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Chapter 4

Investing in People: Education, Workforce Development, and Health

To increase productivity and growth, we must invest in the American people. U.S. investments in universal primary and secondary education in the early 20th century, combined with medical advances in such areas as vaccines and antibiotics, contributed to strong growth throughout most of that century (Goldin and Katz 2008; Goldin 2016). Life expectancy at birth increased by nearly 30 years between 1900 and 2000 in the United States (CDC 2017), and we developed a highly skilled labor force (Goldin and Katz 2008). These gains contributed to economic growth and rising living standards across the Nation. However, increases in educational attainment and life expectancy have slowed in recent decades, and the United States is now falling behind other peer countries.

When society invests in people, the economy has more capacity to grow. In the first half of the 20th century, for example, the United States led the world in high school enrollment (Goldin and Katz 2008) and ranked among the top 10 in life expectancy.[1] In contrast, by 2017, the country had slipped to 12th in the share of 25- to 34-year-olds having completed some postsecondary education and to 29th in life expectancy at birth among members of the Organization for Economic Cooperation and Development (OECD) and its partner countries.[2] These slips in rank are not simply a matter of other

[1] CEA calculations, based on life expectancy data from Roser, Ortiz-Ospina, and Ritchie (2013).
[2] CEA calculations, based on tertiary education data from the OECD (2022a) and life expectancy data from the OECD (2022b). Tertiary education data are not available for India or China in 2017.

countries catching up, but rather of the United States falling further behind.[3] This suggests that the United States may be underinvesting in people, potentially dampening economic progress. Further, there are widespread and long-standing disparities in the United States by race, ethnicity, and gender in measures of human capital investment and accumulation. For example, in 2019, 82 percent of Asian young adults immediately enrolled in college after high school completion, compared with 58 percent of Black recent high school graduates (de Brey et al. 2021, table 302.20); and in 2018, life expectancy at birth for a Hispanic infant was seven years longer than for a non-Hispanic Black infant (Arias and Xu 2020). Inequitable access to relevant resources exacerbates the persistence of these issues. For more discussion of the structural nature of such racial and gender disparities, see chapter 5.

Economists analyze investments in people in terms of the "human capital" they produce—a concept that captures the knowledge, skills, health, and other valuable resources embodied in a person. Just as investments in physical or financial capital can reap benefits, well-timed investments in people can generate payoffs to individuals, employers, and society. Education and job training are classic examples of inputs to human capital. Other crucial investments include mental and physical health and work experience. The contributions these investments in people make to economic well-being and growth depend on how effectively the human capital they produce is developed and deployed.[4]

This chapter focuses on what is known about key investments in human capital—education, workforce development, and health—as well as policies to ensure that individuals, society, and the economy can fully benefit from

[3] In 1992, the United States ranked second in the percentage of young adults with postsecondary education, 3 percentage points behind Canada. By 2019, just over 50 percent of U.S. young adults had completed some form of postsecondary school, roughly 13 percentage points behind Canada and more than 19 percentage points below number-one-ranked South Korea. Further, in 1975, the U.S. life expectancy at birth was within three years of the top-ranked OECD country (Iceland); but by 2019, U.S. life expectancy at birth was four years below Iceland and five and a half years below that of top-ranked Japan.

[4] See Jacobs and Hipple (2018) for a discussion of inequality and intergenerational mobility with a similar frame.

these investments. The first section explains why human capital plays such an important role in economic growth. The second section discusses ways in which additional investments in education, workforce development, and health are needed to improve the development of human capital and reverse the course of the past 20 years. And the third and final section highlights several areas where changes to government policy or institutional and societal practices could help people deploy their human capital more productively.

Human Capital Is Critical for Economic Growth and Individual Well-Being

In thinking about how human capital affects individuals and the economy, researchers focus on both macroeconomic and microeconomic perspectives. From the macroeconomic perspective, human capital improvements are a key factor in generating economic growth; and, ultimately, long-run economic growth helps determine living standards. Generally, economists look for output to grow at least as fast as population growth to maintain living standards and to grow faster than population growth to improve them; thus, they often rewrite total output in terms of output per person.

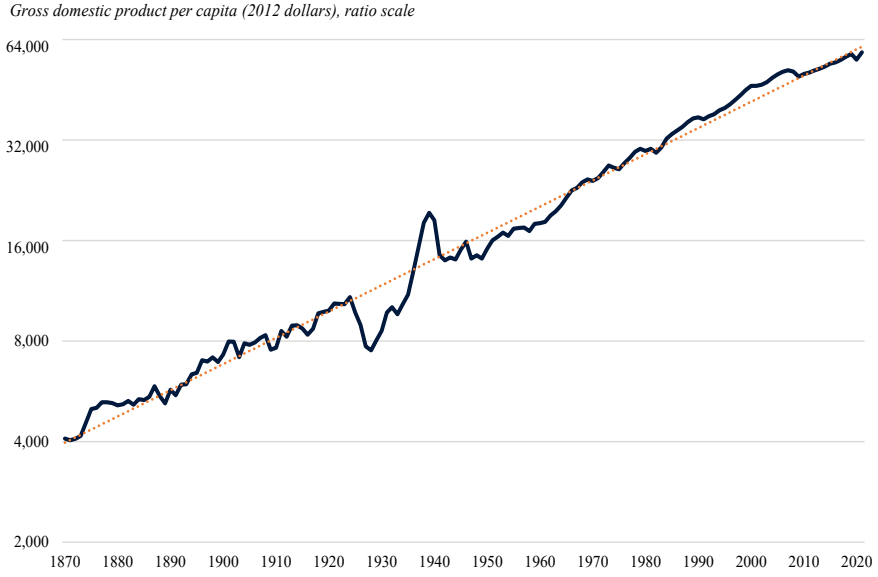
Figure 4-1 shows the time series of per capita U.S. gross domestic product (GDP)—the most popular measure of economic output—on a ratio scale from 1870 through 2021. The ratio scaling means that the slope of the fitted line (shown in orange dots) represents the average annual growth rate over the period. As shown in figure 4-1, the growth rate was remarkably stable over this time, despite large deviations from that trend during and after the Great Depression. Over the roughly 150-year period, per capita U.S. GDP grew at an average rate of 1.8 percent a year.

In a simple model of the economy, output per person can be written in terms of four factors—the (physical) capital-output ratio, human capital per person, research intensity (idea generation), and the number of people in the economy. When Fernald and Jones (2014) decompose per capita GDP growth into growth from these four components over the 1950–2007 period, they estimate that 20 percent of growth came from increases in human capital, nearly 60 percent can be attributed to increases in research intensity, and the remaining roughly 20 percent was due to a growing population.[5]

From a microeconomic perspective, human capital accumulation is associated with various benefits to individuals, their families, and their communities. Although many benefits of human capital investment accrue

[5] Since capital and output grew at roughly the same rate, the capital-output ratio added 0 percent to per capita GDP growth over this period.

Figure 4-1. U.S. Gross Domestic Product per Person, 1870–2021



Source: Updated and reproduced from Fernald and Jones (2014). Data for 1870 to 1929 are from Madison (2008). Data for 1929 to 2021 are from the Bureau of Economic Analysis.
Note: Orange dots represent the fitted line.

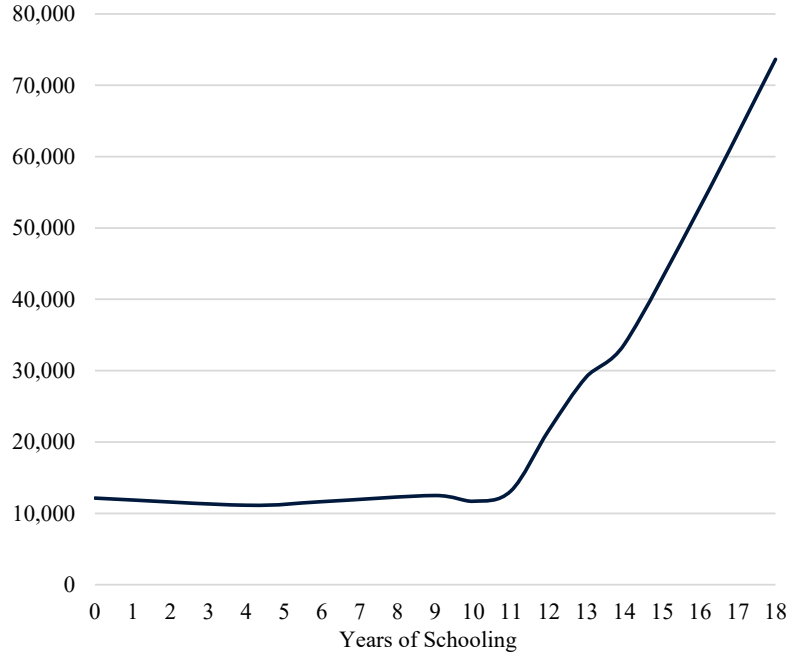
directly to individuals in the form of buying power or the ability to enjoy life, this chapter primarily focuses on individuals as workers in the economy and how human capital investments contribute to U.S. productivity and growth.

The relationship between additional years of education and earnings is among the most extensively documented in economics. Figure 4-2 illustrates this relationship, reflecting that, on average, more highly educated workers both earn higher wages and enjoy higher employment rates. Researchers find positive returns to additional education at the elementary and secondary levels as well as the postsecondary level (Angrist and Krueger 1991; Card 1995; Kane and Rouse 1995; Ashenfelter and Rouse 1998; Card 1999; Zimmerman 2014). Additional years of education increase wages, on average, because education increases worker productivity in the labor market, which increases output growth. Similarly, work experience is associated with higher earnings as workers develop valuable skills through on-the-job training.

Researchers find that more education also reduces adult mortality rates (Buckles et al. 2016) and incarceration rates (Lochner and Moretti 2004) and raises civic engagement (Milligan, Moretti, and Oreopolous 2004). Research also finds that maternal education has a positive effect on infant health

Figure 4-2. Earnings Increase with Years of Schooling

Annual wage and salary income (2019 dollars)



Source: 2015–19, American Community Survey, 5-year sample.
Note: The sample is limited to individuals 25 and above.

(Currie and Moretti 2003). As such, investments in education can even raise the human capital of the next generation.

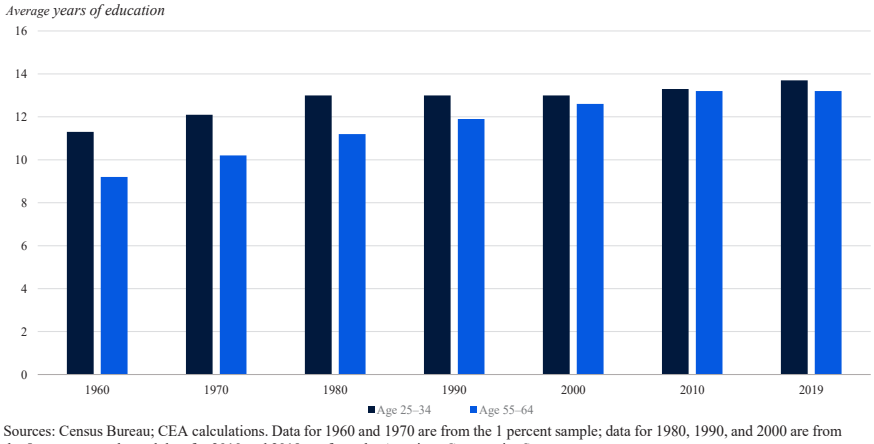
Although health is prominent as one of human capital's key elements (along with education, migration, labor market information, and job training) in the original formulation of human capital by Schultz (1962), fewer studies have explored health within this framework. Vaccines and public safety measures, through reductions in death and work-hampering disability, can increase the size and productivity of the workforce (Bleakley 2010; Hamory et al. 2021). Other health investments increase productivity by improving workers' mental health or quality of daily living. At the macroeconomic level, cross-country regressions suggest that health is a robust predictor of economic growth, with a one-year increase in life expectancy predicting an increase in GDP per capita of about 2 to 4 percent (Sharma 2018; Bloom and Canning 2003).

Measuring the Stock of Human Capital

Researchers would, ideally, like to study all forms of human capital but remain limited to those aspects that can be easily or consistently measured. For example, the World Bank's index of the stock of human capital in different countries is constructed using measures of childhood survival and health in addition to quality-adjusted educational attainment, which are combined with estimates of how these dimensions affect productivity (Kraay 2018). Measures of human capital used to estimate potential GDP growth in the United States depend largely on educational attainment, work experience, and estimates of how both affect productivity. Educational attainment and years of work experience are only proxies for human capital. Notably, years of completed education are not adjusted for differences in quality and do not reflect job-training programs, such as apprenticeships, that operate outside a school-based setting. Further, any systematic change in human capital that is unmeasured, such as improvements in the quality of education or declines in health, can bias estimates of human capital and potential output growth.

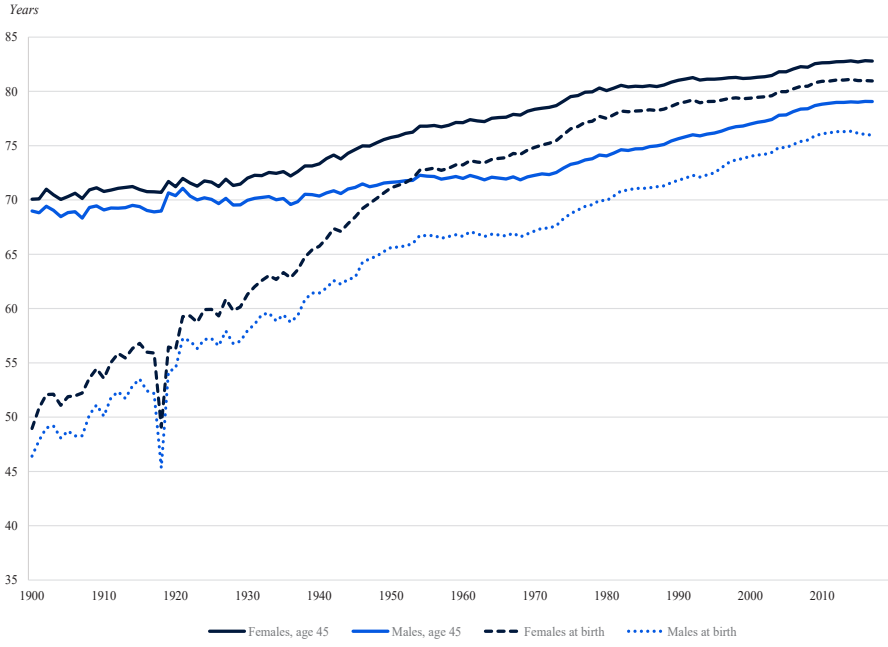
Rising U.S. educational attainment was a main driver of measured human capital growth over the second half of the 20th century (Aaronson and Sullivan 2001). However, though recent cohorts of Americans are the most educated ever, their average years of completed education only modestly exceed what the prior generation attained. Figure 4-3 displays average years of education over time for individuals age 25–34 years and age 55–64. In 1960, individuals in the 55–64 range had completed 9.2 years of education on average, while the younger group, 25–34, averaged 11.3 years of education, a difference of just over 2 years. By 1990 this gap had closed to

Figure 4-3. Average Years of Education by Age Group



Sources: Census Bureau; CEA calculations. Data for 1960 and 1970 are from the 1 percent sample; data for 1980, 1990, and 2000 are from the 5 percent sample; and data for 2010 and 2019 are from the American Community Survey.
Note: If educational attainment is nursery school to grade 4, the observation is coded as 4 years of education. If educational attainment is grade 5, 6, 7, or 8, the observation is coded as 8 years of education. Observations with 5+ years of college are coded as 17 years of education.

Figure 4-4. Life Expectancy, 1900-2019



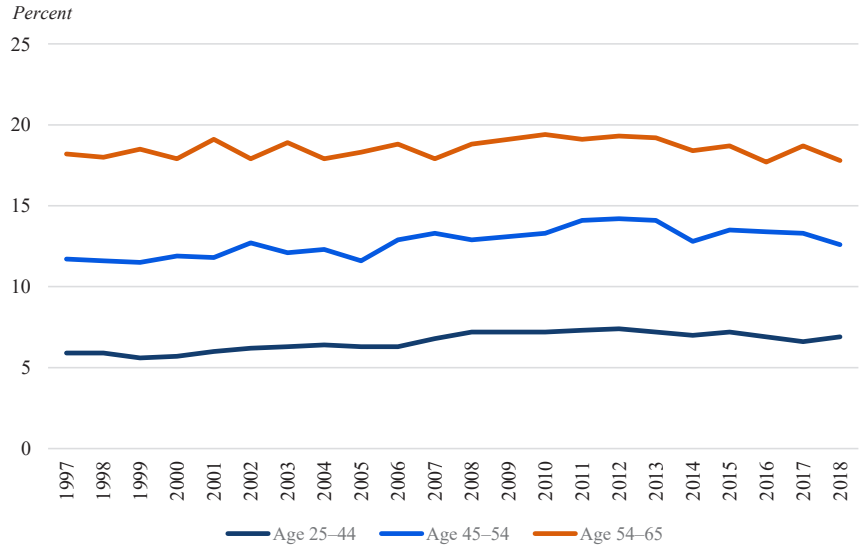
Source: Our World in Data 1900-2014, Social Security Administration 1915-2019.

just over 1 year, and by 2019 the gap was only half a year. When younger cohorts far exceed their elders in years of completed education, the average education level of the workforce increases rapidly. However, as that gap closes, retirees are replaced by new entrants with roughly the same level of education. This slowing in the growth of educational attainment corresponds to a slowing in the growth of human capital per worker, all else being equal.

When measuring health as a contributor to human capital, life expectancy at birth is a common metric used in the United States and other developed countries. Figure 4-4 illustrates life expectancy at birth and at age 45 for both males and females between 1900 and 2019. In that period, life expectancy at birth rose about 30 years for both sexes. Most of the gains occurred between 1900 and 1955, largely due to reductions in infant and child mortality (Crimmins, Preston, and Cohen 2011). As a result, life expectancy at age 45 increased by a more modest 13 years for females and 10 years for males. In the decade before the COVID-19 pandemic, life expectancy at birth rose by less than half a year, compared with gains averaging about 4 years per decade between 1900 and 1950 and 1.7 years per decade between 1950 and 2010.

The COVID-19 pandemic has directly destroyed human capital through death. The virus has also reduced and delayed investments in

Figure 4-5. Percent Reporting Health as Fair or Poor, 1997–2018



Source: National Health Interview Survey.

education, experience, and health. Of note, COVID-19 accounted for sizable reductions in estimates of provisional life expectancy between 2019 and 2020 (Arias et al. 2021), even though children who were born in 2020 are unlikely to experience the same conditions at older ages that led to the estimated decline. This is one example of why changes in life expectancy can be less meaningful as a reflection of health human capital than alternatives such as disease prevalence, work-limiting disabilities, or indices of activities of daily living. (For more on the effect of the COVID-19 pandemic on health human capital, see box 4-1.)

That said, the plateauing of gains in life expectancy before the pandemic is consistent with evidence from other measures of health that are only available for more recent years. Self-reported health, for example, can be predictive of subsequent mortality, even after controlling for socioeconomic status and comorbidities (McGee et al. 1999). Figure 4-5 presents data from the National Health Interview Survey on the percentage of respondents by age group reporting that their self-assessed health status was either fair or poor between 1997 and 2018. For adults in all three age groups, the percentage rating their health as fair or poor has held steady or even increased over this period. These findings suggest that the growth in the stock of health human capital among working-age adults has slowed.

Demographic change, driven by the current and upcoming retirements among the large baby boom generation, also has implications for growth in human capital per person. When baby boomers first started entering

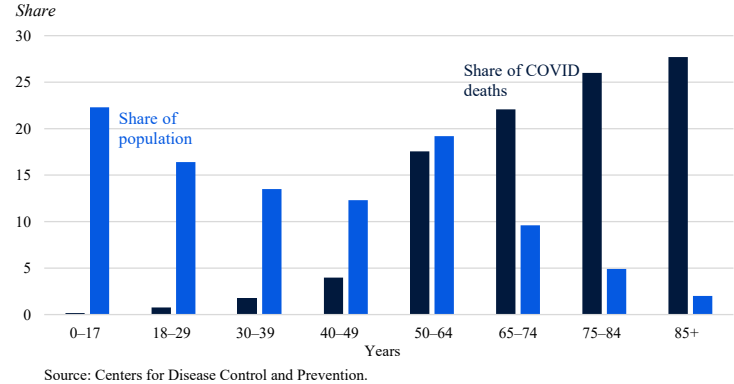
Box 4-1. COVID and Health

Through the end of 2021, there were over 820,000 reported deaths from COVID-19 in the United States (CDC 2022). One measure of excess deaths, which includes unreported pandemic deaths along with deaths from related causes, suggests the true COVID-19 death toll through 2021 might be 15 percent higher than reported (Giattino et al. 2020). About 75 percent of reported deaths from COVID-19 have occurred among those over age 65 (CDC 2021a). As shown in figure 4-i, deaths from COVID-19 are more concentrated among older people, especially those age 85 and above.

However, deaths do not tell the whole story; communities of color saw higher rates of hospitalization and greater losses in life expectancy between 2019 and 2020, largely due to the effects of COVID-19 (CDC 2021c; Arias et al. 2021). Further, there were over 54 million reported COVID-19 infections through the end of 2021, and tens of thousands of patients were hospitalized with the virus during a typical week in 2021 (CDC 2022; Johns Hopkins University 2022). These consequences of the pandemic are causes for concern from a human capital perspective: COVID-19 can cause many health complications aside from death, and those complications may be occurring in people who have much of their working lives ahead of them.

The effects of COVID-19 on health are not limited to those who become infected, however. Secondary consequences of the pandemic have created a series of health challenges. Primary among them has been an overall decline in mental health. More than half of women and a third of men reported worsening mental health after the beginning of the pandemic, with about a fifth saying the pandemic had a major impact

Figure 4-i. Share of COVID Deaths and Share of Population by Age



Source: Centers for Disease Control and Prevention.
Note: Data are current as of January 18, 2022.

(Frederiksen et al. 2021). One study estimates the risk of depression among college students in spring of 2020 was 50 percent higher than prepandemic rates (Giuntella et al. 2021); another finds that the average share of adults reporting symptoms of anxiety disorder and/or depressive disorder were up nearly fourfold in January 2021 (Panchal et al. 2021). The problem has also been worse for groups that are already socially marginalized. Women with children, Hispanic and Black people, the unemployed, and essential workers were more likely to report mental health issues during the pandemic (Panchal et al. 2021).

Declines in mental health during the pandemic exacerbated other negative outcomes. A late 2020 survey found that 15 percent of adults in the United States reported starting or increasing substance use as a way of dealing with the pandemic (Czeisler et al. 2021). In November 2021, the Centers for Disease Control and Prevention (CDC) estimated that there were 100,306 overdose deaths in the 12-month period ending in April 2021, up nearly 30 percent from the previous 12 months and the highest count on record (CDC 2021b). Domestic partner violence also increased globally by about a third in 2020 as compared with 2019 (Newman 2021).

The pandemic also created difficulties in receiving medical care for other conditions. In the initial phases of the pandemic, 29 percent of adults reported forgoing medical care due to fears of catching COVID-19, while another 7 percent missed care due to COVID-related financial concerns (Anderson et al. 2021). This number was still about 10 percent in April 2021, with Black and Hispanic adults, those with low incomes, and people with chronic conditions the most likely to miss care (Gonzalez, Karpman, and Haley 2021). Another study finds that, among adults reporting that they missed or delayed health care due to the pandemic, one-third reported that doing so negatively affected their health, ability to work, or ability to perform other activities (Gonzalez et al. 2021). Declines were particularly acute in the use of mental health services, substance use treatment, primary care, childhood vaccinations, and dental visits (CMS 2021). Uses of many types of care had not fully rebounded as of mid-2021. Hospital admissions were still about 20 percent below the prepandemic trend in April, while health spending remained 7 percent below trend in June (Gallagher et al. 2021). Some of these changes may be due to longer-lasting responses to the pandemic by medical professionals. Two percent of physicians in one survey reported closing their practice due to COVID-19, while 32 percent cut back on staff (Physicians Foundation 2021).

the labor market in the late 1960s, the average age of the labor force (and therefore the number of years of expected work experience) declined. This decline continued until the last of the baby boom generation entered the

labor force in the mid-1980s (Aaronson and Sullivan 2001), at which point the average age of the labor force began to increase, marking a positive effect on average human capital. As the baby boom generation retires, the U.S. labor force is losing a large population of highly experienced workers.

Slowing growth in educational attainment and health improvements, combined with the retirement of baby boomers, results in slower overall growth in human capital per worker. These factors are reflected in economic forecasts of slower potential growth (see, e.g., Woodward 2013; Fernald 2016; and Fernald and Li 2019). There is scope for increasing human capital through targeted investments, and additional scope for increasing effective human capital through policies that help individuals deploy their human capital more efficiently. Such investments help bolster future economic growth.

Investing in Education and Skill Development

Long-term trends point to future cohorts having similar years of educational attainment but no more years of experience than current workers. This raises the question: how else can we develop more human capital during the time in life typically devoted to education? One promising strategy is working to close existing inequities between children in different circumstances—such as different racial or ethnic groups, urban and rural communities, and more- and less-advantaged economic backgrounds—through interventions starting with early childhood.

Early Childhood Education and Care

Although the terms used may differ based on the age of the children involved, all forms of care in early childhood present opportunities for important cognitive, social, and emotional development. Indeed, a National Academy of Sciences review notes that "virtually every aspect of early human development, from the brain's evolving circuitry to the child's capacity for empathy, is affected by the environments and experiences that are encountered in a cumulative fashion, beginning early in the prenatal period and extending throughout the early childhood years" (Shonkoff and Phillips 2000, 6).

Both theoretical models and empirical evidence indicate that access to high-quality early childhood care and education improves human capital. Cunha and Heckman (2007) develop a model of human capital production in which early investments in human capital are complements to investments made later in life. In this model, early investments make later investments more productive; conversely, early investments only have limited productivity if not backed up by later investments. This theory, referred to as dynamic

complementary, is an important basis for supporting investments in high-quality early childhood care and education.

Children from low-income families often begin kindergarten at an academic disadvantage. Though there are also disparities at entry by race and ethnicity, these differences are smaller than those by family income. Based on a nationally representative sample of children entering kindergarten in the fall of 2010, mathematics and reading skills for children from families in the bottom income quintile were, on average, more than 1 standard deviation below math and reading skills for children from families in the top income quintile;[6] by the spring of fifth grade, these gaps were largely unchanged.[7] These large differences in early skills are predictive of worse later outcomes in educational attainment and even arrest rates (Duncan and Magnuson 2011). As a result, expanding access to high-quality early care and education has long been viewed as having the potential to improve outcomes for children from low-income families.

In the short run, many early childhood programs have been shown to increase student achievement, particularly for children from low-income families (Cascio 2015, forthcoming; Yoshikawa, Christina, and Brooks-Gunn 2016). These early test-score advantages often fade out in the medium term (e.g., see Puma et al. 2012; Durkin et al. 2022). In contrast, high-quality early childhood programs have a long track record of improving a broad array of longer-term outcomes ranging from educational attainment and earnings to criminal activity. For example, a study of the cohorts of children who benefited from heavily subsidized universal child care as a result of the Lanham Act during World War II finds that they were more likely to be employed, had higher earnings, and received less cash assistance during adulthood than the cohorts of children born just after those exposed to the Lanham Act funding (Herbst 2017). Similarly, another study finds that a large-scale expansion of subsidized childcare in Norway during the mid-1970s had large positive effects on children's educational attainment and labor force participation as adults and reduced their welfare dependency (Havnes and Mogstad 2011). Further, studies of Head Start, the program established as part of President Lyndon B. Johnson's "War on Poverty" to boost services to low-income children and their families, find long-term benefits of these investments for several human capital and labor market outcomes (Ludwig and Miller 2007; Deming 2009; Bailey, Sun, and Timpe 2021). More recently, students who were randomly selected for preschool

[6] Researchers often measure differences in outcomes in standard deviation units in order to be comparable across different outcomes such as graduation rates and test scores. In a normal distribution, 68 percent of the observations are within 1 standard deviation of the mean, meaning that only 16 percent of all observations are more than 1 standard deviation below the mean. Thus, low-income students scoring, on average, more than 1 standard deviation below high-income students is a large difference.

[7] CEA calculations, based on de Brey et al. (2021, tables 220.40 and 220.41).

slots in Boston were more likely than students who were randomized out of preschool access to take the SAT, graduate from high school, and enroll in college (Gray-Lobe, Pathak, and Walters 2021).

The fact that high-quality early education and care programs have long-term effects on outcomes such as high school graduation and college enrollment suggests that they can generate long-run improvements in children's human capital. Building noncognitive skills (sometimes called soft or social skills) is particularly relevant because of their importance in the current labor market. In this computer age, the tasks that prove difficult to automate are those that rely on personal interactions (Autor 2015). Deming (2017) finds that, between 1980 and 2010, occupations requiring social skills grew by nearly 12 percentage points; wages also grew more rapidly for these types of jobs. This evidence reinforces the role early childhood education can play in increasing human capital and in providing the skills necessary for a modern economy.

However, access to high-quality early care and education differs by family income and race or ethnicity. For example, Hispanic and American Indian / Alaska Native populations are more likely to live in neighborhoods without adequate childcare availability, as are families in the lowest-income neighborhoods (Malik et al. 2018). In Georgia, Bassok and Galdo (2016) found that state preschool classrooms in low-income and high-minority communities were rated significantly lower in quality, even though Georgia is considered a national leader in high-quality early education and care.

Children from low-income families are also less likely to be enrolled in preschool. In 2019, 42 percent of three- and four-year-old children living in households below the poverty threshold were enrolled in preschool, compared with 54 percent of those living in households at or above 185 percent of the poverty threshold (de Brey et al. 2021, table 202.20). Thus, greater access to public preschool programs may help close gaps in kindergarten readiness between lower- and higher-income children. However, results vary between universal preschool programs, which serve all children, and ones that are means-tested, which serve only children from families with low enough incomes to qualify. Cascio (forthcoming) finds that state-funded universal preschool programs generate large test score gains, particularly for children from low-income families. Indeed, Cascio estimates a cost/benefit ratio of $3.52 for universal preschool programs. Universal preschool for all three- and four-year-old children, combined with investments in childcare provisions, could help ensure equal access to high quality early education and care for all children.

K-12 Education

Despite a long-standing debate on the question of whether increased school spending improves student outcomes, modern quasi-experimental research on the topic suggests that increased school spending has a positive causal effect on students' future education and labor market outcomes (Card and Payne 2002; Jackson, Johnson, and Persico 2016; Hyman 2017; Lafortune, Rothstein, and Schanzenbach 2018).

However, as in early childhood education and care, access to high-quality K-12 schools differs by family income and race or ethnicity. Rouse and Barrow (2006) and Barrow and Schanzenbach (2012) find that though some resource measures may be quite similar or even somewhat higher in districts with greater shares of disadvantaged children, children from more advantaged backgrounds arguably attend higher-quality public elementary and secondary schools. For example, students from families of low socioeconomic status are more likely to have teachers with less than three years of experience and to attend schools with inadequate facilities or temporary buildings. Similarly, high-poverty schools are more likely to employ teachers who do not have a certificate or major in the field they teach. Additionally, differences in academic achievement by race and ethnicity widen between kindergarten entry and fifth grade, suggesting that there may be systematic differences in elementary school quality by student race and ethnicity.[8] As such, policy interventions aimed at improving school quality for children from disadvantaged families and communities of color are likely to be important for increasing human capital growth.

Although there is little consensus about effective education policies, several themes have emerged from the literature beyond the basic finding that resources matter. Barrow and Rouse (2007) review evidence on several inputs in K-12 education, including class size, teacher quality, time in school, and technology. Several studies find that class size matters, particularly for students in the early grades (Angrist and Lavy 1999; Krueger 1999; Krueger and Whitmore 2001), though class size reduction is expensive and implementation at scale can be a challenge (Bohrnstedt and Stecher 2002). Not surprisingly, researchers also find strong evidence that teachers matter (Aaronson, Barrow, and Sander 2007; Rivkin, Hanushek, and Kain 2005; Chetty, Friedman, and Rockoff 2014), and many school reform efforts in the early 2010s included the adoption of teacher performance rating systems that combined measures of teachers' effects on student achievement (value added) and classroom observation (National Council on Teacher Quality 2017). Researchers find that these types of reforms can improve average teacher quality by leading the lowest-performing teachers to exit teaching at higher rates (Sartain and Steinberg 2016; Dee, James, and Wycoff 2021).

[8] CEA calculations, based on de Brey et al. (2021, tables 220.40 and 220.41).

There is also some evidence that teacher performance evaluation can lead to improvements in teacher practice (Taylor and Tyler 2012).

Instructional time has also been shown to have a positive effect on student achievement, through evidence that a longer school year can improve student outcomes (Pischke 2007), as can longer school days (Figlio, Holden, and Ozek 2018; Atteberry, Bassok, and Wong 2019). The evidence on accountability policies and technology is somewhat more mixed. Though accountability policies have been shown to cause schools to change instructional practices in meaningful ways, leading to increased test score performance (Rouse et al. 2013), in other settings test score improvements have been shown to come from gaming the system rather than from generating improvements in educational practices that benefit all students (e.g., see Neal and Schanzenbach 2010; Booher-Jennings 2005; and Hout and Elliott 2011). Finally, research on the use of technology in the classroom continues to find mixed results (Bulman and Fairlie 2016), even though the potential for computer-aided instruction to allow for more self-paced learning remains promising (Barrow, Markman, and Rouse 2009).

The COVID-19 pandemic has disrupted instruction at all levels of education, with potentially serious consequences for students. For more discussion of this issue, see box 4-2.

Postsecondary Human Capital Development

The development of universal and compulsory primary and secondary education in the United States during the 20th century meant that, by 2019, more than 90 percent of adults age 25 years and above had completed at least high school (de Brey et al. 2021, table 104.10). After high school, Americans take many paths to further develop their human capital. Some enter the labor force directly and develop their skills through on-the-job training and experience. Others pursue apprenticeship opportunities, military service, or gap-year programs. The majority (66 percent in 2019), however, pursue further academic or vocational training—including certificate programs—at a college or university (de Brey et al. 2021, table 302.20). And over a lifetime, many workers find the need or desire to go back to school or enter a workforce training program to further their career or switch tracks entirely.

Access to postsecondary education has expanded over time, such that two out of three recent high school graduates enrolled in a two-year or four-year college in 2019, up from one out of two in 1965 (de Brey et al. 2021, table 302.10). Community colleges, also known as two-year public colleges, are open enrollment and tend to cost less than programs at public and private nonprofit four-year colleges and private for-profit institutions. They also offer flexibility that allows working adults to attend college. As a result, community colleges enroll nearly one in three first-time degree- or

Box 4-2. COVID and Education

The COVID-19 pandemic disrupted all levels of formal education in the United States, and exacerbated existing disparities in educational opportunities and outcomes (U.S. Department of Education 2021a). By the end of March 2020, leaders of 48 States, 4 territories, and the District of Columbia ordered or recommended building closures in K-12 schools for the remainder of the academic year, affecting over 50 million public school students (Decker et al. 2020). Many school districts, students, and families were not prepared for online learning, particularly in rural communities (Hampton et al. 2020), low-income communities, and communities of color. In 2019, over 10 percent of school-age children in families in the bottom income quartile did not have Internet access at home, and an additional 14 percent only had access through a smartphone (Irwin 2021). Before the pandemic, only 75 percent of Black and Hispanic children lived in a house with a computer, compared with 91 and 96 percent of white and Asian children, respectively (KewalRamani et al. 2018). Online school exacerbated barriers to good educational opportunities and outcomes, especially for children who lived in a home without a computer.

The challenges of switching to remote education thwarted many students' involvement in education. School districts saw attendance decline, and educators expressed concerns about adequate student engagement (Carminucci, Rickles, and Garet 2021; Chambers, Scala, and English 2020). The result has been higher rates of chronic absenteeism (Dorn et al. 2021), which has been shown to have negative effects on the absent students' grades, graduation rates, and college success (Allensworth and Evans 2016).

COVID-19 changed education in a way that also likely affected children's development of noncognitive/social and emotional skills. Students could not interact with their classmates and teachers in the same way and, in many cases, they were cut off from services they accessed at school, such as physical and mental health services, or the support of a social worker. Further, many extracurricular activities were canceled or moved online, limiting social interactions with peers. By limiting these activities, COVID-19 may have disrupted development of students' social and emotional skills, which are associated with future academic achievement (Blake et al. 2014).

School districts, which were largely unprepared for the transition to remote learning, were forced to make changes that will likely have an impact on human capital accumulation. Though some teachers, schools, and districts were ultimately able to effectively transition to remote learning, others were unable to develop a plan to deliver classroom work in a form that would be most effective for students, particularly in the short run. Before the pandemic (2011–12), only about one-third of

teachers reported having training in the use of computers for instruction (Garcia and Weiss 2020). A nationally representative survey of school districts found that in the spring of 2020, 85 percent of school districts expected students to spend less than four hours daily on instructional activities during the pandemic (Rickles et al. 2020). The prepandemic daily instructional time average was five hours (U.S. Department of Education 2021a).

These changes to formal K-12 school have resulted in academic learning loss. One study finds that by the end of the 2020–21 school year, students were, on average, five months behind in math and four months behind in reading (Dorn et al. 2021); another study estimates that by the fall of 2021, students were scoring below expected performance levels based on historical trends by 9 to 11 percentile points in math and 3 to 7 percentile points in reading (Lewis et al. 2021). In both studies, estimated learning losses were larger for historically marginalized students and those enrolled in high-poverty schools.

The COVID-19 pandemic has also affected higher education. Fall enrollment in postsecondary institutions peaked in 2010 and had been declining at an average annual rate of 0.8 percent, primarily driven by declines in enrollment at sub-baccalaureate institutions and all levels of for-profit institutions (CEA calculations, based on deBrey et al. 2021, table 303.25). However, enrollment fell more precipitously with the pandemic, particularly at the sub-baccalaureate level. According to National Student Clearinghouse (2021) data, there was an approximately 8 percent drop in undergraduate enrollment between the fall of 2019 and the fall of 2021 (roughly 4 percent each year), with community colleges losing 14.8 percent of students over the two years. However, enrollments in graduate and professional certificate and degree programs rose, suggesting that, though fewer students were taking initial steps in higher education, more degree holders were returning for additional credentials.

Many students enrolled in higher education during the pandemic have seen disruptions to the mode of instruction, which may affect their learning and ultimately their completion. Prepandemic research found that taking a course online instead of in person reduced student success in the course and mitigated progress in college (Bettinger et al. 2017). Research conducted at the U.S. Military Academy during the pandemic also found that students randomly assigned to online instruction performed worse than those randomly assigned to in-person instruction covering the same material (Kofoed et al. 2021). Adverse effects of online instruction were largest for students who were academically at risk.

Learning loss associated with the pandemic is likely to lower the educational attainment of the future workforce by reducing the share of college-educated adults (Blagg 2021; Fuchs-Schündeln et al. 2020). Using estimates of the decline in the educational attainment of the

future workforce from Fuchs-Schündeln and others (2020), Fernald, Li, and Ochse (2021) estimate that the pandemic learning disruption will decrease average yearly output over the next 70 years by 0.23 percentage point, peaking at a gap of half a percentage point (just below $150 billion, inflation-adjusted) from 2045 to 2050. Similar estimates at the microeconomic level translate learning losses into lifetime earnings losses. Goldhaber, Kane, and McEachin (2021) use the decline in math achievement found by Lewis et al. (2021) to estimate that these losses, if permanent, equal $43,800 in lifetime earnings for each student, or over $2 trillion across the 50 million public school students currently enrolled in grades K to 12.

In order to support educational equity and address these losses, the American Rescue Plan Act of 2021 included $122 billion in the Elementary and Secondary School Emergency Relief Fund to help schools safely reopen and address the academic, social, emotional, and mental health needs of their students (White House 2021a). The act further required States and districts to spend a combined minimum of 24 percent of the total funds on evidence-based practices to address lost instructional time and the coronavirus's impact on underserved students. The funding has been used for such activities as implementing summer learning and enrichment programs and hiring nurses and counselors (U.S. Department of Education 2021b).

certificate-seeking students.[9] Importantly, research shows that community colleges increase the earnings of their students (Kane and Rouse 1995; Marcotte 2010; Jepsen, Troske, and Coomes 2014; Bahr et al. 2015; Minaya and Scott-Clayton 2022).

However, college enrollment rates differ by family income and by race and ethnicity (as noted in the introduction). For example, in 2016, 83 percent of high school graduates from families in the top income quintile immediately enrolled in college after high school graduation, compared with only 67 percent of high school graduates from families in the bottom income quintile (Snyder, de Brey, and Dillow 2017, table 302.30). These differential enrollment rates suggest that some students may face more barriers than others in making the transition to college.

Students who decide to continue their education at a college or university must first navigate complex application, enrollment, and financial aid processes. These hurdles can deter students from continuing to develop their skills through formal education, and those from more advantaged families are likely to have access to better information about how to enroll in higher education than students from less advantaged families. For example,

[9] CEA calculations, based on two-year public institutions, given by de Brey et al. 2019, table 305.10.

students whose parents attended college are well situated to receive first-hand advice on navigating the college enrollment process and information on what to expect as a college student.

In addition, many students and their families have struggled to complete the Free Application for Federal Student Aid (FAFSA), a financial aid application necessary to access Federal postsecondary student aid, including Pell Grants and Direct Loans (Bettinger et al. 2012). Unclear and/or incorrect expectations about the cost of attending selective four-year institutions may dissuade low-income students from applying and attending schools where they would qualify for aid (Hoxby and Turner 2015; Dynarski et al. 2018). The FAFSA Simplification Act of 2021 aims to make applying for aid easier and the award amount more transparent and predictable for students (Congressional Research Service 2022b). These changes, combined with more readily available information on the net price a student faces (as opposed to the overall "sticker price"), can help reduce barriers in the transition to college.

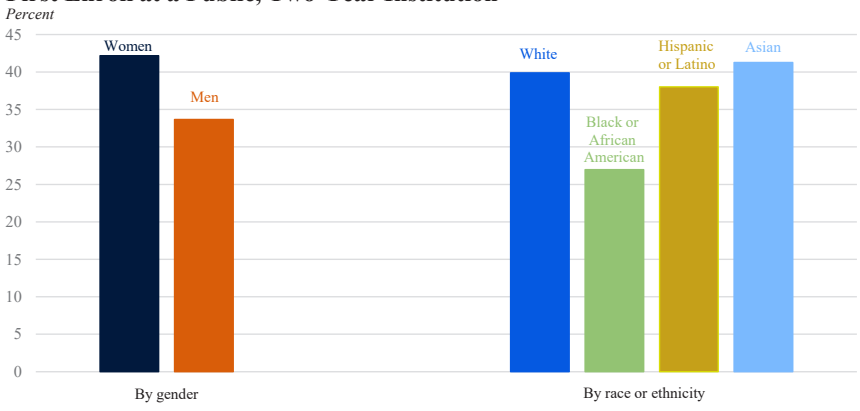
Free community college is another proposal aimed at increasing access to postsecondary education. Although some of the increased enrollment may come from students who would have otherwise enrolled in a four-year college or a private two-year junior college, there is strong evidence that making community college tuition free may also increase enrollment among individuals who otherwise would not have enrolled at all (Carruthers and Fox 2016; Mountjoy 2019; Nguyen 2020). Despite the fact that community college tuition is effectively free for many low-income students due to the availability of Federal Pell Grants and other State and local grant aid (Ma and Pender 2021), a recent study in Michigan finds that students are particularly responsive to a clear, upfront offer of free tuition (Dynarski et al. 2018). In this study, low-income, high-achieving students were randomly selected to receive a promise of free tuition and fees if they applied and were admitted to the University of Michigan in Ann Arbor.[10] Notably, the intervention did not change the probable costs for the students but rather guaranteed grant aid for which the students were likely already eligible.[11] The likelihood of applying to the university more than doubled, and the researchers find that students in the treatment group were 4 percentage points more likely than the control group to attend any postsecondary institution.

However, many students who do enroll in college still fail to complete any degree or certificate program (Chen et al. 2019), and completion rates at two-year public colleges are particularly low. Five years after enrolling, only 39 percent of first-time college students who started at a public two-year

[10] Randomization was at the school level, and parents and principals were also notified.

[11] The offer was unconditional, e.g., students were not required to fill out the FAFSA form, and the offer was guaranteed for four years. This was prominently stated in the mailing, but students were also encouraged to fill out the FAFSA because they would likely qualify for even more aid.

Figure 4-6. Degree or Certificate Completion Rates among Students Who First Enroll at a Public, Two-Year Institution



Source: U.S. Department of Education (2019).

institution in 2011–12, with the expectation of completing a four-year bachelor's degree, had received any degree or certificate, compared with 68 percent of students who started that year at a public four-year institution.[12] Further, as shown in figure 4-6, these completion rates differ by sex and race or ethnicity, ranging from 34 percent for men to 42 percent for women and 27 percent for Black or African American students to 41 percent for Asian students.

Investments aimed at encouraging higher education institutions—and community colleges in particular—to adopt evidence-based strategies for improving student completion are important for increasing human capital accumulation, particularly for students from backgrounds historically marginalized in higher education. These supports include wraparound services, ranging from childcare and mental health services to faculty mentoring. Community college students often live complicated lives, which may be one reason why completion rates are relatively low. Research on initiatives such as the Accelerated Study in Associate Programs has shown that enhanced student services combined with additional financial supports can double graduation rates (Scrivener et al. 2015).

Workforce development programs help create opportunities for displaced workers, new entrants, and current workers seeking higher-paying and more fulfilling work. Having workers with the right skills can raise labor productivity, which in turn increases economic growth. As Holzer (2021, 4) notes, "Workforce development policies, programs, and practices are critical to any effort to improve economic productivity, income mobility, and equity

[12] This computation was by PowerStats, from the National Center for Educational Statistics, using data from the U.S. Department of Education (2019).

among American workers." Such programs can be important alternatives for those not pursuing more formal education after high school. For example, registered apprenticeship programs—including many that are cooperatively run by employers and labor organizations—offer opportunities for individuals to earn industry-recognized credentials through a combination of on-the-job paid training and classroom-based instruction. These programs have been shown to be effective at increasing workers' earning potential. A study of apprenticeships in 10 States finds that individuals who completed their training earned an average of $240,037 more over their lifetime than nonparticipants.[13] Further, the study's conservative estimate of the net social benefits is $49,000 over the course of the apprentice's career (Reed et al. 2012).

That said, apprenticeships remain relatively rare. In a 2016 survey of adults focusing on participation in "work experience" programs—internships, externships, co-ops, practicums, and apprenticeships—a little over 20 percent reported having completed any type of work experience program, and only 3 percent reported having ever completed an apprenticeship program.[14] Even among apprenticeships, which many think of as being non-college-track work experiences, participation was highest among those with a bachelor's degree or higher (5.4 percent) and was lowest among those with no postsecondary enrollment (1.0 percent).

Other sector-focused training programs aimed at preparing disadvantaged workers for employment in high-demand occupations have also been shown to be successful. Examples of promising sector-focused training programs include the Wisconsin Regional Training Partnership, an association of unions and employers in Milwaukee concentrating on two- to eight-week training programs in construction, manufacturing, and health care (Maguire et al. 2010); Year Up, a year-long training program for young adults (18–24) focusing on employment in information technology and business and financial services; Project Quest, a one- to three-year program serving early- to mid-career adults (largely Hispanic women) targeting jobs in the health care sector; as well as programs evaluated under MDRC's WorkAdvance program, which targeted employment in information technology, health care, manufacturing, and transportation (Katz et al. 2020). Katz and others (2020) review these and other programs and investigate the mechanisms whereby programs affect participant outcomes. Their findings indicate that sectoral training programs increase earnings by getting participants into higher-wage jobs and higher-earning occupations, rather than simply increasing employment. They also find that programs that produce the largest and most persistent earnings gains offer a combination of upfront screening of participants

[13] This finding controls for demographic differences at the time of enrollment.

[14] This computation was by PowerStats, from the National Center for Educational Statistics, using data from the U.S. Department of Education (2016).

on basic skills and motivation, wraparound support services for participants, and strong connections to employers.[15]

Investing in Health

A multitude of studies link early-life conditions to human capital accumulation, though many lack definitive explanations of the mechanisms driving these links (Almond and Currie 2011). As Mushkin (1962) highlights, health and education are interrelated in many ways. She notes that formal education is impossible if a child is unable to attend school and learn due to poor health. Lengthening life expectancy by improving health increases the return to education.

The relationship between health and human capital development through school attendance is well documented. One early and important study finds that the eradication of hookworm in the southern U.S. States in the early 20th century increased school attendance, enrollment, and literacy. These changes resulted in higher income about 30 years later (Bleakley 2007). Investments in lead abatement have similar potential today. Other studies link poor childhood health and malnutrition to lower levels of educational attainment (Alderman, Hoddinott, and Kinsey 2006; Case, Fertig, and Paxson 2005; Haas, Glymour, and Berkman 2011). (For discussion of some of the recent Federal infrastructure investments with the potential to improve human capital, see box 4-3.)

Even if children are able to attend school, physical and mental health problems can hinder educational progress. For example, children in the United States and Canada with symptoms of Attention Deficit Hyperactivity Disorder (ADHD)—the most-common chronic neurodevelopmental disorder in young children—performed less well than their siblings without ADHD symptoms on such school-related outcomes as test scores and grade promotion (Currie and Stabile 2006), suggesting that children with ADHD symptoms may accumulate less human capital.

A relationship can also be drawn between health and the development of cognitive and noncognitive skills beyond the classroom. One recent study finds that childhood illnesses lead to poor financial management later in life (Luik 2016). Other studies show similar findings, noting that low income—and the poor early childhood health that comes along with it—is associated with lower socioemotional skills in later childhood (Fletcher and Wolfe 2016). That poor formation of noncognitive skills is associated with

[15] Minimum skill requirements applied to all participants before random assignment for treatment. As noted by Katz et al. (2020), whether these programs can provide a successful career pathway for individuals who do not meet the minimum skill requirements—high school diploma or General Educational Development certificate and testing at the 6th- to 10th-grade level in math and reading—remains an open question.

Box 4-3. Federal Investments in Lead Abatement and Rural Broadband

Recent Federal legislation, including the Bipartisan Infrastructure Law (BIL), provides funding for lead abatement and rural broadband development, both of which would be expected to have positive effects on human capital development. In particular, the BIL invests $55 billion in clean drinking water (White House 2021b); this increases the size of the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) to nearly six times their previous appropriation levels, with $15 billion for lead service line replacement as well as a combined $5 billion to address emerging contaminants (Congressional Research Service 2022a).

Reducing lead exposure through abatement methods is one of the key provisions of the BIL (White House 2021b). The Centers for Disease Control and Prevention recognizes that there is no safe blood lead level in children and that lead service pipes can be one source of lead in a child's environment (CDC n.d.). Situations like the Flint, Michigan, water crisis are a potent example of the nearly 10 million households that lack safe drinking water. Lead abatement also has important equity implications as Black children are at greater risk for elevated blood lead levels than white or Hispanic children, even after controlling for risk factors such as living in pre-1950s housing (Yeter, Banks, and Aschner 2020). Lower blood lead levels are associated with improved health, educational, and economic outcomes. Prenatal lead exposure has been linked to reduced gestational age, lower birth weight, and potential fetal loss (Schwartz 1992a; National Research Council 1993), and childhood exposure has been shown to increase adolescent impulsivity, anxiety, depression, and body mass index (Winter and Sampson 2017). Educationally, lower average blood lead level reduces the probability of suspension and detention among boys (Aizer and Currie 2019) and increases test scores (Aizer et al. 2018). Despite the potentially long-lasting nature of elevated blood lead levels, lead abatement interventions have shown promise in reversing many of the negative consequences of early childhood exposure, demonstrating the potential benefits of the BIL lead abatement funding even for somewhat older children (Billings and Schnepel 2017).

In addition, since the beginning of the COVID-19 pandemic, investments investments in rural broadband connection have been included in the Consolidated Appropriations Act (CAA), the American Rescue Plan (ARP), and the BIL. While the BIL funds $65 billion in broadband investments for all States (White House 2021b), the other bills include programs aimed at digital equity. The Emergency Broadband Benefit ($3.2 billion, CAA), the Emergency Connectivity Fund ($7.2 billion, ARP), and the Capital Projects Fund ($10 billion, ARP) all provide exclusive funding for expanding and discounting broadband to address

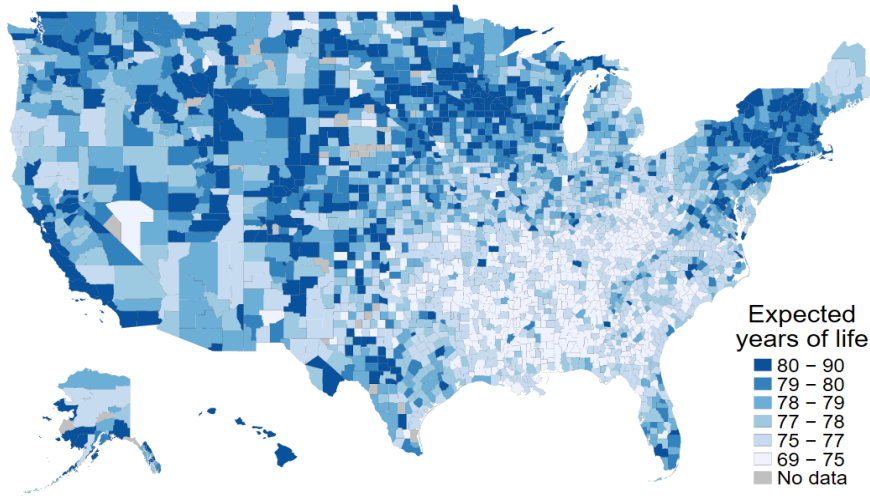
education and health gaps. The ARP includes an additional nine provisions amounting to $388.1 billion in flexible funding that could apply to rural broadband, as well (Tomer and George 2021).

The investments in broadband help address digital equity and geographic disparities in Internet access. According to FCC estimates, about $80 billion in investments are necessary for ubiquitous broadband access (FCC 2017). Given that population density is a major determinant of both service provision and lower prices (Ribiero Pereira 2016), these investments will likely be heavily concentrated in rural areas. The economic benefits of broadband access are well documented. A 10-percentage-point increase in broadband penetration has been found to increase per capita economic growth by 0.9–1.5 percentage points (Czernich et al. 2011). Counties gaining broadband access in the early 2000s were found to have an increase in employment rates by 1.8 percentage points (Atasoy 2013). The benefits of broadband access likely expand to health and education benefits as well. A prepandemic survey of community-based health centers found that, among those not using telehealth, those located in rural areas were much more likely to report broadband as a barrier to adoption (Lin et al. 2018). And survey data show that students in rural school districts with high-speed Internet at home had higher grades and standardized test scores than their peers without access (Hampton et al. 2020). The investments in broadband in rural communities will help spur economic growth and help provide more equitable services to those previously left behind by the digital divide.

lower probabilities of employment in adulthood suggests the connection with human capital accumulation (Carneiro, Crawford, and Goodman 2007).

Interactions between health, life expectancy, and decision-making also affect human capital development. As shown in figure 4-7, life expectancy varies dramatically across geographic areas. In 2010–15, life expectancy at birth for a person born in Mississippi was 74.9 years (and was less than 70 in some areas), while those born in Hawaii could expect to live for 82 years (Tejada-Vera et al. 2020). Similarly, life expectancy at birth in 2018 across the United States was 81.8 years for Hispanic people and only 74.7 for non-Hispanic Black people (Arias and Xu 2020). And the difference in life expectancy between the richest and poorest 1 percent of individuals was 14.6 years (Chetty et al. 2016). Some of these variations are driven by differences in infant mortality rates. As shown in figure 4-8, the infant mortality rate for non-Hispanic Black babies is more than double the rates for Hispanic, white, and Asian babies (Ely and Driscoll 2021). Reducing these

Figure 4-7. Life Expectancy at Birth for U.S. Counties, 2010–19



Sources: Centers for Disease Control and Prevention, National Center for Health Statistics; CEA calculations.

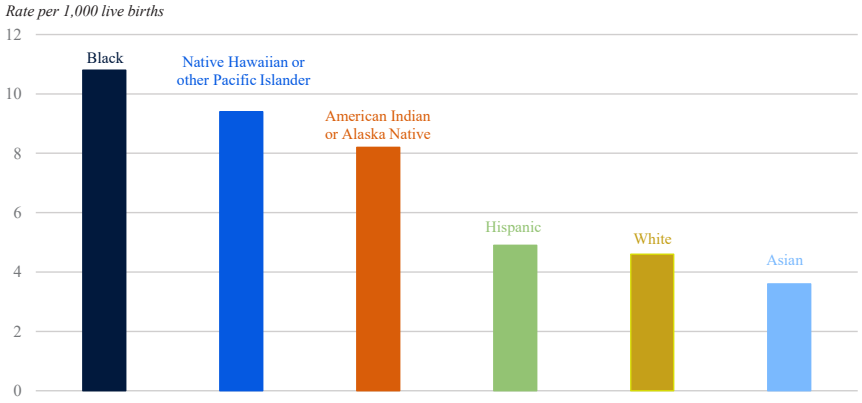
geographic, racial, and socioeconomic differences could improve average life expectancy without requiring scientific or medical advances.

Focusing on policies that improve health care access and equity could be one path toward improving human capital development. Becker (2007) notes that if an individual expects to live for fewer years, the return on investment in healthy decisions, such as exercising or avoiding addiction, is lower. In other words, he argues that it may not simply be that nonsmokers and people who exercise and eat well are healthier, but rather that the causality runs in the opposite direction. Namely, good health causes people to choose healthier habits.

Expansion of public health insurance coverage could boost the development of human capital. Studies of health insurance coverage during childhood have found many positive benefits, including improvements in school performance. For example, one study finds that eligibility for Medicaid reduced the probability of children being below grade for age (Qureshi and Gangopadhyaya 2021). These early human capital effects can be long-lasting; children with more years of Medicaid eligibility during childhood had higher college enrollment, delayed fertility, increased wages, and lower mortality as adults (Brown, Kowalski, and Lurie 2019).

Policies focusing on maternal health by expanding coverage for pregnancy and postpartum care could also lessen inequalities in human capital development. Expansions in postpartum Medicaid coverage under the

Figure 4-8. Infant Mortality Rates by Race or Ethnicity, 2018



Source: Centers for Disease Control and Prevention.

Affordable Care Act increased outpatient visits for mothers, likely improving health outcomes (Gordon et al. 2020). Adequate prenatal care can also create better health habits for mothers, with one study finding that first-trimester prenatal care led to decreases in parental smoking and increases in well-child visits after birth (Reichman et al. 2010).

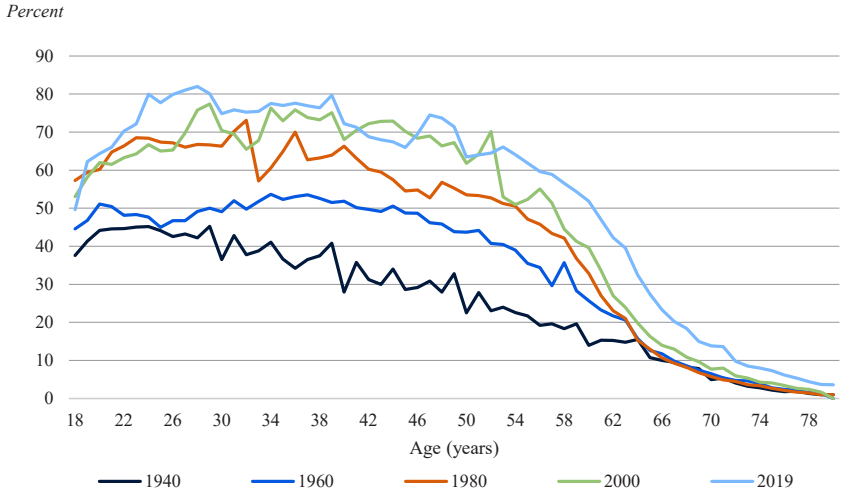
Deploying Human Capital

Deploying human capital effectively—putting a worker's skills to more productive use—is an important component of economic output. Although the deployment of human capital is often straightforward, the real world can present workers with obstacles to making the most of the skills they have rigorously developed. Health problems of their own—or those of a child, parent, or other loved one—can prevent an individual from putting their human capital to work. Sometimes entire groups of workers are legally prevented from working or have their options significantly limited. Other times, as shown in chapter 5, illegal discrimination in the labor market can keep affected workers from realizing their full potential, as can anticompetitive practices that limit workers' ability to change jobs. These obstacles create a smaller, less equitable economy and a less prosperous country.

Health

Better health allows people to deploy their existing human capital more effectively. In his canonical 1972 paper, Michael Grossman (1972) creates a model of "good health" that parallels other models of human capital. He assumes that such inputs as diet, exercise, and health care spending produce health stock, which provides a person with a time allocation of "healthy

Figure 4-9. Percent of U.S.-Born People Employed in the United States, by Age



Sources: CEA calculations from the Decennial Census; Bureau of Labor Statistics, American Community Survey; Statista data.
Note: This figure shows U.S.-born people employed in the United States as a percentage of all people born in the United States, by age. The denominator for the percentage in this figure includes people who have died or have emigrated from the United States, along with those living in the country. To estimate the total number of births for each age and year, we multiplied an estimate of the birth rate by population estimates for that year, interpolating where necessary.

days." People with more healthy days can readily take part in labor and leisure activities; however, those who are sick are more limited. Grossman's model implicitly underlies research showing that health is crucial in the deployment of human capital.

People in better health are more likely to enter and stay in the labor force. Krueger (2017) finds that 40 percent of men not in the labor force report that pain prevented them from doing jobs for which they were otherwise qualified. Further, adults with a serious mental illness are twice as likely to be out of the labor force as adults with no mental illness and are also less likely to be employed full time (Luciano and Meara 2014). Even for those who do enter the labor force, those with poorer health are often prevented from working a full number of days and hours. Multiple studies show that missed workdays due to mental and physical health problems, which result in significant payroll losses, are top causes of work absenteeism each year (Dewa et al. 2004; Luciano and Meara 2014; Currie 2008). Finally, being in good health allows workers to work more intensely on days when they are present, allowing them to more fully expend their human capital (Goldin 2016).

Good health also facilitates deployment of human capital through longer life expectancy; those who live longer and are in better health can work for more years. One analysis shows that "working life expectancies"

have grown as healthy life expectancies and life expectancies have increased across Europe (Loichinger and Weber 2016). To illustrate how this has played out over time in the United States, figure 4-9 shows the likelihood that a U.S.-born person is alive and working, by age, from 1940 to 2019. At every adult age below 60, this likelihood has increased substantially since 1940. Gains in this age range were especially large between 1940 and 1980.

Family Support Policies

Family responsibilities can sometimes pose an obstacle to human capital deployment—a reality made all too clear during the COVID-19 pandemic. Short-term family priorities such as caring for a child or elderly relative may conflict with longer-term priorities, like maintaining a job or career that is necessary to support the family. Without external supports, people may be forced to make decisions that result in underutilization of their human capital. Evidence from settings ranging from recessions and mass layoffs (e.g., Jacobson, LaLonde, and Sullivan 1993; Sullivan and Von Wachter 2009; Oreopoulos, Wachter, and Heisz 2012; Yagan 2019; Stuart 2022; Rinz, forthcoming) to the birth of a child (Bertrand, Goldin, and Katz 2010; Angelov, Johansson, and Lindahl 2016; Goldin and Mitchell 2017; Kleven et al. 2019) to routine job separations (Fallick et al. 2021) indicates that spending time out of work can have persistent adverse effects on earnings and, more broadly, on accumulated human capital.

Providing financial support to keep people connected to their jobs while they address family-related needs can facilitate their return to work. Studies of State programs that provide paid family and medical leave suggest that access to leave can increase mothers' longer-term labor supply after the birth of a child (Baum and Ruhm 2016; Byker 2016; Jones and Wilcher 2020; Saad-Lessler 2020). Leave can also increase the likelihood that a mother returns to her prior employer after having a child (Baum and Ruhm 2016), which can be particularly beneficial when her job made good use of her human capital. Evidence suggests that paid leave may also produce labor supply benefits when used for other purposes, such as caring for a spouse with a work-limiting disability or chronic health condition (Anand, Dague, and Wagner 2021). Though evidence to date finds limited use of paid leave among fathers in U.S. programs (Baum and Ruhm 2016) and little role for paid paternity leave in mitigating gender earnings gaps that tend to emerge after the birth or adoption of a child (Andresen and Nix 2019), available research also suggests that these earnings gaps are driven largely by gender norms and preferences about the allocation of care responsibilities rather than biology (Andresen and Nix, forthcoming; Kleven, Landais, and Sogaard 2019). See chapter 5 for further discussion of paid leave and gender norms.

Paid leave helps with situations where family members want to take care of a new child or ill family member and also retain their job. In other cases, the family member may want to go to work but needs care for their child or disabled or infirm family member. Both childcare and care for the elderly and disabled can be prohibitively expensive. But research indicates that public childcare and preschool programs can help parents of young children, particularly mothers, remain engaged in the workforce. This evidence is based on State programs (Cascio and Schanzenbach 2013), Head Start (Wikle and Wilson 2021), the expansion of kindergarten access to slightly older children (Gelbach 2002; Cascio 2009), and historical experience with childcare provided in the United States from 1943 to 1946 under the Lanham Act (Herbst 2017), as well as various programs in other countries (Bauernschuster and Schlotter 2015; Finseraas, Hardoy, and Schøne 2017). Likewise, programs that provide care for elderly or disabled people can also increase their relatives' ability to work. One recent study finds that for every 2.4 to 3 women whose parents gained access to formal home care as the result of Medicaid covering that service in some States, one additional daughter worked full time (Shen 2021).

Employment Practices

Working conditions can also influence how effectively human capital is deployed. Certain employment practices, sometimes called "high road" practices, for which labor unions have long been important advocates, support employees' success on the job by meeting the needs they have in life. They can also increase workers' productivity and reduce turnover, benefiting both workers and businesses. Higher compensation is an important element of these practices. One recent study based on general compensation policies at a large online retail company indicates that higher wages for warehouse and call center workers increased productivity more than dollar for dollar (Emanuel and Harrington 2020). Another study finds that minimum wage increases led to increased productivity and reduced termination rates among department store sales workers (Coviello, Deserranno, and Persico 2021). Other studies find that increases in compensation driven by changes in the minimum wage reduce separations more generally (Reich, Hall, and Jacobs 2004; Dube, Lester, and Reich 2016; Bassier, Dube, and Naidu, forthcoming). Compensation in the form of benefits like paid sick leave or the ability to work remotely can improve employee health and reduce workplace infection (DeRigne, Stoddard-Dare, and Quinn 2016; Pichler and Ziebarth 2017; Stearns and White 2018; Zhai et al. 2018) or allow them to work under conditions they find most conducive to success (Bloom et al. 2015; Choudhury, Foroughi, and Larson 2021).

Maintaining a safe and respectful workplace also allows workers to get the most from their human capital. Workplace injuries and illnesses reduce productivity by decreasing the quantity and/or effectiveness of time spent at work. A study of randomized inspections by California's Division of Occupational Safety and Health suggests that attention to safety in high-injury industries can reduce injury rates and associated costs without reducing employment, sales, or business survival rates (Levine, Toffel, and Johnson 2012). Treating workers fairly and respectfully can also contribute to higher productivity. For example, one study indicates that the average worker would be willing to give up a substantial share of their wages to avoid having their employer set their schedule on short notice (Mas and Pallais 2017). Avoiding this practice can both improve workers' well-being (Harknett, Schnieder, and Irwin 2021) and increase their productivity. For example, when Gap, Inc., experimentally implemented consistent, predictable scheduling practices at its stores in San Francisco and Chicago, productivity increased by about 5 percent (Kesavan et al. 2021).

Skilled and experienced workers can be tapped to help businesses respond to changing economic conditions in ways that promote resilience and growth. When workers are invested in their jobs and unlikely to leave, managers can reorient business processes and adapt job content to get more from their employees. A wide variety of jobs could incorporate more satisfying tasks if, for example, workers were cross-trained in different types of work or allowed to make certain types of decisions. Setting up processes to reduce errors and eliminate waste can also ensure that employees are as productive as possible. Case studies indicate that, when implemented thoughtfully, these high-road approaches can succeed in sectors ranging from manufacturing (Helper 2009) to retail (Ton 2012). Because the adjustments are broad and largely depend on generating the desired response from workers to be worthwhile, a comprehensive implementation of high-road employment and managerial practices may be more effective than trying to change particular practices on a one-off basis.

Occupational Licensing

Occupational licensing policies are often introduced to ensure safe, high-quality services from professionals, like dentists and electricians, whose safety and quality are difficult for consumers to ascertain themselves. These policies frequently establish minimum standards for workers' human capital investments—such as by mandates to acquire specific credentials or to pursue continuing education. Kleiner and Soltas (2019) show that these standards induce workers who enter these occupations to invest more than they otherwise would, especially in occupation-specific forms of human capital such as vocational associate degrees and master's degrees.

However, occupational licensing can make it more difficult for workers to enter fields or move to places where their human capital would be more productive by increasing the cost of mobility in terms of fees for obtaining a license or time to complete required training or other licensing requirements. Research finds that licensing requirements decrease employment and churn within an occupation (Blair and Chung 2019; Kleiner and Soltas 2019; Kleiner and Xu 2020). On the positive side, licensing increases wages and wage growth within licensed occupations (Kleiner and Krueger 2010, 2013; Gittleman, Klee, and Kleiner 2017; Kleiner and Soltas 2019; Kleiner and Xu 2020). One analysis suggests that the magnitude of the licensing wage premium is comparable to the premium associated with union membership (Kleiner and Krueger 2010). Though licensed workers may benefit from higher wages, other similarly skilled workers who lack the resources to acquire a license may be prevented from moving into jobs where they would be more productive and better paid. There is also evidence that occupational licensing reduces interstate migration (Johnson and Kleiner 2020), making it more difficult for workers to relocate and deploy their human capital where it would be most beneficial for them. This especially affects mobile populations such as military spouses, who are 10 times more likely to have moved across State lines in the last year than their civilian counterparts and experience persistently high unemployment due to relocations (U.S. Department of the Treasury and U.S. Department of Defense 2012).

Although many occupations require licenses in some jurisdictions, relatively few require licenses in all jurisdictions (Council of Economic Advisers et al. 2015), suggesting that there is substantial scope to tailor occupational licensing to balance interests in quality, safety, and effective human capital deployment. In 2019, Current Population Survey data show that just under 20 percent of California's labor force held a professional certification or State or industry license, the lowest share for any State; at the other extreme, in Wyoming, that share was just over 30 percent. In the average State that year, about 84 percent of workers with licenses needed them to do their jobs.[16] In some cases, States have taken steps to reduce barriers associated with occupational licensing, such as creating reciprocity arrangements or interstate compacts related to licensing in certain occupations (National Conference of State Legislatures 2020). For example, during the COVID-19 pandemic, some States waived or modified requirements associated with telehealth to allow providers licensed in other States to serve their residents (Federation of State Medical Boards 2022). As more licensed occupations are deemed well-suited for remote work, further adoption of additional allowances will help reduce barriers for workers to deploy their human capital effectively.

[16] CEA calculations, based on Current Population Survey data.

Immigration

There are about 11 million undocumented immigrant residents of the United States, a group of people who are not able to fully deploy their human capital because they lack legal authorization to work or are authorized to work only temporarily. Research suggests that granting these immigrants permanent legal status would increase the productivity of their human capital. Unauthorized immigrants in the workforce experience a wage penalty relative to what native-born and authorized immigrant workers earn, even after controlling for educational attainment. The gap in wages can largely be explained by differences in the industrial and occupational composition of employment between unauthorized immigrants and other workers. This suggests that allowing these workers to move to different jobs that better utilize their skills could increase their productivity and wages (Rouse et al. 2021). Legal status would enable greater job mobility, a key channel through which workers find more productive job matches during their careers (Engbom 2022). Research also suggests that access to permanent legal status for undocumented immigrants could facilitate the development of additional human capital, because studies have found that legal status leads to increases in labor force attachment, education attainment, and other types of skill development (Gathmann and Keller 2018; Liscow and Woolston 2017; Cortes 2013).

Increasing authorized immigration can also lead to more human capital being deployed in the United States, boosting growth without waiting for a new generation of workers to complete the entirety of their education. Immigrants supply labor to produce a wide variety of goods and services, from agricultural products to medical services. Immigrants also consume a wide variety of goods and services, and this demand creates opportunities for other workers to deploy their human capital productively. On top of this, research identifies innovation and entrepreneurship benefits associated with immigration, which make use of the human capital of both the innovator/entrepreneur immigrants and the U.S. workers employed by their ventures (Hunt and Gauthier-Loiselle 2010; Fairlie and Lofstrom 2015).

Incarceration

A highly carceral criminal justice system as we have in the United States incapacitates a substantial amount of human capital; people cannot work to their full capacity while they are imprisoned. Even after they have served their time, the formerly incarcerated face barriers to being hired in jobs for which they may be fully qualified. About 1.4 million people were incarcerated in Federal or State prisons at the end of 2019, a population that is disproportionately male and nonwhite. About one-third were Black, and nearly another quarter were Hispanic (Carson 2020). Including people

incarcerated in local jails, who are typically incarcerated for shorter periods, would likely bring the total closer to 2 million.[17] People who are incarcerated are generally not available to participate in the labor market, and they have very limited opportunities to put their human capital to use. This fact is sometimes overlooked because commonly used labor market indicators like the employment-population ratio and the labor force participation rate exclude people who are incarcerated.

Producing employment-population ratio measures that include the incarcerated population reveals lower levels of human capital utilization, especially for Black men, and larger gaps between races. In December 2019, the white employment-population ratio was 61.2 percent, while the Black employment-population ratio was 59.3 percent. If people who were incarcerated in Federal or State prisons were included in these estimates, the Black ratio would fall by about 0.8 percentage point, to 58.5 percent, and the white ratio would fall by only about 0.1 percentage point, to 61.0 percent—increasing the difference between the two races to 2.5 percentage points. Including people incarcerated in local jails in this exercise would likely increase this gap further.

Laws that limit post-incarceration employment opportunities create longer-term obstacles to effectively deploying human capital for the formerly incarcerated. Having been incarcerated renders workers ineligible for certain types of employment, licenses, or credentials, regardless of their qualifications. Federal, State, and territorial governments collectively apply over 40,000 restrictions and requirements to people who have been convicted of crimes, 72 percent of which affect the employment opportunities available to them (Umez and Gaines 2021). For example, some of the incarcerated people who helped fight wildfires in California in recent years found themselves ineligible to be hired as firefighters after being released from prison because they were not eligible to receive certification as emergency medical technicians (Romo 2020). Though California has since passed a law that attempts to address this, the law requires that formerly incarcerated people petition to have their convictions expunged, a process that can be burdensome (Smith 2021). Reducing incarceration and post-incarceration employment restrictions could mitigate the extent to which the criminal justice system limits the deployment of human capital, as could improving and increasing access to programs designed to help formerly incarcerated people return to work.

[17] A total of 734,500 people were incarcerated in local jails in 2019, and 549,000 people were incarcerated in local jails in 2020 (Minton and Zeng 2021, table 2). A total of 1,379,786 people were incarcerated in State or Federal corrections facilities in 2019, and 1,182,166 were incarcerated in 2020 (Minton and Zeng 2021, table 3) for total incarcerated populations of 2.1 million in 2019 and 1.7 million in 2020.

Government Personnel Policies

In certain fields, the government plays an important role in determining how human capital is managed and/or compensated. Decisions about how much Medicare and Medicaid pay for various medical procedures, for example, have a direct impact on physicians' earnings (Gottlieb et al. 2020). The government's role extends to other areas of health, such as home health care services.

Nursing homes are one area where government payment policies have particular significance. In 2019, Medicaid accounted for around 29 percent of all spending on nursing care facilities and continuing care retirement communities, and Medicare covered another 22 percent (MACPAC 2021). Evidence suggests that the introduction of State Medicaid policies designed to increase wages in nursing homes was associated with increased staffing of certified nurse aides (Feng et al. 2010). Other evidence on wages in nursing homes also suggests that higher pay keeps workers in the industry. Ruffini (2021) finds that higher minimum wages increased retention among low-wage workers in nursing homes. She also finds that higher wages improved the quality of service provided by nursing homes, as reflected in reduced inspection violations; adverse, preventable health conditions; and mortality. This suggests that increasing compensation not only helps direct human capital toward an industry where it is needed but also induces workers to deploy their human capital more productively.

Conclusion

Increases in human capital accumulation contribute to faster economic growth and improved standards of living. Yet human capital accumulation has slowed over the past two decades, and the United States has fallen behind many other countries in both educational attainment and life expectancy. Further, many long-standing discrepancies remain in human capital accumulation and in deployment between individuals by income, race, and ethnicity. Thus, the Nation can benefit from investing more in education, workforce development, and health, and from exploring policies that can help individuals deploy existing human capital more effectively. These policies range from improving early childhood education and care to ensure that children get a strong start in life to lifting barriers to permit unauthorized immigrants and the formerly incarcerated to employ their human capital in its most effective form. Investments in people expand the productive capacity of the U.S. economy, boost living standards, and ensure that our workforce has the skills and education needed to compete in this dynamic world.

Chapter 4

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