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EDITED BY DORA L. COSTA

HEALTH AND LABOR FORCE PARTICIPATION OVER THE LIFE CYCLE

Evidence from the Past



Health and Labor Force Participation over the Life Cycle



**A National Bureau
of Economic Research
Conference Report**



**Health and Labor Force
Participation over the
Life Cycle**
Evidence from the Past

Edited by

Dora L. Costa

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Preface

The twentieth century witnessed remarkable improvements in the health and longevity of older Americans. At the beginning of the twentieth century a fifty-five-year-old American man could expect to live seventeen more years. By century's end he could expect to live twenty-three more years. This increase in life expectancy was extremely slow at first, rising by only about half a year during the first three decades of the twentieth century. More recently it has been more rapid, rising by four years in the last four decades of the century. Whether the increase in life expectancy has been accompanied by increases in health has been the subject of much debate among scholars (Crimmins 1990; Cutler and Richardson 1997; Manton, Corder, and Stallard 1997; Verbrugge 1984; Waidmann, Bound, and Schoenbaum 1995), but the preponderance of the evidence suggests that the overall trend is one of improving health. Particularly striking is the high burden of chronic disease and of functional impairments at older ages at the beginning of the twentieth century, a burden that lightened only slowly during the first half of the twentieth century but more rapidly later on (Costa 2000, 2002, 2003; Fogel and Costa 1997).

The increase in life expectancy in the United States has raised issues about the fiscal solvency of our health care and pension systems. The net effect of increases in life expectancy and improvements in health on the aggregate cost of health care remains uncertain. More than 80 percent of men older than sixty-four are retired, and continued increases in the share of the population over age sixty-four seem likely, given current fertility and mi-

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gration projections, because of the continuing long-term decrease in the probability of dying.

Attempts to forecast the paths of health care and pension costs over several decades have led researchers to pay increasing attention to the historical record. The past is still with us both because older generations are still with us and because physiological and economic processes have a long reach. Each cohort carries with it a set of expectations, values, human capital, and health capital, often formed at very young ages, and transmits these to future generations. The oldest generation alive today was born when life expectancy at birth was only fifty. A growing body of evidence indicates that chronic disease at older ages and premature older-age mortality are, to a considerable extent, the result of exposure to infectious disease, occupational hazards, malnutrition, and other types of biomedical and socioeconomic stress throughout the life cycle and particularly early in life and that health capital is transmitted to future generations through the mother's womb (Barker 1992, 1994; Costa 2000; Doblehammer and Vaupel 2001; Elo and Preston 1992; Emmanuel et al. 1999; Manton, Corder, and Stallard 1997).

The need to understand changes in health and in retirement rates has led to the creation of several longitudinal surveys, including the Framingham Heart Study, the Panel Study of Income Dynamics; the Retirement History Longitudinal Survey; the National Long Term Care Survey; and the Health and Retirement Study. These surveys, however, generally interview individuals starting only in middle age and cover only the latter half of the twentieth century, when most of the increases in retirement rates and improvements in elderly health and longevity were already well under way. These data sets may not provide a long enough period of observation to differentiate adequately between short-term fluctuations and underlying long-term trends over the twentieth century.

Economic historians have recently begun to create data sets that will help us understand health trends in the past. These have established that past populations were shorter-lived, smaller, and lighter, and that they faced a heavy disease burden in old age. Among Union Army veterans aged sixty to seventy-four in 1910, more than one-third had difficulty walking, almost one-third had valvular heart disease, more than half had arthritis, and more than one-third had decreased breath and adventitious sounds (Costa 2000, 2002). The high prevalence of chronic conditions among these men was directly related to such infectious diseases as rheumatic fever, respiratory infections, typhoid, and malaria and to such occupational hazards as exposure to dust and fumes and the adverse effects of manual labor in an unmechanized society (Costa 2000). High disease prevalence combined with the inefficacy of medical care led to such functional limitations as difficulty in walking (Costa 2002).

Anthropometric measures suggest that even at younger ages, men in the

past did not fare well. Union Army soldiers in their thirties and Union Army veterans in their late fifties and early sixties had an average body mass index (BMI) of only 23, compared to one of 26 for men in the same age groups in 1961 (Costa and Steckel 1997), implying that net nutritional status was poorer in the past. The abundant information that we have on adult heights, a measure of net nutritional status during the growing years, suggests that health cycled in the past. Troops who fought in the French and Indian Wars and in the American Revolution nearly attained the heights of those born in the 1930s (roughly 175 cm), but then average height fell by 4 cm in the ensuing half-century, reaching a trough among those born in the 1880s before rising 6 cm for those cohorts born in the middle of the twentieth century. Life expectancy at age ten underwent similar cycles. Explanations include the increase in infectious disease with the rise of immigration and internal migration, growing crowding with urbanization and the spread of factories, and declines in nutritional intake (Haines, Craig, and Weiss 2000; Costa and Steckel 1997; Fogel 1986).

Economic historians have also created data sets to help us understand trends in migration and in labor force participation in the past. Steckel (1989) established the east-west pattern, along a very similar latitude, of migration in the mid-nineteenth century. As the century progressed, rural-to-urban migration became increasingly important even though city dwellers faced higher mortality rates from infectious disease. Despite their poor health, men in the past spent a much greater percentage of their lives in the labor force than do men today. Labor force participation rates of men older than sixty-four were 84 percent in 1870 but by 1920 had fallen to 60 percent, and by 1940 to 42 percent (Costa 1998). Since the mid-1980s labor force participation rates have fluctuated between 15 and 18 percent (Bureau of Labor Statistics Series LFU606501, available at <http://www.bls.gov/>). Costa argued that increases in income explain much of the rise in retirement rates, but that over time men have become less responsive to changes in income. That is, the income elasticity of retirement has fallen, perhaps because of rising incomes, changes in social norms, or the growth of a retirement lifestyle.

The papers in this volume all use new data that help us obtain a better understanding of health, migration, and work in the past. Joseph P. Ferrie's chapter 2 uses merged mortality and population schedules from the United States federal censuses of 1850 and 1860. These data on 175,000 individuals enable him to examine the link between wealth and mortality.

The other papers in this volume are based largely upon a unique longitudinal database that covers the life histories of men born between 1820 and 1850, and who reached age fifty-five between 1875 and 1905. These data allow researchers to extend their studies of aging patterns to earlier cohorts who retired under very different institutions and who grew old when infectious disease was still common, when most men labored in manual jobs, and

when medicine could provide diagnoses but few cures. The sample is based upon 35,570 men out of a randomly drawn sample of 39,616 white males who were mustered into the Union Army during 1861–65. Socioeconomic and biomedical histories of the recruits from childhood to death were created by linking information from different sources, including military records, pension records, reports from examining surgeons, and the 1850, 1860, 1900, and 1910 censuses. Work is currently in progress on linking these men to the 1880 census. Auxiliary data sets that provide epidemiological information on cities and counties have been collected as well (the data are available for download from <http://www.cpe.uchicago.edu>).

How a data set with 15,000 variables on 35,570 individuals was created from manuscript records, many of them free-form, barely legible doctors' examinations, is the subject of chapter 2 in this volume, by Larry T. Wimmer. Much of the credit goes to Robert Fogel's unwillingness to take no for answer, even when it was clear that the task of collecting the data was much more complex and time consuming than anyone had previously imagined. At least as much of the credit goes to Wimmer, who led the data collection, patiently explaining to Fogel what could and could not be done. Without his efforts, the data would not exist. All of us who have used the data in our research owe him a very large debt.

While the Union Army data is an unusually rich data source, one of its disadvantages is that we cannot examine the mortality experiences of women, children, and Southerners. By using manuscript schedules from the 1850 and 1860 mortality censuses for rural populations, Ferrie's paper sheds light on the experience of these groups. By linking individuals found in the population censuses to the mortality censuses, Ferrie is also able to bring new evidence to bear on the old question of the role of socioeconomic factors on mortality. To date, work on historical populations suggests that the relationship between mortality and income was weak, but became stronger in the twentieth century. Low or negative time-series correlations between income or real wages and mortality rates have been reported for historical data in countries such as England and Italy (Livi-Bacci 1991; Kunitz and Engerman 1992). Among groups that in the United States have been studied at the individual level, the relationship between wealth and survival rates suggests an egalitarian pattern of death. Wealth conveyed no systematic advantage for survival of women and children in households matched in the 1850 and 1860 censuses (Steckel 1988; Davin 1993). Preston and Haines (1991) report that race and place of residence were the most important correlates of child survival in the late nineteenth century. Unlike previous researchers, Ferrie is able to examine mortality by cause for all age groups over a one-year period. His findings show that even when the United States was largely rural and agricultural, when money could not buy access to sophisticated medical care, health differentials by wealth were substantial.

Chulhee Lee's chapter 3 provides insights into mortality patterns in an environment in which infectious and parasitic diseases are common. Union Army camps provide a unique opportunity to examine the mortality effects of being thrust into a high-disease environment. Lee finds that prior exposure to unfavorable epidemiological environments reduced the chances of contracting and dying from disease while in service. Recruits at particularly high risk were farmers and rural residents, the native-born, and those from counties with high child death rates. Wealth reduced the chances of contracting a disease but had no favorable effects on mortality. Lee's results suggest that one reason researchers report such egalitarian patterns of death in the nineteenth century is that it may be hard to identify the effect of wealth under a very severe disease environment in which acute infectious diseases are common. The effects of other factors, such as differences in immunity status or rates of exposure, may dominate the effect of wealth.

Daniel Scott Smith's chapter 4 also examines the roles of prior exposure to disease and individual characteristics on mortality while in the army. Examining companies from New York State, he uses both the Union Army data and published records that provide crude death rate measures, rejection rates, and information on the region in which soldiers served. By examining published sources he can compare the mortality of officers and enlisted men. His findings suggest that simple self-protection measures such as better food and latrines led to a much lower mortality rate for officers than for enlisted men. He also finds that prior exposure to disease was important. The healthier and wealthier were not unambiguously more likely to live than the less healthy and the poorer.

In chapter 5, Sven E. Wilson and Clayne L. Pope examine the effects of family and community variables on the height of recruits. Data on heights provides the most abundant evidence on long-term health trends because height was recorded by military organizations to help identify deserters, to assess fighting strength, and to ensure that soldiers received their proper pay. Adult height depends upon nutritional intake and upon the demands made on that nutritional intake by disease, climate, and work effort during the growing years. In the United States, occupational differences in stature were relatively small by European standards, but widened in the first half of the nineteenth century at the same time that average heights fell. Wilson and Pope find that among Union Army soldiers linked to the 1860 census, urbanization and region were particularly important predictors of height probably because urban areas were centers of infectious disease. Farmers had a height advantage even in remote areas, suggesting that access to food was also important. They also find a positive relation between wealth and height at low levels of wealth. Finally, they also find that movers who are the children of the native-born are shorter than nonmovers, perhaps because migration to the frontier states contributed to environmental stress among children.

Sven E. Wilson's paper on respiratory disease (ch. 6) turns to examining the health of Union Army veterans at older ages. He finds that the prevalence of respiratory disease increased between 1895 and 1910. Several factors could explain this increase: Urbanization (and therefore exposure to respiratory illnesses) increased, the continued growth of manufacturing decreased both indoor and outdoor air quality, cigarette smoking became increasingly popular, and later cohorts suffered worse early childhood health and nutrition (as evidenced by the decline in height and the increase in mortality). During early infancy, when the alveoli are still growing and expanding, a respiratory infection will retard infant growth and lead to worsened lung capacity at late adult ages, a condition associated with respiratory disorders. Although Wilson cannot examine the impact of respiratory infections in early childhood, he finds that having had a respiratory infection during the war, when the veteran was a young adult, is the strongest predictor of respiratory disease later on. His findings suggest that life-cycle factors should be further investigated in explaining cycles in health.

In chapter 7, Werner Troesken and Patricia E. Beeson turn to health hazards at adult ages in large cities. Most researchers are aware of the hazards from inadequate sanitation and from crowding, but another danger that city dwellers faced was cities' use of lead water mains. Troesken and Beeson find that veterans in cities with lead water mains experienced greater dizziness and ear problems. Although they did not disproportionately suffer from even more serious sequelae, such as kidney failure, this may be because they had the good fortune to obtain their water from lead water mains only at later ages, not in early childhood.

Chapter 8, by Mario A. Sánchez, uses the rich residential histories available in the Union Army data to study the migration decision, the return migration decision, and the effect of migration on life expectancy. Sánchez is able to provide new numbers on the extent of migration in the United States and to estimate migration probabilities as a function of individual characteristics. He finds that migrants are especially at risk of dying from infectious disease, regardless of whether they migrated to urban or rural areas (although those who migrated to urban areas were at greater risk), suggesting that moving in and of itself was stressful. His findings suggest that the high level of internal migration experienced by the United States in the nineteenth century contributed to the observed worsening of health and that we may be underestimating the costs of migration to urban areas.

Tayatat Kanjanapitakul (ch. 9) examines the effect of pensions on the labor force participation of Union Army veterans. Although this issue was addressed in Costa (1998), the results need to be replicated on the much larger sample that is now available and extended to investigate differential responsiveness to pension income among different groups and robustness to different specifications of pension income. Kanjanapitakul finds that, in the larger sample, the elasticity of retirement with respect to pension in-

come was larger in 1910 than in 1900 and that while his estimate for 1910 was in line with Costa's results, his estimate for 1900 was much smaller. His findings suggest declines in the income elasticity of retirement date more to the second than to the first half of the twentieth century. Kanjanapitakul also finds that the elasticity varied by occupation. Professionals were most sensitive to pension income, whereas today they are the group least sensitive to pension income.

Chapter 10, by Chen Song and Louis L. Nguyen, focuses on the health and retirement decision. In virtually all studies of either recent or past populations, poor health leads to retirement. Song and Nguyen focus their research on the labor-supply effects of one specific health condition: hernias. Although easily cured today, at the beginning of the twentieth century hernias were chronic, painful, and debilitating. Song and Nguyen find that even when hernias were considered severely disabling by the doctors who examined them, they had relatively little effect on retirement rates, implying that many men continued to work in pain. However, they also find that if men were in less manually demanding occupations, then they were less likely to retire. Their results are consistent with higher costs of switching to a less manually demanding occupation for men with relatively little human capital.

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