FROM THE TALLEST TO (ONE OF) THE FATTEST: THE ENIGMATIC FATE OF THE AMERICAN POPULATION IN THE 20TH CENTURY

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Abstract

Within the course of the 20th century the American population went through a metamorphosis from being the tallest in the world, to being among the most overweight. The American height advantage over Western and Northern Europeans was between 3 and 9 cm in the middle of the 19th century. Americans were also underweight. However, today, the exact opposite is the case as the Dutch, Swedes, and Norwegians are the tallest, and the Danes, British and Germans – even the East-Germans - are also taller, towering over the Americans by as much as 3-7 cm. Americans also live shorter. The hypothesis is worth considering that this adverse development is related to the greater social inequality, an inferior health-care system, and fewer social safety nets in the United States than in Western and Northern Europe, in spite of higher per capita income. The West- and Northern European welfare states, with cradle to grave health and unemployment insurance currently provide a more propitious environment for the biological standard of living than its US counterpart.

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Introduction

Conventional standard-of-living indicators based on income fail to provide a complete accounting of factors that contribute meaningfully to the quality of life of the various members of a society. This is particularly the case for such important aspects of welfare as health, life-expectancy, inequality, security, and entitlements, which are not fully integrated into the above concept (Sen, 1987, Osberg and Sharpe, 2002). Research on happiness or the Human Development Index is helpful in generating new perspectives that help overcome the limitations associated with relying on a single indicator (United Nations, 1996; Frey and Stutzer, 2002). We approach the biological well being of the American population in the 20th century from the perspective afforded by anthropometric indicators in the hope of illuminating socio-economic processes that might otherwise elude even the informed observer (Baten 2000; Baten and Murray 2000; Komlos and Baten 1998; Mielcke 2000; Steckel 1995). We confine our analysis to physical stature and the body mass index[1] (bmi) in order to document a major transformation in the physical shape (morphology) of the American population in the 20th century.

Background

Physical stature is actually a useful summary measure of biological well being, inasmuch as it is affected by many socio-economic variables and generally correlates positively with most health outcomes throughout the life course.[2] In general, physical stature is a mirror of how well the human organism itself thrives in its socio-economic and epidemiological environment primarily during childhood and adolescence (Komlos and Cuff 1998; Komlos and Baten, 1999). In brief, in the absence of offsetting forces, height generally increases in good times and contracts in adversity. It is affected by the state of medical technology, the access to health care, the cost of medical services, the quality of perinatal care, the attitude toward preventive medicine, the virulence of the disease environment, and

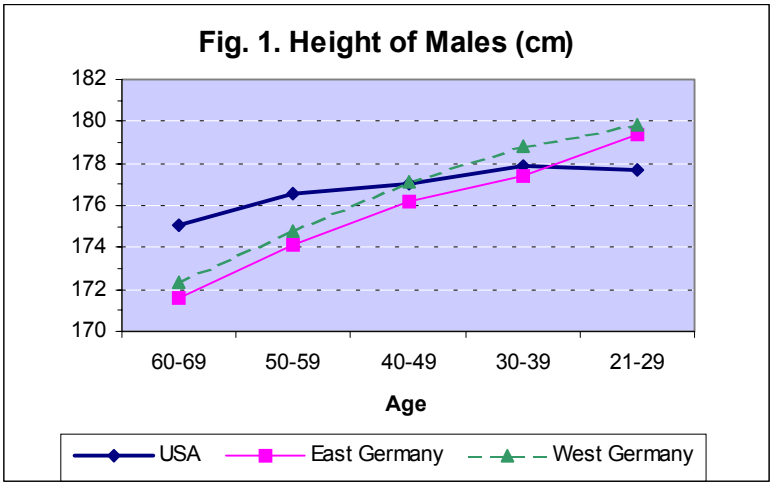
the degree of pollution. Social status is usually an important determinant of height, insofar as income effects are substantial and persistent, and better-educated parents have superior consumption skills, are better informed about long-range health effects of consumption patterns, and are, thus, usually able to take better care of their off-spring (Cigno 1991; Bogin, 1999, 308; 2001). Height is a function of income inasmuch as the consumption of nutrients, particularly of proteins, vitamins, and minerals, and the regularity with which they are consumed, influence height at a particular age until adulthood. Urban/rural differences are also predictors of health outcomes, because the supply of medical services, particularly specialised ones, is more efficient in metropolitan areas than in rural ones (Komlos and Kriwy 2003).[3] There is much concern about the obesity epidemic in the US, because of its health consequences (Gordon-Larsen, Adair, and Popkin, 2003,), but the fact that the average physical stature of Americans has been lagging well behind West-European levels has all but eluded comment. Within half a century a veritable metamorphosis in the shape of the American population took place without notice: from being the tallest in the world still around World War II, Americans have become one of the most obese at the onset of the 21st century. Already in colonial times the height of American men reached modern levels of 173 cm – well above European standards for a very long time to come – except those of a tiny segment of the upper aristocracy (Komlos 2001). The abundant natural resources of the New World combined with the low population density conferred considerable biological advantages on its inhabitants. Yet, as startling as it may appear, Americans have increased in height by only a few centimeters since then. In contrast, many European populations increased by 15 cm in the meanwhile – about 1 cm per decade. The American height advantage at the middle of the 19th century reached as much as 3-9 cm (Table 1), and Americans were very far from being overweight: West Point Cadets, for example, had a bmi value of 19 – considered underweight by today's norms[4] (Cuff 1993). In contrast, Americans are now considerably shorter than Western and Northern Europeans, and the Dutch, Swedes, and Norwegians are the tallest, -

though Danes, British, Germans, and even the East-Germans are also taller[5] (Fredriks, 2000; Sunder 2003) (Figures 1 and 2).

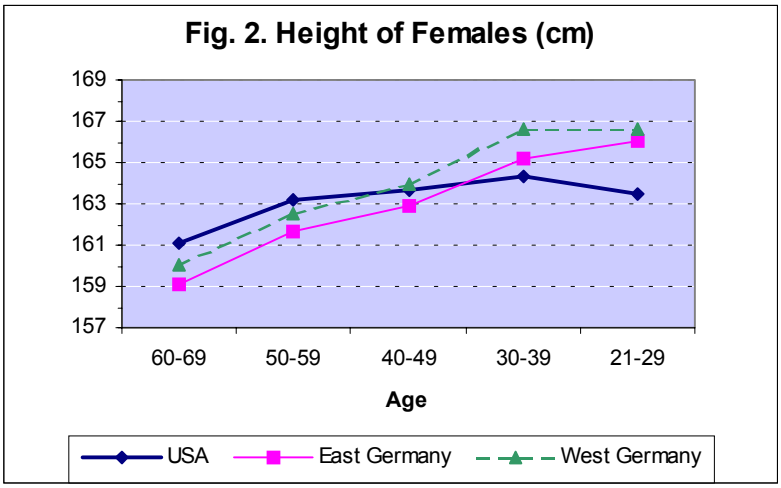
Table 1: Height of Adult Men, mid-19th century

Country	Year	Height (cm)	Sources
America (Whites)	1860	174.1	A´Hearn, 1998, p. 263
Australia	1890	172.7	Whitewell, de Souza and Nicholas, 1997, 390.
Scotland	1840	170.9	Riggs, 1994, 66
America (Slaves)	1860	168.7	Komlos, 1998, 238
Norway	1855	168.6	Floud, 1994, 18
Sweden	1880	168.6	Floud, 1994, 19
Bavaria	1860	167.3	Baten and Murray, 2000.
Netherlands	1830	167.2	DeBeer, 2003.
England	1860	165.6	Johnson and Nicholas, 1995.
Denmark	1850	165.3	Floud 1994, 16

They are as much as 2-6 cm taller than Americans, and the gap is probably slightly greater among females.[6] (Figures 1 and 2).



Source: NHANES III and BGS ´98



Source: NHANES III and BGS ´98

Inasmuch as the US is a high income country with advanced medical services that has enjoyed a long boom in economic activity since WW II (Table 2), the fact that heights have not kept pace with European developments and might have actually began to decline absolutely is quite a conundrum.

Table 2. Per capita income of Several Countries, 1998 US Dollars (Thousands)

USA	29,6	**Netherlands**	22,1
Norway	26,3	**France**	21,2
Denmark	24,1	**Sweden**	20,6
Japan	23,3	**Italy**	20,5
Ger-many	22,2	**U. K.**	20,3

Source: Human Development Report 2000, p.157.

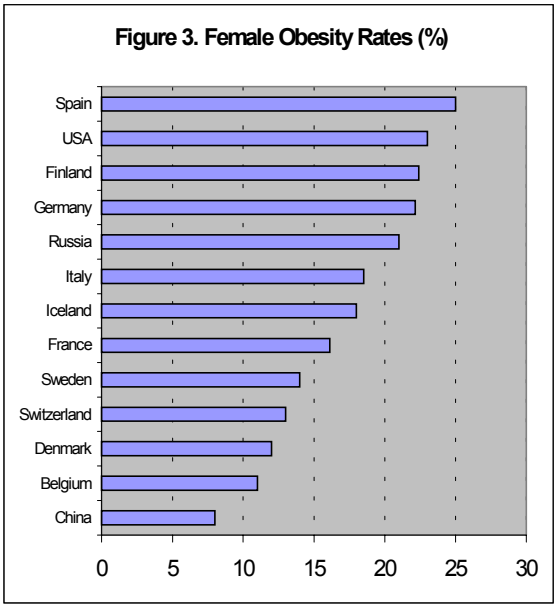
The bmi values of the US population have been increasing rapidly since the 1980s, and as many as 20% are now considered obese (Figures 3 and 4). Although this is part of a worldwide trend (Ulijaszek 2003), the American values are near the top of those of the OECD countries.[7] At the same time, the life-expectancy of Americans is 3.2 years behind Japan, and has fallen behind levels prevailing in West-European: it is now about the 28th in the world (Table 3, Figure 5).

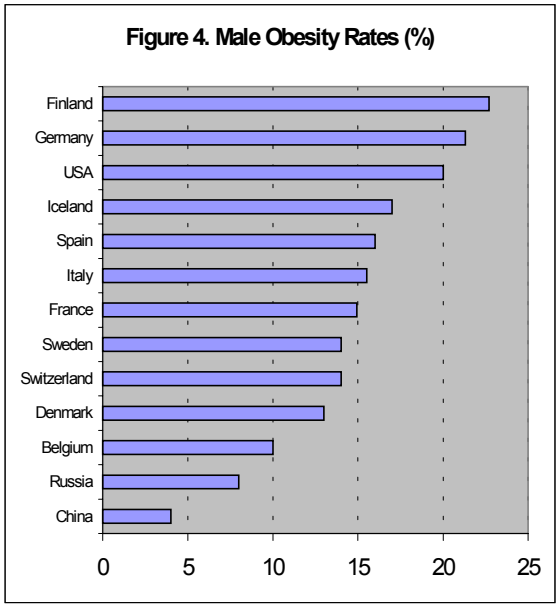
Table 3. Life expectancies at birth in Several Countries, 1998

Japan	80,0	Netherlands	78,0
Sweden	78,7	Germany	77,3
Norway	78,3	UK	77,3
Italy	78,3	USA	76,8
France	78,2		

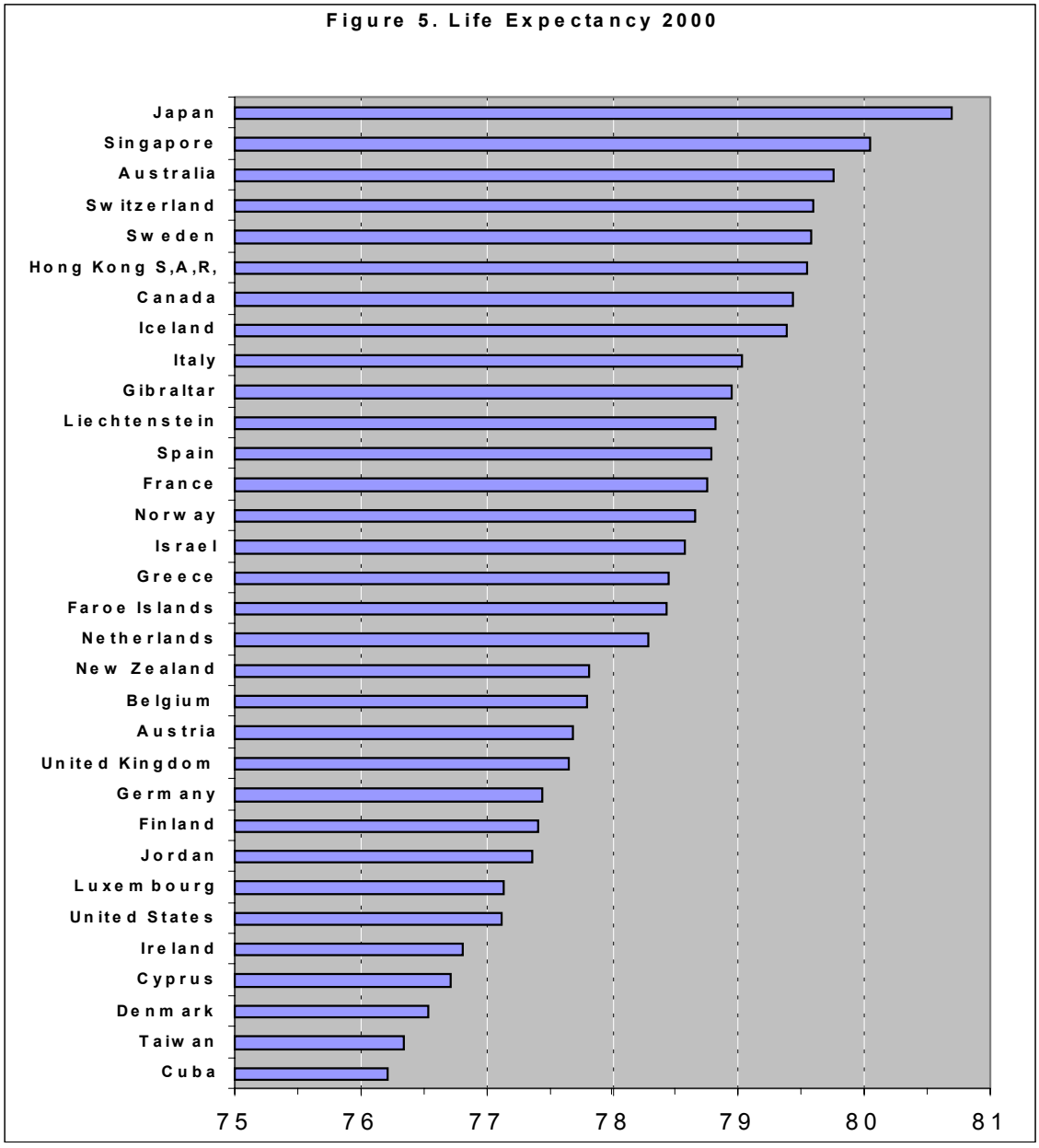
Source: Human Development Report 2000, p.157.

The US infant mortality rate (7.2) is the highest in the OECD countries – twice that of Sweden.[8] This is additional evidence that economic prosperity in America has not translated into the attainment of a comparably high level of biological well-being relative to other economically advanced countries, in spite of the fact that Americans spend a much larger fraction of their income on health-related services. The US population spends 13.7 % of its GNP on health whereas the UK spends 6%, and Japan 7%[9] (WHO, 2000). Some of the inefficiency is due to high administrative costs.





Source: Komlos, Smith and Bogin (2003).



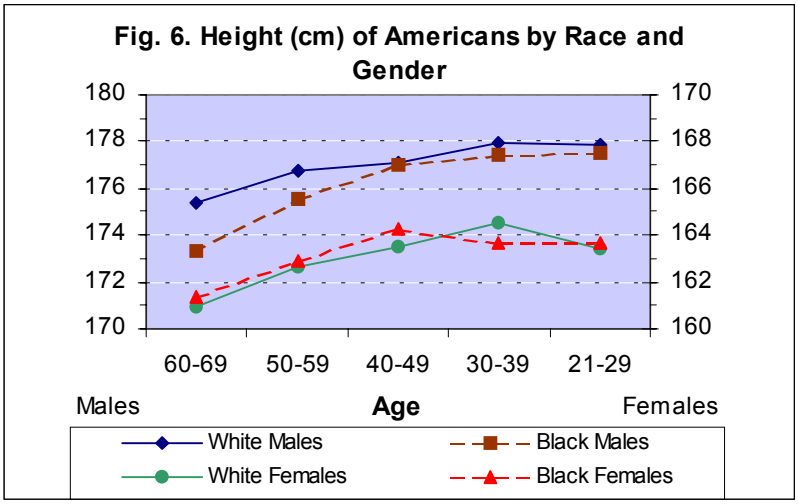
Source: Komlos, Smi

Data

We explore this puzzle using the NHANES III dataset collected by the National Center for Health Statistics (NCHS) of the Center for Disease Control and Prevention (CDC) of the Department of Health and Human Services. Since 1960 the NCHS has carried out surveys on the health and nutritional status of the U.S. population.[10] The sample in this study is from the public-use data of the National Health and Nutrition Examination Survey III (NHANES III), collected between 1988 until 1994. The stratified random sample contains information on 33,994 individuals in 81 counties, representative of the US population at large. Hence, the approximate date of birth is obtained by subtracting age from about 1991. We consider the height and bmi of the adult population (ages 21 – 69) born in the United States. Thus, the sample is reduced to 14,615 observations.

Results

Not only have the average physical stature of Americans not kept pace with European trends, but there is some evidence that heights have been stagnating among men and might actually have decreased among females of the youngest adult birth cohort, i.e., those born in the 1960s, both black and white (Figure 6).



Source: NHANES III

Controlling for income and education, the diminution in height is in access of 3 cm among whites of both gender and 1 cm among blacks and Mexican-Americans[11] (Table 4). To be sure, more people obtained a high school and college education among the 1960s birth cohorts than earlier, so that the average decline is not at all as large as one might infer from this result by itself. Height of white American-born women measured in 1993 (both black and white, and speaking English in the family - but without Hispanics) born in the late 1950s and early 1960s was 164.3 cm. In contrast, those born in the late 1960s and early 1970s were 163.5 cm tall (Figures 2 and 6). Admittedly, 0.8 cm is not much of a decline - but it is amazing that heights would have declined at all at a time when medical know-how was improving greatly, and per capita income was increasing markedly. The trend and level of average heights of blacks and whites are quite similar except for the earliest birth cohorts

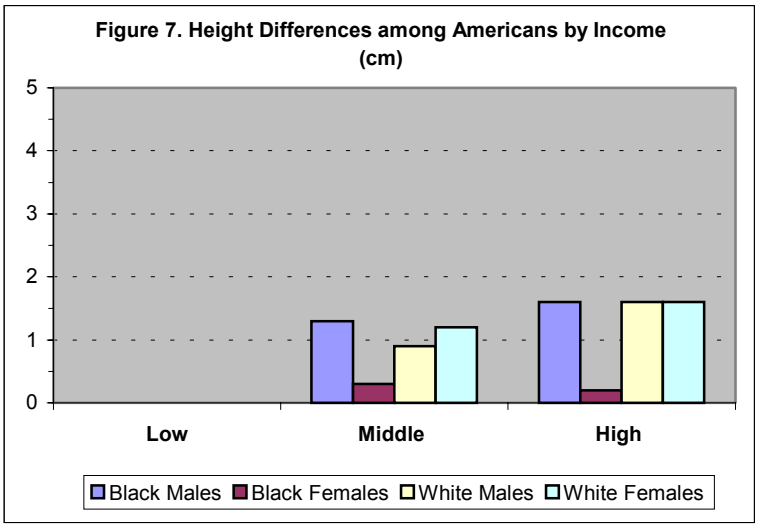
among the males (Figure 6). Actually, average heights for the whole population are almost the same as those of whites by themselves (Figures 1, 2, and 6), inasmuch as whites make up 85 percent of the population without Hispanics (U.S. Census Bureau, 2000). Hence, in subsequent analysis the height of whites is not reported separately, only those of the whole sample considered and of the African-Americans are.

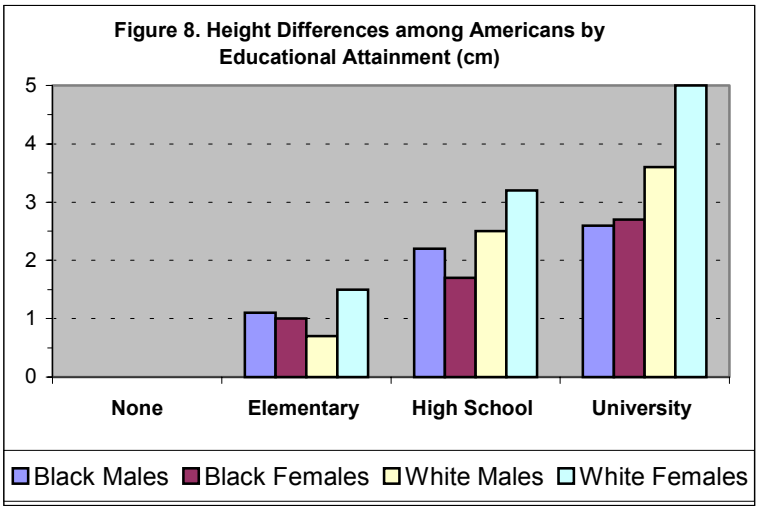
Table 4. Regression Analysis: Dependent Variable: Height (cm) of Americans

	White		Black		Mexican-American	
	male	female	Male	female	male	female
(Constant)	172,4*	157,8*	175,3*	161,4*	170,5*	156,2*
Age						
21-29 years						
30-39 years	3,1*	3,8*	1,3*	1,1*	1,3*	1,3*
40-49 years	2,7*	3,4*	1,3*	1,7*	0,3	1,3*
50-59 years	2,4*	2,9*	0,4	0,9	1,2	0,1
Education						
Elementary						
None	-0,7*	-1,5*	-1,1*	-1,0*	-2,4*	-2,5*
High School	1,8*	1,7*	1,1*	0,7*	2,4*	2,8*
University	2,9*	3,5*	1,5*	1,7*	2,5*	3,3*
Income						
None						
Low	-0,8*	-0,9	-0,9*	0,1	-0,8	-0,7
Middle	0,1	0,3	0,4	0,4	-0,2	-0,1
High	0,8	0,7	0,7	0,3	-0,8	1,3
R^2	0,13	0,19	0,07	0,03	0,1	0,2
F	34,44*	60,1*	9,9*	7,0*	10,5*	16,8*
N	5.240	5.705	686	893	164	184
* significant at 5% level	Source: NHANES III					

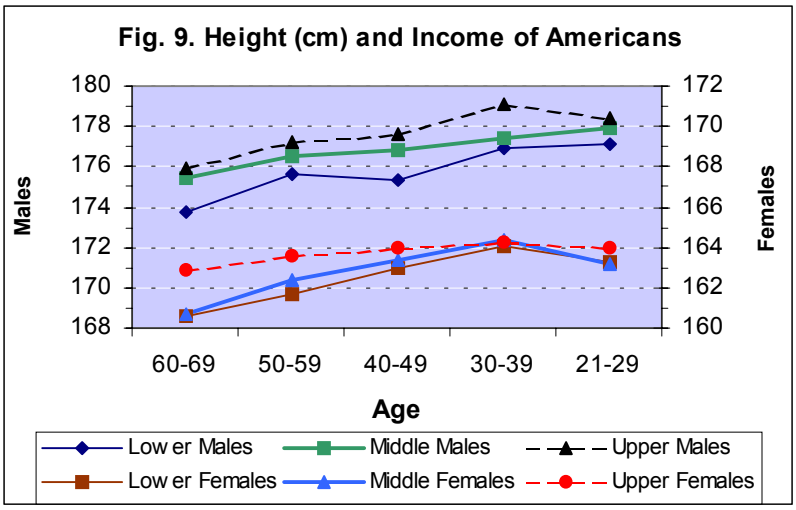
There is a positive association between height and household income. We are unable to establish causation, however, insofar as final height is not determined by one's income but those of the parents for which we do not have data, and we also lack a suitable instrumental variable. Another issue to consider is that taller people earn more on average, so that the direction of causation works in both directions: not only does income determine height, but also height determines income. This is insofar not a problem in this preliminary analysis, as we do not need to interpret the estimated coefficient of the income variable. The aim, rather,

is to describe the trend in the height of the US population by various socio-economic groups to show that in none of them did height keep pace with Western- and Northern European developments (Figures 7 and 8).





Even the height of the American upper-income groups failed to keep up with the West-European averages in recent decades (Figures 9 and 10). In fact, among males the highest income group has become shorter among the most recent cohort (born in the 1960s), perhaps due to social mobility, as pointed out above, while the height of females has declined in all three income categories.



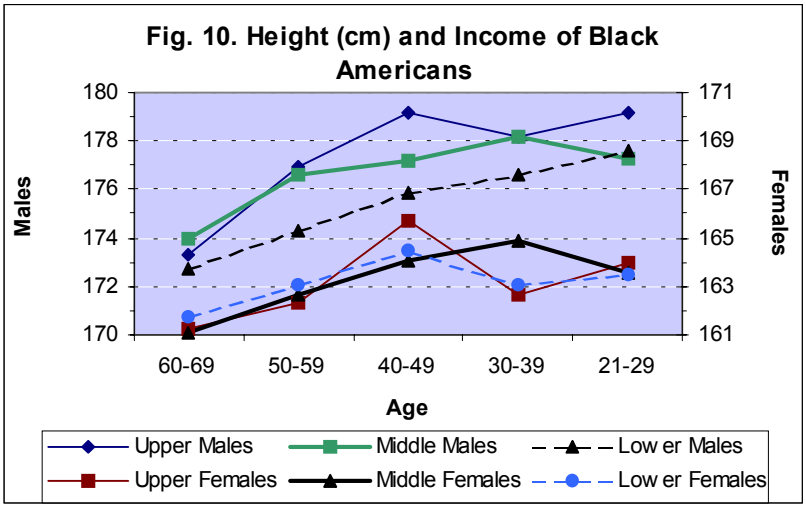
Source: NHANES III

Differences in height by income groups decreased gradually over time among females and disappeared entirely among those in their 30s, only to widen again somewhat among those in their 20s (Figure 10). Height differences among Americans by household income are not as high as those obtained by educational attainment[12] (Table 4 and Figures 7 and 8).

The difference between low and high income groups was nearly 1.5 cm, and there is no difference at all between middle and upper income groups. The difference declined slightly among the most recent birth cohorts (Figure 9). This pattern might well imply that there was considerable upward income mobility so that individuals who now find themselves in the upper income bracket had middle or low income parents whose income determined, in the main, the final attained height of their offspring. Own income in other words, in the presence of social mobility is not a good proxy measure for parents' income.

Among blacks heights increased rapidly especially among upper income groups up to and including the World War II birth cohorts, both male and female. Hence, height differences among the income groups rose substantially among males (reaching 3 cm), and more modestly among females, (Figure 10). Subsequently, the differences declined as the upper income groups made no further gains at all among either males or females.

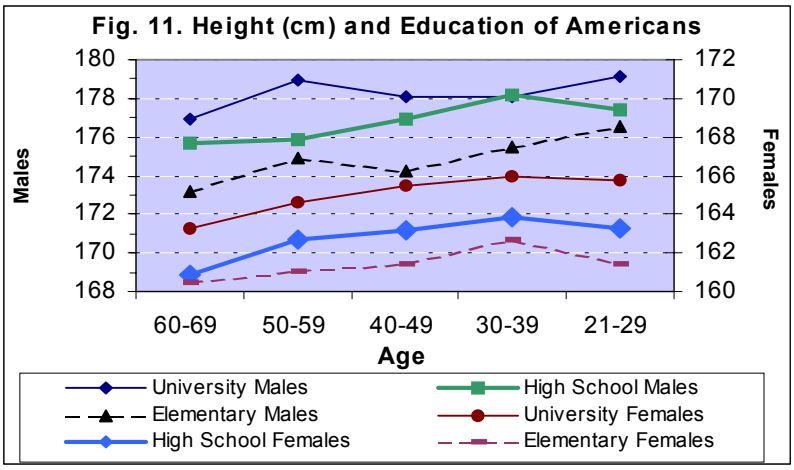
In contrast, lower income black males did continue to experience a positive trend in height after World War II. Black upper income males in their twenties are about as tall as the West-German average, while upper income females are about 2 cm shorter.



Source: NHANES III

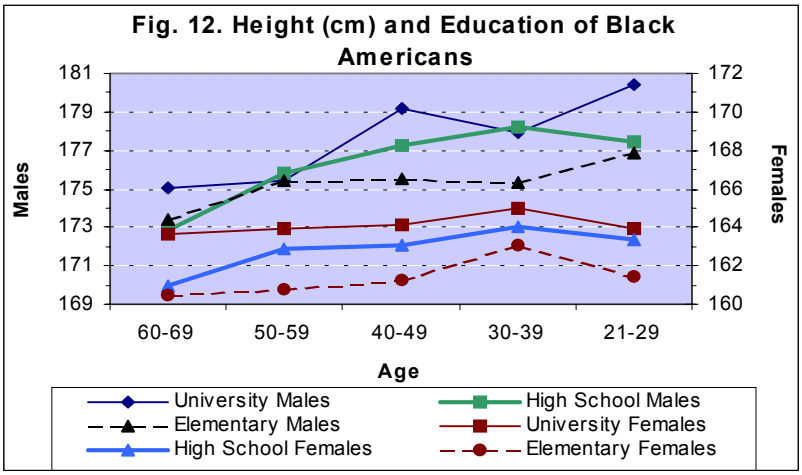
The differences in height among black females by income group are negligible (Table 4). Difference in height by educational attainment, in contrast, is much more pronounced, implying that there could be a higher correlation between parents' and children's educational attainment than with income. The height advantage of college students was greater among whites than among blacks, reaching 5 cm among white females.

The height of men with a university education tended to stagnate, while high-school graduates made some progress in the 1950s but that was reversed among the most recent birth cohorts (Figure 11). The difference between those with an elementary and university education declined from 4 cm to about 2.5 cm. Females' height increased parallel to one another by educational attainment until the most recent birth cohorts, which all decreased, the more markedly the lower was the level of education (Figure 11).



Source: NHANES III

The gap between the lowest and highest educational group widened from about 3 cm to about 4 cm. Controlling for the influence of other factors, university-educated white men were about 2.9-3.5 cm taller than those with an elementary education, The effect was comparable among Mexican-Americans, but about twice as large as the effect among blacks (Table 4). The only groups that made steady gains in height in recent decades are low income black males, low and middle income white men, white men with an elementary education, and black men with college education (Figures 9-12). In contrast, all females, as well as upper income and better educated white men tended not to do as well in this respect (Figures 6, 9-12).



Source: NHANES III

University education has a propitious effect on bmi of all groups with the exception of white males (Table 5). The effect is particularly strong among women. Moreover, people who consider themselves in excellent health have a significantly lower bmi than the other groups. A fast-food culture has developed in the last half of the 20th century in response to the restructuring of work and family life (Offer, 2001). This may well be one of the causes of the high obesity rates.

Table 5. Regression Analysis: Dependent Variable: Body-Mass-Index of Americans

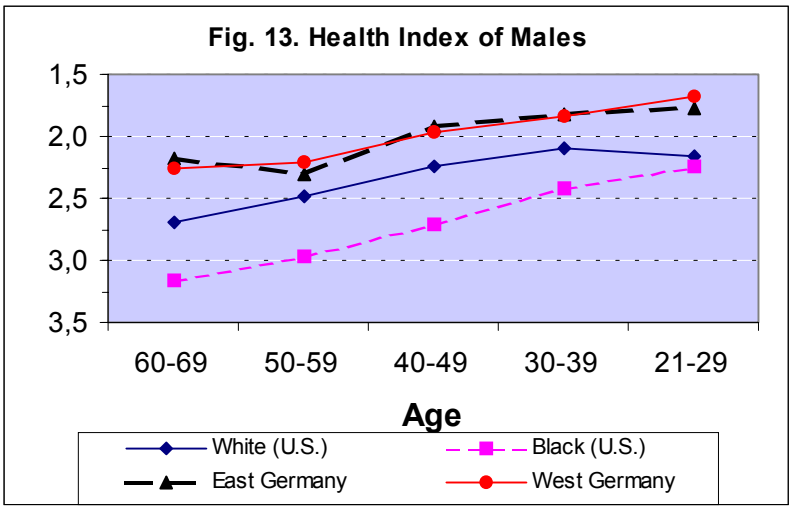
	White		Black		Mexican-American	
	male	female	Male	female	male	female
(Constant)	24,8*	24,3*	25,2*	26,5*	25,8*	25,5*
Age						
21-29 years						
30-39 years	1,1*	1,2*	0,5	2,4*	1,4*	2,5*
40-49 years	1,9*	1,5*	0,7*	3,6*	2,7*	3,4*
50-59 years	2,1*	3,1*	1,1*	3,2*	2,1*	2,6*
Education						
Elementary						
None	-0,7*	-0,5	0,1	-0,3	-0,7	-0,7
High School	0,1	-0,3	0,7*	-0,5	0,2	-0,2
University	-0,2	-1,5*	2,0*	-1,5*	-1,6*	-2,1*
Health						
Excellent						
Very Good	0,7*	0,8*	0,3	0,3	0,7	1,0
Good	1,2*	2,0*	0,6	1,5*	1,2*	1,9*
Fair	1,4*	3,0*	0,9*	2,0*	1,6*	1,9*
Poor	0,1	2,9*	-0,1	1,9*	2,0*	4,7*
R^2	0,0	0,0	0,0	0,0	0,1	0,1
F	16,0*	23,0*	2,9	11,8*	5,7*	7,5*
N	5.240	5.705	686	893	164	184
* significant at 5% level		Source: NHANES III				

Conclusion

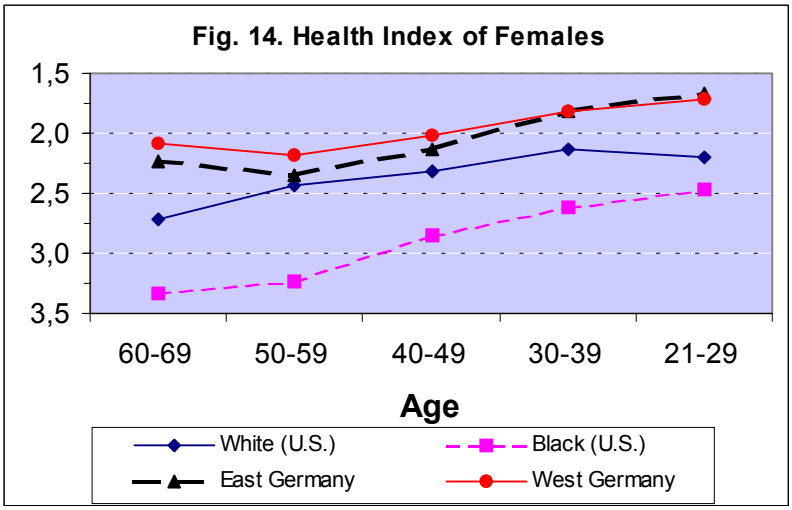
Anthropometric indicators are used as a proxy measure for biological welfare. To be sure, they are not indicative of the contribution of all goods and services to well-being by themselves, and therefore lay no claim to being a substitute for the conventional standard of living. Nonetheless, they are an important complement, illuminating the extent to which a socio-economic or political system provide an environment – broadly conceived - propitious to the physical growth and longevity of human organisms, so that they can reach their biological growth potential. While physical stature ought not to be conflated with the conventional standard of living, it is associated negatively with mortality from many diseases in a non-linear fashion (Waaler 1984; Costa, 1993). It is useful to distinguish between conventional conceptualizations of living standards (based on monetary aggregates), and a population's biological well-being. The biological standard of living is indicative of how well the human organism thrives in its socio-economic and epidemiological environment. The concept is conceived to capture the biologically relevant quality-of-life component of welfare, and acknowledges explicitly that the human experience is inherently multidimensional. Welfare encompasses more than the command over goods and services: it includes, *inter alia*, health in general, the frequency and duration of sickness, the extent of exposure to diseases, and longevity independent of income (Tanner 1987).

Americans are far from achieving the highest biological standard of living in the world today, in spite of their high average per capita income. Tall and thin between colonial times and the middle of the 20th century, Americans by the 21st century are much more affluent but have fallen well behind West-Europeans and Scandinavians in many aspects of biological well being, even as their body mass has risen beyond most European values. These developments are probably related to the reasons why Americans face a lower life expectancy compared to many other populations[13] (Figure 5).

Moreover, their subjective evaluation of their own health status tends also to be more pessimistic than those of Germans (Figures 13 and 14). Blacks tend to think of themselves as less healthy than whites. This is in keeping with their higher mortality rate, but is puzzling in light of the fact that they tend to be practically as tall as whites (Figure 6).



Source: NHANES III

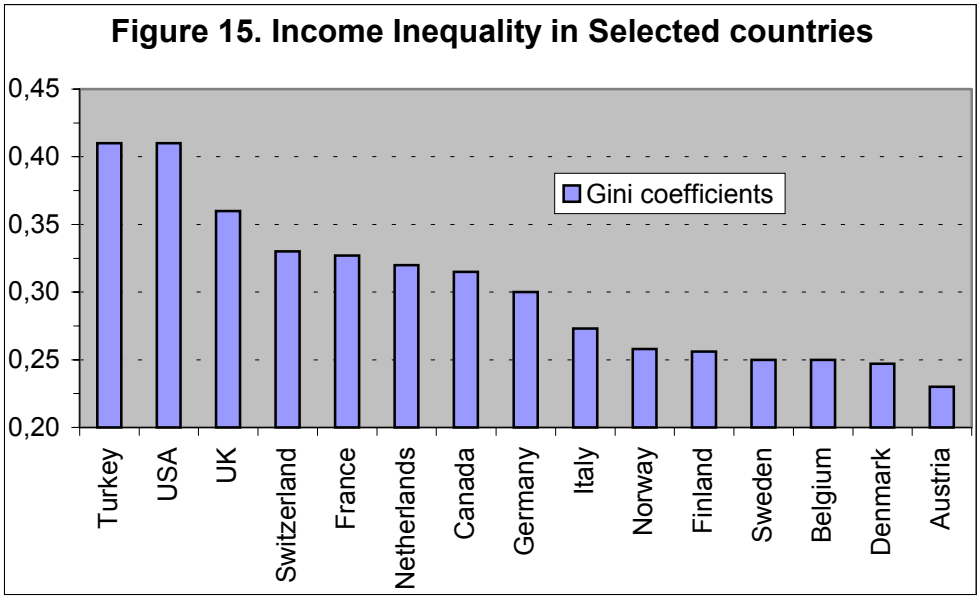


Source: NHANES III

Why does the apparent economic prosperity manifest itself in greater-than-average weight but not in greater physical stature of the American population? Our goal in this survey is not to provide a convincing answer to this uncanny paradox at this stage of the research, but the much more modest one of outlining some relevant issues worth investigating if a convincing explanation is eventually to emerge. There are at least six salient differences between the socio-economic and political systems of the West- and Northern-European welfare states and the more market-oriented economy of the US that might provide a solution to this puzzle:

1) Social inequality in America has been increasing at the end of the 20th century[14] and is greater than in Western Europe[15] (Bohle, 1997, p. 124) (Figure 15). Insofar as the lower classes have a higher propensity to obesity, the US social structure might be conducive to obesity, but not to the attainment of physical stature. Moreover, income inequality is associated with smaller average physical stature (Steckel 1995). The question, however, remains why height by income groups or by education has not increased over time.

Figure 15. Income Inequality in Selected countries



Source: World Bank, World Development Report 2000/2001. Attacking Poverty (Oxford: Oxford University Press, p. 282.

2) Health care systems in Europe provide a much more comprehensive coverage than in the United States. The share of those who have no health insurance at all has risen from 12.9 to 14.6 percent of the US population,[16] and the Congressional Budget Office estimates that nearly 60 million Americans were without health insurance at some time during 1998. This is in stark contrast to the nationally guaranteed minimum health insurance in Western and Northern Europe in which virtually 100 percent of the population is covered. Perinatal care is probably an important aspect of overall advantage of Western Europe (Kaestner and Lee 2003).
3) Health delivery is complicated and is bogged down in overlapping jurisdictions in the US, so that even those who are insured express considerably more dissatisfaction with the health care they do receive than do Europeans. Consequently, in opinion surveys, Americans of all ages tend to judge their health status more negatively than do, for example, Germans (Figure 13 and 14). A recent survey found that the quality of health care in America is well below recommended levels (McGlynn et al., 2003).
4) The West-European welfare states, in which a subsistence income is more-or-less guaranteed, provide a more comprehensive social safety net in other respects as well, including unemployment insurance. Although US unemployment rate is much lower than in Western Europe, only about half of the unemployed are insured and receive benefits.[17] Spells of unemployment of a parent without appropriate insurance or savings may well affect adversely the nutritional status of the household's children.
5) Spatial inequality is much greater in the US than in Europe, as characterized by the suburb-inner city dichotomy that does not have a Western-European analogue. Sanitary conditions and health care, especially perinatal care are generally less-than-adequate in disadvantaged neighborhoods and could well lead to stunting (Ben-Shlomo, White, Marmot 1996; Kawachi and Kennedy 1997).

Is it possible that genetic factors play a role in the US's falling behind in physical stature? While this explanation cannot be ruled out with the data set under consideration, we tend to think that this is not likely to be the main explanation of the patterns found above, because we have eliminated those born outside of the US, and imposed the additional restriction that only those who commonly use the English language in the household are included. Admittedly, this does not rule out second-generation Americans from the analysis,[18] but there are several reasons to think that this is not very likely to be the cause of the patterns reported here. If this were the main reason for the US falling behind, one would expect to find that at least African-Americans, among whom immigration has been small (under 1% of the total in the 1950s), would have kept pace with European developments (U.S. Department of Justice, 2002). Yet, this was not the case. In addition, Americans were still the tallest in the world at the turn of the 20th century, at a time when immigration rates had been very high for some time, particularly from the poorer, hence shorter, populations of Eastern and Southern Europe. Apparently this did not matter in the early-20th century, why would it then matter at its end?[19]

These caveats notwithstanding, the above considerations lead to the hypothesis that perhaps the West-European welfare states have some advantages in providing a higher biological standard of living to their populations than the American more market-oriented one. The patterns elucidated here imply also that per-capita income is not an exhaustive indicator of the quality-of-life. Instead, other welfare measures, such as those pertaining to the health and biological indicators of the population are relevant in providing a broader perspective on well being. The wealthiest are by no means the tallest or the healthiest, or live the longest. They do appear, however, to be among the heaviest.

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Endnotes

[1] The body mass index is defined as: weight in kg /(height in m)^2 and is categorized as follows (Bergmann and Mensink 1999, p. 18): > 20 = Underweight; 20 - 25 kg/m^2 = Normal; 25 -- 30 kg/m^2 = Overweight; > 30 kg/m^2 =Obese

[2] One study found an "inverse associations between height and adulthood cardiorespiratory mortality. Much of the association between height and cardiorespiratory mortality was accounted for by lung function, which is also partly determined by exposures acting in childhood. The inverse association between height and stomach cancer mortality probably reflects *Helicobacter pylori* infection in childhood resulting in—or being associated with—shorter height. [However,] [t]he positive associations between height and several cancers … could reflect the influence of calorie intake during childhood on the risk of these cancers" (Smith et al. 2000). Another set of "results suggest that greater height may be associated with better survival of prostate cancer patients (Chen et al. 2003). Another team of researchers report that "Taller people and those with better lung function are at reduced risk of coronary heart disease." (Gunnell et al. 2003).

[3] There are also interaction effects among the independent variables not considered here.

[4] Students in South Carolina in the late 19th century were 171.6 cm tall at age 17 and weighed 59. 6 kg (0.35 kg/cm). In contrast, youth in the 1970s were 175.8 cm tall and weighed 68.0 kg (Coclanis and Komlos 1995; Frisancho 1990). Hence, the 4,2 cm increase in height was accompanied by a 8.4 kg increase in weight – or 2.0 kg/cm. In contrast, the average weight per cm is now 0.39 kg/cm. Thus, the marginal increase in weight per height was greater than the average, as weight increased much faster than height: a 2.5 percent increase in height was accompanied by a 14.2 percent increase in weight. Similarly, West Point Cadets in the second half of the 19th century at age 17 weighed 57.3 kg and were 169,6 cm tall (0.34 kg/cm) (Komlos 1987).

[5] The American height data in Figures 1 and 2 pertain to persons born in the USA with English as the primary language used in the family. We exclude immigrants because they did not grow up in the environment of the United States. The analysis of adolescents is left for another study.

[6] American women are nearly 3 cm shorter than their West-German counterparts, while American men are just 2 cm shorter.

[7] A similar result for Germany was obtained by Bergmann and Mensink (1999). The people with the greatest weight for height are found in Oceania (Ulijaszek 2003).

[8] In contrast, the infant mortality rate in 2000 was 3.4 in Sweden, 3.6 in Finland, and 3.8 in Norway (WHO, European Health for All database, http://www.who.dk/hfadb).

[9] The US spends more than $4,000 per capita per annum - twice as much as the OECD average. In contrast, Sweden spends $1,700 per annum.

[10] The subjects were interviewed, and thereafter, another sample was drawn from the first sample that was examined by a doctor. The sample is not representative for the US population: Hispanics, children and old people were over sampled. Hence, weights are used in the analysis to obtain representative averages.

[11] This analysis is merely exploratory inasmuch as height also determines income. If taller people are healthier and healthier people are more productive, then taller people will also earn more.

[12] The categories per family per year are: low income: below $ 18,000; Middle income $ 18,000– 60,000; High income above $ 60,000.

[13] In their nutritional status is sub-optimal in childhood, they are less healthy as children and become shorter and less healthier adults, as early health conditions correlate highly with later health status (Case, Fertig, and Paxson, 2003).

[14] According to official U.S. government figures poverty rate increased from 11.1 percent in 1973 to 13.8 percent in 1995 (Triest 1998).

[15] The Gini-coefficient is restricted to a range of 0-1. The higher is the coefficient, the more unequal is the distribution of income.

[16] http://www.census.gov/hhes/hlthins/historic/hihistt1.html.

[17] http://workforcesecurity.doleta.gov/unemploy/content/chartbook/images/chta11.gif

[18] However, those who declare themselves of Asian race are excluded from the analysis.

[19] There are other reasons for questioning the validity of the above inferences: it is possible that the poorer segments of the society are systematically more likely to be included in the Nhanes sample, on account of the fact that it includes a free medical examination which may be more attractive to them.

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