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THE POPULATION OF THE
UNITED STATES, 1790-1920

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ABSTRACT

In the 130 years from the first federal census of the United States in 1790, the American population increased from about four million to almost 107 million persons. This was predominantly due to natural increase, early driven by high birth rates and moderate mortality levels and later (after the Civil War) by declining death rates. In addition, over 33 million recorded immigrant arrivals increased the growth rate. By the two decades prior to World War I, about one third of total increase originated in net migration. A number of unusual features characterized the American demographic transition over the "long" nineteenth century. The fertility transition was early (dating from at least 1800) and from very high levels. The average woman had over seven livebirths in 1800. The crude birth rate declined from about 55 in 1800 to about 25 in 1920. This occurred prior to 1860 in an environment without widespread urbanization and industrialization in most of the nation. Mortality levels were moderate, and death rates began their sustained decline only by the 1870s, long after the fertility transition had begun. This contrasts to the more usual stylization of the demographic transition in which mortality decline precedes or accompanies the fertility transition. Internal migration in the United States was also distinctive. Over most of the 19th century, flows followed east-west axes, although this began to weaken as rural-urban migration began to supplant westward rural migration in importance. International migration proceeded in waves and changed its character as the "new" migration from eastern and southern Europe replaced the "old" migration from western and northern Europe. This paper summarizes much of what is currently known about the American population, its composition, vital processes, and location, over this crucial period of growth.

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In the late eighteenth century, Benjamin Franklin commented on the remarkably high fertility and large family size in what was British North America, which he attributed to the ease of acquiring good farm land. His comments were reiterated by Thomas Robert Malthus in his famous Essay on the Principle of Population:

"But the English North American colonies, now the powerful people of the United States of America, made by far the most rapid progress. To the plenty of good land which they possessed in common with the Spanish and Portuguese settlements, they added a greater degree of liberty and equality...The political institutions that prevailed were favorable to the alienation and division of property...There were no tithes in any of the States and scarcely any taxes. And on account of the extreme cheapness of good land a capital could not be more advantageously employed than in agriculture, which at the same time that it supplies the greatest quantity of healthy work affords the most valuable produce of society.

The consequence of these favorable circumstances united was a rapidity of increase probably without parallel in history. Throughout all of the northern colonies, the population was found to double in twenty-five years."

Although Malthus guessed at the rate of natural increase (implying a 2.8% per year rate of growth), he was not far off. During the period 1790 to 1810, population growth in the new nation (including migration) exceeded 3% per annum (see Table 2). In addition to notably high fertility, areas of North America, especially the New England and northern Middle Atlantic regions, also had a reputation as having more benign mortality conditions than those prevailing in much of Europe. These factors, combined with significant net in-migration in the early 17th century and after about 1720, led to the relatively high rates of population increase.²

Every modern, economically developed nation has undergone a demographic transition from high to low levels of fertility and mortality.³ This was certainly true for the United States, which experienced a sustained fertility decline from at least about 1800. Around that time, the typical American

woman had about 7 or 8 livebirths during her reproductive years, and the average person probably lived about 35-40 years. But the American pattern was distinctive. First, the American fertility transition was underway from at least the beginning of the 19th century, and some evidence indicates that family size was declining in older settled areas from the late 18th century (see Table 3). All other Western, developed nations, with the exception of France, began their sustained, irreversible decline in birth rates only in the late 19th or early 20th centuries.⁴ It is perhaps not coincidental that both France and the United States experienced important political revolutions in the late 18th century and were then characterized by small scale, owner-occupier agriculture. Second, it appears that fertility in America was in sustained decline long before mortality. This is in contrast to the stylized view of the demographic transition, in which the mortality decline precedes or occurs simultaneously with the fertility decline. Mortality in the United States did not stabilize and begin a consistent decline until about the 1870s. Third, these demographic processes were both influenced by the large volume of international net in-migration and also the significant internal population redistribution to frontier areas and to cities, towns, and (later) suburbs.

While the American case may be, in many respects, sui generis, it furnishes a long-term view of a completed demographic transition with accompanying urbanization. The new United States was a demographic laboratory in which natives and migrants, different racial and ethnic groups, and varying occupational and socioeconomic strata experienced these significant behavioral changes in a fertile, land-abundant, resource-rich land.

SOURCES

A difficulty for the study of American historical demography is a lack of

some types of data for the calculation of standard demographic measures. For the colonial period, regular census enumerations or vital registration were not in effect. A number of scholars have, nonetheless, conducted family reconstitutions and other demographic reconstructions using a variety of sources, including parish registers, genealogies, biographical data, wills and probates, and other local records.⁵

For the period prior to the first federal census in 1790, we thus have some ideas about vital rates and population characteristics. We know more about population size than other matters, especially because British colonial authorities carried out some enumerations.^{6a} The non-Amerindian population of British North America had increased to about 2.5 million (with about 2 million whites and about half a million blacks) in 1780.

As commented above, birth rates were high with crude rates ranging from over 40 livebirths per 1000 population per annum to well over 50. The crude birth rate for the United States as a whole has been estimated at over 50 around 1800 (see Bale 3 below). It is unlikely that there had been a substantial rise of fertility in the late 18th century. Evidence for three western Massachusetts towns (Deerfield, Greenfield, and Shelburne) points to crude birth rates in the range 43-52 around 1790 and at 51 for Deerfield in 1765. Completed family sizes in Sturbridge, Massachusetts for cohorts of married women born in the decades 1730/1759 and 1760/1779 were 8.83 and 7.32 respectively, consistent with relatively high crude birth rates (given the high propensity to marry). Even Quakers in the Middle Colonies, who began controlling fertility relatively early, had completed family sizes of 6.7 and 5.7 children for women born before 1730 and between 1731 and 1755 respectively. New Jersey likely had a crude birth rate of 45-50 in 1772.

Data on the proportions of children aged 0 to 15 in the population from colonial censuses imply crude birth rates in the range 45-55 and total fertility rates between 6 and 7 for most colonies in the New England and Middle Atlantic areas. The one southern colony with appropriate census age data, Maryland, showed crude birth rates in the range 44 to 54 for the white population between 1712 and 1755. In general, data by age and sex in censuses in the 18th century imply crude birth rates in the range 45 to 60 and total fertility rates between 6 and 7.^{6b}

Mortality was moderate for the era. Crude death rates varied from about 20 per 1000 population per year to over 40 (and even higher in crisis periods). Lower mortality was found, as a rule, in the colonies and states from Pennsylvania and New Jersey northward, and high mortality characterized the South. In the north, expectations of life at birth ranged all the way from the mid- to early 20s to about 40 years. For example, Dedham Massachusetts is estimated to have had a crude death rate of about 24 per 1000 population in the 17th century. This was probably typical of New England in this period. Death rates likely rose in Massachusetts in the 18th century from the comparatively healthy levels of the 17th century. Male expectation of life at age 20 in Andover, Massachusetts fell from an average of 44.6 years for those born in the 17th century to 39.7 years for those born in the 18th century. For Ipswich, Massachusetts, there was a similar decline from 45 years for males married prior to 1700 to 39.9 years for those married 1700-1750. The increase in mortality for Salem was less severe with a decline of expectation of life at age 20 for males from 36.1 years of those born in the 17th century to 35.5 years for those born after 1700. The expectation of life at age 20 for males in Salem was reported as about 33 years in 1818-1822

(based on registered deaths), indicating a moderate worsening of mortality into the early 19th century as well. Overall, both infant and adult mortality was equal to or above that for Europe in the same era. Further south, New Jersey is believed to have had a crude death rate of at least 15-20 and likely higher in the early 1770s. The colonies still further south in the Chesapeake region, had considerably higher mortality. Males expectations of life at age 20 in the Chesapeake area of Maryland ranged from 22.7 to 30.5 in the 17th and early 18th centuries while they ranged from 21 to 34 on the Virginia side in the same period. Expectations of life at birth covered the range from 19.7 to 28.6 years, implying probable crude death rates above 30 and possibly as high as 40.⁶⁶ Based on available records and analysis done to date, we know a good deal about New England, somewhat less about the Middle Colonies and states, and least about the South (with the notable exception of the Chesapeake area).

A milestone in American demographic history was the institution of the federal decennial census in 1790.⁷ Originally intended to provide the basis for allocating seats in the U.S. House of Representatives, the published census grew from a modest one volume compilation of sparse aggregated statistics in 1790 to multiple volume descriptions of the population, economy, and society by the late 19th and early 20th centuries. Original manuscript returns exist for all dates except 1890, opening great analytical opportunities.⁸ The census has been the major source for the study of population growth, structure, and redistribution, as well as fertility prior to the 20th century. Some states also took censuses, usually in years between the federal censuses. A number have been published and some also exist in manuscript form.⁹

Vital registration was left, however, to state and local governments and, in consequence, it was instituted unevenly. A variety of churches kept parish records of baptisms, burials, and marriages, and these have been used to construct demographic estimates for the colonial period, especially for New England and the Middle Atlantic regions.¹⁰ Although some cities (e.g., New York, Philadelphia) began vital registration earlier in the 19th century, the first state to do so was Massachusetts in 1842. An official Death Registration Area consisting of ten states and the District of Columbia was only successfully established in 1900, and data collection from all states was not completed until 1933. A parallel Birth Registration Area was only instituted in 1915, and all-state collection was also achieved in 1933.¹¹ The federal census did collect mortality information with the censuses of 1850 to 1900, but there were significant problems with completeness. The data do improve over time, and, after 1880, census information was merged with state registration data.¹² Nothing similar, unfortunately, was undertaken for birth data. One consequence of the lack of vital registration data before the early 20th century has been a resort to special estimation techniques and indirect measures of fertility and mortality to gain insight into the demographic transition of the nineteenth century.

International migration statistics are better than the vital data, although there are also serious shortcomings. No official statistics exist prior to 1819, return migration was not counted until 1908, only immigrants through major ports were enumerated, and those crossing land borders were counted only for the period 1855-85 and again after 1904. Some of these deficiencies have been remedied by new estimates, but Table 5 below reports only the official data.¹³ Despite deficiencies, these provide a reasonable

overview of this important source of population growth over the period 1790-1920.

The census also provides, from 1850, information on a person's place of birth and, after 1870, on the nativity of each person's parents. This was either state of birth for the native born or country of birth for the foreign born. These data permit study of international migration (e.g., the geographic distribution of the foreign born) and also analysis of internal migration by providing cross-classification of the native born by birth and current residence (from 1860 onwards). Internal migration is a rather difficult issue because of lack of evidence on date of change of residence between birth and current residence. For the foreign born, questions on duration of residence in the United States were asked in the censuses of 1890 to 1930, but a question was not asked of all inhabitants about duration of current residence until 1940 (when a question was asked concerning a person's place of residence five years prior to the census).

The census cannot be assumed to have been entirely accurate. A number of studies have been done on the federal census and on various systems which collected vital data in the 19th and 20th centuries.¹⁴ Overall, it seems that censuses in the mid 19th century missed anywhere from 5% to 25% of the population. A careful analysis of the white population from 1880 to 1960 indicates overall underenumeration of 6.1% in 1880, declining to 5.7% by 1920 and 2.1% by 1960.¹⁵ Results varied by age and sex with the very young and the elderly being least well enumerated. Blacks were more likely to be missed than whites. A summary of recent work on the mid 19th century federal census notes that those more likely to be counted were older, native-born, heads of more complex households, with moderate wealth and better-paying occupations,

in the political mainstream, and living in smaller communities or rural areas having slow economic and population growth. Those less likely to be enumerated were younger, male, native-born sons or foreign-born boarders, living in smaller households, working in low wage occupations in large, rapidly growing urban areas, and not in the political mainstream.¹⁶

Similarly, collection of vital data also had deficiencies. A criterion for admission to the official federal Death Registration Area after 1900 and the Birth Registration Area after 1915 was only that registration be 90% complete. As late as 1935, it was estimated that birth registration was about 91% complete and only 80% complete for the non-white population.¹⁷ No comprehensive study of death registration completeness has been done, but it appears to have been less than fully complete even in the best states of the Death Registration Area in 1900.¹⁸

Nonetheless, many of these deficiencies do not affect overall results too dramatically. Calculation of rates involves canceling errors. The extent of the errors usually did not change too much from census to census or year to year. In addition, demographic estimates often involve some corrections to the data. Many of the tabular results presented here use uncorrected data, but some of the estimates do make adjustments.

A number of other sources can be used to provide basic demographic measures and some sophisticated analyses. Genealogies have been utilized to provide estimates of fertility, mortality, and migration for particular populations in the 19th century¹⁹ Parish registers, tax rolls, military muster rolls, pension records, wills, probates, and hospital and other institutional records are examples of other sources employed to reconstruct American demographic history.²⁰

MEASUREMENT AND ESTIMATION

Demography, the study of human populations, depends heavily on measurement and estimation techniques. Most of the results presented here are simple tabulations or standard demographic rates. But a number of the newer findings arise from rather sophisticated techniques.²¹ Estimation of better demographic information is of importance for research in economic history. Basic demographic structures and events, reflected in birth and death rates, population size and structure, growth rates, the composition and growth of the labor force, marriage rates and patterns, household composition, the levels and nature of migration flows, causes of death, urbanization and spatial population distribution, etc. determine the human capital of society as producers and consumers and also how that human capital reproduces, relocates, and depreciates. Demographic events are important both as indicators of social and economic change and as integral components of modern economic growth.

Most of the measures presented here are relatively straightforward, such as crude birth and death rates, rates of total and natural increase, and rates of net migration. These are presented in Tables 1 and 3 below and are given as rates per 1000 mid-period population per year. In addition, however, some of the results discussed in this essay arise (at least in theory) from age-specific measures, but such data must usually be summarized to be useful and intuitively interpretable. One technique of summarizing them is the life table. It takes age-specific death rates either for cross-sections of a population at various ages at a point in time, which generates period life tables, or for an actual group of people born in the same time period (a cohort), which provides cohort life tables, and converts them into other

measures. These other measures would include the expectation of life at any age: that is, the average number of years of life remaining if that group experienced the age-specific mortality rates embodied in the life table. Table 3 (below) presents the expectation of life at birth (e^0) for the white and black populations from 1850 onwards. Another life table measure is the probability of an infant surviving from birth to the first birthday (exact age 1), which is presented here as the infant mortality rate (infant deaths per 1000 livebirths per annum).

Similarly, age-specific fertility rates can be summarized. One instance provided in Table 3 is the total fertility rate (TFR), which is the sum of age-specific births for all women aged 15 to 49.²² This can be interpreted as the average number of births a woman would have if she survived her whole reproductive life and if she experienced rates of childbearing given by the age-specific data. It is akin to completed family size for all women of childbearing age (not just married women). This is calculated here for cross-sectional (or period) data and would apply to a synthetic cohort. It can be estimated for true cohorts, however.²³

Table 3 also provides a measure of fertility known as the child-woman ratio, which is the number of surviving children aged 0-4 per 1000 women aged 20-44. It is a wholly census-based fertility rate, requiring no vital statistics. It is, in fact, the main direct source of information on fertility in the United States in the 19th century and is the basis for the early estimates of the crude birth rate and the total fertility rate also given in Table 3. The child-woman ratio does have some serious drawbacks, since it deals with surviving children at the census and not actual births in the preceding five years. It also suffers from relative differences in

underenumeration of young children and adult women.²⁴

POPULATION GROWTH IN THE UNITED STATES, 1790-1920

As mentioned above, the United States began its demographic transition from high to low levels of fertility and mortality from at least the beginning of the 19th century, if not earlier. Table 1 provides summary measures of population growth and its components by decades from 1790 to 1980. The table is organized around the demographic balancing equation, which states that the decade rate of population growth (RTI) equals the birth rate (CBR) minus the death rate (CDR) plus the rate of net migration (RNM). The difference between the birth rate and the death rate is the rate of natural increase (RNI).²⁵ For the period 1790 to 1870, the crude birth and death rates are not given because independent estimates of the crude death rate are too uncertain (see Table 2). For 1790-1870 the rate of natural increase is calculated as the difference between the rate of total increase and the rate of net migration. The rate of net migration is based on new direct calculations of white net migration supplemented by estimates of slave importation (smuggling after 1808, when slave imports were made illegal). For the decade of the 1860s, official estimates of gross in-migration were used. After 1870, estimates of births and deaths are available from the work of Simon Kuznets for the period 1870-1940. Official vital statistics data are used thereafter to 1980. In addition, after 1870 the rate of net migration is calculated as the difference between the rates of total increase and natural increase (i.e., a residual).²⁶

Several features of the American demographic transition can be discerned from Table 1. The United States experienced a truly remarkable population increase during its transition in the "long" 19th century (1790-1920). From a modest 4.5 million inhabitants in 1790, the population grew to over 114

million persons in 1920, an average annual growth rate of 2.5% per year. In the early years of the republic, population growth rates were even higher, above 3% p.a. for the period 1790-1810 and again in the 1840s and 1850s. Such rapid growth is historically rather unusual and is comparable to the recent experience of some developing nations. Growth rates of that magnitude would lead to a doubling of the population in slightly over two decades (approximately 23 years). The surge of growth in the 1840s and 1850s was particularly due to a significant increase in migration from abroad -- the now familiar story of Irish, Germans, and others from Western and Northern Europe fleeing the great potato famine, the "Hungry Forties", and political upheaval and seeking better farming, business, and employment opportunities in the New World. Natural increase had been declining from the early 1800s, largely from decline in birth rates for both the white and black populations. Some of the decline in natural increase in the 1840s and 1850s was also likely due to rising mortality in those decades. Table 1 indicates, however, that mortality did decline steadily from the 1870s onwards.

Another feature notable in Table 1 is the dominant role played by natural increase in overall population growth. In the decades before 1840, less than a sixth or a seventh of total growth originated in net migration. With the surge in overseas migration after 1840, however, the share of net migration in total increase rose to a quarter or a third. Notably, the share of labor force growth accounted for by migration was higher, since migration was selective of persons in the labor force ages. Nonetheless, despite declining birth rates, the American population grew rapidly in the 19th century principally from an excess of births over deaths, although it must be recognized that the births to the foreign born and their descendants

contributed importantly. If it could be assumed that no immigration occurred after 1790 and that the natural increase of the colonial stock population had been what it actually was (with no effect of immigration on the natural increase of the native born), then the white population would have been about 52 million in 1920, or about 55% of what it actually was.²⁷ The surge in migration after 1840 can also be recognized in Table 2 in the rise in the proportion of the population foreign born from less than 10% in 1850 (the first census for which such data were available) to nearly 15% in 1890 and 1910.

Although beyond the temporal scope of the present essay, a few comments on the post 1920 demographic evolution are in order. The effects of immigration restriction after World War I may be seen in the reduced rate of net migration after 1920. The Great Depression had a dramatic damping effect on both fertility and migration from abroad. The post World War II "baby boom" is apparent in the higher crude birth rates in the 1940s and 1950s. More recent changes in immigration regulations clearly affected the surge in net immigrants in the 1970s, when over 40% of population growth was due to this source. This was unprecedented in our history, even considering the decades preceding both the Civil War and World War I.

The effects of regional differences in population growth are apparent in the population distribution figures in Table 4. The 4.5 million inhabitants in 1790 were clustered along the Atlantic coast, about evenly divided between North (New England and Middle Atlantic regions) and South (South Atlantic region). By 1860 only 51% of the 31 million Americans were still in these regions, and this had fallen to 41% in 1920. Regions of early settlement grew at average rate of 1.9% p.a. over the whole period, while the whole United

States was growing at 2.5%. This regional disparity was driven, of course, by the relentless westward movement of population, agriculture, and industry. Much of the growth that did occur on the Atlantic coast was in yet another "frontier" -- urban areas. In the regions of original European settlement cities and towns grew from just 5% of the population in 1790 to 28% in 1860 to 61% in 1920, an annual growth rate of 3.8% p.a. while that of the rural population was merely 1.2% p.a. This led to an increase in the share of national urban population over the century from 5% in 1790 to over half of the population in 1920.²⁸

FERTILITY AND NUPTIALITY

The young republic was notable for its large families and early marriage. The total fertility rate in Table 3 indicates an average number of births per woman of approximately seven in 1800, and the TFR was still over five on the eve of the Civil War. While we know relatively little about marriage early in the 19th century, female age at first marriage was probably rather young, perhaps below 20. Males married on average several years older, and all but a relatively small proportion of both sexes eventually married. The federal census did not ask a question on marital status until 1880 and did not begin reporting results on this until 1890. Several state censuses did, however, ask these questions earlier. A sample of seven New York state counties from the manuscripts of the census of 1865, for example, reveals an estimated age at first marriage of 23.8 years for females and 26.6 years for males. Percentages never married by the ages 45-54 were 7.4% for females and 5.9% for males, pointing to quite low levels of lifetime non-marriage.²⁹ Although marriage age was probably higher in New York than in the nation as a whole and although marriage age had very likely risen by 1865, nuptiality was still

rather extensive by European standards. The average age at first marriage for females was 25.4 years in England and Wales in 1861 and 26.3 years in Germany in 1871 (with German males having had an average age at marriage as late as 28.8 years).³⁰

In 1880, when the U.S. census first asked a question on marital status, the average female age at first marriage was 23.0 years while that for males was 26.5 years. The proportions never marrying by middle age were still relatively low, at 7% for both males and females. Age at marriage rose a bit up until 1890 and 1900 and thereafter began a longer term decline up to the 1950s. By 1920, age at marriage had fallen to 22.5 years for women and 25.9 years for men, although this was now accompanied by a gradual increase in the proportion of those never marrying.³¹

Overall, marriage in the United States was pervasive and early compared to the western and northern European countries in which many of the migrants to North America originated. This was more so early in the 19th century, as the marriage age rose in the United States up until roughly 1900. Americans were also very unlikely not to have been married at some time during their adult lives.

Similarly, in 1800 the United States was a nation of high fertility, but it then experienced a sustained decline in birth rates up until the 1940s when the Baby Boom interrupted this pattern. The unusual aspect of the American experience is that the reduction began before the nation was substantially urban or industrial. Both rural and urban birth rates declined in parallel, although rural fertility remained higher throughout the period considered here. Fertility decreased across regions, but the South lagged behind the Northeast and Midwest in the timing and speed of the reduction. A

decomposition of the fertility transition into the contributions of nuptiality and marital fertility found that, up to approximately 1850, half of the decline could be attributed to adjustments in marriage age and marriage incidence. Thereafter most of the decline originated in reductions of fertility within marriage.³² Even the fertility of the antebellum slave population showed signs of decline just prior to 1860, though family sizes for blacks were, on average, significantly larger than those for whites (see Table 3).³³

Such evidence as we have concerning fertility differentials by nativity (native versus foreign born) points to relatively small differences at mid-century but generally higher fertility for the foreign born thereafter. The fertility of native white women continued to decline, while large families continued among the successive cohorts of incoming migrants. Birth rates of native-born women of foreign-born parentage was intermediate between those of native white women of native parentage and foreign-born white women, suggesting a form of assimilation to native white demographic patterns. Data on children ever born (parity) from a sample of seven New York counties in 1865 revealed few differences between native- and foreign-born women born near the beginning of the 19th century. But published data from the Massachusetts census of 1885 showed substantially more births per ever-married foreign-born woman relative to the native born for those born 1826/35. Such differentials also appeared in the parity data from the federal censuses of 1900 and 1910. Much of the difference was due to the lower age at marriage and lower percentages remaining single among the foreign born. But fertility within marriage was also greater for foreign-born women in the late 19th and early 20th centuries. Relatively few of them, for instance, remained permanently

childless. Published results from the federal census of 1910 reported that native white women aged 55-64 (i.e., born in the years 1846/55) had an average number of children ever born of 4.4 (4.8 for ever-married women). Over 17% of all native white women (and 9% of those who married) remained childless. Among the foreign born enumerated at the same census, average number of children was 5.5 for all women and 5.8 for ever-married women, with only 12% of all women, and 7% of ever-married women, remaining childless. Such differentials between native- and foreign-born women had largely disappeared for those born at the end of the 19th century and enumerated in 1940.³⁴

The inexorable decline of American birth rates continued apace after the Civil War. By now most of the decline originated in adjustments in fertility within marriage. Recent work with parity data from the 1900, 1910, and 1940 federal censuses shows rapid reductions in marital fertility, especially among white urban women. In 1910, for example, over half of native white urban women aged 45-49 were estimated to have been effectively controlling fertility within marriage, and about a quarter rural farm and nonfarm women were doing the same. Among younger women (aged 15-34) the proportions were much higher, rising to over 70% for native white urban women and over half for native white farm women. It could certainly be said that the "two child norm" was being established in the United States in this era. Some fascinating supporting evidence is furnished by the Mosher survey of several dozen wives of professional and white collar men over the period 1892 to 1920. Mosher found extensive use of a wide variety of contraceptives and contraceptive practices and very active strategies of family limitation. This was a preview of the rapid adoption of such behaviors in the 20th century.³⁵

One of the conclusions from this detailed study of fertility has been that

the spacing of births from early in childbearing was, by the late 19th century, as important as the more conventional behavior of stopping before the biological end of the female reproductive span. Results from a different source, the genealogical data base of the Mormon Historical Demography Project, have shown the importance of spacing behavior, which had formerly been considered a relatively modern development, prevalent only in very low fertility populations. New estimates of age-specific fertility rates for the United States around the turn of the century point to low marital fertility at young ages, quite unlike Europe at the time and further suggesting spacing early in childbearing in American families. The one exception was France, which shared with the United States an early fertility decline preceding significant urbanization and industrialization.³⁶

The period after 1865 was further marked by reductions in fertility by residence and by race. For the rural and urban populations, relative differences in child-woman ratios did not disappear. Rural fertility remained above urban fertility, but absolute differences diminished as both types of residents progressively limited family size. The rural child-woman ratio was 56% higher than the urban in 1800, 62% higher in 1840, and 58% greater in 1920. But the absolute gap had dropped from 474 more children aged 0-4 per 1000 women of childbearing age in rural areas in 1800 to 273 in 1920. A standardization and decomposition of the rural-urban differential and its connection to the fertility transition found that over 50% of the overall decline in child-woman ratios from 1800 to 1940 originated in the decline in rural birth rates, with over one quarter due to urban fertility decline, and only about 20% stemming from the shift from higher fertility rural to lower fertility urban areas.³⁷

As Table 3 shows, fertility differences by race tended to converge after the middle of the 19th century. Whereas the black total fertility rate was 48% higher than that for whites in the 1850s, it was only 15% higher in 1920. The end of slavery, difficult conditions in the agrarian South, and increased urbanization of the black population all played roles in this. Differentials in birth rates by race have persisted up to the present and have actually widened somewhat after 1920, but decline has continued for both blacks and whites after the peak of the Baby Boom around 1960.

Birth rates also varied across regions after the Civil War with the South and West having been higher fertility areas relative to the Northeast and Midwest. Variation across space narrowed from 1800 onwards, but the convergence was not smooth. The coefficient of variation (the standard deviation divided by the mean) of child-woman ratios across the nine census regions was .57 in 1810 but declined to .16 in 1860.³⁹ It rose thereafter to .22 before falling again to .15 in 1920. In 1810 the South had fertility ratios over 30% higher than in New England (the lowest fertility region). This differential had increased to about 60% in 1860, and the relative difference was nearly the same in 1910 before modern convergence began. The Midwest moved from being a region of quite large families to, by 1920, one with fertility close the "leaders" in the transition, New England and the Middle Atlantic states.

Finally, although we know rather less about the fertility of different socioeconomic status groups, the evidence points to smaller families among higher socioeconomic status groups, such as professionals, proprietors, clerks, and other white collar workers. This was true, at least, from the middle of the 19th century onwards. Among proprietors, however, an exception

was owner-occupier farmers, who, throughout the century, typically had larger families than other groups. Unskilled workers (often characterized simply as laborers or farm laborers) tended to have fertility closer to that of farmers, while skilled and semiskilled manual workers and craftsmen occupied an intermediate position. These socioeconomic fertility differences may have widened over the course of the 19th century before they eventually narrowed.³⁹

One consequence of declining fertility has been an aging of the population. As Table 2 shows, the median age of the American people rose from 16 years in 1800 to over 20 in 1870 and over 25 in 1920. Today it stands above 30. The reason is that the age structure of the population, particularly the proportion of children, is most affected by fertility, which adds only to the base of the age pyramid. Mortality, in contrast, affects all ages. As fertility declines, so does the proportion of children, and teenagers. The population ages. The implications of this are great, changing the society from one oriented towards children to one centered on adults and eventually the elderly. This process was underway at the end of our period (1920), but its effects are more dramatic today.

THEORIES OF FERTILITY DECLINE

Explaining the American demographic transition poses a series of difficult issues. Conventional demographic transition theory has placed great reliance on the changes in child costs and benefits associated with structural changes accompanying modern economic growth, such as urbanization, industrialization, the rise in literacy and education, and increased employment of women outside the home. A classic statement of the theory was made by Frank Notestein in 1953:

The new ideal of the small family arose typically in the urban industrial society. It is impossible to be precise about the various

causal factors, but apparently many were important. Urban life stripped the family of many functions in production, consumption, recreation, and education. In factory employment the individual stood on his own accomplishments. The new mobility of young people and the anonymity of city life reduced the pressure toward traditional behavior exerted by the family and community. In a period of rapidly developing technology, new skills were needed, and new opportunities for individual advancement arose. Education and a rational point of view became increasingly important. As a consequence the cost of child-rearing grew and the possibilities for economic contributions by children declined. Falling death-rates at once increased the size of the family to be supported and lowered the inducements to have many births. Women, moreover, found new independence from household obligations and new economic roles less compatible with childbearing.⁴⁰

But, of course, the fertility transition began in the United States well before many of these structural changes became important.

The leading theory of the American fertility decline for the antebellum period has been the land availability hypothesis. It is a special case of a child cost theory and was first proposed by Yasuba in 1962, when he discovered, for the period 1800-1860, a strong inverse relationship between population density and child-woman ratios. He interpreted density as measuring the availability of cheap potential agricultural land. High population density would raise the price of land and increase the cost to farm families of endowing their children with adequate farmsteads, that is, a suitable means of earning a living. This is, in reality, a rather sophisticated concept involving bequest motives and intergenerational transfers. More refined fertility and land availability measures and statistical analysis were subsequently employed by Forster and Tucker, but, if anything, the results were strengthened. Research on colonial New England suggests that this was taking place there prior to 1800. Further tests using county-level data within states, micro-data from the 1860 census, and data for the analogous case of Canada have provided support.^{41a}

The decline in American fertility did not take place evenly across

regions. Much of the interest in the historical fertility patterns arose because of spatial differences in the timing and pace of the fertility transition. A prominent feature of regional fertility differentials of whites in the 19th century has been a consistent east-west gradient, with higher fertility in the Midwest and the South Central regions than in the Northeast and South Atlantic areas. The gradient was prominent up to about 1900 but had largely disappeared by 1920. To a lesser extent there was a north-south gradient, with higher fertility among Southern whites. This became more prominent over the 19th century.^{41b}

Competing views look to more conventional economic and demographic variables to explain the phenomenon. One possibility is that sex ratios were biased toward males on the frontier because of sex-selective migration. Since the child-woman ratios measure total and not marital fertility, the observed differences might have been largely due to more complete and earlier marriage for the frontier female population. This was true, but data from census micro samples still reveal strong differences in marital child-woman ratios by density and settlement date. In another study, Vinovskis found for 1850 and 1860 much stronger associations of state-level fertility ratios with the extent of urbanization, industrialization, and literacy. Yasuba had seen the weakening of the density effect on fertility for censuses closer to the Civil War, but Vinovskis also noted that urban child-woman ratios fell in parallel with rural ones. This is unlikely to be explained by land availability. Finally, it is clear for the period after 1860 that such structural variables as urbanization, industrialization, labor force composition, literacy, etc. dominated the statistical relationship.⁴²

An intriguing alternative to the land availability-child bequest

hypothesis has been proposed by Sundstrom and David. They suggest a model of life cycle fertility, savings, parental demand for old age support, and bargaining within the family. They argue that the development of nearby non-agricultural labor market opportunities had much more to do with smaller families than the march of the frontier and the disappearance of inexpensive bequests. Larger material inducements were then necessary to keep children "down on the farm" once jobs were readily available within easy distance. Urban growth and increased education behind the frontier would have been part of this process. This hypothesis can also explain the decline in rural birth rates after the Civil War and is relevant to the urban fertility transition. A related model, that of Ransom and Sutch, emphasizes the westward migration of children who then "defaulted": on their implicit contracts to care for their parents in old age. In response, parents began accumulating real and financial assets as a substitute for offspring as retirement insurance, leading to smaller families.⁴³

Still other hypotheses, or at least provocative findings, have appeared in the search for explanations for the unusual American fertility transition. Steckel, using micro data from the 1850 and 1860 federal censuses, ran some tests on competing hypotheses. While finding some modest support for the land availability view, the strongest predictors of marital fertility differentials just prior to the Civil War were the presence of financial intermediaries (banks) and labor force structure (i.e., the ratio of non-agricultural to agricultural labor force). This is more supportive of the bargaining and/or old age/savings theories. An inquiry by Wahl following a more theoretical line finds that parents progressively traded off quantity (number of children) for quality (education, health care, etc. per child) as the 19th century

progressed. As the price (cost) of quality declined (via public education, more effective public health and medicine), parents opted for greater human capital per child.⁴⁴

Wahl used the extensive and rich Mormon genealogical data base. This was also the basis for the study of fertility decline in Utah from the mid 19th century to the early 20th century by Bean, Mineau and Anderton. In the latter work, the emphasis is on distinguishing between family limitation as an adaptation to changing environmental, economic and social circumstances versus a behavioral innovation which simply spread across groups. These distinctions are related to Ansley Coale's statement of the three preconditions for family limitation: (i) fertility control must be within the calculus of conscious choice; (ii) effective means of fertility regulation must be available at reasonable cost; and (iii) it must be economically and socially advantageous to limit family size. These preconditions are more likely true with adaptive behavior, that is, when family limitation is understood and accepted and occurs when socioeconomic conditions favor it. The Utah study of the Mormon Demographic History Project looks at detailed age-specific cohort and period fertility data and concludes that adaptive behavior is the most consistent explanation. It provides some support to a number of the hypotheses attempting to explain fertility decline, since the changing circumstances to which behavior adapted included not just land costs and availability but also improved socioeconomic opportunities in non-agrarian sectors (e.g., higher urban wages) as well as changes in the institutional and cultural environment. While not entirely satisfactory on grounds of parsimonious explanation, the case is made for a rather more complex explanatory framework.⁴⁵

Most of the hypotheses about the American fertility transition can also be

fit into the more general model offered by Caldwell.⁶³ He proposes that family limitation sets in when the net flow of resources over the life course shifts from children to parents over to parents to children. This signifies a rise in the net cost of children (i.e., benefits minus costs) and is accelerated by such things as the introduction of mass education (implying more years in school and greater enrollment rates), child labor laws, compulsory education laws, and more pervasive views on the positive value of transmitting improved human capital across generations. This intergenerational wealth transfer view is consistent with both the land availability and the socioeconomic and cultural structural adjustment hypotheses. It can also fit the quantity-quality tradeoff explanation.

Fertility of the black population is also described in Table 3 by child-woman ratios from 1820 and by the crude birth rate and the total fertility rate from the 1850s. Interestingly, from 1803, fertility decline also occurred for the black population, largely in the context of slavery, since 86% of the black population were slaves at that date. Also, despite the higher infant and child mortality among blacks (see Table 3 and below), black child-woman ratios were higher than those for whites, pointing to even larger differential fertility for blacks. Further, the regional pattern was the opposite of that for the white population, with higher black child-woman ratios in the east and lower ratios in the west. This, of course, was mostly in the South, where the overwhelming proportion of the black population lived prior to the 20th century. (The proportion of the black population in the South was 87% in 1800 and 85% in 1920.) The fertility decline prior to the Civil War is puzzling. Lower slave fertility was associated with larger plantation size and a movement away from tobacco cultivation and the mixed

farming characteristics of the South Atlantic region (the "Old South"). Selective movement of adult unmarried slaves to the West and the emphasis on slave reproduction in the Old South likely played a role, as did the quite harsh work regime on the newer larger plantations of the New South specializing in cotton and sugar. For the antebellum period, correlations of white and slave child-woman ratios by county were quite low, emphasizing a difference in causal factors. After the Civil War, the decline in black fertility was more similar in nature to the white fertility transition, influenced by urbanization, industrial development, growing shortage of good farmland, and changes in family norms.^{46b}

In sum, the fertility transition in the United States was unusual. It began in a largely rural and agrarian nation long before most of the presently developed nations began their fertility transitions in the late 19th century. Prior to 1860 it seems that the disappearance of good, cheap land for bequests to offspring provides a reasonable model for declining family size across states, at least for rural areas. As the 19th century progressed, however, the more conventional socioeconomic variables seem have more explanatory power. These variables would include rising literacy and education, increased urbanization (with more expensive housing and crowding), more work by women and children outside the home, the spread of institutional restrictions like child labor laws and compulsory education statutes, the rising value of time as real wages and incomes increased, less reliance on children for support in old age, and less available familial child care as smaller, urban nuclear families became dominant. There is also likely a role for declining infant and child mortality, at least after about 1880, which reduced the number of births necessary to achieve a desired number of children surviving to

adulthood (see Table 3 and below). The land availability hypothesis contributes little to explaining the 19th century urban fertility decline. Several other models have been discussed, but many reduce to a rise in net child costs and an increased desire of parents to trade off numbers of children for greater human capital per child. It is not unreasonable to conclude that a range of changing circumstances -- including increased resource scarcity (including land), the rise of mass education, greater accessibility to urban labor markets, rising real incomes and value of time -- all contributed to the transition. But the fact remains that the United States was unusual, although similar to France. As noted above, it is perhaps not coincidental that both nations had democratic political revolutions late in the 18th century and were characterized, in the 19th century, mostly by smallholder agriculture.

MORTALITY

We know less about the American mortality transition of the 19th century than we do about that for fertility. There are no ready census-based mortality measures like the child-woman ratio, and vital statistics were absent or incomplete for most areas up until the early 20th century. We know the most about Massachusetts, which began statewide civil vital registration in 1842, but Massachusetts was not typical of the nation in the 19th century. It was more urban and industrial, had more immigrants, and had lower fertility.⁴⁷ The federal census collected mortality information from 1850 to 1900, but the data were seriously flawed by incompleteness, biases, and uneven coverage. In consequence, there has been disagreement about trends, levels, and differentials in American mortality over the 19th century.

As mentioned, the official Death Registration Area was not formed until

1900, although there had been earlier attempts. In 1900, the Death Registration Area comprised 10 states and the District of Columbia, covering 26% of the population. It was significantly more urban (63%) than the nation as a whole (40%) and had a higher fraction of foreign born (22%) in contrast the overall average (14%). In addition, the nation had 11.6% of its population black while the Death Registration Area had only 2% of its population black. Most blacks (80%) lived in rural areas in 1900, but those in the Death Registration Areas were 82% urban. Since we know that important mortality differentials existed by rural-urban residence, size of place of residence, and race around the turn of the century, these are significant considerations. Coverage of the Death Registration Area had increased to 34 states and the District of Columbia by 1920, representing 81% of the population. It covered the entire United States from 1933 onwards.

Prior to 1900, official mortality data are limited to selected states and cities and to the imperfect mortality data of the census. Massachusetts is a widely cited source for 19th century mortality information. Its data were of reasonable quality by about 1860, but before that time evidence must be sought in other sources, such as genealogies, family reconstitutions, and bills of mortality. Some analysts, such as Coale and Zelnik, have assumed that Massachusetts mortality was typical of the nation, but the representativeness, particularly of the Massachusetts-Maryland life table of Jacobson for 1850, has been questioned. Even earlier, for the colonial period, local studies dominate, with evidence of reasonable levels of expectation of life in New England but few signs of improvement in the 18th century. Research on the Chesapeake does point to some improvement from very unfavorable mortality levels in the 17th century. But we know discouragingly little about mortality

in colonial America.⁴³

Some previous work has involved strong assumptions and considerable a priori reasoning. Thompson and Whelpton assumed a decline in mortality throughout the 19th century with an acceleration after about 1880. Taeuber and Taeuber posited little improvement prior to about 1850, but considerable gains in expectation of life thereafter. Coale and Zelnik assumed a linear trend in improvement from 1850 to 1900 and used the Jacobson Massachusetts-Maryland life table of 1850 to anchor their estimates as well as a model life table system based on the experience of six European nations. Easterlin, assuming an inverse association between mortality and income per capita and between mortality and public health and a positive association between mortality and urbanization, suggested that rising income per capita after about 1840 dominated these effects and outweighed the negative effect of urban growth, with public health playing only a small role in the 19th century. This led him to believe that expectation of life was rising from about 1840. Vinovskis, on the other hand, believes that little change in Massachusetts mortality levels took place between the 1790s and 1860. More recent work with the Mormon genealogical data by Fogel and Pope has concluded that adult mortality (on a period basis) was relatively stable after about 1800 and then rose in the 1840s and 1850s before commencing improvement after the Civil War. This finding is quite unusual, since we have evidence of rising real income per capita and of significant economic growth during the 1840-1860 period. But income distribution may have worsened and urbanization and immigration may have had more deleterious effects than hitherto believed. (The share of population living in areas of 2,500 persons and over grew from 11% in 1840 to 20% in 1860.) Further, the disease environment may have shifted in an

unfavorable direction.⁴⁹

For the postbellum period, we have better information. Higgs has argued, based partly on the death rate data from Kuznets presented in Table 1, that rural mortality began its decline in the 1870s and that this occurred mostly because of improvements in diet, nutrition, housing, and other aspects of standard of living. He saw little role for public health before the 20th century, at least for rural areas. As for urban places, Meeker believes that there was little improvement prior to about 1880 and that thereafter urban public health measures, especially construction of pure central water distribution systems and sanitary sewers, were important. Some work by Condran and Crimmins-Gardner with the census mortality data for larger American cities in 1890 and 1900 found that mortality seemed to be improving and that the improvements were partly related to public health, although the precise relationships were difficult to measure. After about 1900, on the other hand, there is no doubt that mortality improved dramatically in both rural and urban areas and across groups.⁵⁰

Table 3 provides data on the expectation of life at birth and the infant mortality rate (deaths in the first year of life per 1000 livebirths) for the white population from 1850 onwards. No information is given prior to 1850 because of the difficulty of finding comprehensive, comparable, and reliable mortality estimates. The mortality estimates in Table 3 for the 1850-1890 period are based on estimates made by the author using a collection of actual 19th and early 20th century American life tables (for various states and cities, as well as for the Death Registration Area) to construct a model American life table system. Census mortality data for older children and young adults were then fitted to this model system to produce the estimates

presented here. For 1900 and thereafter, official Death Registration Area data are used. The justification is that indirect estimates of child mortality made using the data on children ever born and children surviving from the public use sample of the 1900 census accord quite well with the Death Registration Area data, indicating that the various biases were offsetting. After 1900 the Death Registration Area grew rapidly and became quite representative by 1920 (and complete by 1933).^{51a}

The evidence in Table 3 is quite consistent with the interpretations given. Both the expectation of life at birth and the infant mortality rate (and the crude death rate estimates in Table 1) show sustained improvement in mortality (i.e., rising expectation of life or falling infant mortality or crude death rates) only from about the 1870s onward. It does not appear that the 1880 census year (June, 1879 to May, 1880) was especially unusual in terms of high mortality, but the 1850 census year was marked by a cholera epidemic. What is apparent is that serious fluctuations in mortality were less likely after the 1870s and that this was integral in the process of the mortality transition. This also confirms one unusual aspect of the American demographic transition -- fertility commenced its decline substantially before mortality. Although levels of mortality in the United States in the middle 19th century were comparable with those in western and northern Europe, significant mortality fluctuations were still occurring right up to the 20th century. Consistent control of mortality in terms of a sustained decline and a damping of mortality peaks only comes after the 1870s. This was also true in England and Wales.^{51b} The new findings of rising mortality in the 1840s and 1850s support this contention that mortality in the United States was not substantially under control until after the Civil War.

What were the origins of the "epidemiologic transition" in the United States? A variety of factors affect mortality. They may conveniently be grouped into ecobiological, public health, medical, and socioeconomic. These categories are not mutually exclusive, since, for example, economic growth can make resources available for public health projects and advances in medical science can inform the effectiveness of public health. Ecobiological factors were not likely significant. While there may have been favorable changes in the etiology of a few specific diseases or conditions in the 19th century (notably scarlet fever and possibly diphtheria), reduced disease virulence or changes in transmission mechanisms were not apparent.⁵²

The remaining factors, socioeconomic, medical, and public health, are often difficult to disentangle. For example, if the germ theory of disease (a medical/scientific advance of the later 19th century) contributed to better techniques of water filtration and purification in public health projects, then how should the roles of medicine versus public health be apportioned? Thomas McKeown has proposed that, prior to the 20th century, medical science contributed little to reduced mortality in Europe and elsewhere.⁵³ His argument was basically one of elimination of alternatives: if ecobiological and medical factors are eliminated, the mortality decline before the early 20th century must have been due to socioeconomic factors., especially better diet and nutrition, as well as improved clothing and shelter (i.e., standard of living). Indeed, the trend in standard of living itself is subject to considerable debate. Some room was left for public health, albeit a rather empirical (as opposed to scientific) one. These results were based particularly on the experience of England and Wales, where much of the mortality decline between the 1840s and the 1930s was due to reductions in

deaths from respiratory tuberculosis, other respiratory infections (e.g., bronchitis), and non-specific gastrointestinal diseases (e.g., diarrhea, gastroenteritis). No effective medical therapies were available for these infections until well into the 20th century.

It is true that medical science did have a rather limited direct role before the 20th century. In terms of specific therapies, smallpox vaccination was known by the late 18th century and diphtheria and tetanus antitoxin and rabies therapy by the 1890s. Many other treatments were symptomatic. The germ theory of disease, advanced by Pasteur in the 1860s and greatly advanced by the work of Koch and others in the 1870s and 1880s, was only slowly accepted by what was a very conservative medical profession. Even after Robert Koch conclusively identified the tuberculosis bacillus and the cholera vibrio in 1882 and 1883, various theories of miasmas and anticontagionists views were common among physicians in the United States and elsewhere. Hospitals, having originated as pest houses and alms houses, were (correctly) perceived as generally unhealthy places to be. In 1894 in Milwaukee, for example, an angry crowd prevented the removal of a child to a hospital during a smallpox outbreak on the grounds that the child would die there (as another child had previously). Surgery was also very dangerous before the advances of William Halsted at Johns Hopkins in the 1880s and 1890s. Major thoracic surgery was rarely risked and, if attempted, patients had a high probability of dying from infection or shock or both. The best practice in amputations was to do them quickly to minimize risks. Although anesthesia had been introduced in America in the 1840s and the use of antiseptics in the operating theater had been advocated by the British surgeon Joseph Lister in the 1860s, surgery was not considered even reasonably safe until the 20th century.⁵⁴

Although the direct impact of medicine on mortality in the United States over this period is questionable, public health did play an important role and thereby indirectly allowed medicine a part. After John Snow had identified a polluted water source as the origin of a cholera outbreak on London in 1854, pure water and sewage disposal became important issues for municipal authorities. New York City constructed its 40 mile long Croton Aqueduct in 1844, and Boston was also tapping various outside water sources by aqueduct before the Civil War. Chicago, which drew on Lake Michigan for its water, also had to cope with sewage disposal directly into its water supply from the Chicago River. Water intakes were moved further offshore in the 1860s, requiring tunnels several miles long driven through solid rock. But this was only a temporary solution. Finally, the city had to reverse the flow of the Chicago River, using locks and the Illinois Sanitary and Ship Canal, and send the effluent down to the Illinois River. The project took eight years (1892-1900) and was called one of the "engineering wonders of the modern world." The bond issue to fund it and create the Chicago Sanitary District was overwhelmingly approved in 1889 by a vote of 70,958 to 242. This does not take into account that, at an early date, the entire downtown area had to be raised by one story to facilitate gravity sewage flow.⁵⁵

A pattern was emerging in the late 19th century -- massive public works projects in larger metropolitan areas to provide clean water and proper sewage disposal. But progress was uneven. Baltimore and New Orleans, for example, were rather late in constructing adequate sanitary sewage systems. As time went along, filtration and chlorination were added to remove or neutralize particulate matter and microorganisms. This was a consequence of the acceptance of the findings of the new science of bacteriology. According to

Charles Chapin in his compendious 1901 study of urban sanitation in the United States, public health officials were often much more cognizant of the need to use bacteriology than were physicians, who sometimes saw public health officials as a professional threat. There was also the issue of marshalling resources to pay for many of these public works and public health projects. Much of it was locally funded, with the consequence of uneven and intermittent progress toward water and sewer systems, public health departments, etc. Indeed, one reason for the better mortality showing of the ten largest cities in 1900 as compared with remaining cities over 25,000 population was the capacity of the largest cities to secure the necessary resources for public health reform and improvement.⁵⁶

By 1900, public water supplies were available to 42% of the American population and sewers to 29%, although many households were not connected to the pipes running under the streets and roads in front of their houses. It took longer for filtered water to reach many families. In 1870 almost no water was filtered in the United States. By 1880 about 30,000 persons in urban areas (places over 2,500 persons) were receiving it. The number had grown to 1.86 million in 1900, 10.8 million in 1910, and over 20 million in 1920, about 37% of the whole urban population and a much higher proportion of those living in large cities. In a study of the mortality decline in Philadelphia 1870-1930, Condran and Cheney showed the drastic reduction in typhoid mortality on a ward by ward basis as water filtration was progressively introduced after the turn of the century.⁵⁷

Progress in public health was not confined to water and sewer systems, though they were among the most effective weapons in the fight to prolong and enhance human life. Simply by reducing the incidence and exposure to disease

in any way, overall health, net nutritional status, and resistance to disease was improved. Other areas of public health activity from the late 19th century onward included vaccination against smallpox; use of diphtheria and tetanus antitoxins (from the 1890s); more extensive use of quarantine (as more diseases were identified as contagious); cleaning urban streets and public areas to reduce disease foci; physical examinations for school children; health education; improved child labor and workplace health and safety laws; legislation and enforcement efforts to reduce food adulteration and especially to obtain pure milk; measures to eliminate ineffective or dangerous medications (e.g., the Pure Food and Drug Act of 1906); increased knowledge of and education concerning nutrition; stricter licensing of physicians, nurses, and midwives; more rigorous medical education; building codes to improve heat, plumbing, and ventilation in housing; measures to alleviate air pollution in urban settings; and the creation of state and local boards of health to oversee and administer these programs.

Public health proceeded on a broad front, but not without delays and considerable unevenness in enforcement and effectiveness. Regarding the case of pure milk, it became apparent that pasteurization (heating the milk to a temperature below boiling for a period of time), known since the 1860s, was the only effective means of insuring a bacteria-free product. Certification or inspection of dairy herds was insufficient. This was, however, resisted by milk sellers, and it only came into practice quite late. In 1911, only 15% of the milk in New York City, one of the more advanced urban areas in public health, was pasteurized. In 1908 only 20% of Chicago's milk was so treated. Pasteurization did not become compulsory in Chicago until 1908, and in New York City until 1912. Boston began required medical examinations of school

children in 1894, and mandatory vaccination of school children in New York City was started in 1897. The federal government instituted the Children's Bureau in 1912, and a 1914 pamphlet on infant care became the best selling publication ever issued by the Government Printing Office. Examples of success but with rather uneven progress can easily be multiplied.⁵⁸

Public health can thus be seen as having played a significant part in the mortality transition. But there were interactions between reduced incidence of infectious and parasitic disease and improvements in general health. An indicator of health status is final adult stature. A population may have reasonable levels of food intake, but a virulent disease environment will impair net nutritional status, i.e., the amount of nutrients available for replacement and augmentation of tissue. Repeated bouts of infectious disease, especially gastro-intestinal infections, impair the body's ability to absorb nutrients and divert calories, proteins, vitamins, and minerals in the diet to fighting the infection rather than to tissue construction or reconstruction. Recent research by Robert Fogel and his colleagues indicates cycles in stature in the 19th century. The stature estimates are based largely on military records. There was a downturn in these heights dating from those born about 1830, which also coincides with the rise in mortality seen in the genealogical data in the 1840s and 1850s, the period of child and adolescent growth of these age cohorts. There is some evidence that food availability or distribution (by region or socioeconomic status) deteriorated in the 1820s and 1830s and possibly later. But the case is far from clear as a sole cause. More likely was nutrition interacting with a changing disease environment which was, in turn, affected by urbanization, rapid population turnover, settling of new areas, migration waves from abroad, and the apparent spread of

malaria, fevers, and gastro-intestinal disease. Something close to modern stature had been achieved in the United States by the late 18th century, but these new factors, the reduced food availability, and the worsening disease environment led both to a deterioration of mortality and stature in the mid-19th century before a recovery after the Civil War.⁵⁹

CAUSE OF DEATH

By the late 19th century we begin to have reasonable data on cause of death. Much of the mortality decline since the Civil War originated in reductions in death from infectious and parasitic diseases, both of the respiratory (usually air-borne) and gastro-intestinal (usually water-borne) types. In a study of Philadelphia over the period 1870-1930, about two thirds of the drop in age-standardized death rates came from various infectious diseases, including 22% from respiratory tuberculosis alone. Among children (who accounted for much of the decline), significant contributions were made by reductions in mortality from diphtheria and croup, scarlet fever, smallpox, and respiratory tuberculosis. Diphtheria antitoxin, water filtration, and quarantine helped, but an improved standard of living was also important, especially for tuberculosis. Over half of the mortality decline for those aged 20-39 came from that of respiratory tuberculosis, for which no specific therapy was available until the 1940s.⁶⁰

Reliable cause of death information for larger areas of the nation became available in 1900 with the initiation of the Death Registration Area. Calculated from these data, the crude death rate declined (for the Death Registration Area, at least) by 25% between 1900 and 1920. Of this decline, 70% was accounted for by that in all infectious and parasitic diseases. And of that reduction in infectious disease, 24% came from reductions in mortality

from respiratory tuberculosis. Over the longer period 1900-1960, the crude death rate declined by 45%, while mortality from all infectious and parasitic diseases was reduced by 90%. The decline in mortality from infectious disease actually exceeded that from all causes combined because mortality from chronic, degenerative diseases (cancer, cardiovascular disease) increased.⁶¹

One of the great events in human history has been the prolongation of life and reduction in mortality in the modern era, chiefly due to great declines in death from epidemic and endemic infectious disease. Americans and most in the developed world no longer live with the kind of fear and fatalism that characterized a world in which sudden and pervasive death from disease was a fact of life. For the United States, most of this improvement took place since the late 19th century.

MORTALITY DIFFERENTIALS

During our period, both prior to and during the mortality transition commencing in the 1870s, significant differentials in mortality existed -- by sex, rural-urban residence, race, region, nativity (native versus foreign born), and socioeconomic status. Male mortality usually exceeds female mortality at all ages. This was generally true in the United States in the 19th century. The relative differences were often smaller than in the mid- to late 20th century, as a consequence of the hazards of childbearing and pervasive exposure to disease-causing organisms.⁶²

It is clear that, before about 1920, urban mortality was much in excess of rural mortality. In general, the larger the city, the higher the death rate. A variety of circumstances contributed to the excess mortality of cities: greater density and crowding, leading to the more rapid spread of infection; a higher degree of contaminated water and food; garbage and carrion in streets

and elsewhere not properly disposed of; larger inflows of foreign migrants, both new foci of infection and new victims; and also migrants from the countryside who had not been exposed to the harsher urban disease environment. Writing at the turn of the century, Adna Ferrin Weber noted the positive relationship between city size and mortality levels, both in the United States and Europe:

"It is almost everywhere true that people die more rapidly in cities than in rural districts....There is no inherent or eternal reason why men should die faster in large communities than in small hamlets....Leaving aside accidental causes, it may be affirmed that the excessive urban mortality is due to lack of pure air, water and sunlight, together with uncleanly habits of life induced thereby. Part cause, part effect, poverty, overcrowding, high rates of mortality, are found together in city tenements."⁶³

According to the Death Registration Area life tables for 1900/02, the expectation of life at birth was 48.2 years for white males overall -- 44 years in urban areas and 54 years in rural places. The comparable results for females were similar (51.1 years overall, 48 years urban, 55 years rural). For the seven states with reasonable registration data in both 1890 and 1900, the ratio of urban to rural crude death rates reported in the 1890 census was 1.27, and 1.18 in 1900. For young children (aged 1-4) the ratios were much higher, with urban mortality being 107% higher in 1890 and 97% higher in 1900. For infants the excess urban mortality was 63% in 1890 and 49% in 1900. Residence in cities, with poorer water quality, lack of refrigeration to keep food and milk fresh, and close proximity to a variety of pathogens was very hazardous to the youngest inhabitants. The rural-urban differential seems to have been true earlier as well. For seven New York counties in 1865, the probability of dying before reaching age five was .229 in urban areas but .192 in rural locations. A study of Massachusetts by Vinovskis found a rough direct relationship between city size and mortality for 1859-61, but he

believed that the differences had been larger in the 17th and 18th centuries.⁵⁴

The excess urban mortality was diminishing from the late 19th century onwards, especially as public health measures and improved diet, shelter, and general living standards took effect. The excess in expectation of life at birth for rural white males over those in urban areas was 10 years in 1900. This fell to 7.7 years in 1910, 5.4 years in 1930, and 2.6 years by 1940. The original cause of the rural advantage was unlikely superior knowledge of disease, hygiene, and prevention in rural areas, since farmers were not known to be particularly careful about disease and cleanliness: "There are few occupations [other than farming] in which hygiene is more neglected."⁵⁵ The rural advantage seems simply to have been that rural residents were farther from each other, reducing chances of contagion and contamination of water supplies. Rural-urban mortality differentials likely played a role in the deterioration of mortality in the middle of the 19th century, as the population shifted to cities and towns. Also, the 20th century mortality decline was partly propelled by the elimination of excess urban deaths.⁵⁶

The black population of the United States certainly experienced higher death rates, both as slaves and then as a free population in the postbellum period than did whites. Table 3 provides a breakdown of the expectation of life at birth and the infant mortality rate by race. As of 1920, when reasonably representative data are available for the black population in the official registration states, it is apparent that the mortality of blacks was substantially higher, despite their living in predominantly rural areas. For the 1890s, based on estimates using the 1900 census public use sample, the infant mortality rate was 111 infant deaths per 1000 livebirths for the white

population and 170 for the black population. The implied expectations of life at birth were 51.8 years for whites and 41.8 years for blacks.^{67a} The differential clearly had not disappeared by 1920, when the absolute difference in expectation of life at birth by race was 10.4 years and the black infant mortality rate was 60% higher than that for whites. Even in 1980, although some convergence had occurred, the difference in life expectancy was still 6.3 years and black infant mortality was 90% higher than white. The absolute difference had narrowed, but the relative difference in infant survival had actually worsened. Mortality is a sensitive indicator of socioeconomic well-being, and, by that standard, the absolute improvement for the black population had been considerable, although relative progress had been mixed. The historical disadvantaged status of the black population is apparent, since, despite a greater proportion living in comparatively healthier rural areas, blacks still had substantially higher death rates than whites.

The mortality and health of the antebellum slave population has more recently been studied using plantation records and coastal shipping manifests (giving heights of transported slaves). It has revealed very high mortality and very stunted stature among slave infants and young children, pointing to poor health conditions. For example, the infant mortality rate for slaves is estimated to have been as high as 350 infant deaths per 1000 livebirths in comparison for 197 for the whole American population in 1860 (Table 3). Death rates among slave children aged 1-4 were also very high, although they began to move closer to those for whites for older ages. An hypothesis for the high high mortality and short stature of slave children is that they were not given much animal protein in their diets until about age 10. In addition, pregnant and lactating women were often kept hard at field work, leading to lower

birthweights and to less breastfeeding and earlier weaning. The better diets of adolescent and adult slaves brought their mortality rates and stature closer to those for the white population.⁵⁷⁶

Information on mortality differences between the native and the foreign-born populations is ambiguous. In Massachusetts, for example, the crude death rate for the native population was higher (20.4 per 1000 population) than that for the foreign born (17.4) for the period 1888 to 1895.⁶⁸ This difference disappears, however, once the results are adjusted for the younger age structure of the immigrant population. Using census samples to estimate the mortality of children of native- and foreign-born parents reveals the opposite: for seven New York counties in 1865, the probability of dying before age 5 was .189 for children of native-born parents but .234 for children of foreign-born parents. The same calculation using the national sample of the 1900 census gives a probability of death before 5 of .166 when both parents were native born and .217 when both parents were immigrants. For the Death Registration Area life tables of 1900/02, life expectancies at age 10 were rather similar by nativity: 51.6 years for native white males and 49.1 years for foreign white males. The results for 1919/11 were 51.9 and 50.3 years respectively. Differentials by nativity were converging and had largely disappeared by the 1930s, since the higher mortality of the foreign born was largely due to lower socioeconomic status and a greater proportion in large cities. As socioeconomic attainment narrowed between the groups and as the rural-urban mortality difference disappeared, the mortality penalty paid by the foreign born also diminished. There had been in the late 19th century an effect on mortality cycles in large cities which coincided with waves of immigrants. Surges in immigration produced increased death rates. They

likely were affected by changes in disease environments for both the immigrants and the natives. These cycles too had largely disappeared in the early 20th century.⁶⁹

Regional differences in mortality before the 20th century are rather difficult to establish because of the incompleteness of geographic coverage of both vital statistics and of local studies. In colonial times, New England was the area of lowest mortality while the region from the Chesapeake to the south had higher mortality. This pattern continued into the first half of the 19th century, as is confirmed by estimates of adult mortality from genealogies for cohorts born in the late 18th and early 19th centuries. The Midwest also appeared as a relatively healthy region. For cohorts born in the middle of the century, however, these regional differences had dissipated. Indeed, the highest life expectation at age 20 for white females born in the 1850s and 1860s was in the South Atlantic states. Regional differences, such as they were, converged into the 20th century, but as late as 1950 the region of lowest mortality was still the western Midwest, while the highest death rates were found in the Mountain states. Regional areas of poverty (e.g., West Virginia, New Mexico) have led to significant variation across states.^{70a}

Differences in survival probabilities also existed across socioeconomic groups, although here too the information is sketchy. Using census mortality data for adult males reported by occupation in 1890 and 1900 and vital registration for 1908/10, Paul Uselding found a rough gradient with the lowest death rates among proprietors, clerical, and other white collar workers and the highest death rates among laborers and servants. Interestingly, professionals did only about average. Farmers and clerks did well, as, surprisingly, did workers in forestry and fisheries. The more rural

environment for those in agriculture and extractive industries undoubtedly helped.

These results are echoed in estimates of child mortality according to occupation of father from the 1900 census sample. Children of white collar workers, professionals, proprietors, and farmers did better than average, while children of laborers (including agricultural laborers) had worse than average survival chances. Again, the advantage to professionals, such as physicians, teachers, clergy, was not great. These results stand in contrast to similar calculations from published data from the 1911 Census of Marriage and Fertility of England and Wales. In England the differences in child mortality across socioeconomic group lines were steep. There was a strong, consistent gradient from the low mortality professional, proprietary, and white collar groups through moderate mortality among skilled and semi-skilled manual workers and finally to the highest mortality among the children of unskilled manual workers. Social class clearly had much more salience in the sense of an outcome (child mortality in this case) in England in 1911 than in the United States in 1900. Social class did not have as fundamental an importance in this sense in the United States as in Britain. Greater geographic and possibly socioeconomic mobility likely played a role in the smaller American socioeconomic differences. Also, the eleven year difference in census dates may well have been important, since this was the period in which the impact of public health advance was greatly accelerating. In the United States at the turn of the century, rural-urban residence was more important than father's occupation (or estimated father's income) for child survival. An exception was race, where the black population was at a disadvantage both within occupations and within rural-urban categories.

Indeed, it is important to note that race in the United States took the place of class in Britain in terms of differential child mortality.

There is some evidence from earlier in the 19th century that socioeconomic variables, such as wealth or income, occupation, and literacy, were less important in predicting mortality differentials. For the 1850s, for instance, survival probabilities differed little between the children of the poor and the wealthy. Rural-urban residence and region made more difference.^{70b}

This had begun to change in the early 20th century, however. Analysis of the 1910 census public use sample and published vital statistics from the Birth Registration Area in the 1920s has revealed, however, that the socioeconomic differentials widened in the United States as the new century progressed. Higher income and better educated groups more easily assimilated advice and improvements in child care, hygiene, and health practices and so were "leaders" in the mortality decline of the early 20th century, much as the upper British socioeconomic status groups had been. Public health improvements led to a reduction in the level of mortality but did not lead to a reduction in relative differentials across class and occupation groups. Rural-urban differences did converge into the early 20th century, but both relative and absolute mortality differences by race did not. The role of personal and household health behavior has been inadequately emphasized in the debate on the origins of the mortality transition. It was very likely central, although the precise contribution to differential child mortality is not easy to assess. For adults, the mortality gradient observed at the turn of the century from high mortality among laborers to intermediate levels among skilled manual workers to the most favorable mortality among white collar workers persisted up to the middle of the 20th century.⁷¹

Overall, the mortality transition in the United States was a delayed event. Instead of a decline of death rates across the 19th century in parallel with the decline in birth rates, mortality exhibited an increase prior to the Civil War. The sustained decline only commenced nationally in the 1870s. A damping of year to year mortality fluctuations also took place after mid-century. In the 19th century, cities were definitely less healthy environments -- the larger the city, the higher the mortality risk. The rural advantage was slowly eroded from late in the century, particularly due to the advance of urban public health, broadly defined. The mortality disadvantage of the black population persisted throughout the period considered here, although mortality levels improved for both whites and blacks. It is not easy to assign credit to various causal factors in the mortality transition, but the principal proximate cause was the control of both epidemic and endemic infectious diseases. By the later 19th century, public health certainly contributed much, with improvements in diet, housing, and standard of living also significant. The direct role of medical intervention was rather limited before the 20th century but then increased as the germ theory of disease was accepted and better diagnosis and effective therapies were developed. Though difficult to assess, changes in personal health behavior must be assigned importance, particularly after the turn of the 20th century.

MIGRATION: SOURCES

The United States was, and to a great extent remains, a nation of migrants. As seen in Table 1, a large share of total population growth (approximately 25%) of total population growth over the period 1790-1920 was due to migration from abroad. Between 1819 and 1920, according to official statistics, over 33.7 million migrants entered the United States from abroad.

But, once here, both immigrants and the native born continued to move -- westward to the frontier, from rural to urban areas, and, more recently, to suburbia and to the "sun belt".

In terms of sources of quantitative information, there exist, for international migration, ship manifests after 1819. They recorded landing in major ports, though omitting first class passengers. Entrance at other points, especially land borders with Canada, were not recorded. Efforts to remedy these deficiencies were made intermittently after 1855, but coverage was not complete on this until 1908. Similarly, return migration was not counted until 1907 (and discontinued in 1957). In addition to the border counts, the federal census, of course, asked questions on place of birth of each individual from 1850 onwards and on the nativity of the respondents parents from 1870 onwards. Between 1890 and 1930 questions were asked of immigrants concerning their duration of residence in the United States or year of immigration.⁷² Some of the basic official international migration statistics by country of origin are reported in Table 5.

For internal migration, reliance must be placed on census data by place of birth and current residence (which begins in 1850), "surviving" age cohorts forward or backward from census to census, direct linkage of individuals from census to census, and the census questions on residence at a previous date. Some additional help can be found in genealogical data and such things as military pension records. The census-survival technique requires estimates of mortality (and sometime fertility), which, as is apparent, are not available at the state or local level for many places in the 19th and early twentieth centuries. The question on residence five years prior to the census was not instituted until 1940, though the New York State census of 1855 asked a

similar question.

INTERNAL MIGRATION

Table 4 provides a glimpse of regional population growth at selected censuses between 1790 and 1920. Not surprisingly, the demographic "center" of the nation was moving from the Atlantic coastal states (New England, Middle Atlantic, South Atlantic regions) to the Midwest (East North Central and West North Central) and western South (East South Central and West South Central). By 1920, the Mountain and Pacific states were still relatively small demographically, comprising less than 10% of the total population (as opposed to 21% in 1990). Two migrations were driving the numbers in Table 4 -- the movement from east to west and the movement from rural to urban areas. As Table 2 demonstrates, urban population grew from about 5% of the total population in 1790 to 51% in 1920. The average annual growth rate was 4.3% for the urban population in contrast to only 2.0% per annum for rural dwellers. Since we have every indication the birth rates were lower and death rates higher in urban relative to rural areas, the more rapid growth of urban areas originated in population redistribution and not differences in natural increase. This rural to urban shift reflects, of course, labor market conditions as the economy changed its structure of opportunities from a rural, smallholder agriculture to an urban, industrial and service-based economy made up predominantly of employees. This is certainly exemplified by the increase in the non-farm share of the labor force from 25.6% in 1800 to 44.2% in 1860 to 74.1% in 1920.⁷³ A primary motive for migration in ordinary times is to take advantage of wage and income differences across space, which substitutes factor mobility for interregional trade in goods and services.

Table 4 also reveals that urbanization did spread across regions, albeit

unevenly. The Northeast was the urban-industrial center of the nation in the 19th century. Table 4 confirms this view. By 1860, New England the Middle Atlantic regions had 61% of the nation's urban inhabitants but only 33% of the overall population. Conversely, the South had 17% of the urban population but 36% of the overall total. Even in 1920, the Northeast still had 41% of urban dwellers with the Midwest close behind at 33%. The South still had but 17%.

From 1850 onwards we are able to examine migration by place of birth and current residence. The proportion of the native-born population residing outside the state of birth ("lifetime" migrants) was relatively stable from the middle of the 19th century -- 23.3% of the white population in 1850, 23.5% in 1890, and 23.9% in 1920. The non-white population had lower rates of lifetime mobility in this period, about 15-20% until after 1920.⁷⁴ Much of this interstate movement was on an east-west axis until the closing of the frontier at the end of the 19th century. For instance, in 1850, of those born in Pennsylvania but residing elsewhere, 67% could be found in Ohio, Indiana, or Illinois, while 77% of those born in South Carolina but residing outside that state were in Georgia, Alabama, Mississippi, and Tennessee. A variety of explanations has been advanced for the migration along latitudes, but recently it has been shown that real and human capital invested in seed, livestock, implements, and farming techniques made movement along climatic bands much more rational. This also provides a partial explanation for the greater preference of the bulk of the 19th century immigrants from northern and western Europe for the Northeast and the Midwest -- their human capital matched that climatic band better.⁷⁵ That was true for those going to rural areas, at least. The remainder of the explanation was largely the greater opportunities in the more rapidly urbanizing and industrializing North, as

well as the tendency of migration streams, once established, to grow along familiar paths.

Agrarian motives for migration diminished as the frontier closed in the late 19th century and as rural population growth slowed dramatically (to only 0.8% per year over the period 1890 to 1920). For most of the 19th century, migration flows westward were consistent with the land availability hypothesis discussed in connection with the fertility transition. Rural migrants moved west to secure cheaper, good quality land. Frederick Jackson Turner's thesis that the frontier was a demographic "safety valve" in 19th century America remains a durable view. Nevertheless, by late in the century, rural to urban flow assumed the dominant role. But much of the rural-urban migration was within regions or along an east-west axis, since the bulk of urban and industrial growth from the Civil War to 1920 was in the Northeast or Midwest. Notably, the South failed to increase its share of urban population over this period. The major shift to a south to north movement only began on a large scale with the radical shifts in demand for labor accompanying World War I and the restriction, after 1921, of cheap immigrant labor. The shift to the "sun belt" came even later, largely post World War II. Changes in transportation technology, particularly the electric street and underground railways and later the automobile and motorized bus, led to a movement out of central cities and into suburban communities. This process was underway in parts of the Northeast by the end of the 19th century, but really accelerated after World War I, and again after 1945. So, for instance, during the 1920s the rural part of metropolitan districts (as defined by the Bureau of the Census) increased by 55%, faster than any part of the metropolitan population except for small cities. This development was suburbanization.⁷⁶

The urbanization process was accompanied by a filling out in the city size hierarchy. Large cities did tend to grow most rapidly. In 1810 there were only two cities with more than 50,000 population (New York and Philadelphia), and together they made up 29% of the total urban population. By 1860, there were 16 places of over 50,000 population, containing 50% of urban inhabitants. In 1920, the first census when more than half of the American population was urban, 144 cities exceeded 50,000 persons (with 25 over 250,000 inhabitants), and they now had 60% of city dwellers. The three largest cities of over one million each (New York, Chicago, Philadelphia) alone had 19% of America's urbanites. But the urban size hierarchy did not become distorted, as it has in some developing nations. That is, large cities did not grow such that medium and smaller urban places became unimportant. There were 213 places of 5,000 to 50,000 population in 1860, holding 41% of the urban inhabitants. In 1920 this number had risen to a total of 1,323 places with 32% of the urban population.^{77a}

And this urban growth had powerful economic linkages. Considerable industrial output of the period 1865-1920 was devoted to providing infrastructure and materials to house, transport, and deliver public services for this massive population shift to towns and cities. Iron and steel for sewer and water pipe, bridges, rails, structural pieces, and nails; concrete, stone, brick, and asphalt for roads and structures; cut timber; transport equipment; glass, etc. were demanded in huge quantities to build the cities.

Migration patterns, both internal and international, did affect regional population growth rates and shares. In 1790, the North and South each had about 50% of total population. But differential migration and not differential natural increase began to drive the share in the North upwards as

slower population growth in New England was balanced by more rapid growth in the New York, Pennsylvania, and later the Midwest. The Northeast and Midwest together accounted for 56% of the nation's inhabitants in 1830 and 62% in 1860, compared to 35% for the South at the latter date. This demographic shift alone was instrumental in the political crisis leading up to the Civil War, as southern representation in the Congress slowly ebbed.^{77b}

The regional preference of migrants from abroad, once they had landed in the United States, was strongly in favor of the Northeast and Midwest and not for the South. For instance, in 1860 a mere 5.6% of the South's white population was foreign born while the proportion was 19.3% in the Northeast and 17.4% in the Midwest. For 1910, the proportion of foreign born living in the Northeast had risen to 26.2%. It had fallen to 3.5% in the South and held at 17.4% in the Midwest. Further, at the latter date, only 6.1% of Southern whites had a foreign-born parent or parents, whereas 30.1 % of white residents of the Northeast were first generation native born. This had profound political implications in terms of regional growth both before and after the Civil War. Not only did it change the Congressional balance of power, but it limited the labor supply in the South for industrial and agricultural development throughout the 19th and early 20th centuries.^{77c} The southern share slipped even further, to 31%, in 1920, while the Northeast and Midwest held about steady at 60%. These population realignments were both cause and effect of rapid industrial growth in the postbellum era, as many of the rural migrants and most of the later immigrants were destined for northern cities.

INTERNATIONAL MIGRATION

In discussions of migration to the United States over the long 19th century, the flood of immigrants from Europe usually takes center stage. It

was dramatic and colorful as new arrivals added an ethnic flavor which pervades our culture today.⁷³ Like internal migrants, the immigrants were most often motivated by economic concerns. Labor market models of migration provide sufficient explanations for the phenomenon in circumstances other than war or serious political or environmental upheaval. Individuals and families move to maximize the present discounted net benefits of shifting to a location with better wages, incomes, and opportunities. They must factor in the costs, including direct transportation and moving expenses as well as lost earnings and psychological costs. The comparisons of these factors helps explain why migration is selective: movers tend to be younger and single and have less wealth than non-movers.^{73a}

The selectivity of migration is partly the cause of the phenomenon seen in the last column of Table 3. The sex ratio of the population (males per 100 females) was well above 100 in 1790 and increased in decades of highest immigration (the 1840s, 1850s, 1880s, and 1900s). Migration was selective of males in this case, as they were first to seek the opportunities. The sex ratio of the foreign-born white population in 1850 was 124. It was 129 in 1910. They clearly were raising the national average.^{73b} The general decline of the sex ratio over time was, however, due to the aging of the population. In a normal closed population the sex ratio at birth is about 105 male births per 100 female births. Higher male than female mortality (at most, if not all, ages) then leads to a slow decline in the ratio to below 100 for older age groups. Early in the 19th century, the sex ratio was well above 100 since a young population (median age 16) was weighted towards groups with higher sex ratios. With an aging population caused by declining fertility, the overall sex ratio would fall as the population was weighted towards older age groups

with lower sex ratios. This process was offset to a degree by inflows of migrants heavily selective of males (with the exception of the years of the Great Depression of the 1930s).

Push and pull factors operate in the migration arena, although it is often difficult to disentangle the simultaneous effects of push and pull.^{73c} From this perspective one could ask whether it was poor conditions in 19th century Europe or the expanding opportunities in the United States that propelled millions of souls to make the long and difficult journey? A clue lies in the waves of migration which characterized the period. While not easily apparent from Table 5, there were decades in which migration surged: the 1840s, 1850s, 1880s, and the period 1900/14. These surges can be seen clearly in Figure 1, which plots the annual numbers of officially recorded migrants from 1820 to 1940. Upswings in in-migration corresponded to periods of relative prosperity in the American economy: the boom beginning in 1843 and lasting until the panic of 1857; the post Civil War economic upsurge (1865-1873); the economic peaks of the 1880s; and the prolonged prosperity from the end of the 1890s until the end of World War I. The fall off in the 1920s reflects the new restrictive legislation. Similarly, migration troughs corresponded to the panics of 1837, 1857, 1873, and the sustained economic dislocations of the 1890s. It is not surprising that the uncertain prospects of the American Civil War should have led to a fall off in migration, though recovery in the flows commenced before the end of the war. In sum, waves of immigration were roughly synchronous with long swings in economic activity in the United States. It is also of importance to consider migration to the United States as on part of a global labor market which emerged in the second half of the nineteenth century.^{73d}

Long swings (of about 15 to 25 years in duration) were historically associated with construction cycles and need to be distinguished from the shorter business cycle (of about 8 to 10 years duration) or even shorter inventory cycles. The roughly synchronous cyclical movements in the economies of the United States and the European countries of migrant origin point to the dominance of pull factors in the United States rather than push factors from Europe since favorable conditions generally existed on both sides of the Atlantic during upswings in migrant flows to the United States. If, in times of relative prosperity in Europe, migrants left in increased numbers, then American labor market conditions were the dominant factor. An important exception was the great potato famine of the later 1840s. It was not just confined to Ireland, but also affected the continent of Europe, particularly Germany, Scandinavia, and the Netherlands, where the potato had become an important part of the diet. Here push factors were more clearly at work. Analysis of the cycles in migration to the United States in the 19th century has found that migration had a close correlation with such sensitive cyclical indicators as miles of railroad constructed in the U.S. and railroad rails consumed.^{90a} There is also evidence, albeit more sketchy, that long swings in economic activity and demand for labor also affected interstate migration flows.

Figure 1 also points to a long term upward trend in gross migration across the Atlantic. Average migration increased from about 14,000 persons per year in the 1820s to almost 260,000 per year in the 1850s to approximately one million annually in the peak years 1911/14, an average growth of 4.9% per annum between the 1820s and 1911/14 -- very rapid indeed. Over one million migrants entered the United States in six of the fourteen years before the

First World War erupted in Europe in 1914. These magnitudes have not been exceeded for recorded, legal migration until very recently.

This substantial secular increase was assisted by technological improvements in transportation. In the early to mid 19th century, the trans-Atlantic passage on sailing vessels could take up to several weeks and cost a substantial fraction of an annual income of a peasant or manual worker. The replacement of wooden square-riggers by larger iron- or steel-hulled vessels with steam power and screw propellers reduced the passage to about ten days in the 1870s and about a week in 1900. Trans-Atlantic passenger fares became cheaper over the century, as did those on railroads and vessels on the inland waterways of both the U.S. and Europe.

This reduction in the barriers of time and cost also led to increases in return migration. For the five year period 1908/12, when information about return migration first became available, there were 4.75 alien arrivals and 2.36 million departures of non-citizens, giving a return rate of about 50%. This is a somewhat neglected feature of immigration history, but it was quite important. For Italy, one of the best documented and quantitatively significant cases, over 43% of all migrants who left for the United States in the 1880s returned to Italy. This "repatriation ratio" rose to 53% in the first decade of the 20th century and to 63% during 1910/1920. Overall, it seems that, by the late nineteenth century, one Italian migrant returned home for every two who left for the United States. This proportion was even higher for non_jewish migrants from Greece, Hungary, Russia, and the Balkans. Jewish migrants tended to stay, largely because of the greater freedom and lesser fear of persecution. The reasons for return were varied. A large number of migrants planned to return after having earned a "nest egg". Others became

unsatisfied with their lot in the New World or longed for friends, family, and familiar landscapes.^{10b}

Another salient feature of immigration to America apparent in Table 5 is the changing composition of the flows across the long 19th century. For the decades between 1821 and 1890, 82% of all immigrants originated in northern and western Europe and only 8% in central, eastern, and southern Europe.¹¹ For the three decades 1891 to 1920, the situation had altered dramatically: only 25% of the migrants came from northern and western Europe and 64% from central, eastern, and southern Europe. This was termed by contemporaries as the shift from the "old" to the "new" immigration. This shift in composition, along with the strong upward trend in migration, spurred the formation of the U.S. Immigration Commission of 1907/10 and probably to immigration restriction. Thompson and Whelpton estimate that, at the time of the first federal census in 1790, 90% of the white population was ultimately of northern and western European origin, with 77% from Great Britain and Ireland alone. Their definition excluded Germany, which was the origin of 7.4% of the 1790 population. By 1920, northern and western Europe (excluding Germany) was the origin of only about 63% of the American population (41% from Britain and Northern Ireland) with 27% having their ancestry in central and east Europe (16.3% from Germany) and 4.5% in southern Europe.¹²

Why did this shift to the "new" immigration occur? As modern economic growth progressed in many of the original sending nations of north and west Europe, growth in demand for labor in their domestic economies improved and absorbed many of those who would have migrated abroad. The decline of the size and share of the agrarian sectors in these economies also contributed, since many of the migrants came from rural areas. Germany is an excellent

case in point. In the 1880s, 1,342,000 Germans emigrated. This number dropped to 527,000 in the 1890s and to 274,000 in the 1900s.^{33a} The decline coincided with Germany's rapid emergence as an urbanized industrial power. The increase in outflows from central, eastern, and southern Europe began as these nations (Austria-Hungary, Russia, the Balkan states, Italy) began to experience the dislocations associated with modern economic growth and structural change. There is, however, also the persuasive argument that only late in the nineteenth century did the feedback of information about migration opportunities diffuse widely in southern and eastern Europe. This, combined with cheaper fares and shorter and less hazardous journeys by railway and steamship, led to an upsurge in "migration fever." Legal and institutional barrier to out-migration were also reduced or eliminated in many of these nations from the late 19th century onward.^{33b}

There was considerable nativist opposition to these migrants. The "Know Nothing" or American Party, which flourished in the 1840s and 1850s, proposed anti-alien and anti-Catholic legislation, particularly directed at the Irish. Similar groups arose in the 1870s and 1880s, including in California where hostility to Chinese immigration was strong. As the labor movement grew, there were calls for immigration restriction from that quarter, which is understandable, since the more rapid expansion in the supply of labor provided by immigrants restricted the growth of real wages, raised unemployment, and made labor organizing more difficult. The short-lived National Labor Union (1866-1872) advocated limits to immigration as well as repeal of the Contract Labor Law (1864). The latter allowed employers to advance the costs of passage to prospective immigrant workers. The American Federation of Labor (founded 1886) long campaigned for quotas on immigration. Nonetheless,

between the Alien Act of 1798 (only briefly in force) and the Immigration Act of 1917, which imposed a literacy test, virtually nothing was done to restrict European immigration to the United States. Although migrants had to register with ships' masters (after 1819) and had to be screened for diseases, criminal records, or the possibility of becoming a public charge (after 1891), there was basically an "open door". A notable exception was the Chinese Exclusion Act of 1882 (renewed 1892 and made indefinite in 1902), directly aimed at cutting off the flow of East Asian migrants to the west coast. The literacy test imposed in 1917 over Woodrow Wilson's veto was merely a forerunner of the much more restrictive Emergency Immigration Act of 1921, which imposed quotas based on national origins. Immigration was limited annually to 3% of each nation's share of the American population in 1910. An even more narrow law was enacted in 1924 which reduced the annual quota per country to 2% of a nation's share of the U.S. population in 1890, clearly favoring the nations of northern and western Europe at the expense of the areas of the "new" immigration. All immigration from East Asia was terminated. In 1929, the quotas were ultimately to be based on the census of 1920 but for a total not to exceed 150,000 per year, in contrast to the levels in excess of a million a year in the years just prior to World War I.⁸⁴

It is interesting to speculate why, after such a long period of open immigration and of strong business and employer opposition to immigration restriction, that there would have been such a rapid change in direction around 1920. The cumulative reaction to the new immigration and the increase in immigration flows since 1900 likely played a role. Labor unions were gaining some legislative influence, as the instance of the Clayton Act of 1914 (exempting them from the Sherman Antitrust Act) shows. But union influence

waned after the war, as the failure of the large steel strike of 1919 and the decline in union membership in the 1920s attest. More important, the war itself, the postwar "red scare," and especially the discovery by employers that they had a large pool of lower skilled workers in the rural South were more significant. Further, the rationalization of manufacturing production was underway, reducing the need for additional labor as organizational change, further mechanization, and other technological change greatly improved productivity. For example, manufacturing output subsequently grew by 53% between 1919 and 1929, while the manufacturing labor force was virtually stationary over the same period.⁸⁵

It is true that immigrants did tend to be disproportionately in lower skill occupational groups. In 1910, the foreign-born white population was 21% of the labor force, but they were 37% of all laborers. Only 20% of them were white collar workers, as opposed to 41% of the native whites of native parentage. Relatively few of them were proprietors, especially since only a small number went into agriculture. But the foreign born and their second generation offspring did make up 44% of all white collar workers and 54% of all craftsmen and operatives.⁸⁶ Even though they did occupy a disproportionate share of the lower skill and lower status positions, they made possible, in some sense, the better paid, higher status occupations of the native white population.

Things did improve as the foreign-born white population and their children assimilated to the patterns of labor force activity, occupations, and residence of the native whites of native parentage. A series of mobility studies has been done since the 1960s on the geographic and occupation mobility of Americans. Beginning with the pioneering work of Thernstrom on

Newburyport and Boston, Massachusetts, these mobility studies have used a variety of nominal record sources (census manuscripts, city directories, voter lists, tax and property rolls) to link individual records. Although fraught with difficulties, such studies have found a high degree of geographic mobility, particularly for urban areas, in the nineteenth and early 20th centuries. For Newburyport, almost the entire population of 1850 had gone by 1880, both through natural attrition and through migration (as well as linkage failure). For Boston in the period 1880-1920, net migration made up two thirds of the population growth. There was less occupational mobility, both within the lifetimes of individuals and also across generations, but the results have indicated significant rates of upward occupational mobility, both among the native and the foreign born. Overall about 10-30% of sons of working class fathers were able to advance to higher income and/or status positions over the period 1830-1920. Over time this would have a telling effect, and the foreign born, even the relatively unskilled, did have some real prospects of upward socioeconomic progress. More recent studies, using censuses, immigrant ship lists, property rolls, pension records, and genealogies, are exploring mobility further. A national mobility study has linked about 40% of approximately 10,000 men from the 1880 to the 1900 manuscript censuses. Considerable geographic mobility was confirmed, and the rate of occupational mobility among the non-farm population was considerable, not differing greatly from those found in the middle of the 20th century.⁹⁷

SUMMARY AND CONCLUSIONS

This essay has focused on the evolution of the American population over the "long" 19th century, 1790-1920. The discussion has perforce covered fertility, marriage, mortality and both internal and international migration.

The relatively rapid population growth over this period (averaging 2.5% per year) was driven largely by high (though declining) birth rates and moderate levels of mortality, but immigration was also significant. About three quarters of the growth was due to natural increase and about a quarter to net in-migration. Over 34 million persons entered the United States between the 1790s and the end of World War I.

Family sizes were large in the early days of the republic, being about seven children per woman for the white population and between seven and eight children per black slave mother in the 1850s. There was a sustained decline in white birth rates from at least 1800 and for black birth rates from at least mid-century. The fertility decline proceeded in both rural and urban areas. Conventional explanations for the fertility transition have involved such factors as the rising cost of children because of urbanization, growth of incomes and non-agricultural employment, increased value of education, rising female employment, child labor laws and compulsory education, and declining infant and child mortality. In addition, changing attitudes towards large families and towards contraception, as well as better contraceptive technologies, are also cited. Such structural explanations do well for the American experience since the late nineteenth century, but they are less appropriate for the fertility decline in rural, agrarian areas prior to about 1870. The increased scarcity and higher cost of good agricultural land has been proposed as a prime factor, although the explanation remains controversial. The standard explanations are also not adequate to explain the post World War II "baby boom" and subsequent "baby bust". One fruitful alternative has been to examine the increase of non-agricultural opportunities in farming areas, and the effect of these opportunities on parent-child

bargaining over bequests and old age support for the parents.

Mortality did not begin its sustained decline until the 1870s. Prior to that, death rates fluctuated in response to periodic epidemics and changes in the disease environment. There is even evidence of rising death rates during the 1840s and 1850s. Expectation of life at age 20 may have fallen by 10 percent between the 1830s and the 1850s.⁹⁹ The demographic transition in the United States was thus characterized by the fertility decline prior to the mortality decline, unlike the standard model. The mortality decline since the late 19th century was particularly promoted by improvements in public health and sanitation, especially better water supplies and sewage disposal. The improving diet, clothing, and shelter of the American population over the period since about 1870 also played a role. Specific medical interventions beyond more general environmental public health were not as important until well into the 20th century. While it is difficult to disentangle the precise effects of these different causal factors, much of the mortality decline was due to rapid reductions in specific infectious and parasitic diseases, including tuberculosis, pneumonia, bronchitis, and gastrointestinal infections, as well as such well-known conditions as cholera, smallpox, diphtheria, and typhoid fever. In the 19th century, urban areas were especially unhealthy places, especially the largest cities. Rural areas and small towns had the most salubrious environment. These circumstances began to change by about the 1890s, when the largest cities instituted effective large public works sanitation projects and public health administration. The largest cities then experienced the most rapid improvements in death rates. Rural-urban mortality differentials have converged and largely disappeared, unlike those between whites and blacks.

Migration has been a fact of life for Americans. Within the nation's boundaries, there has been significant movement east to west, following the frontier (until the late 19th century); from rural to urban areas; and, later, from central cities to suburbs, from South to North, and ultimately to the "sun belt." These developments have been responsible for changing the United States from a rural to an urban nation: from only 5% urban in 1790 to over half urban in 1920 and over three quarters urban today. The population shifted from the original areas of settlement on the Atlantic coast to the center of the nation and later to the Pacific and Mountain states. Migration from abroad, first from western and northern Europe and then, after about 1890, from central, eastern, and southern Europe, came in waves in response to upswings in business cycles and the expansion of economic opportunities in the United States. This flood of immigrants both directly augmented population growth rates and indirectly acted to raise birth rates, before it was severely restricted in the 1920s by legislation and subsequently by the Great Depression. But it left an indelible stamp on the American economy, society, and culture.

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FOOTNOTES

1. Thomas Robert Malthus, An Essay Concerning the Principle of Population (1798), ch. VI. Reproduced in Thomas Robert Malthus, An Essay on the Principle of Population and A Summary View of the Principle of Population, edited with and introduction by Antony Flew (Baltimore, MD: Penguin Books, 1970), p. 105.
2. See chapter 5 of Volume I "Population, Labor, and General Economic Development" for a treatment of the demography of colonial British North America in the 17th and 18th centuries.
3. For a survey of various theories of the fertility transition, see George Alter, "Theories of Fertility Decline: A Non-Specialist's Guide to the Current Debate on European Fertility Decline," in John R. Gillis, Louise A. Tilly, and David Levine, eds., The European Experience of Declining Fertility, 1850-1970 (Oxford: Blackwell, 1992), pp 13-27.
4. See Ansley J. Coale and Susan Cotts Watkins, eds., The Decline of Fertility in Europe (Princeton, NJ: Princeton University Press, 1986).
5. See examples in Maris Vinovskis, ed., Studies in American Historical Demography (New York: Academic Press, 1979), passim. See also Robert V. Wells, Uncle Sam's Family: Issues in and Perspectives on American Demographic History (Albany, NY: SUNY Press, 1985).
- 6a. Robert V. Wells, The Population of the British Colonies in America before 1776 (Princeton, NJ: Princeton University Press, 1975).
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Wells, "Family Size and Fertility Control in Eighteenth-Century America: A Study of Quaker Families," Population Studies, Vol. 25 No. 1 (March, 1971), pp. 73-82. The Population of the British Colonies in America before 1790, pp. 141-142. The relationship between the proportion of children aged 0-15 in the total population and a crude child-woman ratio (children aged 0-15 per 1000 women aged 16 and over) was calculated for the white population of the United States for 1800, 1810, and 1820. The average relationship to crude birth rates and total fertility rates in Table 3 (below) was calculated and applied to proportions of children and the child-woman ratios in the available colonial censuses from the U.S. Bureau of the Census, Historical Statistics of the United States from Colonial Times to 1970 (Wash., DC: G.P.O., 1975), pp. 1169-1171. The resulting crude birth rates were in the range 45-60 and the total fertility rates in the range 6-7.

6c. Kenneth Lockridge, "The Population of Dedham, Massachusetts, 1636-1736," Economic History Review, Vol. 19, second series (August, 1966), pp. 324-339. Vinovskis, Studies in American Historical Demography, pp. 185-202. Wells, The Population of the British Colonies in America before 1790, pp. 141-142. Lois Green Carr, "Emigration and the Standard of Living: The Seventeenth Century Chesapeake," Journal of Economic History, Vol 52, No. 2 (June, 1992), Table 1.

7. For a recent history of the American census, see Margo J. Anderson, The American Census: A Social History (New Haven, CT: Yale University Press, 1988).

8. The original enumerators' manuscripts exist for all the population censuses except 1890 and for many of the states for the censuses of manufacturing and agriculture for 1850-1880. The 1890 census returns were destroyed in a fire in 1921. The population schedules are available on

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9. Henry J. Dubester, State Censuses: An Annotated Bibliography of Censuses of Population Taken after the Year 1790 by States and Territories of the United States (Wash, DC: G.P.O., 1948).

10. See Wells, Uncle Sam's Family; Vinovskis, Studies in American Historical Demography, pp. 2-11.

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14. Ansley J. Coale and Melvin Zelnic, New Estimates of Fertility and Population in the United States: A Study of Annual White Births from 1855 to 1960 and of Completeness of Enumeration in the Censuses from 1880 to 1960 (Princeton, NJ: Princeton University Press, 1963); Condran and Crimmins, "A Description and Evaluation of Mortality Data in the Federal Census"; Social Science History, Vol. 15, No. 4 (Winter, 1991), especially papers by Donald Parkerson and Richard Steckel.

15. Henry S. Shryock, Jacob S. Siegel, and associates, The Methods and Materials of Demography (Washington, DC: G.P.O., 1971), Vol 1, p. 109, based partly on the estimates of Coale and Zelnic, New Estimates.

16. Donald H. Parkerson, "Comments on the Underenumeration of the U.S.

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17. Shryock and Siegel, Methods and Materials of Demography, p. 404.

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25. That is, $RTI = CBR - CDR + RNM$, and $CBR - CDR = RNI$.

26. See sources to Table 1.

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31. Calculations of the singulate mean age at marriage (SMAM) and of the proportion never marrying for the period 1890 to 1910 are based on published federal census data. SMAM is calculated by Hajnal's method (see Shryock and Siegel, Methods and Materials, pp. 294-295). The results for 1880 are based on a preliminary sample of the 1880 census made available by Steven Ruggles of the University of Minnesota. The overall results for this period are:

	SMAM		% Single at 45-54	
	Male	Female	Male	Female
1880	26.5	23.0	6.9	7.3
1890	27.6	23.6	9.1	7.0
1900	27.4	23.6	10.4	7.8
1910	26.7	23.1	11.1	8.5
1920	25.9	22.5	12.0	9.6

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33. See Table 3 and evidence presented in Richard Steckel, "The Fertility of American Slaves," Research in Economic History, Vol 7 (1982), pp. 239-286.

34. A problem for the analysis of the fertility of the native born versus

the foreign born is that most of the children of the foreign born were native born. Hence census tabulations by age, sex, race, and nativity cannot provide the appropriate child-woman ratios. One solution is reported in the text, namely asking women questions in censuses on their fertility history. This was first done in New York in 1865, in Massachusetts in 1885, and in the federal censuses of 1890-1910 and again from 1940 onwards. No results were published for the federal censuses of 1890 and 1900, although the public use sample of the 1900 manuscripts (as well as those of 1910) permits analysis. Another solution is to use the micro-data from the census manuscripts to estimate own-children birth rates by nativity of mother. For examples, see Tamara K. Hareven and Maris A. Vinovskis, "Marital Fertility, Ethnicity, and Occupation in Urban Families: An Analysis of South Boston and the South End in 1880," Journal of Social History, Vol 8 (1975), pp. 69-93; Michael R. Haines, Fertility and Occupation: Population Patterns in Industrialization (NY: Academic Press, 1979), ch. IV and "American Fertility in Transition: New Estimates of Birth Rates in the United States, 1900-1910," Demography, Vol 26, No. 1 (February, 1990), pp. 137-148. Finally, there are some 19th and early 20th century birth registration data reported by mother's nativity. These reveal substantially higher birth rates for the foreign born for Massachusetts and other states from the late 19th century. Much was due to higher marriage incidence for foreign women. See J.J. Spengler, "The Fecundity of Native and Foreign-Born Women in New England," Brookings Institution Pamphlet Series, No. II (1) (1930).

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65. Abbott, The Past and Present Condition of Public Hygiene, p. 71.

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given are from the surviving children method. They differ from the results in Table 3 for whites because the numbers in Table 3 apply only to the Death Registration Area (DRA), while those given here apply to the entire nation. Since the black population in the DRA was predominantly urban (82%), black mortality was higher there than for the whole U.S. Compare the DRA infant mortality rate of 234 and an expectation of life at birth of 33.8 years for blacks with the national estimates of 170 and 41.8 respectively. On the other hand, the results for the white population are virtually identical between the DRA official data and the census-based estimates (DRA: infant mortality rate 121 and expectation of life at birth 49.6 years; Census-based estimates: 124 and 49.5 years).

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75. Richard Steckel, "The Economic Foundations of East-West Migration

during the 19th Century," Explorations in Economic History, Vol 20, No. 1 (January, 1983), pp. 14-36. This does not explain why the antebellum South failed to urbanize and industrialize more rapidly. See Fred Bateman and Thomas Weiss, A Deplorable Scarcity: The Failure of Industrialization in the Slave Economy (Chapel Hill, NC: University of North Carolina Press, 1981).

76. Morton Owen Schapiro, Filling Up America: An Economic-Demographic Model of Population Growth and Distribution in the Nineteenth-Century United States (Greenwich, CT: JAI Press, 1986); Frederick Jackson Turner, "The Significance of the Frontier in American History," paper read at the meeting of the American Historical Association, Chicago, July 12, 1893; John R. Stilgoe, Borderland: Origins of the American Suburb, 1820-1939 (New Haven, CT: Yale University Press, 1988).

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77b. The relative decline of the South took place despite the high natural increase of the black population which raised the share of blacks from 35% of the population in 1790 to 37% in 1860. Legal importation of slaves was permitted up to 1808, but the real factor in black population growth was excess of births over deaths.

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79b. One exception was the 1930s, when the Great Depression reduced demand for labor and, consequently, reduced the flow of migrants from abroad. The sex ratio changed in favor of females in that decade as opportunities for new employment for males fell drastically.

79c. J.D. Gould, "European Inter-Continental Emigration, 1815-1914: Patterns and Causes."

79d. See, for example, Timothy J. Hatton and Jeffrey J. Williamson, "What Drove the Mass Migrations from Europe in the Late Nineteenth Century?" National Bureau of Economic Research, Working Paper Series on Historical Factors in Long Run Growth, No. 43 (November, 1992).

80a. Richard A. Easterlin, "Influences in European Overseas Emigration before World War I," Economic Development and Cultural Change, Vol. IX (April, 1961), pp. 331-353; "...typically, the swings in migration were a response to corresponding swings in the demand for labor in the United States," Richard A. Easterlin, Population, Labor Force, and Long Swings in Economic Growth: The American Experience (NY: National Bureau of Economic Research, 1968), pp. 30-31 and Ch. 2; Larry Neal, "Cross-spectral Analysis of Long Swings in Atlantic Migration," Research in Economic History, Vol 1 (1976), pp. 260-297; J.D. Gould, "European Inter-Continental Emigration, 1815-1914: Patterns and Causes."

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Return Migration from the U.S.A."; "European Inter-Continental Emigration: The Role of 'Diffusion' and 'Feedback'".

81. Northern and western Europe are defined here as Great Britain (England, Wales, Scotland); Ireland; the German states and, after 1871, the German Empire; Sweden; Norway; Denmark; Belgium, the Netherlands; France; and Switzerland. Central, eastern, and southern Europe would include Austria-Hungary; Russia; Italy; Greece; the Balkan states; European parts of the Ottoman Empire; Spain; and Portugal.

82. Thompson and Whelpton, Population Trends in the United States, p. 91.

83a. Brian R. Mitchell, European Historical Statistics, 1750-1975, second revised edition (NY: Facts on File, 1981), Table B8.

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84. E.P. Hutchinson, Legislative History of American Immigration Policy, 1798-1965 (Phila., PA: University of Pennsylvania Press, 1981).

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87. A summary of these mobility studies (up to 1977) may be found in Hartmut Kaelble, Historical Research on Social Mobility: Western Europe and the USA in the Nineteenth and Twentieth Centuries (NY: Columbia University Press, 1981). The results for Massachusetts refer to Stephan Thernstrom, Poverty and Progress: Social Mobility in a Nineteenth Century City (Cambridge, MA: Harvard University Press, 1964) and The Other Bostonians: Poverty and Progress in the

American Metropolis, 1880-1970 (Cambridge, MA: Harvard University Press, 1973). For a recent study using genealogies, see Adams and Kasakoff, "Migration and the Family in Colonial New England." For more recent census linkage studies, see Richard Steckel, "Household Migration and Rural Settlement in the United States, 1850-1860," Explorations in Economic History, Vol. 26, No. 2 (April, 1989), pp. 190-218 and David W. Galenson and Clayne L. Pope, "Economic and Geographic Mobility on the Farming Frontier: Evidence from Appanoose County, Iowa, 1850-1870," Journal of Economic History, Vol. 49, No. 3 (Sept., 1989), pp. 635-656 and "Precedence and Wealth: Evidence from Nineteenth-Century Utah," in Goldin and Rockoff, Strategic Factors in Nineteenth Century American Economic History, pp. 225-242. The 1880-1900 national panel study is discussed in Avery M. Guest, "Notes from the National Panel Study: Linkage and Migration in the Late Nineteenth Century," Historical Methods, Vol. 20, No.2 (Spring, 1987), pp. 63-77 and Avery M. Guest, Nancy S. Landale, and James McCann, "Intergenerational Occupational Mobility in the Late Nineteenth Century United States," (unpublished paper).

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TABLE 1. COMPONENTS OF POPULATION GROWTH, UNITED STATES, 1800-1980.
(Rates per 1000 mid-period population per year)(a)

PERIOD	Average Population (000s)	RTI	CBR	CDR	RNI(b)	RNM(b)	RNM as % of RTI
1790-1800	4,520	30.08			26.49	3.59	11.9%
1800-1810	6,132	31.04			26.85	4.19	13.5%
1810-1820	8,276	28.62			24.70	3.92	13.7%
1820-1830	11,031	28.88			26.93	1.95	6.8%
1830-1840	14,685	28.27			23.67	4.60	16.3%
1840-1850	19,686	30.65			22.88	7.77	25.3%
1850-1860	26,721	30.44			20.35	10.09	33.2%
1860-1870	35,156	23.62			17.64	5.98	25.3%
1870-1880	44,414	23.08	41.16	23.66	17.50	5.58	24.2%
1880-1890	55,853	22.72	37.03	21.34	15.69	7.03	30.9%
1890-1900	68,876	18.83	32.22	19.44	12.78	6.06	32.2%
1900-1910	83,245	19.08	30.10	17.27	12.83	6.25	32.8%
1910-1920	98,807	14.86	27.15	15.70	11.45	3.41	23.0%
1920-1930	114,184	14.01	23.40	11.08	12.32	1.68	12.0%
1930-1940	127,058	7.01	18.39	11.18	7.21	-0.20	-2.9%
1940-1950	140,555	13.50	22.48	10.39	12.09	1.41	10.4%
1950-1960	164,011	17.67	24.81	9.47	15.34	2.33	13.2%
1960-1970	190,857	12.27	20.26	9.55	10.71	1.56	12.7%
1970-1980	214,306	10.83	15.49	9.00	6.49	4.34	40.1%

(a) RTI=rate of total increase. CBR=crude birth rate (livebirths per 1000 population per year). CDR=crude death rate (deaths per 1000 population per year). RNI= rate of natural increase (=CBR-CDR). RNM=rate of net international migration.
(b) Rate of net migration calculated directly from net migrants 1790-1860. Gross migrants used for 1860-1870. For 1870-1980, RNM=RTI-RNI and thus is a residual. Prior to 1870, RNI is calculated as a residual (=RTI-RNM).

SOURCE:

(1) Unadjusted populations: U.S. Bureau of the Census, HISTORICAL STATISTICS OF THE UNITED STATES (Washington, DC: GPO, 1975). U.S. Bureau of the Census, STATISTICAL ABSTRACT OF THE UNITED STATES, 1990 (Washington, DC: GPO, 1990).

(2) Births & Deaths: 1870-1940: Simon Kuznets, "Long Swings in the Growth of Population and Related Economic Variables," PROCEEDINGS OF THE AMERICAN PHILOSOPHICAL SOCIETY, Vol. 102 No. 1 (February, 1958), pp. 25-52.

1940-1980: Same as in (1)

(3) Net Migrants: 1790-1820: Henry A. Gemery, "European Emigration to North America: Numbers and Quasi-Numbers," PERSPECTIVES IN AMERICAN HISTORY, New Series, 1 (1984), supplemented by estimates of slave imports from Philip Curtin, THE ATLANTIC SLAVE TRADE: A CENSUS (Madison, WI: University of Wisconsin Press, 1969.) 1820-1860: Peter D. McClelland and Richard J. Zeckhauser, DEMOGRAPHIC DIMENSIONS OF THE NEW REPUBLIC: AMERICAN INTERREGIONAL MIGRATION, VITAL STATISTICS AND MANUMISSIONS, 1800-1860 (New York: Cambridge University Press, 1982) and also supplemented by estimates of slave imports from Curtin.

TABLE 2. POPULATION BY RACE, RESIDENCE, NATIVITY, AGE & SEX, UNITED STATES, 1800-1990.
(Population in 000s)

CENSUS DATE	TOTAL	% p.a. GROWTH	WHITE	BLACK	OTHER	URBAN	%	FOREIGN-BORN	%	MEDIAN AGE	SEX RATIO(b)
1790	3,929	---	3,172	757	(NA)	202	5.1	(NA)	---	(NA)	103.8
1800	5,308	3.01	4,306	1,002	(NA)	322	6.1	(NA)	---	16.0 (a)	104.0
1810	7,240	3.10	5,862	1,378	(NA)	525	7.3	(NA)	---	16.0 (a)	104.0
1820	9,639	2.86	7,867	1,772	(NA)	693	7.2	(NA)	---	16.7	103.3
1830	12,866	2.89	10,537	2,329	(NA)	1,127	8.8	(NA)	---	17.2	103.1
1840	17,070	2.83	14,196	2,874	(NA)	1,845	10.8	(NA)	---	17.8	103.7
1850	23,192	3.06	19,553	3,639	(NA)	3,544	15.3	2,245	9.7	18.9	104.3
1860	31,443	3.04	26,923	4,442	79	6,217	19.8	4,104	13.1	19.4	104.7
1870	39,819	2.36	33,589	4,880	89	9,902	24.9	5,567	14.0	20.2	102.2
1880	50,156	2.31	43,403	6,581	172	14,130	28.2	6,680	13.3	20.9	103.6
1890	62,948	2.27	55,101	7,489	358	22,106	35.1	9,250	14.7	22.0	105.0
1900	75,994	1.88	66,809	8,834	351	30,160	39.7	10,341	13.6	22.9	104.4
1910	91,972	1.91	81,732	9,828	413	41,999	45.7	13,516	14.7	24.1	106.0
1920	106,711	1.49	94,821	10,463	427	54,158	50.8	14,020	13.1	25.3	104.0
1930	122,755	1.40	110,287	11,891	597	68,955	56.2	14,283	11.6	26.5	102.5
1940	131,669	0.70	118,215	12,866	589	74,424	56.5	11,657	8.9	29.0	100.7
1950	150,697	1.35	134,942	15,042	713	96,468	64.0	10,431	6.9	30.2	98.6
1960	179,823	1.77	158,832	18,872	1,620	125,269	69.7	9,738	5.4	29.5	97.1
1970	203,302	1.23	178,098	22,580	2,883	149,325	73.4	9,619	4.7	28.1	94.8
1980	226,546	1.08	194,713	26,683	5,150	167,051	73.7	14,080	6.2	30.0	94.5
1990	248,710	0.93	208,704	30,483	9,523	187,053	75.2	21,632	8.7	32.8	95.1

(a) White population.

(b) Males per 100 females.

SOURCE: U.S. Bureau of the Census, HISTORICAL STATISTICS OF THE UNITED STATES (Washington, DC: GPO, 1975). U.S. Bureau of the Census, STATISTICAL ABSTRACT OF THE UNITED STATES, 1992 (Washington, DC: GPO, 1992).

TABLE 3. FERTILITY AND MORTALITY IN THE UNITED STATES, 1800-1990.

APPROX. DATE	BIRTHRATE(a)		CHILD-WOMAN RATIO(b)		TOTAL FERTI- LITY RATE(c)		EXPECTATION OF LIFE(d)		INFANT MORTAL- ITY RATE(e)	
	WHITE	BLACK(f)	WHITE	BLACK	WHITE	BLACK(f)	WHITE	BLACK(f)	WHITE	BLACK(f)
1800	55.0		1000		7.04					
1810	54.3		1001		6.92					
1820	52.8		950	915	6.73					
1830	51.4		877	938	6.55					
1840	48.3		837	887	6.14					
1850	43.3		692	837	5.42		38.9		217.4	
1860	41.4	58.6 (g)	709	818	5.21	7.90 (g)	40.9 (k)		196.9 (k)	
1870	38.3	55.0 (h)	641	782	4.55	7.58 (h)	44.1		176.0	
1880	35.2	55.4 (i)	615	847	4.24	7.69 (i)	39.6		214.8	
		51.9 (j)				7.26 (j)				
1890	31.5	48.1	543	702	3.87	6.56	45.7		150.9	
1900	30.1	44.4	533	658	3.56	5.61	49.6	41.8 (m)	120.1	170.3 (m)
1910	29.2	38.5	508	586	3.42	4.61	51.9		113.0	
1920	26.9	35.0	495	485	3.17	3.64	57.4	47.0	82.1	131.7
1930	20.6	27.5	405	444	2.45	2.98	60.8	48.5	60.1	99.9
1940	18.6	26.7	340	415	2.22	2.87	65.0	53.9	43.2	73.8
1950	23.0	33.3	490	581	2.98	3.93	69.1	60.8	26.8	44.5
1960	22.7	32.1	546	694	3.53	4.52	70.7	63.6	22.9	43.2
1970	17.4	25.1	392	490	2.39	3.07	71.7	65.2	17.8	30.9
1980	14.9	22.1	300	367	1.75	2.32	74.4	68.1	11.0	21.4
1990	15.0	23.1 (l)	298	359	1.89	2.58 (l)	76.0	70.3	8.2	17.7 (l)

(a) Births per 1000 population per annum.

(b) Children aged 0-4 per 1000 women aged 15-44. Taken from W.S. Thompson & P.K. Whelpton, POPULATION TRENDS IN THE UNITED STATES (NY: McGraw-Hill, 1933), Table 74. Adjusted upward 5% for relative under-enumeration of white children aged 0-4 and 13% for black children for the censuses of 1800-1950.

Based on corrections made in W.H. Grabill, C.V. Kiser, and P.K. Whelpton, THE FERTILITY OF AMERICAN WOMEN (NY: Wiley, 1958), Table 6.

(c) Total number of births per woman if she experienced the current period age-specific fertility rates throughout her life.

(d) Expectation of life at birth.

- (e) Infant deaths per 1000 live births per annum.
- (f) Black and other population.
- (g) Average for 1850-59.
- (h) Average for 1860-69.
- (i) Average for 1870-79.
- (j) Average for 1880-84.
- (k) For the total population.
- (l) For 1989.
- (m) Approximately 1895.

SOURCE: U.S. Bureau of the Census, HISTORICAL STATISTICS OF THE UNITED STATES (Washington, DC: GPO, 1975). U.S. Bureau of the Census, STATISTICAL ABSTRACT OF THE UNITED STATES, 1986 (Wash., DC: GPO, 1985) & STATISTICAL ABSTRACT OF THE UNITED STATES, 1992 (Wash., DC: GPO, 1992). Ansley J. Coale & Melvin Zelnik, NEW ESTIMATES OF FERTILITY AND POPULATION IN THE UNITED STATES (Princeton, NJ: Princeton University Press 1963). Ansley J. Coale & Norfleet W. Rives, "A Statistical Reconstruction of the Black Population of the United States, 1880-1970: Estimates of True Numbers by Age and Sex, Birth Rates, and Total Fertility," POPULATION INDEX, Vol 39, No. 1 (Jan., 1973), pp. 3-36. Michael R. Haines, "The Use of Model Life Tables to Estimate Mortality for the United States in the Late Nineteenth Century," DEMOGRAPHY, Vol. 16, No. 2 (May, 1979), pp. 289-312. Samuel H. Preston & Michael R. Haines, FATAL YEARS: CHILD MORTALITY IN LATE NINETEENTH-CENTURY AMERICA (Princeton, NJ: Princeton University Press, 1991), Table 2.5

TABLE 4. POPULATION BY REGION & RESIDENCE, UNITED STATES, 1790-1920. (000s)

REGION	1790	%	1830	%	1860	%	1890	%	1920	%
TOTAL POPULATION										
New England	1,009	25.7%	1,955	15.2%	3,135	10.0%	4,701	7.5%	7,401	7.0%
Middle Atlantic	959	24.4%	3,588	27.9%	7,459	23.7%	12,706	20.2%	22,261	21.0%
East North Central	---	---	1,470	11.4%	6,927	22.0%	13,478	21.4%	21,476	20.3%
West North Central	---	---	140	1.1%	2,170	6.9%	8,932	14.2%	12,544	11.8%
South Atlantic	1,852	47.1%	3,646	28.3%	5,365	17.1%	8,858	14.1%	13,990	13.2%
East South Central	109	2.8%	1,816	14.1%	4,021	12.8%	6,429	10.2%	8,893	8.4%
West South Central	---	---	246	1.9%	1,748	5.6%	4,741	7.5%	10,242	9.7%
Mountain	---	---	---	---	175	0.6%	1,214	1.9%	3,336	3.1%
Pacific	---	---	---	---	444	1.4%	1,920	3.0%	5,878	5.5%
TOTAL	3,929	100.0%	12,861	100.0%	31,444	100.0%	62,979	100.0%	106,021	100.0%
URBAN POPULATION										
New England	76	37.8%	274	24.3%	1,148	18.5%	2,894	13.1%	5,620	10.4%
Middle Atlantic	83	41.3%	511	45.3%	2,639	42.4%	7,372	33.3%	16,784	30.9%
East North Central	---	---	37	3.3%	974	15.7%	5,112	23.1%	13,050	24.1%
West North Central	---	---	5	0.4%	290	4.7%	2,306	10.4%	4,726	8.7%
South Atlantic	42	20.9%	227	20.1%	615	9.9%	1,728	7.8%	4,336	8.0%
East South Central	---	---	28	2.5%	237	3.8%	817	3.7%	1,994	3.7%
West South Central	---	---	46	4.1%	215	3.5%	716	3.2%	2,969	5.5%
Mountain	---	---	---	---	18	0.3%	356	1.6%	1,218	2.2%
Pacific	---	---	---	---	82	1.3%	805	3.6%	3,555	6.6%
TOTAL	201	100.0%	1,128	100.0%	6,218	100.0%	22,106	100.0%	54,252	100.0%
RURAL POPULATION										
New England	933	25.0%	1,681	14.3%	1,987	7.9%	1,807	4.4%	1,780	3.4%
Middle Atlantic	875	23.5%	3,077	26.2%	4,820	19.1%	5,334	13.1%	5,478	10.6%
East North Central	---	---	1,433	12.2%	5,953	23.6%	8,366	20.5%	8,425	16.3%
West North Central	---	---	136	1.2%	1,880	7.5%	6,626	16.2%	7,818	15.1%
South Atlantic	1,810	48.6%	3,419	29.1%	4,750	18.8%	7,130	17.4%	9,654	18.6%
East South Central	109	2.9%	1,788	15.2%	3,784	15.0%	5,612	13.7%	6,899	13.3%
West South Central	---	---	200	1.7%	1,532	6.1%	4,025	9.8%	7,273	14.0%
Mountain	---	---	---	---	157	0.6%	858	2.1%	2,118	4.1%
Pacific	---	---	---	---	363	1.4%	1,115	2.7%	2,322	4.5%
TOTAL	3,727	100.0%	11,734	100.0%	25,226	100.0%	40,873	100.0%	51,767	100.0%

SOURCE: U.S. Bureau of the Census, U.S. CENSUS OF POPULATION, 1970 (Wash, DC: GPO, 1972),
Vol. I, Part 1, Section 1, Tables 8 & 18. Totals have been adjusted for rounding errors.

TABLE 5. RECORDED IMMIGRATION TO THE UNITED STATES BY ORIGIN, 1819-1920,
(Immigration in '000s).

PERIOD	ORIGINS:							AFRICA				
	TOTAL	EUROPE	North & West	East & Central	South	Other AMERICA	ASIA		AUSTRALIA NEW ZEALAND	PACIFIC ISLANDS		
1819-20	8	8	8									
1821-30	143	99	96		3		12					
1831-40	599	496	490		5		33					
1841-50	1,713	1,598	1,592	1	5		62					
1851-60	2,598	2,453	2,431	2	20		75					
1861-70	2,315	2,065	2,032	12	21		167					
1871-80	2,812	2,272	2,070	126	75	1	404	10			1	
1881-90	5,247	4,737	3,779	627	331	1	427	7			6	
1891-1900	3,688	3,559	1,643	1,211	704		39	3			1	
1901-10	8,795	8,136	1,910	3,915	2,310	1	362	12			1	7
1911-20	5,736	4,377	1,998	1,918	1,452	8	1,144	12			1	8

PERIOD	PERCENTAGE SHARES	
	EUROPE	AFRICA
1819-20	100.0%	100.0%
1821-30	69.2%	67.1%
1831-40	82.8%	81.8%
1841-50	93.3%	92.9%
1851-60	94.4%	93.6%
1861-70	89.2%	87.8%
1871-80	80.8%	73.6%
1881-90	90.3%	72.0%
1891-1900	96.5%	44.5%
1901-10	92.5%	21.7%
1911-20	76.3%	17.4%

PERIOD	PERCENTAGE SHARES	
	Other AMERICA	ASIA
1819-20	0.0%	0.0%
1821-30	2.1%	8.4%
1831-40	0.8%	5.5%
1841-50	0.3%	3.6%
1851-60	0.8%	2.9%
1861-70	0.9%	7.2%
1871-80	2.7%	14.4%
1881-90	6.3%	8.1%
1891-1900	19.1%	1.1%
1901-10	26.3%	4.1%
1911-20	25.3%	19.9%

SOURCE: Conrad Taeuber & Irene B. Taeuber, THE CHANGING POPULATION OF THE UNITED STATES (NY: Wiley, 1958), pp. 53 & 57. Prior to 1871, totals are not always for calendar years.

FIGURE 1.
Immigrants to the U.S., 1820-1940.

