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**Employment at Older Ages
and the Changing Nature of Work**

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The AARP Public Policy Institute, formed in 1985, is part of the Policy and Strategy Group at AARP. One of the missions of the Institute is to foster research and analysis on public policy issues of importance to mid-life and older Americans. This publication represents part of that effort.

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FOREWORD

Older men and women today are better educated and generally believed to be healthier than their counterparts of a generation or more ago. Fewer jobs are physically demanding. As a result, longer worklives should be more feasible and attractive, especially if part-time and phased retirement programs, job sharing, telecommuting, and other flexible arrangements become more widely available. Interest in fostering longer workers lives is on the rise, as policymakers, economists, and advocates for older Americans, among others, worry about the solvency of the Social Security system and the financial preparedness of many older persons for retirement. If labor shortages materialize in the face of boomer retirements, employers are likely to attempt to encourage more older workers to remain on the job or return to the workforce after retirement. Indeed, employers industries such as health care that already have trouble meeting staffing needs have begun to target older workers in their recruitment efforts.

But although workers may not be doing the heavy lifting that they did a generation or two ago, other aspects of work today may be taking their toll and making continued employment later in life problematic. These include possible increases in work intensity (e.g., pace of work, work hours, tight deadlines), job strain, and job insecurity resulting from globalization, corporate restructuring, outsourcing, and offshoring. Rapid technological change means more frequent training and retraining, which can make workers more employable on the one hand or running faster and faster just to stay in place on the other. The strain of commuting and coping with competing job and family responsibilities may compound work-related stress.

In *Employment at Older Ages and the Changing Nature of Work*, Richard Johnson, Gordon Mermin, and Matthew Resseger of the Urban Institute examine many of the job demands workers face today, how demands have changed over time, and what they might look like in the future. Linking information on occupational characteristics from the Occupational Information Network (O*NET) to the March 1971 and March 2006 Current Population Surveys, the investigators document a sharp decline in the physical demands of jobs over the past 35 years. Not only are jobs less physically demanding, they are less likely to entail difficult working conditions. However, jobs have become more cognitively challenging and more stressful.

Looking ahead, Johnson, Mermin, and Resseger conclude that the prevalence of job demands will not change much in coming decades if the occupational growth trends projected by the Bureau of Labor Statistics continue through 2041 and if the job demands of particular occupations remain constant. The future thus “bodes well for the employability of older adults,” the investigators conclude. Nor do they feel that the increase in cognitively demanding work will prevent many workers from extending their worklives.

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EXECUTIVE SUMMARY

Work and retirement decisions depend partly on job attributes. Positions that require physically strenuous work are often ill-suited for older workers, who frequently choose to retire early from these jobs when possible. Jobs that impose constant time pressures and require fast-paced work may be considered stressful and undesirable employment options by some older adults. Cognitively demanding work may be better suited for older people than physically demanding work, but probably not for those with limited education.

Changes over time in the nature of work have important implications for the employment prospects of older people. The shift from a manufacturing-dominated economy to one dominated by services has reduced physical work demands, potentially increasing the chances that older workers will delay retirement. However, increases over time in work intensity may push some people into early retirement. This report describes the job demands faced by workers today, changes over time in job demands, and the impact of those changes on the employability of older workers.

Methods

The study used detailed occupational characteristics from the Occupational Information Network (O*NET) to examine job demands. O*NET is a comprehensive database of job characteristics produced by the U.S. Department of Labor's Employment and Training Administration and is the only data source on objective job demands. It rates about 800 occupations on more than 200 scales, including required skills, abilities, education and training, knowledge, and work styles. O*NET also measures the tasks performed and the characteristics of the physical work environment. Each job attribute is assigned a score of between one and five, where one indicates that the attribute is not important to job performance and five indicates that it is extremely important.

To describe the current and past distribution of job demands, the analysis linked occupational information from O*NET to individual workers in the March 2006 Current Population Survey (CPS) and the March 1971 CPS. The CPS is a large household survey of the civilian noninstitutionalized population conducted by the U.S. Census Bureau for the Bureau of Labor Statistics (BLS). It collects information on employment, health status, and demographics, including occupation, gender, age, race, and educational attainment.

The study also applied BLS employment projections to the CPS-O*NET file to examine future trends. BLS projects employment by occupation, with current projections to 2014, reflecting trends in consumer demand, technological change, population growth, and labor force participation. The analysis extended the projections to 2041, under the assumption that the occupational growth rates forecast by BLS between 2006 and 2014 will continue another 27 years. Although necessarily imprecise, these extended projections might give some indication of the labor market's long-term direction.

The analysis created 14 summary job attribute measures from more than 55 specific job characteristics. It identified an occupation as involving a specific demand if its O*NET score equaled or exceeded four on the five-point scale, indicating that the requirement was very or extremely important to job performance. Summary measures consisted of physical demands, nonphysical demands, and difficult workplace conditions.

An important caveat is that the study likely underestimated trends in job demands. Observed trends arose only from changes in the relative size of occupations, not from changes in job demands within occupations (which could not be measured). For example, the analysis captured the reduction in job demands due to employment shifts from manufacturing to knowledge-based occupations, but it did not capture any reductions that arose from declines over time in physical demands within particular manufacturing jobs.

Prevalence of Job Demands in 2006

Relatively few workers held jobs with high physical demands in 2006, although many jobs involved some physical demands. Cognitive demands and stress were widespread in the workplace.

- About 46 percent of workers were employed in occupations that entailed any general physical demands (which included strength, stamina, quick reaction time, balance, bending or twisting, kneeling or crouching, handling objects, standing, walking, running, and making repetitive motions). Spending time standing—the most common physical demand—was very or extremely important to job performance for 34 percent of workers. Only 7 percent, however, were employed in jobs that imposed high general physical demands.
- Almost 35 percent of workers were employed in occupations requiring high cognitive ability, and nearly 70 percent were in occupations that required some cognitive ability. Computer use was very or extremely important to performance in about 43 percent of jobs.
- About 44 percent of jobs involved some stress (conflict situations, competition, and time pressure—including meeting strict deadlines), and about 9 percent of workers were in high stress occupations.
- Almost a quarter of workers were in occupations with difficult working conditions. About 12 percent worked in jobs that involved exposure to contaminants, 11 percent worked outdoors with exposure to the weather, and 9 percent were exposed to high noise levels on the job.
- On-the-job cognitive demands increased with workers' education, on average, whereas physical demands (other than vision) fell as educational attainment increased. Men were more likely than women to hold physically demanding jobs and jobs with difficult working conditions, but were less likely to hold jobs with high cognitive demands. Workers reporting fair or poor health were more likely than those in better health to hold jobs entailing physical demands or difficult working conditions. The prevalence of job demands did not generally change much after age 25.

Trends in Job Demands

The nature of work has changed markedly over the last 35 years. Jobs have become less physically demanding and less likely to entail difficult working conditions, but are more cognitively challenging and more stressful.

- Between 1971 and 2006 the share of jobs involving any general physical demands declined from about 57 percent to 46 percent.
- The share of jobs requiring high cognitive ability and strong interpersonal skills grew from about one-quarter to more than one-third over the past 35 years, an increase of about 35 percent.
- The shift away from physically demanding work and toward stressful, cognitively demanding work was more pronounced for women than men.
- Workers ages 50 and older experienced sharper declines in physically demanding work than younger people and steeper increases in stressful, cognitively demanding work.
- If the occupational growth trends projected by BLS continue through 2041 and demands within particular occupations remain constant over time, the prevalence of job demands within the labor market will not change much over the next 35 years. Actual job demands could change substantially, however, if the attributes of particular jobs shift over time.

Implications

The sharp decline in physical job demands over the past 35 years bodes well for the employability of older adults, increasing the chances that older people will be willing and able to remain at work. However, the growth in stressful, cognitively demanding jobs complicates the outlook for older workers. Although psychologists have found that cognitive skills that involve on-the-spot reasoning ability—independent of past experience—decline with age, cognitive skills such as verbal ability that rely on accumulated knowledge do not. Acquired knowledge, enhanced communication skills, and sharper decision-making abilities can offset age-related declines in mental efficiency. The growth in high-stress jobs, however, may be more problematic. Older people may be increasingly able to fulfill the physical and intellectual requirements of their jobs, but they may choose to retire early to escape their hectic, pressure-filled lives, especially if they can afford to stop working or are unable to transition to slower-paced jobs.

How employment rates for older adults will evolve in coming years remains uncertain. After falling steadily for most of the twentieth century, labor force participation rates for older men have been rising for the past two decades. It is not yet clear, however, whether these recent increases will develop into a long-term trend. Widespread anxiety about old-age income security, which is likely to persist as employers continue to cut traditional retirement benefits and health care costs continue to rise, has led many older people to plan to delay retirement. Health problems could upend work plans, however, forcing more people to retire earlier than they expected. Other uncertainties include policy choices—such as Social Security reform—and the willingness of firms to hire and employ older people and offer the flexible employment

arrangements that older workers prefer. Although it is unclear how all of these forces will play out, the changing nature of work will likely promote old-age employment for most people, or at least not interfere with longer worklives.

EMPLOYMENT AT OLDER AGES AND THE CHANGING NATURE OF WORK

Introduction

The economic burden of an aging population depends on the employment decisions of older adults. If workers continue to retire at the relatively young ages that have become the norm over the past generation, then the aging of the baby boomers will reduce the number of people working and paying taxes for every older person collecting retirement and health benefits. Workers may have to pay higher taxes to support more retirees, employers may face labor shortages (particularly in selected industries), retirement benefits will likely be cut, and per capita economic output will fall. However, if people choose to work longer, the economy can produce more goods and services, boosting living standards for both workers and nonworkers and generating additional tax revenue to fund all kinds of government services. The crucial question, then, is whether older people will respond to the coming demographic challenges by working longer and retiring later.

Job attributes are important factors in the retirement decision. Positions that require heavy lifting, crouching, or stooping; standing for long periods; or other types of physically exhausting work are generally ill-suited for older workers, who often choose to retire early from these jobs if possible. Some older workers are forced to leave physically demanding jobs early when they develop health problems. Cognitively demanding work may be better suited for older people than physically demanding work, but probably not for those with limited education. Jobs that impose constant time pressures and require fast-paced work may be considered stressful and undesirable employment options by some older adults.

Changes over time in the nature of work have important implications for the employment prospects of older people. Older workers may be more likely to delay retirement if work is becoming less physically demanding. On the other hand, increases over time in work intensity may push some workers into early retirement. Better information is needed about the current distribution of job demands and how those demands are changing.

This report describes the job demands faced by workers today, the changes over time in job demands, and the impact of those changes on the employability of older workers. We linked job characteristics data from the U.S. Department of Labor's Employment and Training Administration (ETA) to the Current Population Survey (CPS) to calculate the proportion of workers facing various types of job demands in 2006 and 1971. Employment projections were used to estimate the prevalence of job demands in 2014 and in 2041. The job attributes that we considered included physical demands, nonphysical demands, and difficult workplace conditions. We also examined how job demands varied by demographic characteristics, including gender, educational attainment, race, and age.

Background

Extending the work life may be the surest way to a financially secure retirement. By working until age 67 instead of retiring at age 62, a typical worker could gain about \$10,000 in annual income at age 75, net of federal income taxes and health insurance premiums (Butrica, et al. 2004). Working longer also generates additional payroll and income taxes to help fund necessary government services, including retirement benefits (Butrica, Smith, and Steuerle 2006). Delaying retirement might even improve one's health (Calvo 2006).

Retirement Decisions

Despite the advantages of delaying retirement, many workers retire early. In 2005, the labor force participation rate for men was only 69 percent at ages 55 to 64 and only 20 percent at ages 65 and older (Bureau of Labor Statistics 2006). Although participation rates for older men have been slowly increasing since the late 1980s, they remain substantially below the levels in the middle part of the last century. For example, 46 percent of men ages 65 and older participated in the labor force in 1950 (Bureau of Labor Statistics 2006).

Research has identified several factors that affect work decisions at older ages, including wealth, health status, and retirement benefits (Quinn, Burkhauser, and Myers 1990). Wealthy workers tend to retire early, all else equal, because they can afford to maintain pre-retirement consumption levels after they stop working. Poor health typically promotes retirement by making work more difficult and reducing workers' earnings potential (Bound, et al. 1998; McGarry 2004). Traditional defined-benefit (DB) pensions, which provide workers with lifetime retirement annuities usually based on years of service and earnings near the end of the career, tend to discourage work at older ages (Stock and Wise 1990). They often provide substantial subsidies for early retirement and penalize workers who remain on the job past the plan's normal retirement age, because workers who delay retirement by a month forfeit a month of benefits. These traditional plans are disappearing, giving way to 401(k)-type plans, but they still predominate in the public sector and unionized workplaces (Munnell and Perun 2006). Retiree health benefits reduce the costs that stem from the loss of employer-provided health insurance, thus encouraging people to retire early (Johnson, Davidoff, and Perese 2003; Rogowski and Karoly 2000).

Some aspects of Social Security also encourage early retirement. Social Security allows people to stop work and begin collecting retirement benefits at age 62, although early take-up reduces the amount of payments received each month. Also, the system does not reward additional employment much for workers who spend more than 35 years in the labor market (Coile and Gruber 2007). Social Security benefits are based on average indexed monthly earnings, computed over the 35 years with the highest indexed earnings. For workers with fewer than 35 years of employment, an additional year of work and contributions eliminates a year of zero earnings from the benefit computation, and may raise future benefits substantially. But for those with longer employment histories, an additional year of work will raise future Social Security benefits only to the extent that current earnings exceed adjusted earnings in the least remunerative of the top 35 years already used in the computation. This relatively small gain in benefits is not typically large enough to compensate for the additional payroll taxes that workers

must pay (Butrica, et al. 2004). For someone employed continuously since age 25, work beyond age 60 does not generally produce much net gain in future Social Security benefits.

Even for older workers who have not yet completed 35 years of qualified work, the net increase in Social Security benefits is often small. Under the Social Security benefit formula, the last dollars of lifetime earnings subject to tax generate future benefits at a much lower rate than the first dollars earned, even within a 35-year timeframe. In addition, some spouses earn few or no additional Social Security benefits in return for the payroll taxes they pay. By design, Social Security pays a higher benefit to workers only when and if the workers' benefit exceeds what they are eligible to receive as spouses or survivors of beneficiaries.

When making retirement decisions, workers consider not only financial factors and health status but also the nonmonetary aspects of work, including job satisfaction and demands. Physical job demands are particularly relevant for older workers. When health declines with age, workers may find physically demanding jobs unattractive or not feasible. And physically demanding jobs and adverse working conditions may themselves impair health status (Burtless 1997; Grossman 1972; Wolfe 1985).

Workers in physically demanding jobs frequently retire earlier than workers in other occupations. In a survey of new Social Security recipients, workers in physically demanding jobs were less likely than other workers to remain in the labor force after they first received benefits (Holden 1988). Using the 1980 Census and the CPS, Filer and Petri (1988) found that average retirement ages were especially low in physically demanding occupations. Similarly, respondents to the National Longitudinal Survey of Older Men who worked in physically demanding occupations transitioned into retirement more quickly than workers in less demanding jobs (Hayward, et al. 1989).

Nonphysical job demands may also affect employment at older ages. Cognitive demands appear to make work more attractive, at least for those with the necessary skills. Although cognitively demanding jobs require more education and training than other occupations, the autonomy and intellectual stimulation they provide often leads to greater job satisfaction. Hayward, et al. (1989) found that workers in substantively complex occupations retired later than other workers, all else equal. Stress and work flexibility also appear to influence retirement decisions. Research suggests that workers in stressful occupations retire early, whereas those in occupations that allow greater flexibility retire later (Filer and Petri 1988; Hurd and McGarry 1993). Many older workers transition into less demanding post-career jobs before completely withdrawing from the labor force (Cahill, Giandrea, and Quinn 2005; Johnson and Kawachi 2007).

Trends in Factors Affecting Retirement

Public and private pension reforms are promoting work at older ages. Social Security changes that have recently been implemented have enhanced work incentives for older people. The normal retirement age for full Social Security benefits recently increased from 65 to 66, and will reach 67 for those born after 1959 (who will begin turning 62 in 2022). Delayed retirement credits have been raised to better compensate retirees who wait until after the normal retirement

age to begin collecting benefits. And Congress has repealed the earnings test for beneficiaries who work past the normal retirement age. The earnings test reduces Social Security benefits for employed recipients who earn more than a limited amount. These changes appear to have increased work at older ages (Pingle 2006; Song and Manchester 2007)

Changes in employer-provided benefits are also likely to result in delayed retirement. As noted earlier, employers have been shifting from traditional DB pensions to defined contribution (DC) plans, which do not encourage early retirement (Pension and Welfare Benefits Administration 1998). Employers typically make specified contributions into individual DC accounts that workers can access at retirement, generally as lump sum payments. Because contributions continue as long as plan participants remain employed and workers with a given account balance can receive the same lifetime benefit regardless of when they choose to begin collecting, DC plans do not generally penalize work at older ages. As a result, DC plan participants tend to retire later than DB plan participants (Friedberg and Webb 2005).

Far fewer employers offer retiree health insurance than 20 years ago, significantly increasing out-of-pocket health care costs in retirement before Medicare eligibility begins at age 65. Rising health care costs and the introduction of an accounting rule in 1993 requiring employers to recognize on their balance sheets the full liability of future retiree health costs have led many employers to terminate or radically cut back on their retiree health plans. In 2005, only 33 percent of employers with more than 200 employees offered retiree health benefits, down from 68 percent in 1988 (Kaiser Family Foundation and Health Research Educational Trust 2005).

Although retirement benefit changes are increasing the work incentives for older adults, other trends may discourage work at older ages. Fewer middle-aged adults report health problems now than in the early 1980s (National Center for Health Statistics 2006), but evidence from the Health and Retirement Study suggests that the trend toward better health at midlife has now stopped and may have even reversed in recent years (Soldo, et al. 2006). Other evidence indicates that disability rates at ages 40 to 49 increased between 1984 and 2000 (Lakdawalla, Bhattacharya, and Goldman 2004). The recent downturn in health may be related to rising diabetes and obesity rates among older Americans (Centers for Disease Control and Prevention 2005, 2006). Growing instability in the labor market, as increasing global competition forces many firms to downsize or outsource their labor needs, may be increasing the frequency and duration of unemployment spells, which have especially serious consequences for older workers (Chan and Stevens 2001). Among a sample of adults age 51 to 61 in 1992, about 1 in 5 were laid off at some point during the 12-year period ending in 2004 (Johnson, Mermin, and Murphy, 2007).

Assessing trends in job demands can provide further insight into changes in the work capacity of older adults. Economic and technological changes over the last 50 years have likely altered the nature of work. The shift in employment from manufacturing to services and the professions has reduced the share of workers in physically demanding occupations and increased the share in cognitively complex jobs. In 1950 about a third of the U.S. workforce was employed in manufacturing, compared with about 10 percent today (National Research Council 2004). Additionally, changes in business organization since the 1980s may have increased nonphysical

job demands. These changes have sought to boost productivity by better utilizing the skills and decision-making of frontline workers, promoting teamwork, and integrating computers and technology into the manufacturing process. The changes may have increased job-related cognitive demands, social demands, and stress—particularly in blue collar occupations (National Institute for Occupational Safety and Health 2002; National Research Council 1999).

Previous research has found that between 1950 and 1996 the share of U.S. workers in physically demanding jobs declined from about 20 percent to about 8 percent, where demanding jobs were defined as requiring frequent lifting or carrying objects weighing more than 25 pounds (Steuerle, Spiro, and Johnson 1999). From 1992 to 2002 the share of men reporting that their jobs never or almost never required “lots of physical effort” fell by 8 percentage points, a relative decline of about 26 percent (Johnson 2004). There is also evidence that work may be more intense than it once was, requiring employees to work at a faster pace, put in longer hours, and meet tighter deadlines (National Research Council 2004), which in turn can exact a high physical toll on workers (McEwen 1998). Better information on trends in job attributes would provide a more complete portrait of the changing employment prospects of older adults.

Data and Methods

We used detailed occupational characteristics from the ETA to examine the current distribution of job demands and trends over time. The Occupational Information Network (O*NET) is a comprehensive database of job characteristics produced by ETA. To our knowledge this is the only data source on objective job demands. It rates about 800 occupations on more than 200 scales, including required skills, abilities, education and training, knowledge, and work styles, as well as tasks performed and the characteristics of the physical work environment. O*NET occupational ratings are based on a random sample of businesses and workers within each business.¹ Each job attribute is assigned a score of between one and five, where one indicates that the attribute is not important to job performance and five indicates that it is extremely important.

To describe the current distribution of job demands, we linked occupational information from O*NET to individual workers in the March 2006 CPS, a large household survey of the civilian noninstitutionalized population conducted by the U.S. Census Bureau for the Bureau of Labor Statistics (BLS). It collected information on employment, health status, and demographics, including occupation, gender, age, race, and educational attainment. In most cases O*NET and the 2006 CPS categorized occupations by the same Standard Occupation Classification codes, so the vast majority of workers could be matched directly to occupational ratings. In some cases, however, O*NET occupation codes were more specific than the 2006 CPS occupation codes. For example, all financial managers in the CPS had the same occupation code, whereas in O*NET treasurers/controllers and financial managers had different classifications. In cases in which the O*NET codes were more detailed than the 2006 CPS codes, we randomly assigned CPS workers

¹ Before 2002 ratings were based on input from trained job analysts. Since then ETA has been gradually replacing those ratings with ones based on business and worker surveys. Ratings for 580 of the 810 O*NET occupations are now based on survey information. This analysis used the ratings from the full set of 810 occupations, including those based on analyst scores. For additional information on O*NET, visit <http://www.onetcenter.org>.

in a given occupation to the detailed sub-occupations. In almost all cases the job ratings for the O*NET sub-occupations did not vary much within a given CPS occupation. Our 2006 sample consisted of 104,158 workers.

We linked O*NET to the March 1971 CPS to examine trends in the distribution of job demands over the past 35 years. Older CPS data files used a different coding system than the current survey to classify occupations and were not easily matched to O*NET. However, a file developed by the National Academy of Sciences' (NAS) Committee on Occupational Classification and Analysis assigned to workers in the 1971 survey occupational codes from the ETA's Dictionary of Occupational Titles (DOT), which in turn could be linked to O*NET using a crosswalk developed by the National Crosswalk Service Center (2007).² Our sample in 1971 included 60,441 workers.

To examine future trends in job demands we applied BLS employment projections to our 2006 CPS-O*NET file. BLS projects employment by occupation, currently out to 2014, which reflects trends in consumer demand, technological change, population growth, and labor force participation (Hecker 2005). We adjusted each worker's weight in the 2006 CPS-O*NET file by employment growth to 2014 for that worker's occupation. Although these forecasts are necessarily uncertain, past BLS employment projections have turned out to be reasonably accurate. Of the 20 occupations that BLS projected to grow most rapidly in 1988, 15 ranked among the top 25 in actual growth between that year and 2000 (Alpert and Auyer 2003). Of the 20 occupations that BLS projected would create the most jobs, 13 ranked among the top 20 in actual job growth between 1988 and 2000. These 13 occupations accounted for 94 percent of net job growth over the period.

We also extended the projections out to 2041 so that we could compare job demands 35 years into the future (from 2006) and 35 years into the past (to 1971). These projections assume that the occupational growth rates forecast by BLS between 2006 and 2014 will continue through 2041. Although necessarily imprecise, these extended projections might give some indication of where the labor market is headed over the long term.

An important caveat to our analysis is that it likely underestimated trends in job demands. Since comparable information on job characteristics over time was not available, we used O*NET for our analysis of job demands in 1971, 2006, 2014, and 2041.³ Trends in job demands that we observed arose only from changes in the relative size of occupations, not changes in job demands within occupations, which we were unable to measure. For example, our analysis captured the reduction in job demands due to employment shifts from manufacturing to

² About 12 percent of the observations in the 1971 CPS lacked a direct match to the DOT codes. We imputed a DOT code for these cases, based on the assumption that all workers with a given CPS occupational code had the same probability of falling into various DOT occupational classifications. We preferred this imputation strategy to dropping cases that lacked a direct match to a DOT code because DOT job characteristics did not vary much within CPS occupations, and dropping observations with missing job information could have biased our estimates of the overall prevalence of various job demands.

³ The DOT, last updated in 1991, provides information on job characteristics in earlier years, but its ratings system differs markedly from the O*NET ratings. As a result, we could not use it to compare past job demands to those prevailing today.

knowledge-based occupations, but it did not capture any reductions that occurred from declines over time in physical demands within particular manufacturing jobs.

Job Demands

We created 14 summary job attribute measures from more than 55 specific job characteristics. We identified an occupation as involving a specific demand if its O*NET score equaled or exceeded four on the five-point scale, indicating that the requirement was very or extremely important to job performance. Our summary measures consisted of physical demands, nonphysical demands, and difficult workplace conditions.

The summary measures of physical job demands included general physical demands, flexibility and dexterity, and vision. We classified a job as imposing *high* general physical demands on workers if the job had an O*NET score that equaled four or five on any of the following dimensions: dynamic strength, explosive strength, static strength, trunk strength, stamina, bending or twisting, kneeling or crouching, reaction time, and maintaining balance. Occupations were classified as having *any* general physical demands if the O*NET score equaled four or more on ratings for handling objects, significant time standing, significant time walking and running, general physical activities, or repetitive motions—or if it met the criteria for high general physical demands. Jobs with some general physical demands but not high physical demands may be inappropriate for some older workers, because many people are unable to stand for long time periods. We classified occupations as requiring *high* flexibility and dexterity if they demanded arm-hand steadiness, extent flexibility, finger dexterity, or manual dexterity, and as requiring *any* flexibility and dexterity if they required that workers spend significant time using their hands or demanded high flexibility and dexterity. Our vision measure included depth perception, near vision, and far vision. (The Appendix provides some additional information on how these measures were defined.)

We also examined nonphysical demands including cognitive ability, computer use, stress, interpersonal skills, dealing with unpleasant people, and the need for continually updating skills and knowledge. Our analysis classified occupations as requiring *high* cognitive ability if they demanded deductive, inductive, or mathematical reasoning; originality; written expression; creative thinking; complex problem solving; judgment and decision making; or the use of scientific rules or methods. Occupations requiring *some* cognitive ability imposed some of these demands or required workers to get or process information, write letters and memos, make decisions and solve problems, learn actively, or think critically. We classified occupations as requiring computer use if they involved using computers for entering data, processing information, programming, or electronic mail. Our *high* stress measure was based on the frequency of conflict situations and level of competition. Jobs with *any* stress imposed these demands or required workers to meet strict deadlines. We classified occupations as requiring interpersonal skills if they entailed social perceptiveness or required workers to establish and maintain interpersonal relationships. The last two nonphysical demand categories were dealing with unpleasant people and the need for continually updating skills and knowledge.

Finally, we identified occupations involving difficult workplace conditions. These occupations involved work in cramped spaces; exposure to contaminants, hazardous conditions,

or hazardous equipment; outside work; indoor work without heat or cooling; high noise levels; or extreme temperatures.

Results

Prevalence of Job Demands

Table 1 shows the proportion of workers in 2006 facing different types of job demands. Relatively few workers, just more than 7 percent, were employed in occupations that imposed *high* general physical demands. The most prevalent of these demands were static strength (exerting maximum muscle force to lift, push, pull, or carry objects), the need to bend or twist the body, and quick reaction time (by responding to a signal with the hand, finger, or foot). Far more workers, about 46 percent, were employed in occupations that entailed *any* general physical demands. Spending time standing—the most common general physical demand—was very or extremely important to job performance for 34 percent of workers. About 7 percent of jobs demanded *high* flexibility and dexterity, with arm-hand steadiness being the most common requirement. When the measure included time spent handling objects, the share of workers in jobs requiring flexibility and dexterity increased to about 26 percent. Vision, particularly the ability to see details at close range, was a very or extremely important requirement in about 14 percent of jobs.

Nonphysical demands were more prevalent than physical demands. Almost 35 percent of workers were employed in occupations requiring high cognitive ability. Deductive and inductive reasoning were the most common of these requirements, followed by decision making and written expression. Under a more expansive measure, nearly 7 in 10 workers were employed in occupations requiring some cognitive ability, with the need to acquire information being the most prevalent requirement. Computer use was very or extremely important to job performance in about 43 percent of jobs, reflecting the proliferation of computers in the workplace. Perhaps also reflecting technological change, the need to continually update relevant skills and knowledge was very or extremely important for 18 percent of workers. About 34 percent of jobs required strong interpersonal skills and about 8 percent required regular dealings with angry or unpleasant people, as self-defined by the O*NET survey respondents.

Stress is an important feature of many of today's jobs. Although just more than 9 percent of workers were in occupations involving high stress, with frequent conflict situations and much competition, about 39 percent of jobs involved time pressure, including strict deadlines. Overall, 44 percent of jobs involved stress under an expansive measure that included conflict situations, competition, and time pressures.

Almost a quarter of workers were employed in occupations with difficult working conditions. About 12 percent worked in jobs that involved exposure to contaminants, about 11 percent worked outdoors with exposure to the weather, and about 9 percent were exposed to high noise levels on the job.

Demands by Demographic Group

Table 2 reports how 2006 job demands varied by gender, education, and race. Men were more likely than women to hold physically demanding jobs and jobs with difficult working conditions, but were less likely to hold jobs with high cognitive demands. For example, about 11 percent of men worked in occupations with high general physical demands, compared with about 3 percent of women. And slightly more than half of men held jobs with any general physical demands, compared with about 39 percent of women. Men were also more than twice as likely as women to hold jobs that required any type of flexibility or dexterity, and they were almost three times as likely to hold jobs with difficult working conditions. However, high cognitive ability and interpersonal skills were more important job requirements for women than men. Women were also nearly twice as likely as men to have to deal with unpleasant people on the job.⁴

On average, on-the-job cognitive demands increased with workers' education, whereas physical demands (other than vision) fell as educational attainment increased. For example, nearly two-thirds of college graduates held jobs that required high cognitive ability, compared with less than 1 in 5 high school graduates and less than 1 in 10 workers who did not complete high school. Compared with workers who did not attend college, college graduates faced higher stress on the job, used computers more frequently, and made more use of interpersonal skills. However, their jobs entailed less physical effort, less frequent dealings with unpleasant people, and more pleasant working conditions. For example, 17 percent of workers who did not complete high school and 11 percent of high school graduates who did not attend college faced high general physical job demands, compared with less than 2 percent of college graduates. More than one-third of employees with only a high school diploma, and about 47 percent of those without a diploma, worked under difficult circumstances, compared to less than 9 percent of college graduates.

Job demands varied by race and ethnicity, but the differences were less pronounced than those observed across educational groups. Employed African Americans and especially Hispanics were more likely than whites and people of other races to work in physically demanding jobs, and they were less likely to hold jobs that required high cognitive ability. More than one-third of Hispanics in the workforce held jobs that entailed difficult workplace conditions, compared with less than one-fourth of whites.

Table 3 shows how job demands varied by age. Not surprisingly, college-age workers held jobs with far different demands than the rest of the workforce. Workers ages 25 and younger were more likely to hold jobs that were physically demanding or required dealing with unpleasant people. For example, 64 percent of workers in this age group faced general physical demands on the job, compared with about 44 percent of workers ages 26 to 49. Workers in the youngest age group were much less likely than older workers to hold stressful jobs or those requiring cognitive ability, computer use, strong interpersonal skills, and updating and using knowledge. For example, workers ages 25 and younger were only half as likely as workers ages 26 to 49 to be employed in jobs requiring high cognitive ability.

⁴ Because most occupational ratings in O*NET are based on employee surveys, this result may partially reflect gender differences in how people perceive and react to others' behavior.

Although jobs differed markedly for the youngest workers, the prevalence of job demands did not generally change much after age 25. We found some evidence that on-the-job physical demands declined with age after 25, but the differences were modest. For example, about 26 percent of workers held jobs requiring any flexibility and dexterity at ages 26 to 49, compared with about 23 percent at ages 62 and older. This age pattern seems inconsistent with evidence that physically demanding work leads to early retirement (Filer and Petri 1988; Hayward et al. 1989), but it could result from cohort differences in the likelihood of holding physically demanding jobs. For example, many older workers would be observed today in physically demanding jobs—even if workers in demanding jobs retire relatively early—if the current cohort of older workers was more likely than the current cohort of younger workers to hold demanding jobs when they were young (and if many people remain in the same occupation throughout their lives).

As seen in Table 3, the share of jobs requiring cognitive ability, computer use, and updating and using knowledge held steady or increased before declining at age 62 or older. These skills declined by at least 4 percentage points after age 64. The proportion of jobs requiring some cognitive ability fell from about 73 percent for workers ages 26 to 49 to about 68 percent for workers ages 62 and older.

Table 4 shows job demands by self-reported health status. Workers reporting fair or poor health were more likely than those in better health to hold jobs entailing physical demands or difficult working conditions.⁵ For example, almost one-third of workers in fair or poor health held jobs requiring any flexibility and dexterity, compared with about one-quarter of workers in excellent or very good health. In contrast, workers in excellent or very good health were more likely than those in worse health to hold jobs with cognitive demands or those that required work with computers, interpersonal skills, and updating and using knowledge. For example, 45 percent of workers in excellent or very good health were employed in jobs requiring computer use, compared with 32 percent of workers in fair or poor health.

Overall Trends in Job Demands

Table 5 compares the prevalence of job demands in 1971 and 2006, and in projections for 2014 and 2041. The nature of work has changed markedly over the last 35 years. Jobs have become less physically demanding and are less likely to entail difficult working conditions. Between 1971 and 2006 the share of jobs involving any general physical demands declined from about 57 percent to 46 percent, while the share requiring high flexibility and dexterity declined from about 12 percent to 7 percent. In relative terms, the share of jobs with any general physical demands fell by about 19 percent over the 35-year period, while the share with high flexibility and dexterity demands fell by about 43 percent. Similarly, the proportion of jobs with difficult working conditions fell from nearly one-third to about one-quarter.

While jobs have been become less physically demanding over time, nonphysical demands have increased. Between 1971 and 2006 the share of jobs requiring high cognitive ability and strong interpersonal skills grew from about one-quarter to more than one-third, an increase of

⁵ Workers in fair or poor health were also significantly more likely than those in better health to hold jobs that required dealing with unpleasant people, but the differences were relatively small.

about 35 percent. Over the same period the proportion of jobs involving high stress and requiring dealing with unpleasant people more than doubled. And the share of workers whose jobs involved continually updating and using relevant knowledge increased from 11 percent to 18 percent.

In contrast to the trend over the past 35 years, our projections show little change in the prevalence of job demands between 2006 and 2014 (Table 5). For example, based on BLS occupational employment projections and the assumption that job demands within occupations do not change, we predicted that the share of workers in jobs with any general physical demands will decline by about 1 percentage point, from 46 percent to 45 percent, while the share in jobs requiring cognitive ability will increase by about 1 percentage point. The small size of these changes is not surprising, since the projection period spans only eight years.

Even if the occupational growth trends projected by BLS continue through 2041, the prevalence of job demands will not change much over the next 35 years. If job demands within occupations remain constant and the annual occupational growth rates that BLS has projected for the period from 2006 to 2014 continue into the more distant future, we projected that the proportion of workers facing some general physical demands on the job will fall by 2 percentage points between 2006 and 2041. The share in jobs requiring high levels of cognitive ability will increase by 3 percentage points over the period, to about 38 percent. The changes projected for the next 35 years are much less pronounced than those observed over the past 35 years.

Our estimates of the change in job demands necessarily understate the true shifts that occurred or likely will occur because they ignore changes in work activities within occupations. Our estimated changes were driven completely by shifts over time in occupational employment, and assumed that job demands within occupations remained unchanged.

The occupational distribution has changed over time, as reported in Table 6. Over the past three and a half decades employment has shifted significantly to knowledge-based occupations. For example, between 1971 and 2006 the share of the workforce in blue-collar occupations (including production, transportation, maintenance, construction, and farming jobs) fell from about 36 percent to 24 percent, while the share in management and professional jobs increased from 23 percent to about 34 percent (Table 6). However, BLS employment projections show almost no change in the occupational distribution between 2006 and 2014, and we saw little change through 2041 when we extrapolated these growth rates into the more distant future. This occupational stability explains why we found little change in future job demands.

Major changes in the demographic composition of the workforce have accompanied the occupational shifts observed since 1971. Women entered the labor force, particularly in management and professional occupations, in large numbers. By 2006 women accounted for about 47 percent of the workforce, up from just 38 percent in 1971 (Table 7). Educational attainment has soared over the past 35 years. Between 1971 and 2006 the share of workers with a bachelor's degree has more than doubled, while the share that failed to complete high school fell from about 36 percent to about 13 percent.⁶ The workforce has also become more racially

⁶ The CPS coded educational attainment differently in 1971 and 2006. In 2006 there was more detail about degrees earned rather than simply recording the number of years of completed schooling. Our analysis assumed that a 1971

diverse, with whites accounting for 82 percent of the workforce in 2006, down from 89 percent in 1971.⁷ The share of the labor force occupied by younger workers has declined significantly over the last 35 years as the baby boomers have aged and more young people have pursued higher education instead of immediately entering the workforce. Between 1971 and 2006 the share of workers under age 25 declined from 24 percent to 17 percent while the share ages 26 to 49 increased from 49 percent to 55 percent. However, the proportion of workers ages 50 and older has increased by only 1 percentage point over the period.

Trends by Demographic Group

Table 8 shows how differences in job demands between 1971 and 2006 varied by gender.⁸ The overall trend away from physically demanding jobs towards stressful, cognitively demanding jobs was more pronounced for women than men. Between 1971 and 2006 women's employment in *highly* physically demanding jobs declined by about 2 percentage points—a 40 percent drop—while the proportion of men in such jobs held steady. The share of workers in jobs with *any* physical demands fell for both men and women, but the 24 percent decline for women was nearly twice as steep as the roughly 13 percent decline for men. Although working women were less likely than working men to be employed in physically demanding jobs throughout the 35-year period, the gap has increased over time.

The shift in physical demands has been accompanied by trends in nonphysical demands that have substantially increased the representation of women in stressful jobs and those that require strong cognitive abilities. Between 1971 and 2006 the portion of working women in jobs with high cognitive demands jumped from 24 percent to about 38 percent, about a 59 percent relative increase. Over the same period the portion of men facing high cognitive demands increased from about 27 percent to only 32 percent, about a 19 percent relative increase. The trends are similar, although less pronounced, for jobs with *any* cognitive demands. Whereas a slightly smaller percentage of working women than men faced cognitive demands on the job in 1971, women have now overtaken men in the proportion using some cognitive skills in the workplace.

Women have also experienced sharper increases than men in on-the-job stress. Women have almost entirely closed the gender gap in employment in high stress jobs, with the share of women working in such jobs rising from just about 2 percent in 1971 to about 9 percent in 2006, more than a threefold increase. The share of men employed in high stress jobs increased from about 6 percent to about 10 percent over the same time period. Men have maintained higher levels of employment in jobs categorized as entailing *any* stress, although women have narrowed the gap substantially. In 1971 about 49 percent of men and only about 24 percent of women worked in jobs entailing any stress, but the gender gap had closed to less than 10 percentage

worker who completed four years of college had earned a bachelor's degree, although some people with four or more years of college fail to earn a degree.

⁷ The share of workers who were non-Hispanic whites likely fell even more sharply, but we were unable to measure these changes because the CPS did not ask about ethnicity in 1971.

⁸ Because our projections showed that job demands will not change much in the future, we examined trends by demographic groups only from 1971 to 2006.

points by 2006 as the share of women in stressful jobs grew by about 16 percentage points over the period.

Other gender differences in the evolution of job demands include sharper percentage-point increases in the share of women than men working in jobs requiring strong interpersonal skills and dealing with unpleasant and angry people. Steeper percentage-point declines were evident in the share of men in jobs with difficult working conditions and jobs that require flexibility and dexterity. These changes are consistent with the movement of working women into professional occupations and out of blue collar jobs, office and administrative support, and services. (Appendix Table 1 reports changes over time in the occupational distribution of men and women. Other Appendix tables show occupational differences by education, race, and age.)

Table 9 shows changes over time in job demands by educational attainment. In contrast to the sharp gender differences in the evolution of job demands reported in Table 8, trends were much more similar across educational groups. Interestingly, despite the overall decline in physically demanding jobs, the share of workers in jobs that entailed high general physical demands increased over time for each educational group, and the share in jobs with any general physical demands increased for those with no more than a high school diploma. Thus, the overall decline in physically demanding jobs over the past 35 years resulted from improvements in educational attainment.

Similarly, despite the overall growth in the proportion of cognitively demanding jobs, the share of workers in jobs requiring cognitive ability decreased from 1971 to 2006 for all educational groups except for people who attended college but did not earn a bachelor's degree. During this time period the share of college graduates in jobs requiring high cognitive ability fell by about 8 percentage points, a decline of 11 percent. As more workers earned college degrees, a growing portion of college graduates appeared to be holding jobs that did not require that level of schooling. The growth in stressful jobs was not confined to the well-educated workforce. In relative terms, the share of workers in high-stress jobs increased much more over time for those who never attended college than for better-educated workers. Among workers who did not complete high school, for example, the share in high-stress jobs nearly doubled over the 35 years.

Table 10 documents how job demand trends varied by race. The prevalence of certain job demands changed more over time for blacks than for whites. Between 1971 and 2006 blacks experienced especially high gains in the share of jobs that required some cognitive ability. Steep declines were evident in the share of jobs that entailed general physical demands. For example, the share of employed African Americans in jobs with high general physical demands fell by about 11 percentage points—about a 56 percent relative decline—whereas the share of employed whites in such jobs fell by less than 1 percentage point—only a 5 percent relative decline. At the same time, the share of employed African Americans in jobs requiring high cognitive ability increased by about 118 percent compared with about 31 percent for whites. The share of workers in stressful jobs also increased much more for blacks than for whites.

Breaking out trends by age, Table 11 shows that workers ages 50 and older experienced larger changes in the prevalence of most job demands than younger workers. Between 1971 and

2006 the share of workers in jobs entailing high general physical demands fell by about 3 percentage points at ages 50 to 61 and at ages 62 and older, about a 30 percent relative decline. In contrast, the share of workers ages 26 to 49 in jobs with high general physical demands fell by only about 1 percentage point. Older workers also experienced stronger growth in cognitive demands on the job. Over the past 35 years the share of workers in jobs requiring high cognitive ability increased by about 56 percent for workers ages 50 to 61 and by about 33 percent for workers ages 62 and older. The corresponding share grew by only about 26 percent for workers ages 26 to 49 and by about 10 percent for workers ages 25 and younger. The growth in stressful jobs was also particularly pronounced among older workers and those ages 25 and younger.

These age trends were consistent with observed age differences in occupational growth. Between 1971 and 2006 the share in professional occupations, which entail more cognitive demands and less physical demands than other occupations, grew more for older workers than for younger workers. At the same time, the share of workers ages 50 to 61 in physically demanding blue-collar jobs, especially those involved in goods production, fell sharply. (See Appendix Table 4 for details.)

Conclusions

The decline in physical job demands over the past 35 years bodes well for the employability of older adults. Between 1971 and 2006, as the importance of the U.S. manufacturing sector declined, the share of jobs held by adults ages 50 and older involving high general physical demands fell by about 30 percent. In 2006, only about 6 percent of workers ages 50 and older faced high general physical demands on the job, and only about 40 percent faced any general physical demands. Working conditions have also been improving over time. Only about one-quarter of workers in 2006 faced difficult working conditions such as being exposed to contaminants, having to endure extreme temperatures, or having to work outdoors or in very noisy environments. These trends increase the chances that older people will be willing and able to remain at work.

The true long-term decline in physical job demands has probably been even more dramatic than these estimates indicate. Our analysis assumed that job requirements have not changed at all within occupations. Instead, the declines we measured arose solely from employment shifts from physically demanding occupations to less demanding ones. In reality, of course, physical requirements for some specific occupations have fallen over time. As a result of technological advancements, for example, some manufacturing jobs now depend less on workers' physical strength than in the past and more on workers' ability to operate machinery. It is impossible to say how much our analysis understates the actual decline in physical job demands, but it could be substantial. Our estimates, then, should be viewed as the lower bounds on the true decline in the share of workers in physically demanding occupations.

Although physical job demands have fallen, the growth over time in nonphysical job demands may limit increases in the employment rates of older people. The growth in high-stress jobs and occupations that require interactions with unpleasant people may make work less appealing to many older adults and lead some to retire at relatively early ages. The share of

workers in jobs that involved high stress or difficult interpersonal dealings more than doubled between 1971 and 2006. By 2006 nearly one-half of older workers were employed in occupations that involved at least some stress, and nearly 1 in 10 were in high-stress occupations. Older people may be increasingly able to fulfill the physical requirements of their jobs, but they may choose to retire early to escape their hectic, pressured-filled lives, especially if they can afford to stop working or are unable to transition to slower-paced jobs.

Jobs have also become more cognitively challenging over the past 35 years, further complicating the outlook for older workers. More than one-third of workers are now employed in occupations that require high cognitive ability, such as complex problem solving or creative thinking, and more than two-thirds are in occupations that require at least some cognitive ability, such as information processing or critical thinking. What psychologists refer to as fluid intelligence (Cattell 1971)—cognitive skills that involve on-the-spot reasoning ability, independent of past experience—generally declines with age. For example, numerical ability and the capacity to master new material peak at age 35 and then erode over time (Avolio and Waldman 1994; Verhaeghen and Salthouse 1997). However, cognitive skills such as verbal ability that rely on accumulated knowledge—known as crystallized intelligence—do not appear to decline with age (Horn and Cattell 1966). Acquired knowledge, enhanced communication skills, and sharper decision-making abilities can offset age-related declines in mental efficiency. For example, one study found that older hotel reservation clerks were more productive than their younger colleagues, even though they handled fewer calls, because their superior communications skills generated more bookings per call (McNaught, Barth, and Henderson 1989). The rise in cognitively demanding work, then, would probably not prevent many Americans from extending their worklives.

The growth in cognitive skill requirements and the proliferation of jobs that demand constant updating of relevant knowledge highlight the importance of on-the-job training. This trend may disadvantage older people, because some employers appear reluctant to train older workers (Amirault 1992). Perhaps this is because they believe it is difficult to teach older people new skills or they believe that older workers will retire before firms are able to recoup their training costs. Formal employer-sponsored training tends to decline with age. In one survey only 51 percent of workers ages 55 and older received formal training from their employers during a 12-month period, compared with 79 percent of workers ages 25 to 34 (Frazis, Gittleman, and Joyce 1998). Older workers who receive on-the-job training often obtain less intensive training than their younger counterparts. Over a 6-month period in 1995, for example, workers ages 55 and older who received informal training—which is much more common than formal training programs—obtained 17 hours of assistance, compared with 33 hours for workers ages 25 to 34 (Frazis, Gittleman, and Joyce 1998). Government training programs can help fill skill gaps, but they generally focus on younger workers and offer limited opportunities for older people (Government Accountability Office 2003).

Although the changing nature of work will likely benefit many older people, some may be left behind. Despite the decline in physically demanding work, about two-fifths of older workers remain employed in jobs that impose some physical demands. Men, workers with limited education, and Hispanics may encounter more difficulty in working longer because they tend to work in more physically demanding jobs than women, well-educated workers, and

whites. Men have experienced smaller declines in physical work demands than women, and physical work demands have actually increased over time for workers who never attended college. The preponderance of physically demanding jobs is particularly problematic for low-income workers, many of whom need to work longer to supplement their retirement wealth.

How employment rates for older adults will evolve in coming years remains uncertain. After falling steadily for most of the twentieth century, labor force participation rates for older men have been rising for the past two decades (Bureau of Labor Statistics 2006). It is not yet clear, however, whether these recent increases will develop into a long-term trend. Many older people plan to delay retirement because of concerns about old-age income security, as employers cut back on traditional defined benefit pension plans and retiree health benefits (Mermin, Johnson, and Murphy 2007). Anxiety over retirement security is likely to persist, especially since employers show no signs of shoring up traditional retirement benefits and health care costs continue to rise. Health problems could upend work plans, however. Although overall health status in this age group appears better than it was 20 years ago (National Center for Health Statistics 2006), the share of people in their early 50s with health problems is now beginning to rise (Soldo, et al. 2006), which could force more individuals to retire earlier than they expect. Other uncertainties include policy choices—such as Social Security reform—and the willingness of firms to hire and employ older people and offer the flexible employment arrangements that older workers prefer. Although it is unclear how all of these forces will play out, the changing nature of work will likely promote old-age employment for most people, or at least not interfere with longer worklives.

Tables

Table 1. Share of Workers in Jobs with Given Demands, 2006

Job Demand	% of Workers	Job Demand	% of Workers
High General Physical Demands	7.3	Some Cognitive Ability	69.3
Dynamic Strength	0.3	<i>High Cognitive Ability</i>	34.8
Explosive Strength	0.1	Getting Information	57.8
Static Strength	2.8	Processing Information	12.0
Stamina	0.1	Writing Letters or Memos	24.0
Trunk Strength	0.9	Making Decisions and Solving Problems	33.2
Bending or Twisting of the Body	2.8	Active Learning	20.1
Kneeling, Crouching, Stooping, or Crawling	0.3	Critical Thinking	27.7
Reaction Time	1.4		
Gross Body Equilibrium	0.2	Computer Use	42.5
		Interacting With Computers	26.3
Any General Physical Demands	46.0	Using Electronic Mail	35.8
<i>High General Physical Demands</i>	7.3		
Handling and Moving Objects	12.7	Interpersonal Skills	34.2
Standing	34.0	Establishing, Maintaining Interpersonal Relationships	30.1
Walking and Running	10.0	Social Perceptiveness	15.6
Performing General Physical Activities	12.1	Dealing with Unpleasant or Angry People	8.4
Making Repetitive Motions	10.4		
		High Stress	9.3
High Flexibility and Dexterity	6.9	Frequent Conflict Situations	4.7
Arm-Hand Steadiness	4.8	High Level of Competition	3.9
Extent Flexibility	0.7		
Finger Dexterity	2.4	Any Stress	44.0
Manual Dexterity	3.3	<i>High Stress</i>	9.3
		Time Pressure	39.2
Any Flexibility and Dexterity	26.1		
<i>High Flexibility and Dexterity</i>	6.9	Updating and Using Relevant Knowledge	18.0
Handling or Controlling Objects or Tools	25.2		

(continued)

Table 1. Share of Workers in Jobs with Given Demands, 2006 (continued)

Job Demand	% of Workers	Job Demand	% of Workers
Vision	13.9	Difficult Working Conditions	24.8
Depth Perception	0.9	Cramped Work Space, Awkward Positions	1.3
Far Vision	1.9	Exposed to Contaminants	11.8
Near Vision	12.2	Exposed to Hazardous Conditions	1.8
		Exposed to Hazardous Equipment	5.6
High Cognitive Ability	34.8	Exposed to Whole Body Vibration	0.3
Deductive Reasoning	16.7	Works Indoors, Not Environmentally Controlled	5.0
Inductive Reasoning	14.5	Works Outdoors, Exposed to the Weather	11.2
Mathematical Reasoning	2.7	Works Outdoors, Covered	1.3
Originality	1.0	Noise Levels are Distracting or Uncomfortable	9.3
Written Expression	11.7	Exposed to Very Hot or Cold Temperatures	5.0
Thinking Creatively	9.7		
Complex Problem Solving	8.1		
Judgment and Decision Making	12.2		
Science	3.9		
N	104,158		

Source: Authors' calculations based on the March 2006 CPS matched to O*NET.

Table 2. Percentage of Workers in Jobs with Given Demands by Gender, Education and Race, 2006

Job Demand	Gender		Education				Race and Ethnicity				
	Male [†]	Female	Not High School Graduate	High School Graduate [†]	Some College	Bachelor's Degree	White (Non-Hisp) [†]	Black (Non-Hisp)	Hispanic	Other (Non-Hisp)	
High General Physical Demands	10.7	3.3 **	17.0 **	10.8	5.2 **	1.6 **	5.9	8.1 **	14.7 **	4.8 **	
Any General Physical Demands	51.8	39.3 **	77.8 **	58.4	41.8 **	23.5 **	42.1	49.9 **	64.1 **	42.8	
High Flexibility and Dexterity	9.8	3.6 **	10.2	10.0	6.9 **	2.4 **	6.6	6.1 *	9.3 **	6.8	
Any Flexibility and Dexterity	35.8	14.8 **	45.1 **	36.8	23.8 **	9.0 **	23.7	26.5 **	38.6 **	24.5	
Vision	14.5	13.2 **	7.9 **	13.6	15.6 **	15.1 **	14.3	13.8	11.4 **	15.5 **	
High Cognitive Ability	31.9	38.2 **	8.4 **	18.9	33.3 **	64.1 **	38.2	28.7 **	19.5 **	42.0 **	
Some Cognitive Ability	68.6	70.0 **	38.4 **	57.7	69.5 **	90.2 **	72.3	64.9 **	55.2 **	71.5	
Computer Use	37.8	47.2 **	11.4 **	28.7	41.7 **	66.6 **	46.1	33.7 **	27.8 **	46.8	
Interpersonal Skills	26.6	43.0 **	10.8 **	21.1	34.3 **	57.7 **	37.2	30.9 **	20.9 **	35.0 **	
Dealing with Unpleasant People	6.1	11.0 **	8.9 **	7.8	9.9 **	7.2 **	8.0	11.3 **	7.9	8.2	
High Stress	9.5	9.2	5.7 **	7.1	8.8 **	13.1 **	9.6	9.9	8.1 **	8.3 **	
Any Stress	48.2	39.7 **	32.1 **	44.7	46.6 **	45.0	45.4	42.2 **	39.5 **	39.8 **	
Updating and Using Knowledge	16.3	20.0 **	3.4 **	8.1	16.4 **	36.1 **	19.8	14.1 **	9.1 **	25.6 **	
Difficult Working Conditions	36.3	13.2 **	47.1 **	37.1	22.2 **	8.5 **	22.5	27.7 **	37.5 **	20.3 **	
N	54,416	49,742	14,064	30,613	29,983	29,498	70,431	10,555	15,645	7,527	

Source: Authors' calculations based on the March 2006 CPS matched to O*NET.

* Indicates that the difference from the reference group was marginally significant ($.05 < p < .10$).

** Indicates that the difference from the reference group was significant ($p < .05$).

† Reference group.

Table 3. Percentage of Workers in Jobs with Given Demands by Age, 2006

Job Demand	25 and Younger	26 to 49 [†]	50 to 61	62 and Older	Subgroups of Older Workers			
					50 to 54	55 to 61	62 to 64	65 and Older
High General Physical Demands	7.7	7.6	6.2 **	6.8 *	6.4 **	6.1 **	6.9	6.8
Any General Physical Demands	64.0 **	43.5	39.2 **	41.8 **	39.9 **	38.6 **	39.5 **	43.4
High Flexibility and Dexterity	6.5 **	7.3	6.5 **	5.6 **	6.7 *	6.3 **	5.8 **	5.4 **
Any Flexibility and Dexterity	29.3 **	26.3	23.6 **	23.2 **	24.1 **	23.1 **	23.1 **	23.2 **
Vision	9.8 **	14.8	14.9	13.5 **	14.8	14.9	13.3 *	13.6
High Cognitive Ability	18.8 **	37.6	40.5 **	34.4 **	40.5 **	40.5 **	37.7	32.2 **
Some Cognitive Ability	49.0 **	73.4	75.3 **	67.8 **	75.1 **	75.4 **	71.8	64.9 **
Computer Use	25.9 **	44.9	49.3 **	43.6	48.2 **	50.3 **	46.5	41.5 **
Interpersonal Skills	20.6 **	36.0	39.6 **	36.5	38.6 **	40.5 **	38.4 *	35.2
Dealing with Unpleasant People	11.9 **	7.7	7.3 *	7.9	7.2 *	7.3	7.9	7.9
High Stress	6.3 **	10.2	9.6 *	9.4	9.4 **	9.8	9.2	9.6
Any Stress	32.1 **	46.3	47.4 **	44.1 **	47.8 **	47.1	44.5	43.8 **
Updating and Using Knowledge	9.4 **	19.9	20.4	17.3 **	20.3	20.5	19.7	15.7 **
Difficult Working Conditions	26.5 **	25.3	22.7 **	23.4 **	23.3 **	22.0 **	24.0	23.0 **
N	17,365	60,248	21,037	5,508	11,019	10,018	2,180	3,328

Source: Authors' calculations based on the March 2006 CPS matched to O*NET.

* Indicates that the difference from the reference group was marginally significant ($.05 < p < .10$).

** Indicates that the difference from the reference group was significant ($p < .05$).

† Reference group.

Table 4. Percentage of Workers in Jobs with Given Demands by Health Status, 2006

Job Demand	Excellent or Very Good[†]	Good	Fair or Poor
High General Physical Demands	6.5	8.8 **	9.7 **
Any General Physical Demands	43.6	50.6 **	53.1 **
High Flexibility and Dexterity	6.5	8.0 **	7.3 **
Any Flexibility and Dexterity	24.2	29.9 **	30.7 **
Vision	14.0	14.0	12.7 **
High Cognitive Ability	37.8	29.3 **	25.5 **
Some Cognitive Ability	71.6	65.1 **	59.7 **
Computer Use	45.3	37.5 **	32.2 **
Interpersonal Skills	36.5	29.6 **	28.2 **
Dealing with Unpleasant People	8.3	8.3	9.4 **
High Stress	9.6	8.6 **	8.8 *
Any Stress	44.3	43.5 *	42.4 **
Updating and Using Knowledge	19.9	14.4 **	12.8 **
Difficult Working Conditions	22.8	28.9 **	30.9 **
N	71,737	25,976	6,445

Source: Authors' calculations based on the March 2006 CPS matched to O*NET.

* Indicates that the difference from the reference group was marginally significant ($.05 < p < .10$).

** Indicates that the difference from the reference group was significant ($p < .05$).

† Reference group.

Table 5. Job Demand Trends, 1971, 2006, 2014, and 2041

Job Demand	Percentage of Workers Facing Job Demand				Percentage Change	
	1971	2006	2014	2041	1971–2006	2006–2041
High General Physical Demands	8.8	7.3	7.2	7.1	-17.0	-2.7
Any General Physical Demands	56.5	46.0	45.2	44.0	-18.6	-4.3
High Flexibility and Dexterity	12.2	6.9	6.7	6.4	-43.4	-7.2
Any Flexibility and Dexterity	36.1	26.1	25.2	24.1	-27.7	-7.7
Vision	15.0	13.9	13.8	13.8	-7.3	-0.7
High Cognitive Ability	25.7	34.8	36.0	37.7	35.4	8.3
Some Cognitive Ability	61.6	69.3	70.0	71.0	12.5	2.5
Interpersonal Skills	25.1	34.2	35.0	36.0	36.3	5.3
Dealing with Unpleasant People	3.8	8.4	8.3	8.2	121.1	-2.4
High Stress	4.6	9.3	9.4	9.5	102.2	2.2
Any Stress	38.7	44.0	43.4	42.5	13.7	-3.4
Updating and Using Knowledge	10.6	18.0	19.0	20.3	69.8	12.8
Difficult Working Conditions	32.1	24.8	24.4	23.9	-22.7	-3.6
N	60,433	104,158	104,158	104,158		

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET. Projections to 2014 were based on BLS employment estimates, and projections to 2041 assumed that the annual occupational growth rates that prevailed between 2006 and 2014 would continue.

Notes: All differences between 1971 and 2006 were statistically significant ($p < .05$). The analysis did not test for significant differences between 2006 and future years because those estimates were based on the same sample; they differed only in terms of the sample weights used.

Table 6. Percentage of Workers in Different Occupations, 1971, 2006, 2014, and 2041

	1971	2006	2014	2041
All	100.0	100.0	100.0	100.0
Management and Business	9.7	14.1	14.3	14.4
Professionals	13.3	19.6	20.7	22.4
Computer and Mathematical Occupations	0.3	2.2	2.5	2.9
Architecture and Engineering	2.4	1.8	1.8	1.8
Life, Physical, and Social Sciences	0.6	0.9	0.9	1.0
Community and Social Services	0.8	1.5	1.5	1.6
Legal	0.6	1.0	1.1	1.1
Education, Training, and Library	4.7	5.6	5.9	6.3
Arts, Design, Entertainment, Sports, and Media	1.0	1.8	1.9	1.9
Healthcare Practitioners and Technical Occupations	2.7	4.7	5.1	5.8
Services	14.9	17.1	17.8	18.8
Healthcare Support	1.3	2.3	2.6	3.0
Protective Service	1.4	2.0	2.0	2.0
Food Preparation and Services	4.3	5.6	5.7	5.8
Building and Grounds Cleaning and Maintenance	4.8	3.9	4.0	4.1
Personal Care and Services	3.1	3.3	3.5	3.8
Sales	10.4	11.6	11.3	10.7
Office and Administrative Support	15.4	13.6	12.9	12.0
Blue Collar	36.3	23.9	23.0	21.7
Farming, Fishing, and Forestry	2.5	0.7	0.6	0.6
Construction and Extraction	5.8	6.7	6.7	6.5
Installation, Maintenance, and Repair	4.8	3.6	3.5	3.4
Production	15.2	6.7	6.0	5.2
Transportation and Material Moving	8.0	6.2	6.2	6.1

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET. Projections to 2014 were based on BLS employment estimates, and projections to 2041 assumed that the annual occupational growth rates that prevailed between 2006 and 2014 would continue.

Notes: All differences between 1971 and 2006 were statistically significant ($p < .05$). The analysis did not test for significant differences between 2006 and future years because those estimates were based on the same sample; they differed only in terms of the sample weights used.

Table 7. Demographic Composition of the Workforce, 1971 and 2006 (in percentages)

Demographic Group	1971	2006[†]
Gender		
Male	61.9 *	53.5
Female	38.1 *	46.5
Education		
Not High School Graduate/Less than 12 Years of School	36.1 *	12.6
High School Graduate/12 Years of School	34.5 *	29.6
Some College	16.5 *	28.9
Bachelor's Degree/4 or More Years of College	12.9 *	28.9
Race		
White	89.1 *	81.9
Black	9.9 *	11.7
Other	1.0 *	6.4
Age		
25 and Younger	24.3 *	17.1
26 to 49	48.7 *	55.4
50 to 61	20.3 *	21.5
62 and Older	6.7 *	6.1

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

Notes: Estimates indicate the percentage of the workforce with the given characteristic. The analysis did not identify Hispanics because the 1971 CPS did not ask about ethnicity.

* Indicates that the difference from the reference group was significant ($p < .05$).

† Reference group.

Table 8. Job Demands by Gender, 1971 and 2006

Job Demand	Male			Female		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
High General Physical Demands	10.8	-0.1	-0.9	5.5	-2.2 *	-40.0
Any General Physical Demands	59.4	-7.6 *	-12.8	51.7	-12.4 *	-24.0
High Flexibility and Dexterity	14.9	-5.1 *	-34.2	7.9	-4.3 *	-54.4
Any Flexibility and Dexterity	45.7	-9.9 *	-21.7	20.4	-5.6 *	-27.5
Vision	15.5	-1.0 *	-6.5	14.1	-0.9 *	-6.4
High Cognitive Ability	26.7	5.2 *	19.5	24.0	14.2 *	59.2
Some Cognitive Ability	63.5	5.1 *	8.0	58.9	11.1 *	18.8
Interpersonal Skills	22.2	4.4 *	19.8	29.7	13.3 *	44.8
Dealing with Unpleasant People	2.7	3.4 *	125.9	5.6	5.4 *	96.4
High Stress	6.4	3.1 *	48.4	2.1	7.1 *	338.1
Any Stress	49.3	-1.1	-2.2	23.5	16.2 *	68.9
Updating and Using Knowledge	10.6	5.7 *	53.8	10.4	9.6 *	92.3
Difficult Working Conditions	44.7	-8.4 *	-18.8	14.1	-0.9 *	-6.4

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

* Indicates difference between 1971 and 2006 values was significant ($p < .05$).

Table 9. Job Demands by Education, 1971 and 2006

Job Demand	Not High School Graduate			High School Graduate			Some College			Bachelor's Degree		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
High General Physical Demands	15.0	2.0 **	13.3	7.6	3.2 **	42.1	4.2	1.0 **	23.8	0.8	0.8 **	100.0
Any General Physical Demands	75.7	2.1 **	2.8	53.6	4.8 **	9.0	42.0	-0.2	-0.5	29.7	-6.2 **	-20.9
High Flexibility and Dexterity	17.1	-6.9 **	-40.4	13.3	-3.3 **	-24.8	7.3	-0.4	-5.5	1.9	0.5 **	26.3
Any Flexibility and Dexterity	51.6	-6.5 **	-12.6	36.5	0.3	0.8	24.1	-0.3	-1.2	7.5	1.5 **	20.0
Vision	12.1	-4.2 **	-34.7	18.0	-4.4 **	-24.4	17.9	-2.3 **	-12.8	11.2	3.9 **	34.8
High Cognitive Ability	10.2	-1.8 **	-17.6	21.2	-2.3 **	-10.8	32.1	1.2 **	3.7	71.8	-7.7 **	-10.7
Some Cognitive Ability	41.3	-2.9 **	-7.0	62.8	-5.1 **	-8.1	69.7	-0.2	-0.3	91.7	-1.5 **	-1.6
Interpersonal Skills	8.9	1.9 **	21.3	23.3	-2.2 **	-9.4	33.7	0.6	1.8	63.6	-5.9 **	-9.3
Deals With Unpleasant People	2.7	6.2 **	229.6	4.4	3.4 **	77.3	5.5	4.4 **	80.0	2.9	4.3 **	148.3
High Stress	2.0	3.7 **	185.0	3.9	3.2 **	82.1	6.3	2.5 **	39.7	9.6	3.5 **	36.5
Any Stress	32.5	-0.4	-1.2	41.9	2.8 **	6.7	45.3	1.3 *	2.9	36.5	8.5 **	23.3
Updating and Using Knowledge	3.7	-0.3	-8.1	8.3	-0.2	-2.4	12.7	3.7 **	29.1	33.0	3.1 **	9.4
Difficult Working Conditions	50.7	-3.6 **	-7.1	31.3	5.8 **	18.5	20.9	1.3 **	6.2	8.2	0.3	3.7

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

* Indicates difference between 1971 and 2006 values was marginally significant ($.05 < p < .10$).

** Indicates difference between 1971 and 2006 values was significant ($p < .05$).

Table 10. Job Demands by Race, 1971 and 2006

Job Demand	White			Black			Other		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
High General Physical Demands	7.7	–0.4 *	–5.2	18.8	–10.5 *	–55.9	9.4	–4.0 *	–42.6
Any General Physical Demands	54.4	–8.9 *	–16.4	75.0	–24.7 *	–32.9	58.1	–13.8 *	–23.8
High Flexibility and Dexterity	12.2	–5.2 *	–42.6	12.8	–6.7 *	–52.3	10.0	–3.0 *	–30.0
Any Flexibility and Dexterity	35.3	–9.3 *	–26.3	43.5	–16.8 *	–38.6	34.3	–8.7 *	–25.4
Vision	15.2	–1.4 *	–9.2	12.4	1.3 *	10.5	14.9	0.3	2.0
High Cognitive Ability	27.0	8.3 *	30.7	13.1	15.4 *	117.6	31.3	9.3 *	29.7
Some Cognitive Ability	63.3	6.6 *	10.4	45.8	18.8 *	41.0	61.9	8.5 *	13.7
Interpersonal Skills	26.4	8.3 *	31.4	13.5	17.1 *	126.7	20.6	13.6 *	66.0
Dealing with Unpleasant People	3.8	4.2 *	110.5	4.0	7.2 *	180.0	3.4	4.8 *	141.2
High Stress	4.8	4.5 *	93.8	2.8	7.1 *	253.6	2.9	5.4 *	186.2
Any Stress	39.9	4.7 *	11.8	27.7	14.4 *	52.0	33.4	6.1 *	18.3
Updating and Using Knowledge	11.0	7.1 *	64.5	6.1	7.8 *	127.9	13.3	11.3 *	85.0
Difficult Working Conditions	30.2	–5.6 *	–18.5	49.5	–21.7 *	–43.8	31.7	–10.3 *	–32.5

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

* Indicates difference between 1971 and 2006 values was significant ($p < .05$).

Table 11. Job Demands by Age, 1971 and 2006

Job Demand	25 and Under			26 to 49			50 to 61			62 and Older		
	% of workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
High General Physical Demands	7.9	-0.2	-2.5	8.9	-1.3 *	-14.6	9.3	-3.1 *	-33.3	9.6	-2.8 *	-29.2
Any General Physical Demands	62.6	1.4 *	2.2	52.7	-9.2 *	-17.5	57.1	-17.9 *	-31.3	60.0	-18.2 *	-30.3
High Flexibility and Dexterity	11.3	-4.8 *	-42.5	12.9	-5.6 *	-43.4	12.8	-6.3 *	-49.2	8.7	-3.1 *	-35.6
Any Flexibility and Dexterity	35.9	-6.6 *	-18.4	36.0	-9.7 *	-26.9	37.0	-13.4 *	-36.2	34.6	-11.4 *	-32.9
Vision	13.0	-3.2 *	-24.6	16.8	-2.0 *	-11.9	14.3	0.6	4.2	11.5	2.0 *	17.4
High Cognitive Ability	17.1	1.7 *	9.9	29.8	7.8 *	26.2	26.0	14.5 *	55.8	25.8	8.6 *	33.3
Some Cognitive Ability	51.3	-2.3 *	-4.5	67.5	5.9 *	8.7	61.6	13.7 *	22.2	55.6	12.2 *	21.9
Interpersonal Skills	19.8	0.8	4.0	27.5	8.5 *	30.9	24.8	14.8 *	59.7	27.8	8.7 *	31.3
Deals With Unpleasant People	4.2	7.7 *	183.3	3.8	3.9 *	102.6	3.4	3.9 *	114.7	3.6	4.3 *	119.4
High Stress	2.3	4.0 *	173.9	5.7	4.5 *	78.9	4.7	4.9 *	104.3	4.9	4.5 *	91.8
Any Stress	27.5	4.6 *	16.7	43.2	3.1 *	7.2	41.5	5.9 *	14.2	37.2	6.9 *	18.5
Updating and Using Knowledge	7.8	1.6 *	20.5	12.8	7.1 *	55.5	9.3	11.1 *	119.4	8.6	8.7 *	101.2
Difficult Working Conditions	29.2	-2.7 *	-9.2	32.4	-7.1 *	-21.9	34.7	-12.0 *	-34.6	31.9	-8.5 *	-26.6

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

* Indicates difference between 1971 and 2006 values was significant ($p < .05$).

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Appendix

Glossary of O*NET Job Demands

Active Learning—Understanding the implications of new information for both current and future problem solving and decision making.

Arm-Hand Steadiness—The ability to keep your hand and arm steady while moving your arm or while holding your arm and hand in one position.

Bending or Twisting of the Body—Job requires bending or twisting one’s body.

Climbing of Ladders, Scaffolds, or Poles—Job requires climbing ladders, scaffolds, or poles.

Complex Problem Solving—Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

Cramped Work Space, Awkward Positions—Job requires working in cramped workspaces that require getting into awkward positions.

Critical Thinking—Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.

Dealing with Unpleasant or Angry People—The worker has to deal with unpleasant, angry, or discourteous individuals as part of the job requirements.

Deductive Reasoning—The ability to apply general rules to specific problems to produce answers that make sense.

Depth Perception—The ability to judge which of several objects is closer or farther away from you, or to judge the distance between you and an object.

Dynamic Strength—The ability to exert muscle force repeatedly or continuously over time. This involves muscular endurance and resistance to muscle fatigue.

Establishing and Maintaining Interpersonal Relationships—Developing constructive and cooperative working relationships with others, and maintaining them over time.

Explosive Strength—The ability to use short bursts of muscle force to propel oneself (as in jumping or sprinting) or to throw an object.

Exposed to Contaminants—Job requires working exposed to contaminants (such as pollutants, gases, dust or odors).

Exposed to Hazardous Conditions—Job requires exposure to hazardous conditions.

Exposed to Hazardous Equipment—Job requires exposure to hazardous equipment.

Exposed to Very Hot or Cold Temperatures—Job requires working in very hot (above 90 F degrees) or very cold (below 32 F degrees) temperatures.

Exposed to Whole Body Vibration—Job requires exposure to whole body vibration (e.g., operating a jackhammer).

Extent Flexibility—The ability to bend, stretch, twist, or reach with your body, arms, and/or legs.

Far Vision—The ability to see details at a distance.

Finger Dexterity—The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.

Frequent Conflict Situations—Conflict situations the employee has to face in this job are frequent.

Getting Information—Observing, receiving, and otherwise obtaining information from all relevant sources.

Gross Body Equilibrium—The ability to keep or regain your body balance or stay upright when in an unstable position.

Handling and Moving Objects—Using hands and arms in handling, installing, positioning, and moving materials; and manipulating things.

Handling or Controlling Objects or Tools—Job requires using your hands to handle, control, or feel objects, tools, or controls.

High Level of Competition—Job requires the worker to compete or to be aware of competitive pressures.

Inductive Reasoning—The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).

Interacting With Computers—Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.

Judgment and Decision Making—Considering the relative costs and benefits of potential actions to choose the most appropriate one.

Keeping or Regaining Balance—Job requires keeping or regaining one’s balance.

Kneeling, Crouching, Stooping, or Crawling—Job requires kneeling, crouching, stooping, or crawling.

Making Decisions and Solving Problems—Analyzing information and evaluating results to choose the best solution and solve problems.

Making Repetitive Motions—Job requires making repetitive motions.

Manual Dexterity—The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.

Mathematical Reasoning—The ability to choose the right mathematical methods or formulas to solve a problem.

Near Vision—The ability to see details at close range (within a few feet of the observer).

Noise Levels are Distracting or Uncomfortable—Job requires working exposed to sounds and noise levels that are distracting or uncomfortable.

Originality—The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.

Performing General Physical Activities—Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling materials.

Processing Information—Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.

Reaction Time—The ability to quickly respond (with the hand, finger, or foot) to a signal (sound, light, picture) when it appears.

Science—Using scientific rules and methods to solve problems.

Social Perceptiveness—Being aware of others' reactions and understanding why they react as they do.

Stamina—The ability to exert yourself physically over long periods of time without getting winded or out of breath.

Standing—Job requires standing.

Static Strength—The ability to exert maximum muscle force to lift, push, pull, or carry objects.

Thinking Creatively—Developing, designing, or creating new applications, ideas, relationships, systems, or products including artistic contributions.

Time Pressure—Job requires the worker to meet strict deadlines.

Trunk Strength—The ability to use your abdominal and lower back muscles to support part of the body repeatedly or continuously over time without "giving out" or fatiguing.

Updating and Using Relevant Knowledge—Keeping up-to-date technically and applying new knowledge to your job.

Using Electronic Mail—Job requires use of electronic mail.

Walking and Running—Job requires walking and running.

Works Indoors, Not Environmentally Controlled—Job requires working indoors in non-controlled environmental conditions (e.g., warehouse without heat).

Works Outdoors, Covered—Job requires working outdoors, under cover (e.g., structure with roof but no walls).

Works Outdoors, Exposed to the Weather—Job requires working outdoors, exposed to all weather conditions.

Writing Letters or Memos—Job requires written letters and memos.

Written Expression—The ability to communicate information and ideas in writing so others will understand.

Appendix Tables

Appendix Table 1. Change in Occupational Distribution by Gender, 1971 to 2006

Job Demand	Male			Female		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
Management and Business	13.2	2.1	15.9	4.1	8.8	213.1
Professionals	11.6	4.1	35.6	16.0	8.1	50.5
Computers and Mathematics	0.4	2.6	605.8	0.2	1.0	590.9
Architecture and Engineering	3.8	-0.9	-22.7	0.3	0.3	127.9
Life, Physical, and Social Sciences	0.8	0.1	16.7	0.3	0.6	199.0
Community and Social Services	0.8	0.3	34.0	0.8	1.1	148.1
Legal	0.6	0.3	54.2	0.7	0.5	79.0
Education, Training, and Library	2.7	0.1	2.1	8.1	0.9	11.7
Arts, Design, Entertainment, Media	1.1	0.7	63.2	1.0	1.0	99.7
Health Practitioners and Technicians	1.4	0.9	64.0	4.8	2.6	53.5
Services	9.9	3.8	38.2	23.0	-2.1	-8.9
Healthcare Support	0.3	0.2	78.9	3.0	1.3	44.1
Protective Service	2.1	0.7	34.9	0.3	0.7	249.3
Food Preparation and Services	2.2	2.4	107.6	7.6	-0.9	-11.4
Building Cleaning and Maintenance	4.2	0.2	3.9	5.7	-2.4	-41.9
Personal Care and Services	1.1	0.3	24.0	6.4	-0.8	-13.1
Sales	10.3	0.5	4.8	10.6	2.0	18.6
Office and Administrative Support	6.9	-0.5	-7.4	29.3	-7.3	-25.0
Blue Collar	48.2	-10.0	-20.7	16.9	-9.4	-55.8
Farming, Fishing, and Forestry	3.1	-2.1	-66.1	1.4	-1.1	-75.8
Construction and Extraction	9.3	3.0	32.0	0.2	0.1	56.3
Installation, Maintenance, and Repair	7.5	-1.0	-13.9	0.5	-0.2	-38.9
Production	16.8	-8.2	-48.9	12.5	-8.0	-64.4
Transportation and Material Moving	11.5	-1.6	-14.2	2.3	-0.3	-13.3

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

Appendix Table 2. Change in Occupational Distribution by Education, 1971 to 2006

Job Demand	Not High School Graduate			High School Graduate			Some College			Bachelor's Degree		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
Management and Business	6.0	-3.0	-50.7	8.6	-0.2	-2.6	12.6	0.5	3.8	19.6	6.5	33.0
Professionals	2.0	0.3	15.2	1.5	0.2	16.4	3.4	0.4	11.3	1.0	3.5	356.5
Computers and Mathematics	0.0	0.1	700.0	0.2	0.4	204.5	0.6	1.4	249.6	1.3	3.6	284.0
Architecture and Engineering	0.4	-0.2	-55.2	1.5	-0.9	-61.6	4.7	-3.0	-64.0	7.7	-3.7	-48.1
Life, Physical, and Social Sciences	0.1	0.0	-33.3	0.3	-0.2	-45.3	0.7	-0.2	-37.3	2.8	-0.3	-9.5
Community and Social Services	0.1	0.1	91.5	0.2	0.2	73.3	0.8	0.2	28.4	4.1	-0.6	-15.0
Legal	0.1	0.0	-14.1	0.5	-0.2	-48.4	0.5	0.1	24.9	2.7	0.0	-0.8
Education, Training, and Library	0.4	0.2	54.6	1.1	0.5	46.7	3.2	-0.2	-6.2	28.4	-13.9	-48.9
Arts, Design, Entertainment, Media	0.4	0.4	94.5	0.8	0.1	9.0	1.9	0.0	2.1	2.6	0.7	26.4
Health Practitioners and Technicians	0.5	-0.2	-46.7	2.3	-1.0	-44.3	4.6	1.1	24.0	7.9	1.3	16.7
Services	23.9	7.9	32.9	12.0	9.2	76.8	10.6	7.1	66.9	2.8	2.9	103.4
Healthcare Support	1.5	0.7	42.5	1.4	1.6	109.3	1.4	1.6	113.0	0.2	0.6	342.6
Protective Service	1.1	-0.2	-17.8	1.7	0.2	8.8	2.1	1.0	44.8	0.5	0.9	176.9
Food Preparation and Services	7.0	6.9	97.4	3.4	3.3	98.3	3.1	2.1	69.3	0.4	0.9	238.3
Building Cleaning and Maintenance	9.5	1.0	11.1	2.8	2.8	99.6	1.9	0.5	23.7	0.5	0.3	54.4
Personal Care and Services	4.8	-0.5	-10.2	2.7	1.4	52.3	2.0	1.9	95.2	1.3	0.3	19.7
Sales	8.3	3.2	38.6	11.3	0.6	5.0	14.3	-1.2	-8.4	9.1	1.0	10.6
Office and Administrative Support	6.8	0.1	1.6	24.3	-8.1	-33.5	23.0	-3.4	-14.6	6.1	1.9	30.6

(continued)

Appendix Table 2. Change in Occupational Distribution by Education, 1971 to 2006 (continued)

Job Demand	Not High School Graduate			High School Graduate			Some College			Bachelor's Degree		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
Blue Collar	53.0	–8.5	–16.0	37.0	–0.3	–0.8	22.7	–2.4	–10.7	4.8	0.7	13.7
Farming, Fishing, and Forestry	4.8	–1.8	–37.4	1.4	–0.6	–45.7	1.2	–1.0	–77.9	0.4	–0.2	–60.9
Construction and Extraction	8.6	6.7	78.0	5.9	4.1	69.0	3.6	1.5	42.2	0.7	0.6	76.2
Installation, Maintenance, and Repair	5.6	–1.7	–30.2	5.8	–0.6	–9.6	4.2	0.2	3.9	0.9	0.2	20.1
Production	21.7	–10.0	–46.2	16.5	–5.8	–35.4	8.6	–3.0	–35.2	1.6	–0.1	–8.0
Transportation and Material Moving	12.3	–1.7	–13.6	7.4	2.7	36.5	5.1	–0.1	–2.5	1.2	0.3	22.7

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

Appendix Table 3. Change in Occupational Distribution by Race, 1971 to 2006

Job Demand	White			Black			Other		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
Management and Business	10.4	4.5	42.9	3.3	5.7	173.7	8.3	5.3	64.0
Professionals	13.8	5.8	42.3	8.3	8.0	95.4	19.1	7.0	36.9
Computers and Mathematics	0.3	1.6	481.1	0.2	1.3	537.7	0.6	5.4	839.8
Architecture and Engineering	2.6	-0.7	-27.7	0.5	0.4	85.5	5.6	-2.7	-48.7
Life, Physical, and Social Sciences	0.7	0.2	34.1	0.2	0.3	151.0	1.1	1.0	88.5
Community and Social Services	0.8	0.6	77.2	1.0	1.5	140.2	0.9	0.2	19.5
Legal	0.7	0.5	69.4	0.3	0.4	135.6	0.4	0.4	92.3
Education, Training, and Library	4.8	1.0	21.8	3.7	1.0	26.5	5.7	-1.2	-20.5
Arts, Design, Entertainment, Media	1.1	0.8	70.4	0.4	0.9	194.3	0.6	1.5	248.0
Health Practitioners and Technicians	2.8	1.8	65.3	2.0	2.3	113.3	4.2	2.5	59.2
Services	13.2	2.7	20.2	30.0	-5.0	-16.6	19.9	-1.4	-6.8
Healthcare Support	1.1	0.9	80.1	3.4	1.4	41.4	1.7	0.2	14.1
Protective Service	1.4	0.4	29.3	1.4	2.1	151.8	0.6	0.5	79.9
Food Preparation and Services	4.0	1.3	32.5	5.9	0.5	8.8	8.1	-0.9	-11.0
Building Cleaning and Maintenance	3.4	0.2	5.6	16.4	-10.5	-64.4	8.6	-5.2	-60.7
Personal Care and Services	3.2	-0.1	-3.9	2.9	1.5	52.2	0.8	4.0	490.7
Sales	11.2	0.8	7.3	3.7	5.7	154.6	7.2	3.6	50.9
Office and Administrative Support	15.8	-2.4	-15.3	11.7	4.5	38.6	15.2	-3.6	-23.4
Blue Collar	35.6	-11.4	-31.9	42.9	-18.9	-44.1	30.4	-11.1	-36.4
Farming, Fishing, and Forestry	2.4	-1.6	-66.5	2.8	-2.5	-89.2	4.2	-3.8	-89.2
Construction and Extraction	5.8	1.5	25.2	6.3	-2.1	-32.7	3.9	0.3	8.5
Installation, Maintenance, and Repair	5.0	-1.2	-23.6	3.4	-1.0	-30.0	3.4	-0.5	-15.1
Production	14.8	-8.3	-56.6	19.2	-11.2	-58.3	12.2	-4.8	-39.2
Transportation and Material Moving	7.6	-1.7	-22.2	11.2	-2.1	-18.9	6.6	-2.3	-35.6

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.

Appendix Table 4. Change in Occupational Distribution by Age, 1971 to 2006

Job Demand	25 and Younger			26 to 49			50 to 61			62 and Older		
	% of Worker s, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Worker s, 1971	% of Worker s, 1971	Change: 1971–2006 (% of 1971)	% of Worker s, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Worker s, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
Management and Business	3.0	1.6	55.1	11.0	4.2	37.8	12.7	5.3	41.6	15.8	2.3	14.8
Professionals	11.0	0.1	1.3	15.5	5.8	37.6	11.3	11.1	98.9	11.7	6.7	56.8
Computers and Mathematics	0.3	0.8	249.8	0.5	2.4	521.5	0.1	1.6	1131.7	0.0	0.8	1610.4
Architecture and Engineering	1.3	-0.4	-34.5	3.3	-1.3	-38.6	2.2	-0.1	-2.4	1.2	0.7	54.4
Life, Physical, and Social Sciences	0.4	0.0	10.8	0.8	0.2	26.6	0.5	0.5	96.3	0.3	0.5	184.4
Community and Social Services	0.6	0.3	45.0	0.9	0.6	68.8	0.8	1.1	144.0	1.0	0.7	70.6
Legal	0.5	-0.1	-18.3	0.6	0.5	83.0	0.6	0.6	95.8	1.1	0.1	4.7
Education, Training, and Library	4.5	-0.6	-13.4	5.3	0.3	5.8	3.7	3.5	92.8	4.4	1.2	27.9
Arts, Design, Entertainment, Media	1.1	0.6	57.6	1.1	0.9	78.5	0.8	0.9	110.7	1.3	0.6	41.9
Health Practitioners and Technicians	2.4	-0.5	-19.5	3.1	2.2	72.3	2.5	3.0	121.8	2.3	2.2	95.0
Services	21.3	6.9	32.6	11.4	4.0	35.5	14.0	-1.3	-9.6	20.4	-3.6	-17.7
Healthcare Support	1.9	1.0	51.2	1.1	1.1	100.4	1.1	0.8	72.3	1.1	0.8	74.3
Protective Service	0.9	0.7	83.3	1.6	0.6	35.0	1.3	0.4	31.5	2.0	-0.1	-3.7
Food Preparation and Services	7.1	8.0	113.6	3.2	0.9	28.3	3.6	-1.1	-29.2	3.8	-0.6	-15.1
Building Cleaning and Maintenance	4.9	-1.0	-21.1	3.4	0.4	10.9	6.1	-2.3	-38.2	10.1	-5.0	-49.2
Personal Care and Services	6.5	-1.8	-27.5	2.0	1.1	52.3	1.8	0.8	44.5	3.4	1.2	35.7
Sales	10.5	6.7	64.2	9.7	0.6	6.6	11.1	-1.0	-9.0	13.5	-0.2	-1.1
Office and Administrative Support	19.5	-4.4	-22.7	14.9	-2.1	-13.9	13.4	1.1	8.5	10.8	3.1	29.2

(continued)

Appendix Table 4. Change in Occupational Distribution by Age, 1971 to 2006 (continued)

Job Demand	25 and Younger			26 to 49			50 to 61			62 and Older		
	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	% of Workers, 1971	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)	% of Workers, 1971	Change: 1971–2006 (pct. point)	Change: 1971–2006 (% of 1971)
Blue Collar	34.8	–11.0	–31.7	37.6	–12.6	–33.5	37.6	–15.2	–40.4	27.8	–8.4	–30.1
Farming, Fishing, and Forestry	3.7	–2.5	–67.3	1.7	–1.2	–65.9	2.1	–1.5	–70.2	4.3	–3.4	–80.1
Construction and Extraction	4.8	2.7	56.5	6.3	1.1	16.8	6.1	–1.0	–15.8	4.8	–1.3	–26.8
Installation, Maintenance, and Repair	3.9	–1.0	–25.4	5.5	–1.6	–30.0	4.9	–1.0	–21.1	3.7	–1.0	–26.9
Production	13.1	–8.0	–60.7	16.1	–9.0	–55.8	17.0	–10.0	–58.7	10.3	–4.7	–46.2
Transportation and Material Moving	9.3	–2.3	–25.1	8.0	–1.9	–23.7	7.6	–1.8	–23.5	4.8	2.1	43.5

Source: Authors' calculations based on the March 1971 and March 2006 CPS matched to O*NET.