height of British lower- and upper-class youth and compare them to other data extracted from various archives during the last quarter century. The data originate in records of military schools, armies, prisons, orphanages, charities, and in the case of African-Americans, shipping documents, runaway newspaper advertisements and certificates of freedom.

DATA AND RESULTS

THE HEIGHT OF THE WELL-TO-DO

We first turn to an analysis of the height of students at the prestigious Royal Military Academy at Sandhurst in the 19th century, who were primarily of middle and upper-class origin.¹ The data were collected by Roderick Floud (1986a) and analysed in Floud et al. (1990, 174-178). We return to these data, because the initial analysis revealed unreasonable fluctuations in the estimated height of 13-15 year old youth. The scarcity of extant evidence on the height of elite students makes it important to estimate their height accurately. The height distributions indicate that the original assumption that there were no height

requirements for entrance into the academy is unwarranted. Apparently, there were both minimum and maximum height requirements enforced from time to time by the examiners, insofar as the height distributions, particularly those of the younger students, often reveal truncation by departing quite obviously from normality (Figures 1-4). As a consequence, the calculation of simple means is misleading, and the appropriate statistical procedure to estimate mean heights, and their correlates, is truncated regression (Komlos 2004). In addition, Floud et al. did not consider the effect of family income on the height of the students. Insofar as the fees paid by the student's families is available, it can be used as a proxy for family economic circumstances, and consequently, is used as an independent variable in the determinant of physical stature (Table 1). Hence, we proceed with the estimation of trends taking these two factors into account.

INSERT FIGURES 1-4 AND TABLE 1 ABOUT HERE

The students were divided into two groups: those who paid fee category 1 and 2, and those who paid fee category 3, which was higher.² Over time the height requirements changed, and as a consequence, (after some trial and error) the distributions were examined for three time periods by recruitment years: during the Napoleonic Wars (1807-1816) (referred to as Period 1), between 1817-1836 (Period 2), and after 1836 (Period 3) by fee categories.³ For example, in Period 2 there was a minimum height requirement imposed on 13-year-olds at 56 inches, which, however, was raised to 57 inches in Period 3 on fee category 1 and 2 students, but not on fee category 3 students (Table 2 and Figure 1). After having estimated the height requirements, we proceed to estimate the height of the students by age and fee category using truncated regression program in STATA7.

There were substantial differences in height among the Sandhurst students by fees paid (Figure 5). Those who paid higher fees were invariably taller by between 0.8 and 3.3 cm (Table 3). Our estimated trends are quite similar to those of Floud et al., although the new estimates fluctuate much less (Figure 6). The estimated heights do not decline among the birth

cohorts of the late-18th century as those of the average adult population, which is quite plausible for upper-class youth. A similar pattern was found among aristocratic and middle-class German youth of the late-18th century (Komlos et al. 1992). Upper-class height trends departed substantially from those of the rest of the population in the late-18th century. Sandhurst students tended to increase in heights at all ages with some setbacks. Yet, all three ages for which evidence exists were taller in 1840 than in 1795, even if the trends are not uniform.⁴ A regression of time on the three ages simultaneously between 1795-1840 yields an average annual increase of 0.7 mm per annum (with $t=4.0$).

TABLE 3 AND FIGURES 5 AND 6 ABOUT HERE

Data on older students are available for ages 16 to 20 beginning with the birth cohorts of 1840, although the trend for those 20 and above cannot be estimated due to the small number of observations. The height of 16 to 19-year olds is tend to be constant (Figure 7).

Figures 7 and 8 ABOUT HERE

Sandhurst students were exceptionally tall for their time in international comparison. Their height at age 20, which can be considered their adult height, was 174 cm (68.5 inches), just 3 cm less than the height of current British male youth on average (Table 3). High-fee students were 1.6 cm shorter than today's US standard (Figure 8).⁵ Even low-fee-paying students were taller than most other students attending elite schools in Germany, France, or the United States (Figure 9). Although the reference to the German youth is to the birth cohorts of the 18th century, the 10 cm advantage of the low-fee paying Sandhurst students at age 16, is nonetheless, very substantial. It is also quite extraordinary that the Sandhurst students – even the low-fee-paying ones, - were taller than the cadets attending the West Point Military Academy as well as the Citadel, the Military Academy of Charleston, South Carolina (Figure 9). This is unexpected, because of the more propitious disease environment and the greater availability of nutrients meant that the average American adult male was at least 5-6 cm taller than its European, including British, counterparts in the 19th century (Komlos and

Baur 2004). In fact, Americans were the tallest in the world, on average, but quite obviously did not have the privileged groups analogous to the European elite.⁶ The European elite was clearly capable of overcoming the disadvantages brought about by a higher level of urbanisation, higher population density, a more virulent disease environment, and higher nutrient prices. In fact, the high-nobility in Germany was the only group who were as tall as, and at younger ages even exceeded, that of the high-fee paying Sandhurst students (Figure 10). Hence, only the sons of the hereditary princes and barons on the Continent were as tall as the descendants of the British gentry attending the Sandhurst Academy.

Figures 9 and 10 about here

THE HEIGHT OF THE POOR

The records of the Marine Society provides evidence on the height of lower-class English boys in the late-18th and first half of the 19th centuries, first reported in Floud and Wachter (1982). Floud collected more than 50 thousand observations of pupils who entered this institution between the 1770s and 1870s (Table 4). The initial trends were not identified accurately (Floud, Wachter and Gregory 1990), as is evident from the extremely large and implausible variations in the height estimates (Figure 11). However, the use of truncated regression alleviates this problem to a considerable extent, and identifies the secular trends in height of these children as follows: heights declined between the birth cohorts of circa 1770 and those of 1795, increased thereafter, and then declined again in the 1830s and 1840s, as in most other parts of the Atlantic community (Figure 12) (Komlos 1993, 1998, 2004). The growth profiles were shifting practically parallel to one another over time, with heights ending up in the mid-19th century at the level of circa 1795, the probable 18th century nadir (Figure 13).

Table 4 and Figures 11-13 about here.

The British data reveal an extremely deep divide that separated the social classes, in fact to an extent that is no longer imaginable today. The great income inequality during the

early industrial era is illustrated more vividly by the differences in physical stature of the children of the two social classes than possibly by any other measure. The average difference between Sandhurst and Marine Society boys was 16.3 cm at age 13, rising to 22 cm at age 16, indicating that the wealthy experienced an adolescent growth spurt earlier and their peak growth velocity was greater than those of the poor (Figures 14). The difference between the two groups traces a “U”-shaped curve: the elite students enjoyed a 20.8 cm height advantage at the beginning of the period, declining to about 15 cm for most of the period under consideration, and rising again in the late 1830s to reach 22.6 in 1840 (Figure 15).

Figures 14 and 15 about here

The poor Marine Society boys, many of them from London, were the shortest group in Europe and North America ever recorded. At age 16 they were 1.4-2.6 cm shorter than contemporary German servants (Komlos 1990) (Figure 16) and 5-8 cm shorter than American slaves (Engerman 1976, Steckel 1979). The tallest 16-year old Marine Society boys, born in the 1820s, were on average 155 cm tall, shorter than the 3rd centile of the modern US height distribution of 160 cm.

Figure 16 about here

The more egalitarian nature of the American society prevented such European-size hiatus from emerging between the classes in North America. American apprentices, for example, were 8.2 cm and American Slaves were 6.6 cm taller than German servants or boys attending Habsburg military schools (Figure 16). Among lower class Americans, the Georgia convicts were the tallest and the slaves the shortest, with the difference between them at age 17 of about 5.2 cm, but northern white apprentices were only 1.6 cm taller than slaves, while free blacks were merely 1.1 cm taller than slaves. Freed slaves were but 3.5 cm shorter than the average northern soldier.

Conclusion

The evidence points to the very deep divide in English society between the wealthy students of the Sandhurst Military Academy and the poor boys who were enrolled in the Marine Society. In fact, the “Oliver Twists” of England were shorter than any other group hitherto discovered in Europe or North America including American slaves. We are reminded of the hitherto largely hidden costs of industrialization. At the same time, the wealthy Englishmen were the tallest historical group in the 18th or 19th centuries, equalled only by the upper aristocracy of Germany. Hence, the anthropometric evidence on youth in England of the 18th and 19th centuries once again provides valuable insights into the socio-economic processes accompanying the industrial revolution.

Table 1. Characteristics of the Sandhurst Sample

Age	N
13	1,235
14	1,687
15	544
16	513
17	1,086
18	2,213
19	2,240
20	820
>20	494
Total	10,832

Fees Paid

Fee Category	Before 1858	After 1858	
	N	Fees (Pounds)	N
1	645	0	756
2	1,027	>50	700
3	1,808	50-99	1,706
Total	3,480	100-	3,677
		unknown	513
		Total	7,352

Table 2. Height Requirements of Sandhurst Students

Age	Period	Fee	Lower	Upper
13	1807-16	1, 2, 3	-	65
	1817-36	1, 2, 3	56	-
	1837-57	1, 2	57	-
	1837-57	3	-	-
14	1807-16	1, 2	58	-
	1807-16	3	57	-
	1817-36	1, 2, 3	58	-
	1837-57	1, 2, 3	58	65
15	1807-16	1, 2, 3	-	-
	1817-36	1, 2	-	70
	1817-36	3	-	70
	1837-57	1, 2, 3	-	69
16	1855-70	1, 2	-	-
	1855-70	3	65	-
17	1839-43	1, 2, 3	-	71
	1844-53	1, 2	63	72
	1844-53	3	-	72
	1854-76	1, 2, 3	64	72

Table 3. Height of Sandhurst Students by Fees Paid

Age	Fees Paid		Difference in Height		Average		Growth Velocity cm
	1&2 inches	3 inches	Fees 1&2 and 3		inches	cm	
13	59.1	60.4	1.3	3.3	59.6	151.5	
14	61.4	62.4	1.0	2.5	62.0	157.5	6.0
15	64.2	64.5	0.3	0.8	64.4	163.5	6.0
16	67.0	67.8	0.8	2.1	67.4	171.1	7.6
17	67.9	68.3	0.4	1.1	68.1	173.1	2.0
18	68.2	68.5	0.3	0.8	68.4	173.8	0.7
19	68.4	68.9	0.5	1.3	68.7	174.4	0.6
>19	68.0	68.9	0.9	2.4	68.5	174.1	-

Table 4. Characteristics of the Marine Society Sample

Age	Number of Observations
10	17
11	93
12	600
13	9,527
14	12,392
15	15,150
16	10,435
17	2,103
18	655
19	213
20	38
21	11
other	42
Total	51,276

Date of Recruitment	Number of Observations
1770s	4228
1780s	4467
1790s	7289
1800s	6091
1810s	4327
1820s	5103
1830s	5851
1840s	4847
1850s	4344
1860s	3331
1870s	1398

Fig 1 . Height Distribution of 13-Year-Old Boys, Sandhurst Military Academy

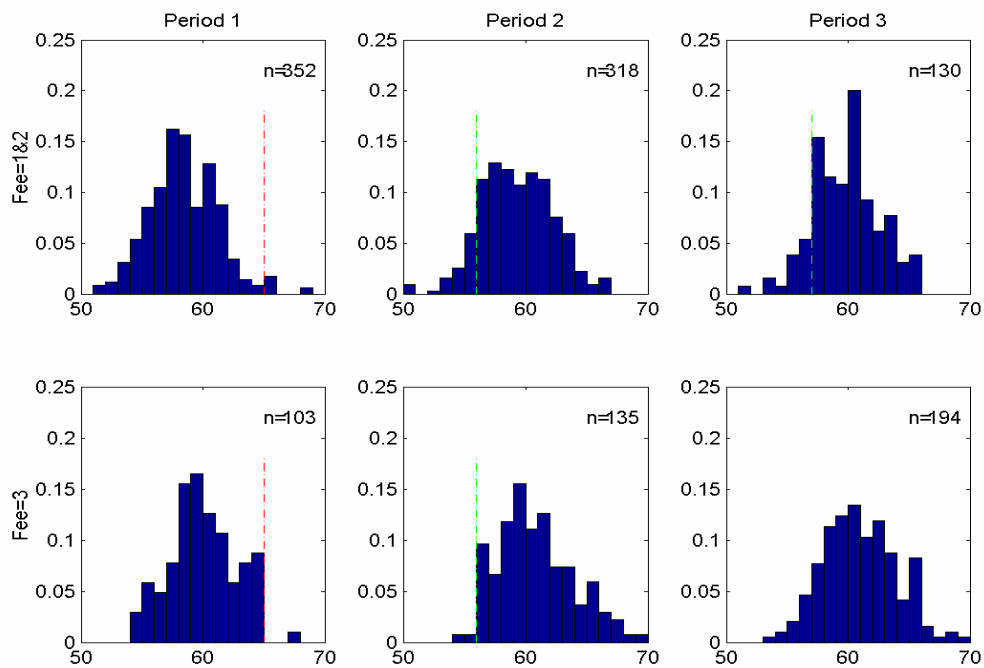


Fig 2 . Height Distribution of 14-Year-Old Boys, Sandhurst Military Academy

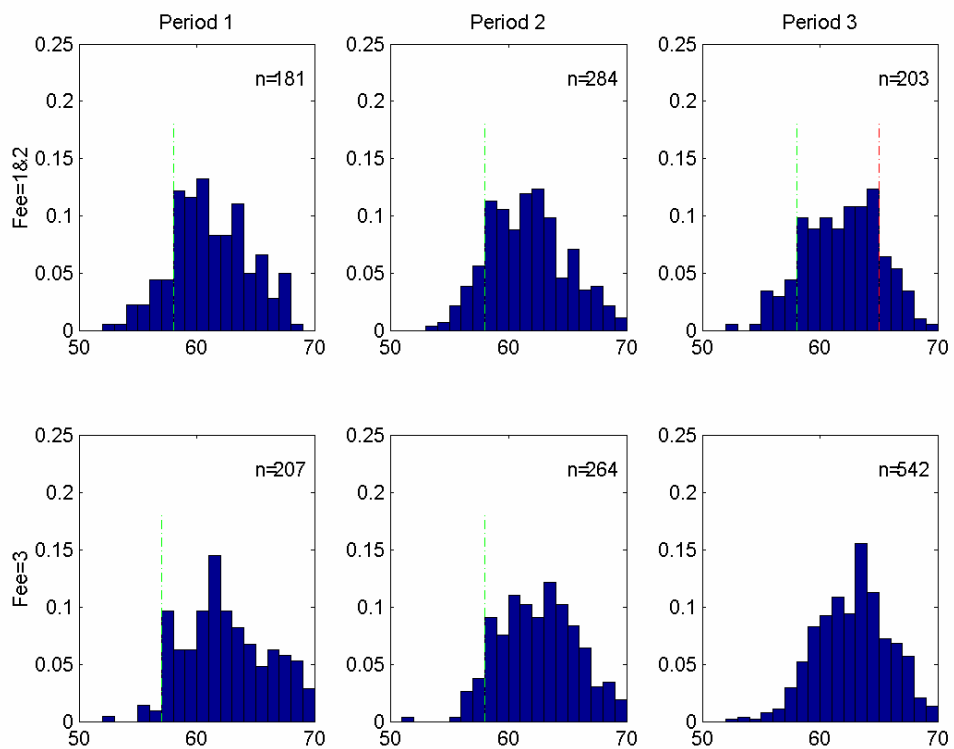


Fig 3 . Height Distribution of 15-Year-Old Boys, Sandhurst Military Academy

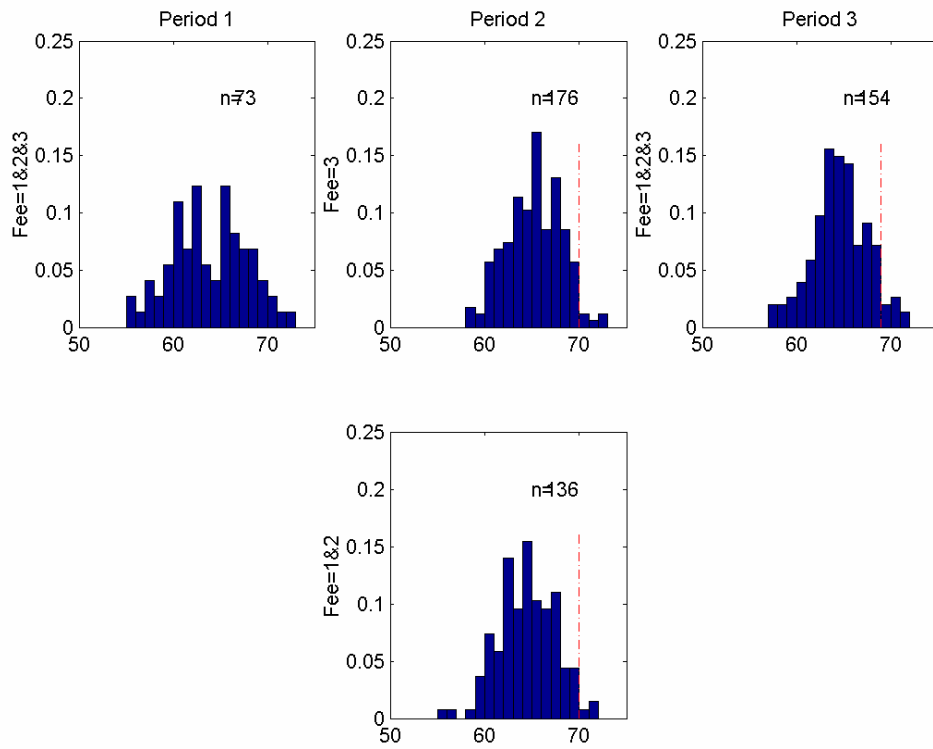
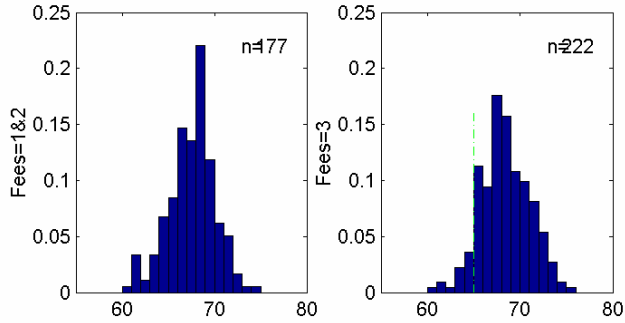
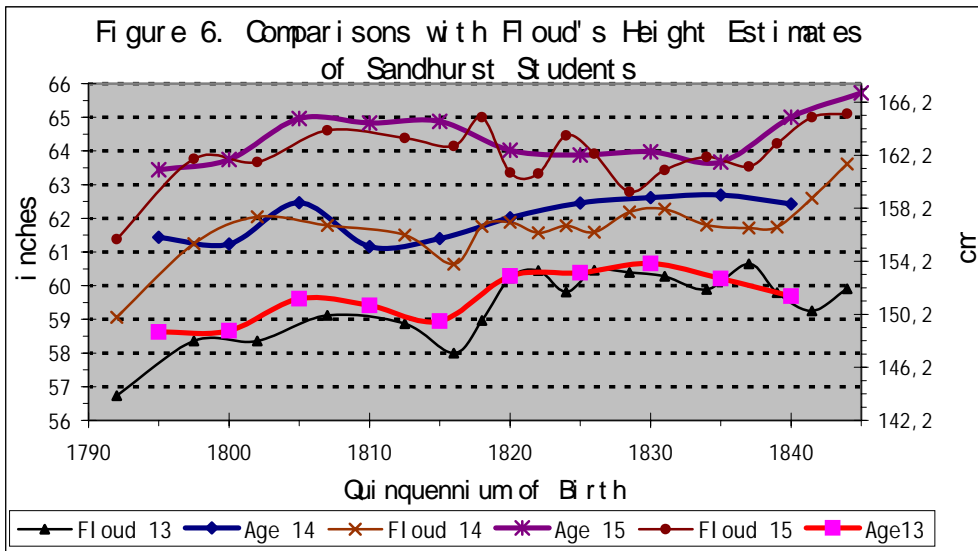
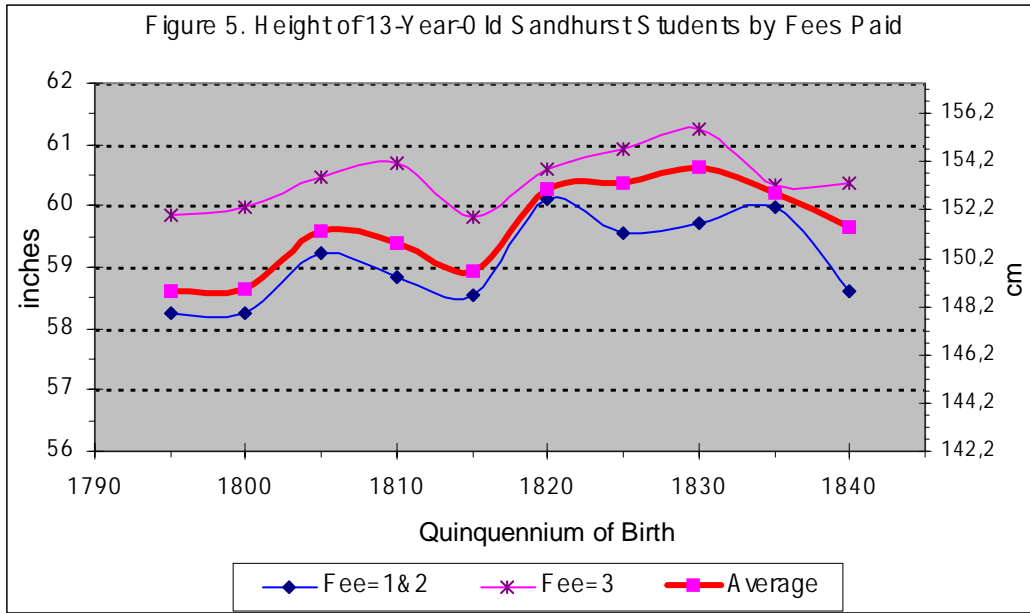
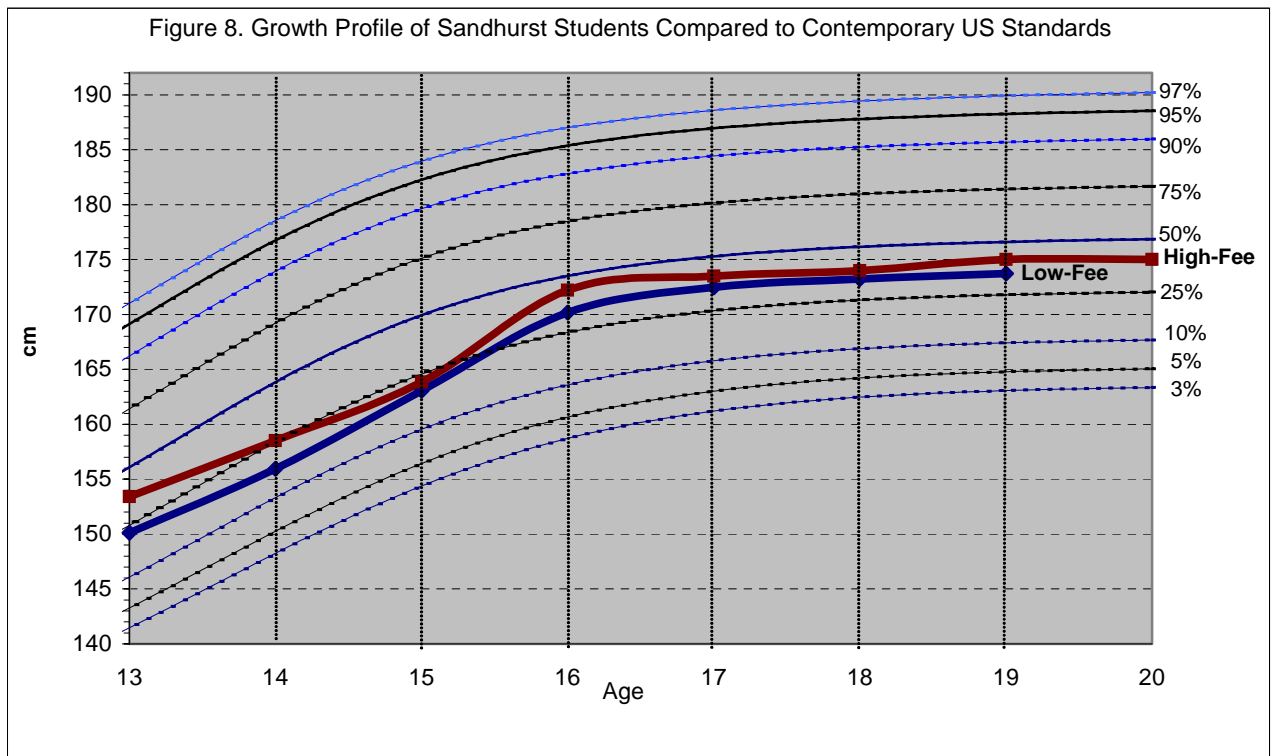
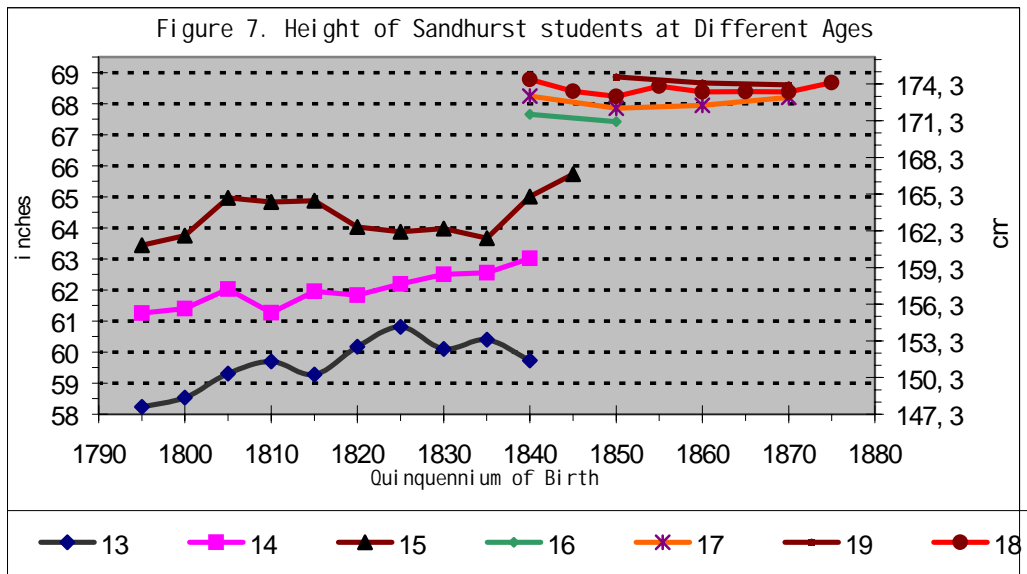
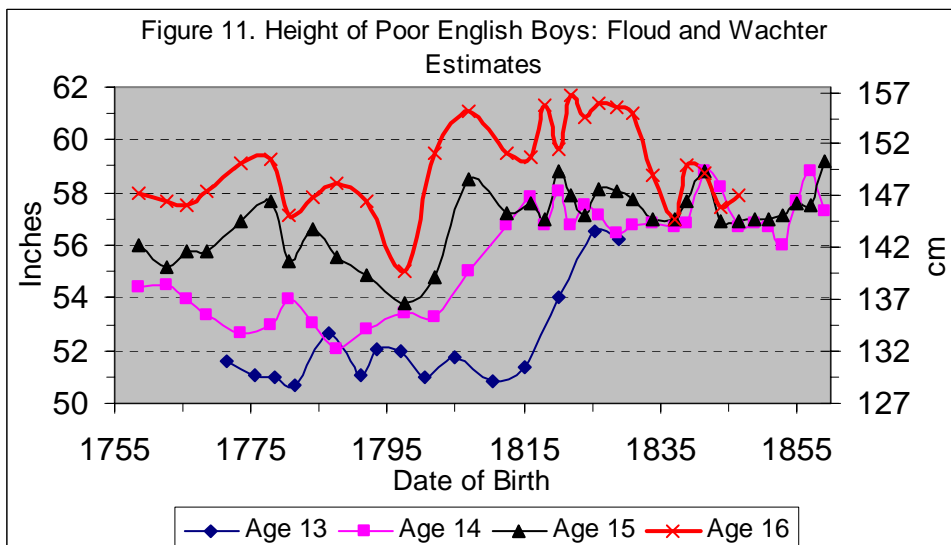
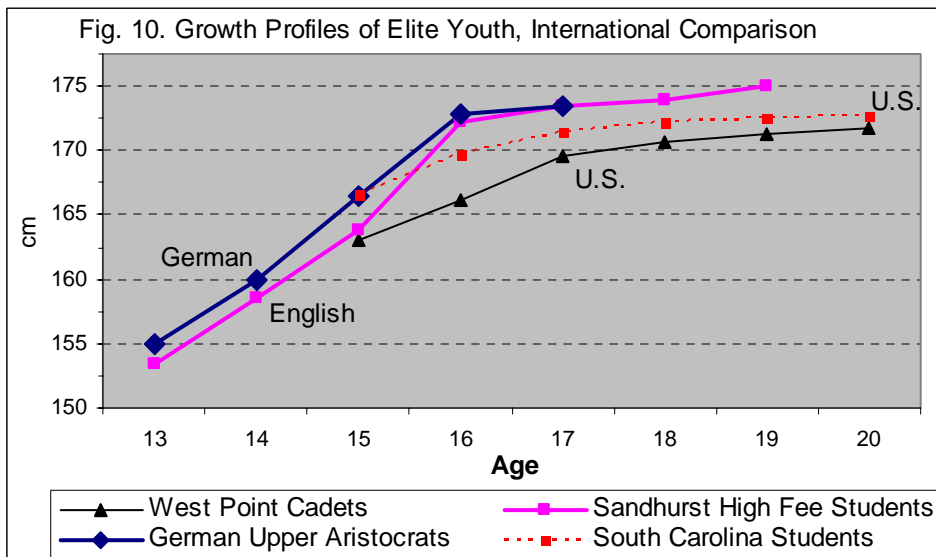
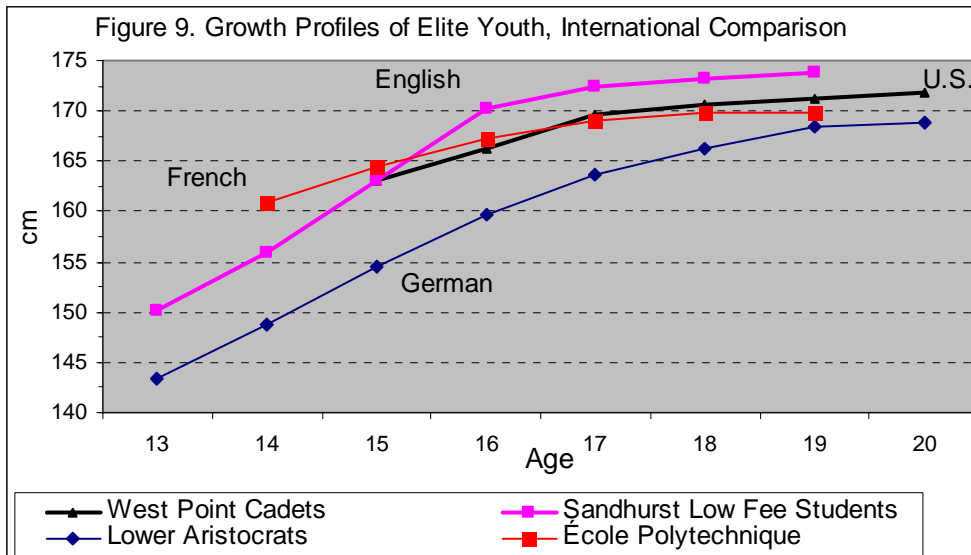


Fig 4 . Height Distribution of 16-Year-Old Boys, Sandhurst Military Academy

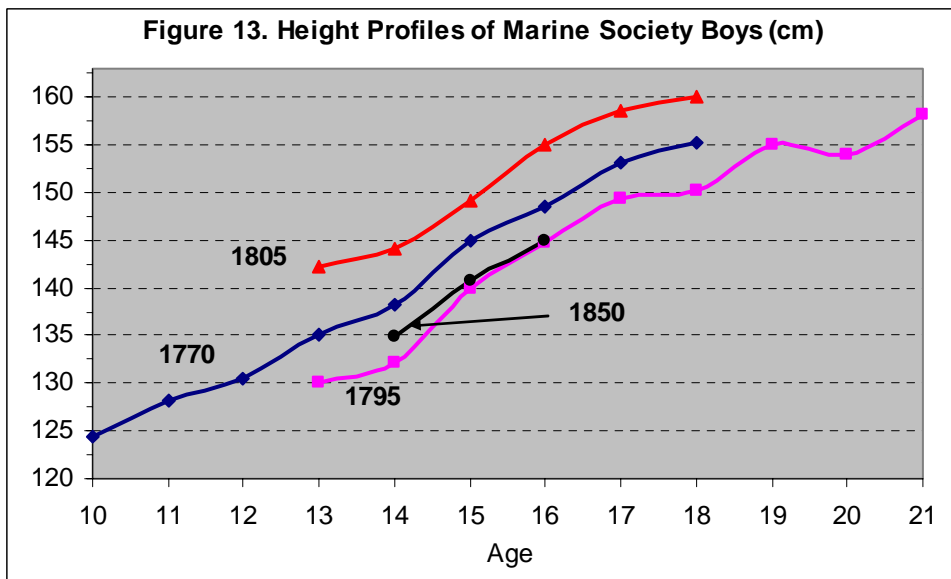
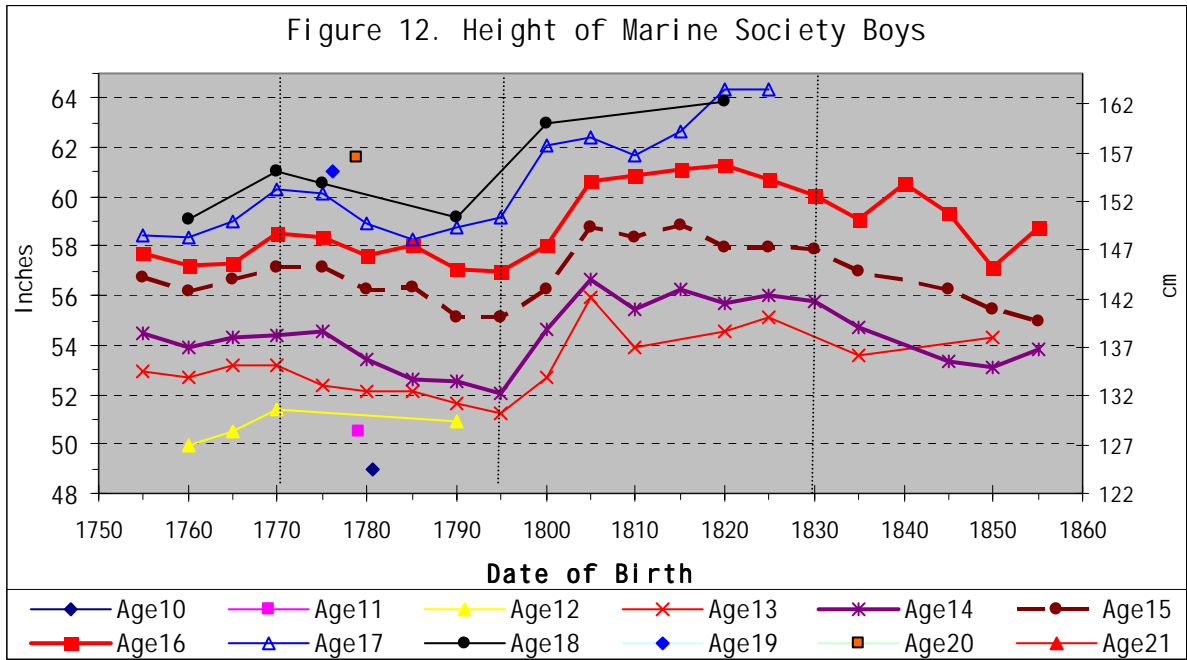


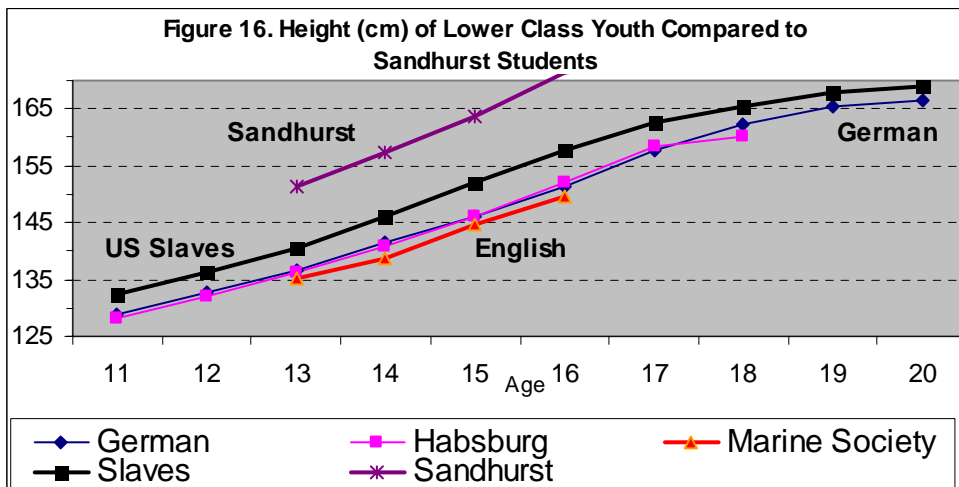
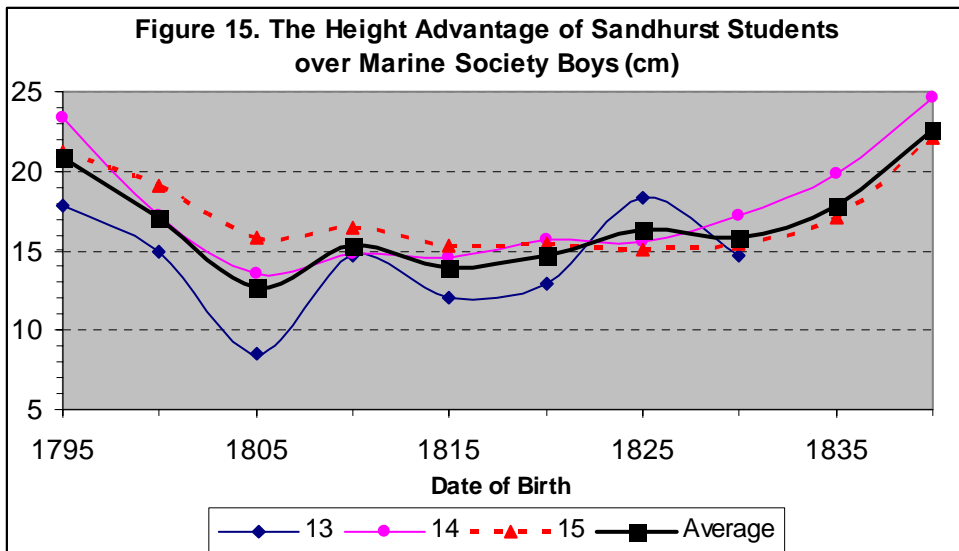
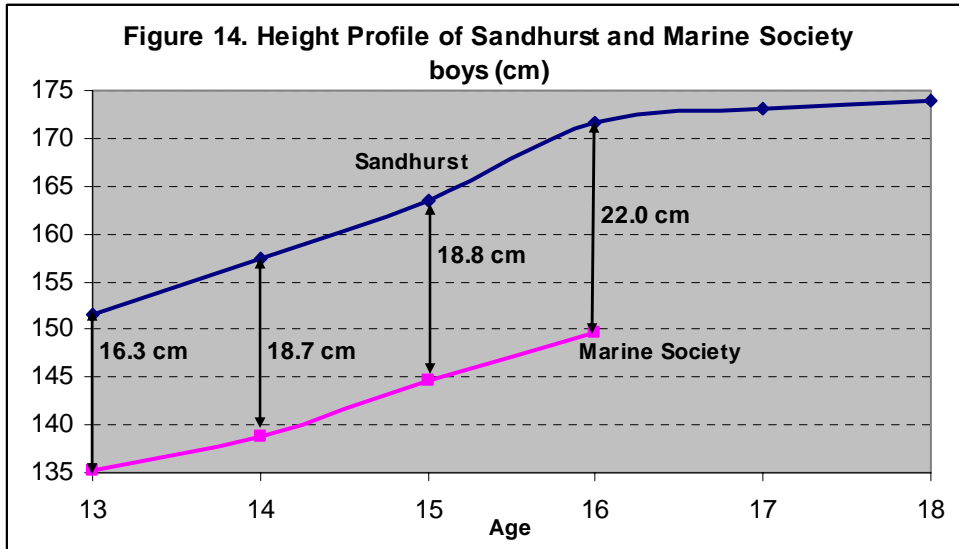






Source: Floud, Wachter and Gregory, 1990, p. 166.





References

Coclanis, Peter, and John Komlos. "Nutrition and Economic Development in Post-Reconstruction South Carolina: an Anthropometric Approach." Social Science History 19, no. 1 (1995): 92-115.

Engerman, Stanley: The Height of U.S. Slaves. Local Population Studies 16 (Spring 1976), S. 45-49.

Floud, R., (1986a) Long-Term Changes in Nutrition, Welfare and Productivity in Britain. Heights and Ages of Sandhurst Recruits, 1808-1893 [computer file]. (UKDA study number 2133) Colchester, Essex: UK Data Archive [distributor], 7 July 1986.

Floud, R., (1986b) Long-Term Changes in Nutrition, Welfare and Productivity in Britain Physical and Socio-Economic Characteristics of Boys Recruited into the Marine Society, 1770-1873 (UKDA study number 2134) [computer file]. Colchester, Essex: UK Data Archive [distributor], 7 July 1986.

Floud, R. and Wachter, K.W., (1982) Poverty and physical stature: evidence on the standard of living of London boys 1770-1870. Social Science History, 6 : 422.

Floud, Roderick, Kenneth Wachter, and Annabel Gregory. Height, Health and History. Nutritional Status in the United Kingdom, 1750-1980. Cambridge: Cambridge University Press, 1990.

Komlos, J. "The Nutritional Status of French Students," Journal of Interdisciplinary History 24 (Winter 1994) 3: 493-508;

Komlos, J. "The Secular Trend in the Biological Standard of Living in the United Kingdom, 1730-1860," Economic History Review 46 (Feb. 1993): 115-44;

Komlos, J. 1990, "Height and Social Status in Eighteenth-Century Germany," Journal of Interdisciplinary History 20 (1990): 607-621.

Komlos, J., "The Height and Weight of West Point Cadets: Dietary Change in Antebellum America," Journal of Economic History 47 (1987): 897-927;

Komlos, J., "Patterns of Children's Growth in East-Central Europe in the Eighteenth Century," Annals of Human Biology 13 (1986): 33-48.

Komlos, John, James Tanner, P.S.W. Davies, and Timothy Cole, "The Growth of Boys in the Stuttgart Carlschule, 1771-93," Annals of Human Biology 19 (1992): 139-152.

Komlos, J. 2004, How to (and How Not to) Analyze Deficient Height Samples: an Introduction, Historical Methods, forthcoming.

Steckel, Richard. "Slave Height Profiles from Coastwise Manifests." Explorations in Economic History 16, no. 4 (1979): 363-80.

Endnotes

¹ The data were extracted from the records of the academy by Roderick Floud (1986) and deposited at the University of Essex's data archive. There are about 10,000 data deposited in the archive even though Floud et al. (1990, p. 133) mention that there were twice as many extracted from the archive. Unfortunately the occupation of the parents were not recorded, even though the information is apparently available in the archives. The extension of the data set to include this information would obviously make a valuable research project.

² After 1858 three fee categories were built: >50, 50-99, 100< (Table 1).

³ Because there were few observations in category 1, categories 1 and 2 were analysed together.

⁴ Some of the fluctuations is possibly due to omitted variables, such as the regional provenance of the boys and the occupation of the parents. Coupled with the uncertainties associated with the determination of the height requirements, the missing variables prohibit a precise estimate of the trends.

⁵ High-fee paying students were 2.4 cm (0.9 in.) taller as adults than low-fee paying students.

⁶ The students at the École Polytechnique, whose admission policies were more meritorious, were as tall as the cadets of the West Point Military Academy (Figure 9).