

# **MEASURING THE DISTRIBUTION OF WELL-BEING**

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# MEASURING THE DISTRIBUTION OF WELL-BEING<sup>\*</sup>

## INTRODUCTION

The debate over the course of the standard of living since the beginning of the industrial revolution (say 1750) has been one of the most enduring debates in economic history. It occupied, to some degree, the early classical economists especially David Ricardo and Thomas Malthus who both forecast a bleak future for common people. Capitalism and the industrial revolution horrified reformers such as Robert Owen, Saint Simon and Fourier, all of whom foreshadowed the more intense and direct criticisms of Marx and Engels. Economic historians, such as Hobsbawm, Ashton and Hartwell, put empirical content into the debate.<sup>1</sup> But by the late nineteenth century, certainly the early twentieth century, it was clear the absolute standard of living was substantially and, most likely, irrevocably higher than it had been a century earlier. The debate over the exact course of that upward movement continued. Was there a decline in the standard of living in the early stages of industrialization? Were there pauses or cyclical movements in living conditions? Nevertheless, it was clear that the absolute standard of living had risen and continued to rise. This conclusion held whether or not measurement was confined to income per capita or broadened to include other dimensions of the standard of living such as infant mortality, life expectancy, working time and conditions, health and leisure. The upward trend in well-being has continued to the present in developed economies to such an extent that the industrial revolution may be viewed as the “great discontinuity.”<sup>2</sup>

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<sup>1</sup> There is a voluminous literature on the standard of living debate, especially in Britain. The *Economic History Review* has been a primary vehicle of that debate. See Arthur J. Taylor (1975) for a summary of the debate. Engerman (1994) and (1997) bring the debate forward and connect the controversies of the 1950s and 1960s to contemporary research. The debate over the standard of living in the U.S. has been less controversial and less focused.

<sup>2</sup> Engerman (1994) p. 50.

This improvement in living standards represents one of the major achievements of human history. For the United States, GDP per capita has grown more than twenty-fold since 1800 in the face of very high rates of natural increase in the population and large waves of immigration from Europe and of late, world-wide immigration. Data on life expectation before 1900 are somewhat sketchy, but show a clear upward trend by the late nineteenth century. Infant mortality for the United States has fallen from about 1 in 6 births in 1850 to 1 in 140 today. Life expectancy more or less doubled in the twentieth century for whites and increased even more for African-Americans though a race differential in mortality is still significant.

Yet this remarkable rise in living standards did not quell concerns over trends in living standards. Rather it shifted focus from concern over the trend in the average absolute standard of living to the trend or lack of trend in the relative standard of living.<sup>3</sup> Fabian Socialists in England and the Progressives in the United States clearly began the shift of the political agenda to concerns over the distribution of income and consumption.<sup>4</sup> This focus on relative living standards is very clear in the attention given to the distribution of income in the early twentieth century. Progressive income taxes as a primary form of revenue gained political acceptance in part because of their anticipated re-distributive effects.<sup>5</sup> As tax returns and social surveys made household income data readily available, social scientists and policy-makers produced data sets on the distribution of income correlated with race, education, and household characteristics. The rise in income inequality between 1970 and 1996 provoked a large body of research attempting to explain the forces behind the inequality. In particular, labor economists looked at the gap between unskilled and skilled wages.<sup>6</sup>

At the same time economists and others were looking at forces behind rising income inequality, economic historians were working on broader measurement of living standards that could be used when income per capita was not available and which could be used to supplement

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<sup>3</sup> In this paper, I am using the terms “distribution of well-being” and “relative standard of living” interchangeably. I will also offend purists by sometimes using the logically impossible, but sometimes less awkward phrase “more equal” in place of “less unequal.”

<sup>4</sup> Fogel (2000) puts this change in the egalitarian ethic in terms of religious movements, particularly the social gospel movement in the U.S.

<sup>5</sup> See Seligman (1914) and Baack and Ray (1985).

<sup>6</sup> Katz and Autor (1999) review changes in the structure of wages in the latter part of the twentieth century. Acemoglu (2002) is a survey of literature connecting inequality, the wage structure and technical change.

our understanding of the real change in living standards. Height, often recorded in military records as well as on coastal shipping manifests for slaves, was used to examine changes in net nutrition and, by extrapolation, to other elements of well-being.<sup>7</sup> New sources and techniques to estimate mortality and life expectancy were also exploited.<sup>8</sup> Civil War pension records added insights on trends in morbidity, body mass indices and retirement.<sup>9</sup> Naturally, these new sources created a more complete picture of trends in living standards. Not all measures of living standards moved in tandem. The most notable example of divergence in the United States occurred in the antebellum period when heights and adult mortality showed clear cyclical decline followed by sporadic postbellum increases while income per capita rose rapidly in both antebellum and postbellum periods.<sup>10</sup>

Just as broader measures of well-being or living standards create a more complex picture of the rise in absolute level of living standards, our view of trends in relative living standards using broader measures of well-being may also prove to be more complex. This paper is a description of a project to bring together what we know about trends in the distribution of specific aspects of well-being and contrast those trends in those distributions with trends in the more familiar distributions of income and wealth. In particular, the trends in the distributions of length of life, leisure time, education and some aspects of consumption are examined and compared with the distributions of income and wealth. The results summarized in this paper are not new. These conclusions may be drawn from the work of Costa on retirement and work, Fogel on nutrition, mortality and the egalitarian effects of the social gospel movement, Goldin and Katz on education and the high school revolution and Haines on mortality, Lebergott on consumption, to name some examples.<sup>11</sup> Fogel has reviewed the findings on these broader measures of well-being and concluded that the Social Gospel movement and the Progressives

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<sup>7</sup> Steckel (1995) surveys the literature on stature and the standard of living.

<sup>8</sup> Fogel (1986) puts together changes in stature and mortality to highlight the downturn in these two measures of living standards for the period before the Civil War. See Pope (1992), Haines and Preston (1991) and Haines (1998) for some of the additions to evidence on mortality.

<sup>9</sup> The Center for Population Economics has a listing of most of the work coming from the Civil War pension sample. See particularly Costa (1998) and Fogel (2000). The URL is [www.cpe.uchicago.edu/publications/publications.htm](http://www.cpe.uchicago.edu/publications/publications.htm)

<sup>10</sup> See Costa and Steckel (1997) for a consideration of the congruence or lack of congruence in the U.S. trends in the measures of living standards.

<sup>11</sup> Costa (1998) and (2000); Fogel (2000); Goldin and Katz (1998) and Goldin (1999); Lebergott (1993) and Haines (1998) and (2000)

were so successful in promoting material well-being that the primary challenge of the future is the inequality of non-material (spiritual) resources.<sup>12</sup> The intent here is to consider the distributional aspects of this research more systematically and to try to put distributional trends in comparable forms in order to understand implications for well-being or the standard of living.

Well-being or the standard of living may be considered from either a cohort or a cross-sectional point of view. Both approaches seem valuable. We know that a household's income varies from one year to the next making income more unequal than consumption. As the past few years have demonstrated, wealth also has a transitory component. But current income and wealth are good indicators of access to goods and services, the base of living standards. It is natural to think of inequality of length of life, and educational attainment in a cohort form. They are observed when a person has died or at an age when formal education is usually completed (age 25 in most census tables). The distributions of income, wealth, consumption and leisure may be measured over a lifetime from a cohort point of view or cross-sectionally with annual data.<sup>13</sup> In practice, income inequality is almost always measured cross-sectionally with some discussion of permanent income and the variability of annual income by characteristics.<sup>14</sup> Cross-sectional inequality of income, consumption and leisure are most likely to be relevant to political or social movements. Hence, they have received the most attention. But cohort measures, especially of the distributions of education and mortality, are important for our understanding of overall well-being and its trend.

Cohort measures suffer from one serious defect. It takes a very long time to complete the required experience of a cohort. In the case of educational attainment, most education is acquired by age 25, certainly by age 30. In the case of lifespan, a true cohort measure requires a century of experience. For any cohort born since 1920, there is still a substantial part of the cohort alive and the distribution of lifespan is still to be seen. The usual approach to this problem is to create a synthetic cohort and assume that they experience the mortality of a life table calculated from current mortality rates. But this approach may understate the inequality of lifespans if mortality rates are falling. A cohort born in 1925 experiences infant mortality during

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<sup>12</sup> Fogel (2000) pp.202-215.

<sup>13</sup> Lifetime income combined with bequests received and given represents wealth from a cohort view.

<sup>14</sup> Jackson (1994) is an attempt to study inequality of lifetime income in Britain.

the 1920s before widespread use of antibiotics, but experiences post-retirement mortality after 1990 with an array of new medical technologies. However, these improvements in health will also have the effect of increasing the equality of lifespan for those who survive childhood to enjoy the improvements in medical care. Thus, there are confounding influences that may make cohort inequality in lifespan greater or less than period inequality.<sup>15</sup> In this paper, we will consider distributions based on cross-sections, cohorts and synthetic cohorts.

## TRENDS IN THE DISTRIBUTIONS OF INCOME AND WEALTH

Income data is rare before the advent of the income tax and the ubiquitous government surveys of the twentieth century. But considerable work has been done in the eighteenth and nineteenth centuries on the distribution of wealth. There have been many local studies of wealth distributions for a community or state, but the national samples of most relevance are the wealth estimates based on probate inventories of 1774 compiled by Alice Hanson Jones and wealth estimates based on a sample of census returns of 1850 (real estate only), 1860 and 1870 drawn by Lee Soltow.<sup>16</sup> Probate inventories allow calculation of net worth as well as gross wealth. The primary challenge in constructing a distribution of wealth is the movement from the distribution of wealth of decedents to a distribution of wealth of the living. The census returns have the virtue of more complete coverage, but they are simply household responses to census questions about their personal wealth and their real estate. Moreover, values of less than \$100 of personal wealth were not to be recorded. Early twentieth century estimates of wealth inequality come from manipulation of estate tax records—a source undoubtedly affected by incentives for tax avoidance, but still useful for trends. In the latter half of the twentieth century, the Federal Reserve Board's Survey of Financial Characteristics adds another source.

Table 1 summarizes some of the primary studies of the distribution of wealth for the U.S. Discerning a trend from such disparate sources is difficult. There is certainly no consensus. Alice Jones suggests that inequality increased from the revolution to the Civil War with perhaps

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<sup>15</sup> In the 1920s, over 10 percent would die before age 10 with life expectation at the time of 12 years at age 65. When the cohort reached age 65 in 1990, less than 2 percent would die before age 10 and life expectation at 65 was in excess of 17 years. Preliminary work with the cohort life tables produced by the Social Security Administration suggest that cohort inequality in lifespan is less than the period inequality.

<sup>16</sup> Jones (1980) and Soltow (1975).

some slight increase in concentration until 1890 or 1929 with decreasing inequality of wealth by the 1950s. Lee Soltow uses the similarity the distribution of real estate wealth in 1798 and 1860 to argue for little change in inequality between the revolution and the Civil War. Williamson and Lindert argue that wealth inequality increased between 1774 and 1860, remained high until the Great Depression, then decreased between 1930 and the 1950s. Wolff believes that wealth

**TABLE 1**  
**TRENDS IN THE DISTRIBUTION OF WEALTH**

<b>Year</b>	<b>Source</b>	<b>Wealth type</b>	<b>Gini</b>	<b>Share of Richest 10 %</b>	<b>Share of Richest 1 %</b>
<b>1774</b>	<b>Jones</b>	<b>Gross Wealth</b>	<b>.73</b>	<b>56 %</b>	<b>15 %</b>
<b>1798</b>	<b>Soltow</b>	<b>Real Estate</b>	<b>.80</b>	<b>62 %<sup>a</sup></b>	<b>26 %<sup>a</sup></b>
<b>1850</b>	<b>Soltow</b>	<b>Real Estate Free Adult Males</b>	<b>.86</b>	<b>73</b>	<b>30</b>
<b>1860</b>	<b>Soltow</b>	<b>Gross Wealth Free Adult Males</b>	<b>.83</b>	<b>68 %</b>	<b>29</b>
<b>1870</b>	<b>Soltow</b>	<b>Gross Wealth All Adult Males</b>	<b>.833</b>	<b>70</b>	<b>27</b>
<b>1890</b>	<b>Gallman/Holmes</b>	<b>Value of Farms and Homes</b>		<b>72</b>	<b>26</b>
<b>1922</b>	<b>Lampman</b>	<b>Gross Wealth</b>			<b>32</b>
<b>1929</b>	<b>Lampman</b>	<b>Gross Wealth</b>			<b>36</b>
<b>1953</b>	<b>Lampman</b>	<b>Gross Wealth</b>			<b>24</b>
<b>1953</b>	<b>Smith and Franklin</b>	<b>Net Worth</b>			<b>28</b>
<b>1962</b>	<b>Projector and Weiss</b>	<b>Net Worth</b>	<b>.76</b>	<b>62</b>	<b>34</b>
<b>1962</b>	<b>Wolff</b>	<b>Net Worth</b>	<b>.80</b>	<b>67</b>	<b>33</b>
<b>1989</b>	<b>Wolff</b>	<b>Net Worth</b>	<b>.83</b>	<b>72</b>	<b>39</b>
<b>1995</b>	<b>Wolff</b>	<b>Net Worth</b>	<b>.83</b>	<b>73</b>	<b>39</b>

Notes: a Approximate value

inequality rose through the 1980s and early 1990s. The cyber bubble in the stock market probably increased wealth inequality, but the subsequent downturn has eliminated that effect. It seems most likely that inequality increased somewhat between the revolution and the Civil War. It would also be surprising if wealth inequality did not also increase marginally with the capitalization of business between the Civil War and WW I while farm values languished and farming as a share of the economy diminished. The most apparent trend coming from the disparate studies on wealth is the increased share of wealth held by the very rich. This result is consistent with an economy that is growing in scale and scope enabling entrepreneurs and, in the late twentieth century, individuals with rare talents to amass large fortunes.

The most clear result from these national wealth studies is the underlying durability of the wealth distribution over two centuries even though the economy has undergone massive structural changes with implications for wealthholding and the distribution of wealth. Evidently, there have been countervailing influences on the wealth distribution holding inequality within a narrow band over two centuries of change. The abolition of slavery combined with the rise of corporate business in the post-bellum era replaced slave owners at the top of the wealth distribution with entrepreneurs and stockholders. The shift of population from rural to urban settings and the decline of farming as an occupation reduced the share of the population with significant non-residential real estate holdings. However, this movement off the farm was counteracted by steady increases in owner-occupied housing. In 1890, 37 percent of residential housing was owner-occupied. By 1930, owner-occupancy had increased to 46 percent. After a decline in home owner-ship in the 1930s, rates increased markedly with a rate of 63 percent in 1970 to 68 percent today.<sup>17</sup> The change in the distribution of wealth has been surprisingly small over the past two centuries.

We know very little about the distribution of income before the advent of the income tax. Attempts have been made to estimate the distribution of income indirectly with mixed results. Soltow used the 1798 housing distribution and assumptions about the income elasticity of

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<sup>17</sup> Historical Statistics (1975) p. 646 and table 939 of the Statistical Abstract.



housing to estimate the distribution of income.<sup>18</sup> Assuming income elasticities of housing of .8, 1.0, 1.2, Soltow estimates that the income distribution in 1798 was .81, .71, and .63 respectively, all estimates well above income inequality in the twentieth century. These estimates seem implausibly high if Jones' estimates for 1774 are accurate. Wealth distributions are generally more unequal than income distributions because labor income is not capitalized into wealth (excluding slavery). Soltow's estimate rests fundamentally on the ratio of income to the value of housing occupied and the distribution of that ratio across housing values. If the households occupying dwellings valued at less than \$50 (39 percent of all households), had relatively high income to house-value ratios, then the income inequality could have been substantially less than Soltow's estimate. As households moved to the frontier, many lived in dug-outs and log cabins while they cleared land for crops. The resolution of this puzzle may involve the treatment of non-market activity by households. If subsistence agriculture and land clearing is included in the definition of income, it is difficult to see how incomes could have been so unequal at the beginning of the nineteenth century.

The ratio of skilled to unskilled wages has also been used to infer income distributions.<sup>19</sup> Williamson and Lindert find an increase in the premium to skilled labor in the antebellum period leading them to conclude that there was probably a rise in income inequality in that period. Margo also finds an increase in the wage of skilled labor relative to unskilled for this period and, unlike Williamson and Lindert, finds regional differences in wages favoring the Midwest. The regional differences and slow integration of the labor market could also contribute to income inequality. Information on income inequality between the Civil War and World War I is also meager. Falling southern incomes during this period created more national inequality. The large influx of immigrants around the turn of the century also would have had an inegalitarian influence. The political movements of the time, populism and progressivism were rooted in perceived income inequities. Given these influences, one would expect rising income inequality, but the empirical evidence for this conjecture is weak. Neither Williamson and Lindert nor Soltow take a strong position on the trend in this period.<sup>20</sup>

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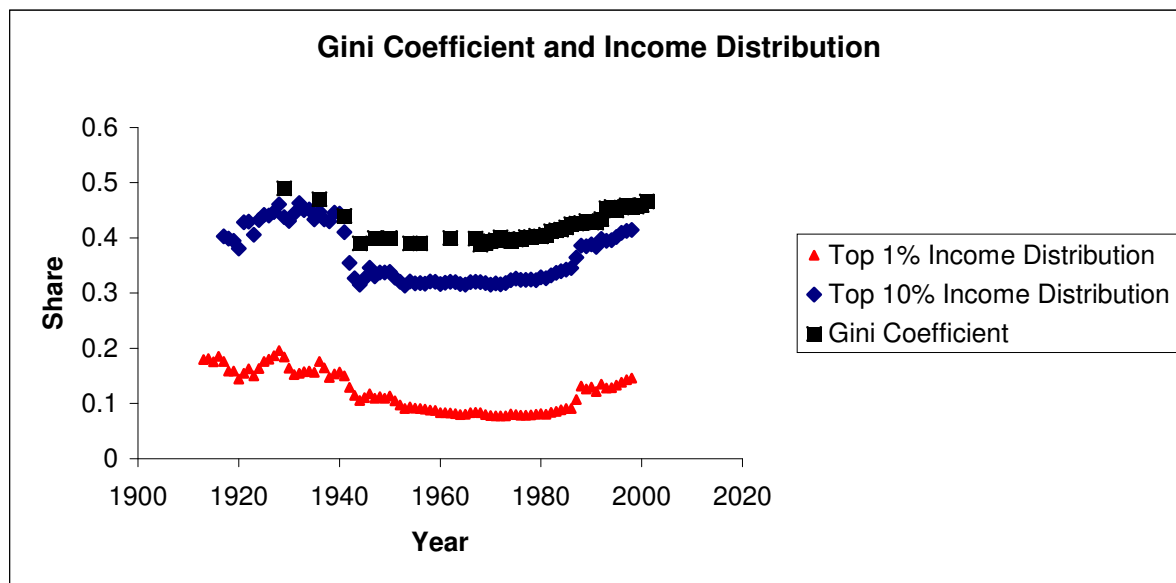
<sup>18</sup> Soltow (1989) ch. 3.

<sup>19</sup> Most notably, Williamson and Lindert (1980).

<sup>20</sup> Williamson and Lindert (1980) p. 75-80 and Soltow (1969).

Measurement of the size distribution of income in the United States begins to be systematic with consistent measures of income after World War II.<sup>21</sup> However, measurement of income during the 1920s and 1930s as well as data on differentials of wages adds evidence about the first half of the twentieth century.<sup>22</sup>

**FIGURE 1**



Sources: Piketty and Saez (2003); Budd (1967); [Census.gov/hhes/www/income/html](http://Census.gov/hhes/www/income/html)

Figure 1 gives a rough sense of the trend in the distribution of income during the twentieth century. Income inequality rose during the 1920s, then fell during the 1930s and 1940s, then was roughly constant during the 1950s and 1960s before beginning an upward trend in the last three decades of the twentieth century. Series on the ratio of skilled to unskilled wages have a similar U-shaped pattern.<sup>23</sup> As a result, the distribution of income may not be much different today than it was nearly a century ago. The share of the richest 1 percent of

<sup>21</sup> See Budd (1969), Miller (1960) and Schultz (1969) for early discussions of the methods and results.

<sup>22</sup> See Kuznets (1953) for estimates of the upper tail of the income distribution from 1913 to 1948. Goldsmith et al. (1954) reports early estimates of the complete distribution for 1929, 1935-36 and the 1940s. Goldin and Margo (1992) summarizes the trends in the wage structure.

<sup>23</sup> Goldin and Margo (1992); Acemoglu (2002).

taxpayers ranges between 19.6 percent in 1928 and 7.7 in 1973.<sup>24</sup> The decline in this share occurred during both the 1930s and World War II. By the end of this remarkable period, the income share had fallen to 11.1 percent. There was a very gradual decline until the 1970s. Increases in the income share of the very rich continued through the 1980s and 1990s and stood at 14.6 percent, a level near the level on the eve of World War II. In contrast to the share of the richest 1 percent, the share of the richest 10 percent did not decline significantly in the 1930s. The income share of the richest 10 percent rose through the 1920s, stayed high during the 1930s and dropped precipitately during World War II. It then rose during the 1980s to a level near that of the 1920s.

For the period of overlapping observations (1929 to the present), gini coefficients of income inequality exhibit a similar pattern. Overall income inequality fell during the 1930s and 1940s from .49 in 1929 to .40 by the end of the war where it stayed until the 1980. Following other inequality trends, overall inequality rose from .40 in 1980 to .47 in 2001. It remains to be seen whether the rise in inequality over the past two decades is temporary or permanent.

Income inequality, like wealth inequality, is the result of many confounding influences--pushing the rents of some characteristics higher while dissipating other rents as well as increasing and decreasing returns to various forms of physical and human capital. Substantial movements in these distributions have been hard to find. Overall, it would be a reasonable characterization to say that changes in the distributions of income and wealth have been quite small as the average levels of both income and wealth have risen dramatically accompanied by significant structural change in the economy. It is possible that better data or better methods will fill in the many gaps in long-term trends in these distributions. For now, rough long-term stability best characterizes the distributions of wealth and income.<sup>25</sup>

What implications does a steady increase in income per capita combined with a constant distribution of income have for well-being and its distribution? Clearly average well-being has increased. This conclusion is supported by growth in income and by changes in other aspects of

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<sup>24</sup> Piketty and Saez (2003) Table II. These percentages exclude capital gains which when added increase the share of the richest 1 percent from 0 to 4%.

<sup>25</sup> I am not arguing here for a universal pattern. It may well be that European countries with settled land, little immigration and less structural change experienced different trends in these distributions. Fogel (2000) p. 143 argues for a general pattern of decline in income inequality..

the standard of living such as life expectation and leisure. The constant distribution of income would lead to the conclusion that the relative standard of living or well-being was not changing over the long term or was actually deteriorating in periods like the 1980s and 1990s. But acceptance of life expectation, leisure and education as components of the average standard of living implies that we also consider the distribution of these other aspects of well-being.

**TABLE 2**  
**LIFE EXPECTATIONS 1810 TO 1990**

	White				Non-White			
	Male		Female		Male		Female	
Year	At birth	Age 20	At birth	Age 20	At birth	Age 20	At birth	Age 20
1810		44.6 yrs.		44.4 yrs.				
1830		44.6		44.6				
1850	38.4 yrs.	38.8	40.6 yrs.	40.3				
1870	44.1	41.8	46.4	43.3				
1890	46.0	41.7	47.4	46.7				
1910	53.0	44.1	56.2	46.7	41.8 yrs.	34.6 yrs.	44.6 yrs.	36.6 yrs.
1930	59.1	46.0	62.7	48.5	47.6	36.0	49.5	37.2
1950	66.6	49.7	72.4	54.9	59.2	44.0	63.2	47.3
1970	68.0	50.3	75.6	57.4	61.3	44.7	69.4	52.2
1990	72.7	54.0	79.4	60.3	67.0	49.0	75.2	56.8

Notes: 1810 and 1830 are from Pope (1992) and are for native whites only. For native whites, the 1850 estimates for age 20 are 40.8 and 39.5. 1850-1910 are from Haines (1998). Life tables based on death registration would give lower estimates of life expectancy. 1930-1990 are selected life tables from government vital statistics.

## LENGTH OF LIFE

From 1750 to the Civil War, there was little overall progress in either life expectancy or the distribution of the length of life. Indeed life expectancy on the eve of the Civil War was similar to life expectation at the time of the revolution. In contrast to a cyclical stagnation for the first century of the industrial revolution, there has been a dramatic surge toward equality in length of life over the past one hundred years.<sup>26</sup> Table 2 summarizes the upward trend in life expectation for whites over the past 150 years as well as the cyclical pattern between 1800 and 1860. The more dramatic increases in life expectancy clearly have occurred in the twentieth

<sup>26</sup> For surveys of the demographic experience including mortality of both African-American and white populations, see Haines and Steckel (2000).

century. Life expectancy at birth for white males and females was 48 years and 51 years respectively in 1900 in contrast to 75 years and 80 years in 1999. Life expectancy for blacks and other ethnic groups improved in a similar fashion. At birth, male and female life expectation for African-Americans in 1900 was 33 years and 35 years respectively compared to 68 years and 75 years in 1999.<sup>27</sup> Much of the increase in life expectancy at birth was the result of dramatic decreases in infant mortality from rates in death-registration states of one in four and one in five for males and females respectively to rates of 1 in 63 and 1 in 76 for 1999.<sup>28</sup> However, life expectations at later ages also increased substantially. Over the twentieth century, life expectancy at age 20 increased by 39 percent for white females and 32 percent for white males. Percentage increases for African-Americans at age 20 were somewhat larger at 52 percent for females and 41 percent for males.

With life expectation trending strongly upward over the past 150 years, inequality of length of life has been trending strongly downward. Consider a cohort facing the mortality schedule of 1850. According to Haines (1998) estimate of a life table for 1850 for whites, one in five to six births ended in death in the first year of life. Because of this high infant mortality, average life expectation was just 40.2 years. But there was also high adult mortality. Of the adults reaching age twenty, over half could expect to die by age 65. Yet many individuals did live to old age so the level of inequality of length of life was substantial. Compare this high level of nineteenth century inequality to that of a synthetic cohort of whites facing the mortality schedule of today. Infant mortality was a little less than one birth out of 140 with life expectation at birth of over 76 years. Over 98 percent of the cohort would reach age 20 with 83 percent of the cohort still alive at age 65. Indeed half of the cohort would still be living at age 80 whereas half of the cohort facing the 1850 mortality schedules would die by age 45

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<sup>27</sup> These life expectations are for the death registration area. Not all states are included because many states did not have comprehensive death registration until well into the twentieth century. Preston and Haines (1991) argue that the use of death registration data overstates the black-white differential. So the gradient of the improvement in relative black mortality should be used with caution.

<sup>28</sup> These figures are calculated from the life tables published by the census bureau. Preston and Haines estimate lower rates. They put the probability of dying before age 5 at .26 for African-Americans across the country in contrast to a rate of .34 from the death registration states. For comparison, they estimate the white rate as .16 for U.S. as a whole and .18 for the death registration states.

One way to express this increase in concentration of deaths toward the end of life is to ask what is the range in ages for the “middle deaths” or range of life -spans for those who comprise three-fifths of the population. In the nineteenth century, the exclusion the two quintiles that lived the shortest and longest lives gave life spans for the middle quintiles from age 1 or 2 years to 68 or 73 years depending on the life table chosen. By the 1920s that span had fallen to 40 years and by 1999, it had fallen to 24 years as the shortest lived quintile would not all die until age 66 and the longest lived quintile would begin at age 90. From a mechanistic view, this trend toward equality of life span occurs because of the dramatic decreases in premature deaths (say before age 60) which are not offset by increases in the maximum life span or by more inequality in the deaths of the elderly. Hence, inequality in the length of life has necessarily diminished.

**TABLE 3**  
**INEQUALITY OF LIFESPAN**  
**1850 TO 2000**

	Gini Coefficients by Race and Gender			
	White		Non-White	
Year	Male	Female	Male	Female
1850	.47	.45		
1870	.40	.39		
1900	.35	.34	.51	.49
1920	.26	.25	.34	.33
1940	.17	.16	.26	.26
1960	.14	.11	.19	.17
1980	.12	.12	.17	.14
2000	.12	.10	.15	.13

Source: Selected life tables listed in the references.

Economists and economic historians are used to a process of relating measures of well-being (lifespan, education, consumption, leisure) to the distribution of income. That is, we normally consider the inequality in these other aspects of well-being that is associated with the

inequality of income. But that view gives income a primacy it may not deserve in our evaluation of well-being and its distribution. Should the day come that longevity is not correlated with income, we would still be interested in the distribution of lifespan as a measure of well-being. Therefore, it should prove useful to measure the trend toward equality in the length of life with the same methodology used to describe inequality of income or wealth. The usual apparatus of Lorenz curves, shares of quintiles and gini coefficients or other measures of concentration may be applied to any measure of well-being even though economists have generally confined their application to income and wealth.<sup>29</sup> For mortality or lifespan, total person-years lived is analogous to total aggregate income with individuals arrayed from shortest lived to longest lived just as they are arrayed from poorest to richest in a description of an income distribution.

Table 3 reports gini coefficients for the white population for imagined cohorts based on period life tables from 1850 to 1999. For males, the gini coefficient falls fairly steadily from a value of .47, above current income inequality, to .12 in 1999. The largest movement toward equality came in the first half of the twentieth century. For females, there is a similar pattern of decline with less inequality for females as a group compared to males. The gini coefficient for females falls from .45 in 1850 to .10 in 1999.<sup>30</sup>

Obviously the fall in infant mortality has driven a significant part of this decline in inequality. The effect of the decline in infant mortality is apparent in the change in the share of total person-years lived by the shortest lived quintile. In 1850, this 20 percent of the

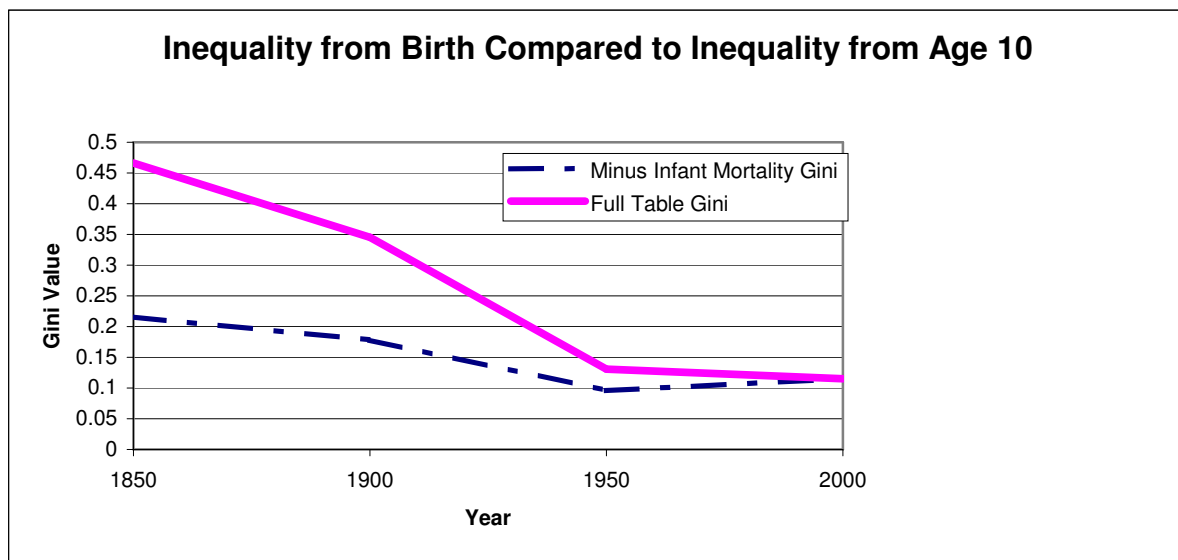
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<sup>29</sup> Anand (1983) has a good discussion of inequality measures and alternative specifications of Gini coefficient. Shkolnikov et al. (2001) and Hanada (1983) discuss the application of gini coefficient measures to lifespans. Wilmoth and Horiuchi (1999) also discuss the distribution of lifespans. In principle, measures of inequality may be applied to any variable distributed across a population. By measuring the distribution of lifespan or the distribution of years of education as is done later in this paper, there is an implicit assumption that the variable is homogeneous in the same way that we assume income or dollars are homogeneous. In the case of lifespan, we are assuming that the first year of life is no different than the 90<sup>th</sup> year of life. The same will be true for education. The junior year of college is treated as equal to the first grade. The further we go away from homogeneity, the more important this assumption becomes.

<sup>30</sup> The gini coefficient for white females is actually lower in 1990 than in 1999--.08 in 1990 and .10 in 1999. It is not clear whether or not this is a real increase or a artifact of calculation because the 1999 figure is calculated from a more complete life table. One of the problems encountered in comparing these gini coefficients is the grouping of data for age intervals and the cutoff of life tables at ages when much of the population is still alive. In essence, grouping of data and an early cutoff creates a Lorenz curve that is interior to the Lorenz curve based on single years of age. Hence, group data produces a slightly lower calculated gini coefficient. For most instances, the differences are small.

population who lived the shortest time lived on 0.87 percent of the total years lived by the cohort whereas the shortest lived quintile lived 13 percent of the total years lived for the 1999 life table. At the other extreme, the longest lived quintile of 1850 lived 40 percent of total years but only 28 percent of total years for 1999.

**FIGURE 2**

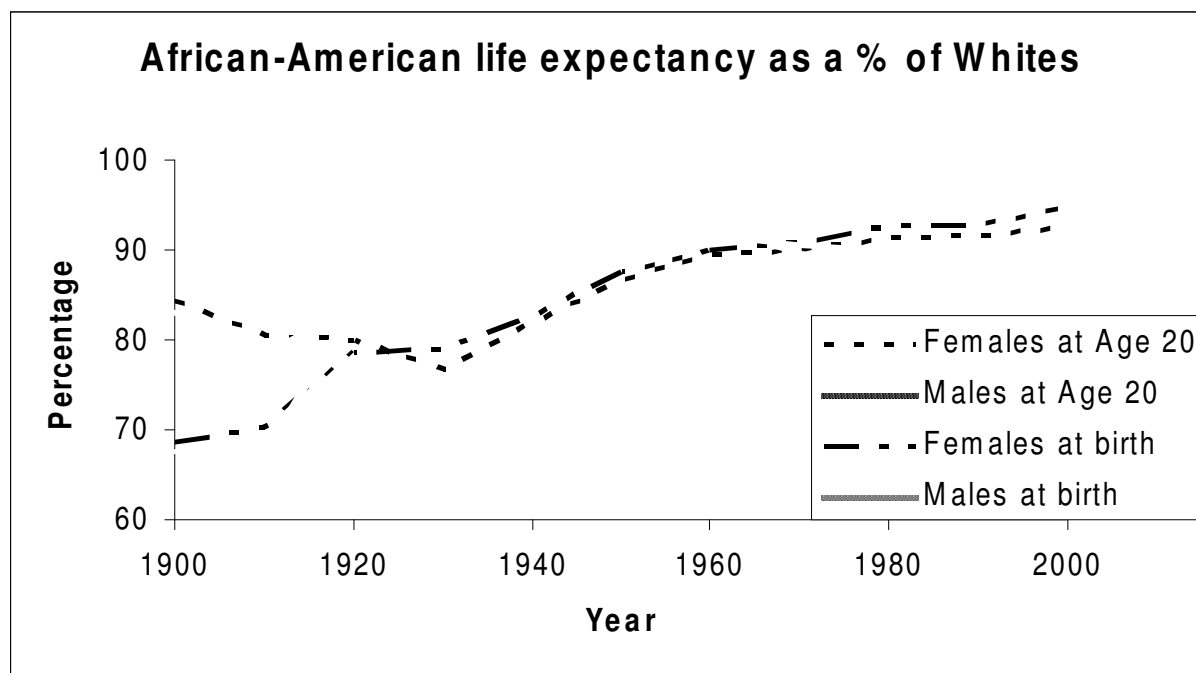


Source: Computed from selected life tables

Figure 2 illustrates the decrease in inequality for the whole population compared to the decrease in inequality of lifespan for those who reach age 10. As can be seen, much of the improvement stems from the substantial elimination of infant deaths which necessarily produced a great deal of the earlier inequality of lifespan. Gini coefficients for those who live to age 10 have fallen from about .22 to .11. Before de-emphasizing the improvement in equality of lifespans due to reduction of infant mortality, we should note an analogous procedure for income would entail the calculation of gini coefficients after eliminating the bottom 10 to 20 percent of the population. But figure 2 does illustrate that the easy gains in equality of lifespan are probably over. For one thing, the gini coefficient is approaching the lower bound of zero. For another, the ability of medicine to continue to push more and more deaths past 65 or 75 is not self-evident.



**FIGURE 3**



Source: Computed from selected life tables

Inequality in length of life has declined primarily because inequality within each sex and race has declined. But there has also been some narrowing of mortality differentials by race though those differentials are still pronounced and of social concern. Figure 3 shows trends in life expectancy of African-Americans as a percentage of white life expectancies. There was significant narrowing of the gap between white and black mortality in the first half of the twentieth century. Reductions in African-American infant mortality relative to white increases the life expectancy of African-Americans from 68 percent and 70 percent of white life expectancy for males and females respectively at the beginning of the century to 91 percent and 95 percent in 1999 for the same calculations. Differential adult mortality also diminished moving African-Americans from about 80 percent of white life expectancy in 1902 to 90 percent by 1999. Clearly there is still progress to be made since race differentials in mortality are still large.

**FIGURE 4**

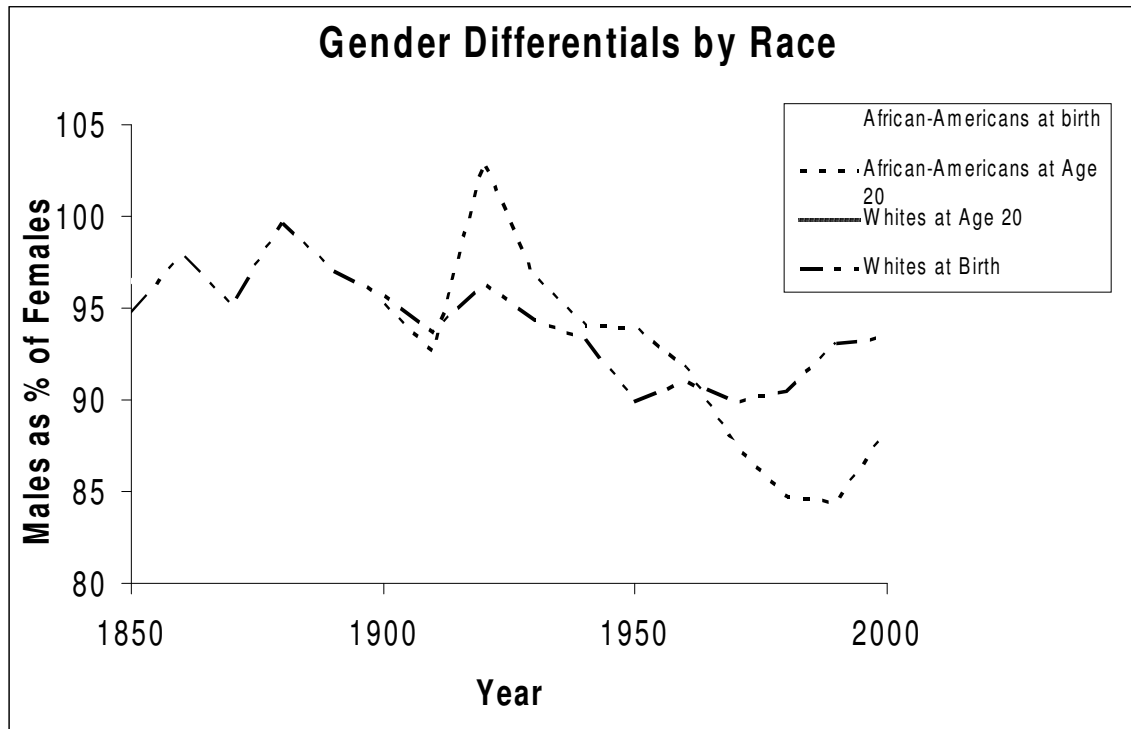


Figure 4 illustrates the lack of significant long-term change in differential mortality by gender. In the nineteenth century, life expectancies of males and females were closer together than for most of the twentieth century. Antebellum life expectations for adult females were sometimes even lower than those of males and the differences were never very large. In the twentieth century, there were slight trends toward increasing advantages for females though the last two decades saw some relative improvement for white males. African-American males continue to have the shortest life expectations and their disadvantage relative to African-American females seems to be increasing. Overall, gender differences certainly account for a significant part of remaining inequality in the length of life as do racial differences, but trends in these differentials account for little of the overall trend of lifespan inequality. The dramatic surge toward equality in length of life has been driven largely by general improvements rather than a narrowing of differentials by race and sex.

The contribution of socioeconomic differentials in mortality to long term trends is still being pursued. It is well known that there are mortality differentials by income and education.<sup>31</sup> However, there is much less evidence about the course of those differentials through time. Are they narrowing as race differentials did during the first part of the twentieth century or are they remaining constant in terms of relative mortality? It would seem plausible that lifespan increases at a decreasing rate with increases in income.<sup>32</sup> It would also seem plausible that increasing levels of education would have diminishing impacts on lifespan. If these two statements proved to be true, we would expect socioeconomic differentials in mortality to decline. Alternatively, health knowledge and the discipline to apply that knowledge may have become increasingly important in the prevention of premature mortality. (Consider the effects of obesity and smoking on mortality and the prevalence of these characteristics by education and income.) Then it is possible that socioeconomic differences are not declining with time. Wilkinson has raised the provocative issue that inequality itself controlling for level of income increases mortality. Deaton does not find evidence for an independent effect of inequality.<sup>33</sup> The nature of the trend in the effects of socioeconomic differences on mortality awaits more systematic study. Even if socioeconomic differences by education or occupational class (the two most common measures of SES) persist through time. The impact of socioeconomic differences on inequality of lifespan may be declining because the weights attached to lower educational attainment or lower occupational classes will be declining. The effect of income inequality would be different because of the increase in wage and income inequality of the last few decades. To date, no one has systematically estimated the effects of socioeconomic status on mortality and attached the changing weights in order to link socioeconomic status to inequality of lifespan.

We also need further research on the relationships between the distribution of education and mortality and between income and mortality. It may well be the case that the relationships between these distributions may have been weak during the infectious disease regimes of earlier times and have become stronger as organ failure becomes the primary pathway of disease.

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<sup>31</sup> For a sample of this literature see Kitagawa and Hauser (1973); Angus Deaton (1999) ; Duleep (1989); Michael R. Haines (1985); Menchik (1993); Deaton and Paxson (1999) and Deaton (2003).

<sup>32</sup> This is the pattern that Preston (1975) found for developing countries. He emphasizes the importance of exogenous factors relative to income.

<sup>33</sup> Wilkinson (1996); Deaton (1999) and (2003).

Ewbank and Preston point out that the children of teachers and physicians experienced mortality at about two-thirds of the national average in 1925, but had essentially the same mortality thirty years earlier.<sup>34</sup>

Knowledge about the root causes of this impressive progress toward equality in length of life is certainly incomplete, but there are some factors that are readily identifiable. The general influences appear to be rising per capita income, government reduction of externalities associated with infectious disease and the private and public provision of medical knowledge as a public good. Growth in per capita income, especially growth in the nineteenth century, undoubtedly helped reduce early death. Mortality in the nineteenth century and early twentieth century was heavily influenced by infant deaths and infectious disease. These causes of death have given way to heart disease, cancer and organ dysfunction as the primary agents of mortality. Tuberculosis fell from 194 deaths per 100,000 population in 1900—a rate very similar to cancer today. Other infectious diseases that have fallen to low levels as causes of death include typhoid fever, syphilis, whooping cough, diphtheria, influenza and measles.<sup>35</sup> Increases in per capita income with resulting improvements in shelter and food undoubtedly played an important role in reducing both infant mortality and infectious disease. The increases in height that serve as a proxy for net nutrition have been documented. Males born in 1980 are roughly 2 inches taller than white males born in 1845. Birth weight of babies has increased and better nutrition provided protection against fatality from infectious disease even though diseases such as malaria, measles, small pox and typhoid fever were still present in the nineteenth century. Better housing conditions also provided protection.

In addition to the effect of income on mortality, public health measures begun in the late nineteenth century had a positive effect especially in combating infectious disease in both infants and adults. Public sanitation and reduction of the contamination of water and milk supplies substantially reduced infectious disease in urban areas at the turn of the century and in the early twentieth century. The importance of public health measures in reducing mortality rates and in

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<sup>34</sup> Ewbank and Preston (1989)

<sup>35</sup> Historical Statistics (1975) p. 48 and Statistical Abstract (2001) P. 90.

extending the benefits of medical knowledge to more of the population highlights the role that government can play in producing equality in an important aspect of well-being.<sup>36</sup>

Finally, any discovery of knowledge or technique that has an effect on mortality rates increasing life expectation will also affect the distribution of lifespans because that knowledge can be applied across the population at low marginal cost. The discovery and acceptance of the germ theory of disease reduced the spread of infection leading to substantial reductions in infant and maternal mortality as well as other deaths. The development of antibiotics provided important weapons against all infectious diseases while inoculations and vaccinations eradicated smallpox and polio and made deaths from other infectious disease such as measles and diphtheria rare. Of late, the development of hypertensive medicines, chemotherapies and surgical repair of heart disease have continued the positive role of medical technology in reducing inequality of length of life. The statistical support for smoking as a cause of lung cancer significantly reduced smoking rates and is now reducing the death rate from smoking related-diseases.

It seems somewhat puzzling that this progress toward equality in length of life receives so little notice in discussions of well-being. One would think that life itself would represent a central dimension of material well-being. Yet, much more attention has been directed toward inequality of income and wealth. Economists have often made note of the fact that individuals living in the future may be under-represented in decisions involving savings or use of resources today. Perhaps, the prematurely deceased are under-represented in our judgements about inequality of material well-being. They are missed individually, but are collectively ignored in discussions of progress in levels and distribution of well-being.

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<sup>36</sup> As examples, see Meeker (1974) or Troesken (1999).

## EDUCATIONAL ATTAINMENT

Growing per capita income creates more time and opportunity for education of children and young adults. The upward trend in the average levels of education over the past 250 years has been well-established by educational historians.<sup>37</sup> Increasing political franchise helped create the political will to subsidize or provide educational opportunity widely. Common schools, developed at the community and state levels, became wide spread by the middle of the nineteenth century with fairly high rates of attendance by whites.<sup>38</sup> African-American elementary school attendance improved significantly in the late nineteenth and early twentieth centuries though it lagged well behind the attendance of whites.<sup>39</sup> Yet, only 3 percent of the population was graduating from high school by 1890.<sup>40</sup> The early twentieth century saw a “revolution” in high school attendance and graduation. The end of World War II brought a smaller increase in college attendance.<sup>41</sup> Thus the average level of educational attainment has been increasing with each successive cohort with periods of near stagnation as well as rapid increase.

Census questions on educational attainment beginning with the 1940 Census provide systematic evidence for trends in educational attainment for the past 140 years. Respondents may be organized by birth cohorts to study trends in average educational attainment and in cohort inequality of education. There is a well-known upward drift in the reported educational attainment as a cohort ages. For example, 56 percent of white males reported 12 or more years of education in the 1960 census. That same birth cohort reported 60 percent, 65 percent and 70 percent with 12 or more years of education in the 1970, 1980 and 1990 censuses respectively. Mortality, immigration and possibly emigration will change the exact composition of a particular cohort from census to census and may change, therefore, both the average and distribution of educational attainment. (Some education may also be completed after each age, especially between ages 25 and 35. However, it is unlikely that real changes in the composition of

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<sup>37</sup> For example, see Pulliam and Van Patten (1995) for a general history and Goldin (1999) for a statistical summary of the course of American education.

<sup>38</sup> See Fishlow (1966), Galenson (1995),

<sup>39</sup> See Margo (1990).

<sup>40</sup> Goldin (1995) p. 62.

<sup>41</sup> See Goldin and Katz, (1998); Goldin, (2001)

respondents explains all or even most of the reported change. It is likely that there is ‘recall’ bias as a cohort ages and older individuals are living in a society where younger cohorts have

**TABLE 4**  
**HISTORICAL MEDIAN EDUCATIONAL ATTAINMENT**  
**BY RACE AND GENDER, 1865-1960**

	Total	Male	Female	White	White Male	White Female	Black	Black Male	Black Female
1865	8.0	7.7	8.1	8.2	8.0	8.2	1.3	1.5	1.0
1870	8.1	8.0	8.2	8.2	8.1	8.3	2.9	2.9	2.8
1875	8.2	8.1	8.2	8.3	8.2	8.3	3.8	3.7	3.8
1880	8.3	8.2	8.3	8.4	8.3	8.4	4.4	4.3	4.5
1885	8.3	8.2	8.4	8.4	8.3	8.5	4.8	4.6	4.9
1890	8.4	8.3	8.4	8.5	8.4	8.5	5.0	4.8	5.2
1895	8.5	8.4	8.5	8.6	8.5	8.6	5.5	5.2	5.7
1900	8.6	8.6	8.7	8.8	8.7	8.8	5.8	5.5	6.1
1905	8.8	8.7	8.9	9.0	8.8	9.1	6.1	5.6	6.3
1910	9.5	9.2	9.9	10.0	9.7	10.3	7.3	6.2	7.8
1915	10.3	10.1	10.5	10.7	10.5	10.9	8.3	8.2	8.4
1920	11.6	11.4	11.8	11.9	11.9	11.8	9.1	9.5	8.9
1925	12.1	12.0	12.1	12.3	12.4	12.1	10.4	10.1	10.7
1930	12.2	12.1	12.2	12.3	12.2	12.3	10.7	10.3	10.8
1935	12.3	12.3	12.3	12.4	12.4	12.3	12.0	12.0	12.1
1940	12.5	12.6	12.5	12.6	12.6	12.5	12.3	12.2	12.3
1945	12.6	12.7	12.5	12.6	12.7	12.5	12.4	12.4	12.4
1950	12.9	13.0	12.8	12.9	13.3	12.8	12.6	12.7	12.6
1955	12.9	12.9	12.8	12.9	12.9	12.8	12.6	12.6	12.6
1960	12.7	12.7	12.8	12.8	12.7	12.8	12.6	12.5	12.6

Note: From 1865 to 1900, the Black group represents Black and Others.

Sources: Current Population Reports: Educational Attainment in the United States: March 1981 and 1980, and Historical Statistics of the United States, Colonial Times to 1970, Part I. The statistics are reported with individuals allocated across an educational year—hence, medians with partial years.

more and more education. However, this bias is not sufficient to create spurious upward trends in educational attainment.<sup>42</sup>

Table 4 reports median attainment by race and gender for cohorts born between 1865 and 1975. The general trend is upward with periods of marked increases and other periods with relatively little change. There was little general improvement in median educational attainment for white cohorts born between the Civil War and the beginning of the twentieth century. However improvement did occur in the educational attainment of non-whites with median attainment moving from almost no education to six years by the turn of the century. Levels of attainment varied little by gender. There is a marked rise in educational attainment for cohorts born in the first two decades of the twentieth century with overall median attainment moving from 8 years of education for cohorts born in 1900 to 12 years of education for cohorts born in the early 1920s. There was across-the-board improvement in attainment for whites, non-whites, males and females. The improvement in attainment since 1925 has been more modest with increases in the percentage going on to college, most notably increases in the post-World War II period.

Rising average levels of attainment do not necessarily correlate with a more equal distribution of attainment. Therefore, it is useful to examine the trend in educational inequality. Tables 5 and 6 use the IPUMS samples from the censuses of 1940 through 1990 to calculate quintiles and Gini coefficients for the size distribution of educational attainment. That is, total person-years of education are distributed among a birth cohort of individuals. Of the units of measurement of well-being considered here, years of education may be the least homogeneous. Dollars for income, wealth or consumption, hours or days for leisure and years for lifespan seem more homogeneous than years of schooling. But all measurement requires homogenization. In the case of educational attainment, we have to stretch the rubric a bit further.

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<sup>42</sup> It is possible to compare birth cohorts at similar ages—say the 1900-1905 cohort in 1940 and the 1920-1925 cohort in 1960—in order to establish the trend. We are now computing inequality indices for each cohort across censuses to establish the effect of the bias on long-term trends in inequality.



The distribution of educational attainment for the cohort born 1870-1874 is similar to the income distribution for families today. The least-educated twenty percent of individuals of this cohort received 5.04 percent of the total years of education while the poorest quintile of families received 4.2 percent of income

**TABLE 5**  
**QUINTILE DISTRIBUTION OF EDUCATION FOR BIRTH COHORTS**

Year	Least-educated 20% of the Population	2 <sup>nd</sup> 20% of the Population	Middle 20% of the Population	4 <sup>th</sup> 20% of the Population	Most-educated 20% of the Population
1870-74	5.0	7.5	30.0	22.9	34.6
1875-79	5.1	15.3	21.9	22.9	34.9
1880-84	5.9	16.0	21.3	22.5	34.4
1885-89	6.1	16.0	21.2	22.6	34.1
1890-94	6.4	16.3	20.7	22.7	34.0
1895-99	7.1	16.8	19.8	23.1	33.1
1900-04	8.4	17.1	19.1	23.6	31.8
1905-09	9.3	17.1	18.5	24.2	30.9
1910-14	10.2	16.6	19.1	24.4	29.7
1915-19	10.7	16.4	20.1	24.4	28.5
1920-24	11.2	16.7	21.4	22.9	27.9
1925-29	11.3	17.2	21.6	22.1	27.7
1930-34	11.5	17.4	21.4	22.0	27.8
1935-39	12.00	18.1	21.2	21.5	27.2
1940-44	12.6	19.0	20.3	21.2	27.0
1945-49	13.3	19.2	19.8	21.2	26.6
1950-54	14.0	17.9	19.3	22.6	26.2
1955-59	14.4	17.6	19.6	22.5	25.9

1960-64	14.6	18.2	19.0	22.4	25.7
1965-69	14.8	18.4	19.0	22.4	25.4
Source:	Calculated from the IPUMS samples from the 1940 through 1990 censuses.				

**TABLE 6**  
**GINI COEFFICIENTS BY RACE AND GENDER**

Birth Cohort	Total	White	Non-White	Male	Female	White Male	White Female	Non-white Male	Non-white Female
1865	.30	.27	.67	.31	.29	.28	.26	.66	.68
1870	.28	.26	.56	.30	.27	.27	.24	.56	.57
1875	.28	.26	.49	.30	.27	.27	.25	.50	.49
1880	.27	.25	.44	.28	.26	.26	.24	.45	.44
1885	.26	.31	.41	.28	.25	.26	.24	.42	.39
1890	.26	.25	.39	.27	.25	.25	.24	.40	.37
1895	.25	.23	.36	.25	.24	.24	.23	.37	.34
1900	.23	.21	.33	.23	.22	.21	.21	.35	.32
1905	.22	.20	.31	.22	.21	.20	.19	.34	.30
1910	.20	.18	.30	.21	.19	.19	.17	.32	.28
1915	.18	.17	.29	.19	.17	.17	.16	.31	.26
1920	.17	.16	.27	.18	.16	.17	.15	.28	.24
1925	.16	.15	.25	.18	.14	.16	.13	.25	.21
1930	.16	.15	.23	.17	.14	.16	.13	.23	.19
1935	.14	.14	.20	.16	.13	.15	.12	.21	.17
1940	.13	.13	.17	.14	.12	.14	.11	.18	.16
1945	.12	.12	.15	.13	.11	.13	.11	.16	.15
1950	.13	.12	.17	.13	.12	.12	.10	.16	.15
1955	.12	.11	.15	.12	.11	.12	.11	.15	.15
1960	.11	.11	.14	.12	.11	.11	.10	.13	.14
1965	.11	.10	.13	.11	.10	.11	.10	.12	.13

Source: computed from IPUMS

in 1998. The most educated quintile of the 1870-1874 cohort received 35.47 percent of the total education while the richest quintile of today receives 47% of income.<sup>43</sup>

The trend toward equality in educational attainment over this one hundred year period is impressive. The least-educated quintile went from five percent of total education years to nearly fifteen percent of the years. The most-educated quintile lost nearly ten percentage points in their share of education dropping from 35 percent of education for the 1870-74 cohort to 25 percent for the 1965-69 cohort. The three middle groups naturally varied less. The second quintile increased its share slightly over time from about 15 percent to 18 percent while the middle and fourth cohort saw their shares decrease slightly. While there are occasional small increases or decreases in quintile shares, the overall trend is clearly toward a more equal distribution of education over time. Since there is a steady upward trend in average educational levels, this distributional trend of more equality implies that the educational levels of the least educated were rising substantially faster than overall levels of education.

As measured by a Gini Coefficient, overall inequality in educational attainment fell by over 60 percent between 1870 and 1965—an impressive decline. This overall decline in educational inequality is driven by the decline in inequality of educational attainment within each race and gender and by the narrowing of educational differences between races. For the period reported here, there was no significant gap in educational attainment of men and women of the same race.

In 1865, the non-white level of education was a paltry 1.3 years. The males had 1.5 years and the females had only 1 year of education. In comparison, the white cohort had 8.1 years with females having two tenths of a year more education than the males at 8.2 years. This seven year difference in education narrows steadily over the whole period. For the cohort born in 1960-64, the difference in the median between cohorts had narrowed to a fraction of a year with total years of education for the entire population reaching 12.7 years, the white total at 12.8 years and the black total at 12.6 years. Thus, the narrowing of race differentials contributes substantially to the reduced inequality of overall educational attainment.

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<sup>43</sup> Statistical Abstract of the U.S. (2000) p. 471.

Just as inequality across groups narrowed, inequality within groups narrowed. In the nineteenth century inequality in education among non-whites was extremely high with a Gini coefficient of .56 for the 1870-1874 cohort. But this within-race inequality diminished substantially over time with the non-white Gini coefficient for the 1960s being less than 30 percent of its 19<sup>th</sup> century level. White educational inequality was never as high as that of non-whites. Nonetheless, the white Gini coefficient fell by nearly two-thirds over the century. Educational attainment of each gender also became more equal with Gini coefficients for males and females falling by about two-thirds. Gini coefficients disaggregated for both race and gender display similar substantial declines.

The data reported above is educational attainment without adjusted for educational quality. For any given cohort, the distribution of education adjusted for quality would be more unequal than the distribution of years of education because the least educated in years also receive the poorest quality of education. However, it is likely that the trend in the distribution of quality-adjusted education moves more sharply toward equality than the distribution in years because the gaps of educational quality are probably narrowing even though they are still quite large.

Six variables are standard proxies for measuring school quality--length of school year, teacher qualifications, teacher salary, class size (or pupil-to-teacher ratio), standardized test scores, and expenditures per pupil.<sup>44</sup> Though long-term trends in American school quality are difficult to ascertain due to the lack of systematic historical data, there is reason to believe that all of these measures are more tightly distributed today across schools than they were in the nineteenth and early twentieth century. Many scholars have evaluated school quality inputs and assert that the quality of American schooling has increased substantially.<sup>45</sup> But, again, an average increase in quality does not necessarily produce a narrowing of the distribution of school quality. But there is sufficient data at the state level to make reasonable inferences about the variance of state averages.

The quality variable that has shown the most convergence is the length of the school year in elementary and secondary schools. There was substantial variance in the length of year in the

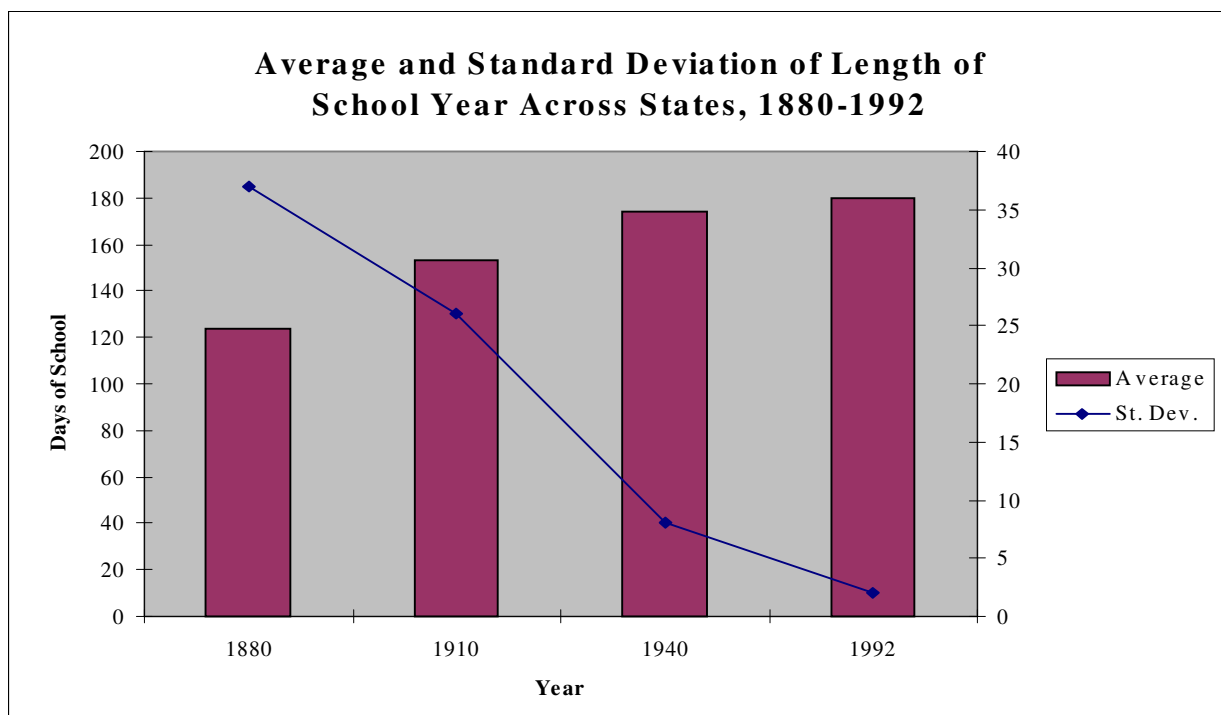
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<sup>44</sup> See Hanushek (1986 and 1996) and Eide and Showalter (1998).

<sup>45</sup> For an example, see Burtless, (1996).

nineteenth century as exhibited in figure 5. Length of school year varied by as much as 37 days across states in 1880 around a mean school-year length of 124 days. By 1992, students were receiving more instruction per year as the average length of the school year increased to 180 days with almost no variance in the length of the year. There was also a reduction in the variance within states. For example, the New York Superintendent's annual report historically

**FIGURE 5**



categorized education data by cities and towns. In 1880, students in New York towns attended school approximately 32 fewer days than students schooled in cities. By 1914, the difference had decreased to 11 days.<sup>46</sup>

<sup>46</sup>See the *Annual Report of the Superintendent of the State of New York* (1880) and the *State of New York Eleventh Annual Report of the Education Department* (1914).

Other measures of school quality including class size and expenditures per pupil have also converged at the state level through time. The variation in class size across states has clearly diminished over the past century. In 1880, class size deviated by 6.1 students, whereas by 1994 class size deviated by just 2.2 students across states.<sup>47</sup> There was strong convergence in the class sizes of black and white schools between 1900 and 1970. Pupil to teacher ratios were 20 students higher for black schools in 1900, but were at the same level as white schools by the 1960s.<sup>48</sup>

State variation in expenditures per pupil has also narrowed through time. Table 7 illustrates the wide variation that existed in 1880 and the much tighter distribution that has evolved over the past 120 years as education has assumed more importance in national and state policies.

**TABLE 7**  
**State Variations in Expenditures per Pupil in Average Daily Attendance**  
**(in Current \$)**

	<b>1880</b>	<b>1910</b>	<b>1940</b>	<b>1970</b>	<b>1996</b>
Minimum	2.39	8.00	33.58	510	3867.47
Maximum	39.27	83.68	195.23	1327.00	9955.40
Mean	14.63	35.07	99.83	770.16	6134.33
St. Dev.	8.04	16.76	36.66	162.19	1410.06
St. Dev. / Mean	.55	.48	.37	.21	.23

Sources: Report of the Commissioner of Education for the Year 1880; Report of the Commissioner of Education for the Year 1910; Statistical Summary of Education, 1939-1940; and the National Center for Education Statistics

<sup>47</sup> Pupil-to-teacher ratios calculated with data from the *Report of the Commissioner of Education for the Year 1880* and from the National Center for Education Statistics.

<sup>48</sup>See Card and Krueger (1996)

Presumably, teacher salary corresponds to teacher qualifications as an input into overall school quality. The distribution of this measurement has also converged around an increasing mean. Differences in the average monthly teacher salary across states have diminished. In 1880, the ratio of the standard deviation of teacher salaries across states to the mean teacher salary was .38. By 1994, the teacher salary spread around the mean had narrowed to .18.<sup>49</sup> Gary Burtless summarizes, “Until the 1950s states varied widely in average class size, teacher pay, length of school year, and spending per pupil. They continue to differ, but disparities were much larger during the 1920s through the 1940s than they are today”<sup>50</sup> Teacher salaries have been equalizing concurrently with the increase in average teacher salary.

The pattern identified from the state-level data holds when analyzing the trends in teacher salary and qualifications according to racial/ethnic variations. For Florida, Louisiana, and North Carolina in 1910, Margo finds that African-American teachers held “state” grades of teaching certificates 9%, 34% and 31 % respectively compared to 32%, 73% and 80% for whites.<sup>51</sup> By 1966, racial differences in teacher qualifications had diminished. Ronald Ehrenberg and Dominic Brewer reanalyzed the *Coleman Report* and school-level 1966 data in 1995. They find that “in both elementary and secondary schools at which white students were present, black teachers were more likely than white teachers to have advanced degrees.”<sup>52</sup> Along with the convergence of teacher qualifications by race, racial variations in teacher salaries also decreased after the 1940s. In 1942, black teachers earned 61 percent of the average annual salary of white teachers. By 1954, “the average annual salary of black teachers was nearly equal (92 percent) to that of white teachers.”<sup>53</sup>

While the evidence cited above on converging school quality is not systematic, it does appear to be the case that the distribution of school quality was narrowing through time even though it remained quite unequal. The most reasonable conclusion would be that quality-

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<sup>49</sup>Teacher salary calculations utilized data from the *Report of the Commissioner of Education for the Year 1880* and from the National Center for Education Statistics.

<sup>50</sup> Burtless (1996)

<sup>51</sup> Margo (1990) p. 59.

<sup>52</sup> Ehrenberg and Brewer (1995).

<sup>53</sup> Margo (1990) p. 56.



adjusted education, more unequal than years of education, has had a sharper trend toward equality than the trends in years of schooling summarized above.

What have been the primary forces reducing inequality of educational attainment? First, rising incomes allowed families to invest in the human capital of their children and take advantage of the growing returns to this form of investment. This combination of higher incomes and higher returns to human capital coupled with urbanization made child and teenage labor an increasingly rare choice. Second, over time, local and state governments committed themselves to provision of virtually free elementary and secondary education as well as inexpensive higher education so that the opportunity cost of the foregone earnings represented the primary financial burden to the families investing in education. The debate over the best methods to achieve more equal educational opportunity is currently intense. Government provision of education created more educational equality, whether or not the most effective policy instrument.

## DISTRIBUTION OF TIME

Just before the beginning of the twentieth century, Thorstein Veblen wrote his classic, *The Theory of the Leisure Class*. A century later, it was clear that leisure was among the most equally distributed components of well-being. Leisure is not an operational category of time. For the most part, we see it as a residual after subtracting time used for market labor, home production and sleep.<sup>54</sup> We know most about the distribution of hours worked.

No precise measure of the trend in the average work week is available for the nineteenth and earlier centuries. Documenting hours of work by self-employed farmers is particularly difficult. It does seem clear that hours worked in factories fell throughout the nineteenth centuries. Lebergott suggests that the work week in many factories fell from 13 hours a day to 10 hours a day from the 1780s to the Civil War.<sup>55</sup> Atack and Bateman used the 1880 Census of Manufacturers to estimate a work day of 10 hours in 1880, a decline of 1.5 hours from the 11.5 hour day indicated in the Aldrich and Weeks reports.<sup>56</sup> The various series on hours in manufacturing that become systematic around 1890 show a fall in weekly hours from 55 to 60 hours in 1890 to about 40 hours by 1950 with the Great Depression decreasing weekly hours and World War II increasing those hours.<sup>57</sup> The forty hour work week has remained more or less standard in the Post-war period with continued increases in holidays and vacation hours.

Costa adds two important results with a comparison of the available state surveys around 1890 to data from 1973 and 1991.<sup>58</sup> The distribution of the workday in her survey of state reports narrowed between the 1890s and 1973. Perhaps more significantly, there was a reversal of the relationship between wages and the length of the workday. In the 1890s, high wage men worked shorter hours. The 90<sup>th</sup> wage decile worked nearly 20 percent less (a little over 2 hours) than the 10<sup>th</sup> decile. By 1973, high wage men were working longer—a little over a half hour. The pattern had intensified by 1991 with the 90<sup>th</sup> wage decile working 8 percent longer (two-thirds of an hour) than the 10<sup>th</sup> decile. Similar patterns exist for women in the labor force. Thus, the

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<sup>54</sup> Leisure is an activity or use of time that provides utility in and of itself. In other words, it is an activity we would pay to do as opposed to activities we would pay others to do for us if we had the income or if the price was sufficiently low or if it was technologically feasible.

<sup>55</sup> Lebergott (1984) p. 68.

<sup>56</sup> Atack and Bateman (1992)

<sup>57</sup> Historical Statistics pp. 168-172.

<sup>58</sup> Costa (2000)

distribution of hours worked per day has narrowed over the past century. It is difficult to go from usual workday to annual hours worked, but it is likely that the distribution of annual hours worked, considering only those in the labor force, has also narrowed. Seasonality of work has declined. The number of holidays and vacation hours has increased and become more pervasive across wage levels. The proportion of the labor force that is self-employed has fallen largely because of the decline of farming as an occupation. One estimate puts hours worked in farming at 3200 hours a year in 1860.<sup>59</sup> The shift of these workers out of agriculture into shorter work weeks in manufacturing and services has produced more leisure time and a more equal distribution of leisure. If we consider all of these forces together, it is clear there has been a strong trend toward a more equal distribution of hours work, both per day and per year, for those in the labor force.

Perhaps the most important component of the increase in leisure time is the secular increase in retirement over time regardless of occupation, income or wealth.<sup>60</sup> There is dispute over the exact timing of the decline in the labor force participation rate of older men.<sup>61</sup> However, wherever one starts the decline, there is no question that the rates are much lower today. Male labor force participation after age 55 has fallen substantially since 1880 even though life expectancy and the rate of chronic disabilities have been improving. Consequently, males are adding significant years of leisure to their well-being. Costa finds that much of the fall in labor force participation by older men has been driven by increases in income with social security playing a strong role in the last half of the twentieth century. However, the link between retirement and income appears to be more attenuated now than in earlier times.<sup>62</sup>

It is possible that the cross-sectional distribution of leisure among adults has become more unequal as the number of retired has increased offsetting forces leading to a more equal distribution of hours worked for those in the labor force. During the twentieth century the share of the adult population (those age 20 or greater) who are 65 years of age or greater has grown from 7 percent to 17 percent. During that same period, the labor force participation of males age

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<sup>59</sup> Fogel (1989) p.78.

<sup>60</sup> See Costa (1999)

<sup>61</sup> See Ransom and Sutch (1986); Moen (1987); Margo (1993) and Lee (1998).

<sup>62</sup> Costa (1998b) p.53ff

65 or greater has fallen from 63 percent and 18 percent. If one assumes that those involved in home production enjoy the same amount of leisure as those who have retired from the labor force, then the share of the population enjoying the leisure of the retired rose from about 3 percent of the adult population to about 14 percent of the population. It would be incorrect to assume that the retired have total leisure. Some of their day is taken up by more home production and personal maintenance. Costa estimates the time allocation of older men (65+) in 1985 had somewhat more recreation (28 percent compared to 19 percent for men age 25-54), but they also spent more time on home and garden, personal care or care of others, preparing food and shopping.<sup>63</sup> Since the retired are about one seventh of the adult population today, they would have to consume much more leisure than the working population in order to create a trend toward more unequal distribution of leisure. But the time studies suggest they don't spend very much more time on leisure unless the chores they are doing constitutes leisure. As the number of retired grows over the next decades with retirement of the baby boomers, the possibility of a less equal cross-sectional distribution of leisure still exists. So far however, it would appear that the cross-sectional distribution of leisure as well as successive cohort distributions of leisure have become more equal.

## THE DISTRIBUTION OF CONSUMPTION

Consumption is obviously one of the most important elements in judging well-being or the trend in well-being. So the distribution of consumption and the trend in that distribution will be a key element in our judgments about inequality and its trend. In fact, the distribution of consumption would seem to be more central to the inequality we care about than income or wealth since our usual notions of utility or satisfaction are more closely related to consumption than income though income gives a measure of the capacity for consumption.

Only preliminary work has been done on the distribution of cross-sectional consumption, but initial evidence would suggest that important elements of consumption are becoming more equally distributed through time while the distribution of other elements do not appear to change significantly. A combination of high and low income elasticities, the natural course of

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<sup>63</sup> Costa (1998a) p. 27.

consumption of newly introduced goods, especially consumer durables, and the increased development of consumer credit markets appear to lead toward less inequality of consumption in many goods.

**TABLE 8**  
**EXAMPLE OF CONVERGENCE OF CONSUMPTION**  
**WITH VARYING INCOME ELASTICITIES**

Period	Income			Consumption of X			Consumption of Y			Income Elasticities	
	George	Martha	Ratio of incomes	George	Martha	Ratio	George	Martha	Ratio	X	Y
1	100	200	2	80	120	1.5	20	80	4	.5	4
2	200	400	2	120	168	1.4	80	232	2.9	.4	2.9
3	400	800	2	148	202	1.36	232	598	2.58	.2	1.5
4	800	1600	2	202	222	1.10	598	1378	2.30	.1	1.3
5	1600	3200	2	222	233	1.05	1378	2967	2.15	.05	1.2
6	3200	6400	2	233	238	1.02	2967	6162	2.08	.02	1.1

There are important *a priori* reasons for expecting consumption inequality to decline with increases in income. Assume that the distribution of income between two individuals is held fixed as income grows. Assume further that the two individuals have the same preferences over two goods (X, Y) and face the same prices so that the shares of their total expenditure on X and Y are determined solely by the income expansion paths for X and Y. If we think of good X as a necessity like food, then we expect it to be a large share of consumption at low incomes and we expect that share to decrease with income growth. This the basic description of an income-inelastic good discussed in basic economics classes. However, we would also expect the income elasticity to fall as income grows and the uses of this necessity are met. This pattern would certainly be true for food where initial increases in income could result in quite large increases in food expenditures, but would soon be diverted to consumption of other goods. If X

is income inelastic and good Y is income elastic, then the shares of total expenditure on X will decline with income and shares of consumption on Y will increase with income. Further, the distribution of both goods will narrow as income grows, illustrated in Table 8. I offer no mathematical proof, but it seems clear that the ratio of consumption of X for the two individuals will converge asymptotically toward 1 as the income elasticity declines toward 0 while the ratio of consumption of Y will converge asymptotically toward the ratio of incomes. Of course once the individuals reach the asymptotes, then the income elasticity of X is 0 and the income elasticity of Y is 1. Thus, in the contrived world of two goods with very different income elasticities, one would expect the distribution of consumption of each good individually to narrow as income grows while the distribution of aggregate consumption would be the same as the distribution of income by construction. If income elasticities were unitary for all goods then the distribution of goods will follow the distribution of income exactly.

A preliminary examination of the current expenditure survey data reported in Table 9 bears out this general pattern. Not surprisingly, aggregate consumption is distributed more equally than income for the households surveyed. Of the broad categories, only pensions/insurance, more accurately classified as savings, is more unequally distributed than current income. Cash contributions, another category not usually thought of as consumption, is the only other category clearly distributed more unequally than total consumption. Apparel, transportation, housing and alcohol expenditures are distributed similarly to total consumption. The distribution of reading and education has thicker tails than the distribution of total consumption reflecting the concentration of students in the poorest quintile. Consumption of food, both at home and away, as well as consumption of health, personal care and services and tobacco is more equally distributed than total consumption.

**TABLE 9**  
**AGGREGATE SHARES OF CONSUMPTION BY INCOME QUINTILES**  
**(2000)**

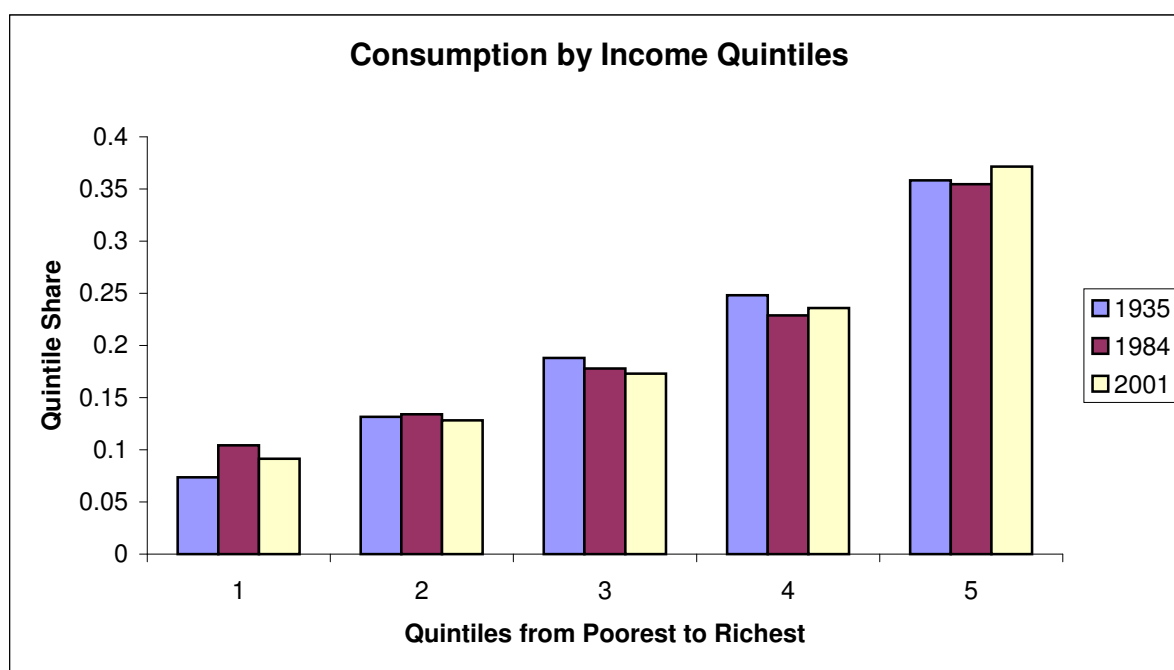
Category	Poorest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	Richest Quintile
After-tax and transfer income	3.6%	9.0	15.1	24.0	48.4
Total Consumption	8.9%	13.2	17.3	23.3	37.3
Per Capita Food at Home	16.5	19.6	20.1	20.7	23.0
Per Capita Food Away	11.1	14.4	19.8	24.0	30.7
Housing	10.4	13.5	17.3	22.6	36.1
Apparel	8.4	13.0	16.1	22.6	39.8
Transportation	8.5	13.3	18.6	24.4	35.2
Health	13.9	18.8	18.5	21.8	27.0
Entertainment	8.6	11.7	16.4	23.8	39.5
Personal Care and Services	10.7	14.9	18.9	23.5	33.0
Reading and Education	12.7	10.0	13.4	19.6	44.3
Cash Contributions	4.9	17.3	14.2	18.1	45.4
Personal Insurance and Pensions	1.5	4.64	10.7	20.1	42.9
Tobacco	15.4	19.0	22.0	23.4	20.2
Alcohol	9.7	11.7	17.3	24.3	36.9

Notes: Calculated from the Expenditure Survey for 2000. 81454 households reported complete income and complete expenditure data. Quintiles are determined by pre-tax income.

One of the next tasks in the research is to compare the expenditure surveys of 1898-1890, 1935-36, and 1960 to the present to establish a trend. A preliminary comparison of the distribution of consumption by income quintiles for the expenditure surveys of 1935, 1984 and

2001 also suggests little change in the distribution of consumption over time. Expenditures have been adjusted for taxes (including social security taxes), charitable contributions and contributions to pension funds. The results displayed in figure 6 show a very slight trend toward equality between 1935 and 1984. The Gini coefficient falls from .27 to .24 with the poorest quintile increasing its share of total consumption from 7 percent to 10 percent. From 1984 to 2001, the trend, if it can be called such, reverses with the Gini coefficient rising back to .27 and the share of total consumption for the poorest quintile falling to 9 percent. As expected, Gini coefficients for consumption are much lower than those for income for corresponding years.

**Figure 6**



Sources: Consumer Expenditures in the United States: Estimates for 1935-36; Consumer expenditure surveys found at <http://www.bls.gov/cex/>.

Perhaps the most noteworthy result of this preliminary examination is the lack of much change in consumption as income inequality increases. Krueger and Perri argue that consumption inequality has stayed more or less constant from 1972 to 1998 as income inequality was



increasing.<sup>64</sup> They attribute this result to increased income volatility combined with more evolved credit markets to smooth consumption.

**Table 10**  
**DISTRIBUTION OF CONSUMER ACCESS TO SELECTED**  
**GOODS AND SERVICE**

Good or Service	1900	1920	1940	1960	1980	2000
<b>Household</b>						
Running Water	24%		70%	93%	99%	99%
Indoor Toilet	15	20	60	87	98	99
Heating by Oil, Gas or electricity	1		22	82	95	98
Electric Lighting	3	35	79	99	99	99
<b>Appliances</b>						
Refrigerator	Na	1	44	90	100	100
Washing Machine	Na	8		73	73	79
Dishwasher						53
Microwave Oven						92
<b>Transportation</b>						
Automobile Ownership	0	26	60	75	84	90
<b>Communication</b>						
Telephone	Na	35 (1922)	37	78	93	94
Cell Phone					5.2 mil	56
Computer						53
<b>Recreation</b>						
Radio	Na	<10	46	95	99	99
Television			9 (1950)	87	98	99
VCR					1	85

Sources: Much of this data has been taken from Lebergott (1993) which treats the development of consumption. The rest has been taken from the Statistical Abstract and other government data found at [www.fedstats.gov](http://www.fedstats.gov)

<sup>64</sup> Dirk Krueger and Fabrizio Perri (2002) "Does Income Inequality Lead to Consumption Inequality? Evidence and Theory" NBER Working Paper 9202.

Over the long term, a significant portion of consumption inequality is primarily reflected in the consumption of new goods and higher quality goods. New goods, especially large items such as Franklin stoves, iceboxes, washing machines, automobiles, TV etc., enter as luxuries primarily consumed by the wealthy. The nature of the U.S. economy has been such that falling prices with widespread demand and economies of scale soon make new goods widely available.<sup>65</sup> Luxuries quickly become commonplace and the wealthy have to find new sources for differentiation. Table 10 reports the pace of adoption of various goods during the twentieth century. Within as little as a decade of becoming available, radios (1920s), TVs (1950s), VCRs (1980s), became widespread. Telephone, electricity and to a lesser degree cable television took longer because of the need to develop higher cost networks in areas with less dense populations. The growth of automobile ownership was slower as well. Private passenger vehicles were widely purchased from 1910 forward with explosive growth in the 1920s. The Great Depression and the halt of production during World War II slowed growth so that 59 percent of families owned motor vehicles by 1950. By century's end, 90 percent of households had at least one motor vehicle.

To say that everyone has access to a particular good is not the same as saying there is equal consumption of that good. A Newport cottage is not the same as a fifth floor walk-up and a twenty-year old pickup is not the same as a new Mercedes off the assembly line. So the introduction of new goods and their often quick adoption across income groups does not imply equal consumption, only that some characteristic common to that good in that classification is widely, if not equally, distributed. If every household has some sort of television set, then all households have the capacity to view the non-cable channels with varying degrees of picture quality etc. Presumably the person who buys a \$15,000 plasma wide screen TV is getting some other characteristics—brightness of picture, vivid colors—that households with a five year old 19 inch TV do not share.

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<sup>65</sup> Romer's description of growth with non-rival goods, economies of scale and homogeneous demand is consistent with this path for new goods.

New goods and the different qualities of goods create problems of interpretation for price indices, distribution of consumption and interpretations of the distribution of well-being.<sup>66</sup> Goods carry a set of attributes or characteristics.<sup>67</sup> These attributes will be distributed more or less independently. Calories consumed will be much more evenly distributed than expenditures on food, which is more evenly distributed than expenditures on meat. Household ownership of horsepower is more evenly distributed than keyless entry systems in motor vehicles. There is no obvious way to weight the importance of each characteristic and their distribution. But one step in the right direction might be measurement of the distributions of characteristics of various goods just as measurement of the various components of well-being is progress beyond reliance on the distribution of income.

Lifetime consumption is distributed more equally than annual consumption. Standard expositions of the permanent income hypothesis and life cycles of saving and consumption would suggest that annual income is more unequal than permanent income while the distribution of consumption would follow that of permanent income. However, consideration of the government transfers, distribution of bequests, intergenerational transfers, bankruptcies and the constraint that debts may not be transferred to heirs would lead to the conjecture that permanent consumption is more equally distributed than permanent income. The long-term trend in the distribution of life-time consumption is naturally becoming more equal because of the more equal distribution of lifespan.

## FORCES FOR EQUALITY

What forces have produced these egalitarian trends and why have these same forces had so little effect on income and wealth? We do not have definitive answers to this fundamental question, but four influences seem to be important in producing the egalitarian trends.

The most powerful egalitarian force has probably been the continued increase in per capita income. Rising incomes allowed households to create environments conducive to better health and longer life. Higher incomes purchased better nutrition, better shelter, better clothing, improved household sanitation and medical care. Higher incomes supported greater investment

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<sup>66</sup> This problem is an old one in economic history. For example, see Brady (1966).

<sup>67</sup> For an early treatment of this problem see Griliches (1971).

in education allowing children to substitute schooling for labor. Growing incomes were the primary influence reducing hours worked, increasing labor-saving household durables and, thereby, increasing leisure. Growing incomes had strong egalitarian effects on these sub-component even though it had no apparent effect on the distribution of income itself.

Public or non-rival goods are a powerful force for equality in specific areas, but have little effect on distributions of income and wealth. Public goods have played an important role in the introduction of new consumer goods and in conquering infectious disease and ameliorating other disease. Discoveries such as the germ theory of disease and its application in public sanitation, techniques of inoculation and vaccination, the myriad uses of the electric motor and so on have produced direct benefits for millions of people. But public goods are specific and do not produce egalitarian changes in income or wealth.

Specific government action that commands broad political support has achieved more equality in specific areas. The provision of public education and public sanitation are examples of government actions that commanded extremely broad public support. For the most part, both were provided at the local level forcing other localities to respond. There were few political forces that found it in their interest to oppose these programs. On the other hand, redistribution of income whether through taxes, affirmative action or welfare does not command the same level of support and redistribution programs are surrounded by conflicting interests.

In addition to the effects of rising incomes, public goods and targeted government actions, egalitarian trends in the distributions of leisure, lifespan, education and to some degree consumption are all influenced by natural boundaries or constraints--most notably, boundaries on time and lifespan. While these boundaries have some effect on income, they have imposed no serious limitation on the extent of income.

There are only 24 hours in a day regardless of one's income or wealth. Certainly substitutability between time and income exists, but that substitutability is limited. Consumption of a movie requires 2 hours and a movie ticket regardless of income. We could hire a cook to reduce time preparing and cleaning up dinner, but we still have to take time to eat it. Time is an egalitarian force in the production of well-being.

There is still some controversy over whether or not the maximum lifespan is variable. Perhaps the most reasonable view might be that the maximum lifespan of an individual may be increased somewhat by healthy habits and that the maximum within the population may be increased through advances in technology and medicine. But certainly those changes occur slowly. Consequently, the primary effect of medical advances and healthier living in the population (say the elimination of smoking and obesity) will be to pile up more and more individual lifespans near the maximum producing an increasingly degenerate distribution of near equality. Thus, the bounded nature of length of life promotes equality just as the bounded nature of time in a day or a year promotes equality of leisure and to some degree consumption if measured as a combination of goods and time.

Boundaries play an important role in curbing the inequality of some types of consumption. Calorie consumption would be a notable example. Biology imposes a constraint on consumption of food. We can only eat so much. Even the obese seem to have natural limits to that obesity. Thus, the distribution of calories consumed, especially a distribution adjusted for height and muscle mass would be very narrow. Though not distributed as tightly as calories, the distribution of food is also constrained to a degree by biology. Space constraints push people toward somewhat egalitarian distributions of numbers of automobiles, other consumer durables and housing square footage.

There are also boundaries that reduce inequality of education. The nature of investment in human capital is such that formal education is not likely to extend very far beyond twenty to twenty-five years. There must be sufficient time between retirement or death and the accumulation of human capital to turn the flow of increased earnings from the education into consumption or non-human wealth. Even if retirement ages increase slowly, which they have not really done as yet, formal education is not likely to move much beyond the current limits for various professions (say 18 to 25 years). Again, the education distribution is likely to become concentrated between 16 and 20 years.

In contrast to length of life, leisure, some consumption and, to a lesser degree, education, income has no natural boundary. The income distribution is always likely to have a very long right hand tail with a few individuals receiving extraordinarily high incomes. Indeed, the growth

of the size of markets through economic development increases reward to rare talents and abilities. This inequality of income can be replicated in the inequality of certain types of consumption (say ownership of fine art, exotic or unique items or services or collections of books, cars, antiques or any collectibles) and the quality of consumption.

## SUMMARY

What are we to make of the conjectures sprinkled through this paper and the fragmentary evidence summarized here? Table 11 is my attempt to summarize the state of our knowledge about the long-term trend in well-being for the United States. Table 11 says nothing about the magnitude of some of the trends only the direction. Much more work is needed to solidify our knowledge about these long-term trends. There may well be important measures of well-being that show a consistent trend toward less equality. Incidence of crime and uninsured risks of various kinds come to mind. Moreover, the long-term trend in annual consumption, one of the most important cells for our interpretation of these trends isn't known. Nonetheless, a picture does emerge and does suggest that the distribution of well-being is clearly more egalitarian than it was at the beginning of the industrial revolution.

**Table 11**

### **LONG TERM TRENDS IN VARIOUS MEASURES OF WELL-BEING**

Measure of Well-Being	Measured by Trends in the Distribution for Successive Birth Cohorts	Measured by Trends in the Distribution for Successive Years
Wealth	NA	Rough Constancy
Income	More Equal	Rough Constancy
Lifespan	More Equal	NA
Educational Attainment	More Equal	NA
Leisure	More Equal	More Equal?
Consumption	More Equal	???

The driving economic forces behind the egalitarian trends for successive cohorts are the growth of average lifespan, the trend toward equality in lifespan and the growth in mean income and mean wealth with rough constancy in their distributions. Politically, the extension of the franchise and increased democratization has probably played an important role. The egalitarian trends in lifespan and educational attainment seem impressive to anyone used to having changes in Gini coefficients of few hundredths scrutinized closely. Were we to carefully measure egalitarian trends in cohort distributions of income, leisure and consumption, we would also see them change significantly although those changes may be downplayed because they are largely a product of changes in lifespan and its distribution. Nonetheless, cohort inequality of well-being has been falling. The trend of cross-sectional inequality is less clear.<sup>68</sup>

If there is a story in this exercise, it is the powerful egalitarian influences unleashed by the sustained growth in income that followed from the industrial revolution and its scientific counterpart. The last quarter millennium has produced remarkable equality in the developed world and there is good reason to believe these egalitarian benefits will be extended to the developing world as incomes grow. There are, of course, many continuing inequalities and inequities in all measures of well-being. No one would be so naïve as to pronounce the quest for a humane and just society at an end. There is much for social reformers and policy-makers to consider. Yet why is it that the remarkable success of economic growth and modernization in the transformation of the life of ordinary people is so easily ignored or shunted aside?

Social scientists have naturally been more active in pointing out remaining inequalities than in documenting the progress made over the past centuries. On inequality, economists have directed their attention toward inequality of wealth, income and earnings, the aggregate measures. Sociologists continue to emphasize class and stratification. Demographers have emphasized mortality differences across race much more than the egalitarian implications of increasing rarity of infant mortality and other premature death. Educational experts have focused on disparities in educational access and result. This emphasis on inequality is, to a degree, as it should be. After all, we are interested in reducing the inequities that persist and working on

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<sup>68</sup> One important measure of well-being has been omitted here. Health is the cross-sectional counterpart of lifespan. Costa (2000) and Fogel (2001) have argued that the distribution of health (measured by absence of chronic disease or disability) is improving.

remaining problems. But it would also seem useful to put the remaining inequalities in a context of the significant egalitarian forces that have prevailed since both the industrial revolution and the rise of democracies since 1750. Part of the explanation of the neglect of these egalitarian trends lies in their slow and gradual nature. Even historians seem to ignore the dramatic change in the distribution of well-being over the past two hundred years. Life expectancy, leisure time, increasing consumer durables and the like are not the kind of subjects that take prominence in an American history text. Moreover, inequalities or differences take on a stronger sense of injustice when more inequality has been eliminated. Socioeconomic differences in mortality, health, education, basic consumption and the amenities of modern life become more pressing as society can at least consider the possibility of eliminating or seriously reducing them. It would have been hard to have a serious discussion about equal access to college education in 1900 or to implement government subsidized retirement in 1850. Paradoxically, infant mortality became a bigger issue in the twentieth century when it was falling than in the nineteenth century when it seemed to be a near universal affliction in all families. Current inequalities, no matter how small or large compared to the past, have built-in political constituencies while past achievements evoke responses ranging from mild satisfaction to a sustained yawn. Yet, it does seem that economic historians should point out how the engine of growth with all of its attendant components has raised the level of all the boats. Moreover, the boats have many similar amenities and characteristics and they sail for about the same amount of time. But still, some boats are a lot bigger than others. (I never was very good with metaphors or is it similies or is an anology? See, educational attainment is not yet equal.)



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