

## **In What Occupations did SSDI Applicants Work? New Statistics and their Implications for Policy**

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*The issue brief provides new statistics on the attributes of the jobs held by applicants to Social Security Disability Insurance (SSDI) before they applied to SSDI. Occupation data is collected from applicants when they seek SSDI benefits, but have not been used frequently in empirical research because they are collected in open-ended text fields. We use an innovative supervised machine-learning approach to map the open-ended text to a Standard Occupation Classification (SOC) code for a sample of SSDI applicants in 2007 and 2014. Using that information, we compare job attributes of the occupations held by SSDI applicants before they applied to SSDI with the job attributes of all workers in the same years. Our findings shed light on the types of policies that might be most beneficial to help workers with medical problems stay in the labor force instead of seeking SSDI benefits. The information in this brief highlights findings from a longer manuscript (Wu 2018).*

### **Introduction**

Between 1980 and 2015, applications for SSDI nearly doubled—from 1,262,300 to 2,505,290 (Social Security Administration [SSA] 2016). Not all of the causes of this growth are well-understood, though the previous literature has documented changes in labor force demographics (Autor and Duggan 2006; Autor 2015), changes in federal policies (Autor and Duggan 2003), and the effect of the Great Recession (Autor and Duggan 2003, Maestas et al. 2015) as partial causes.

One potential explanation for some of the remaining growth is the “job mismatch” hypothesis: changing job demands over time has resulted in mismatches between the capabilities of existing workers and the requirements of available jobs. Research shows that the nature of work has changed over time. Jobs have become less physically demanding, less repetitive, and less likely to involve difficult or dangerous working conditions, but at the same time, they are more cognitively challenging and more stressful (see, for example, Johnson et al. 2007; Autor et al. 2003; Stapleton et al. 2003). Further, the development of technologies has led to a declining share of “middle-skill occupations,” the occupations that involve routine tasks and repetitive production activities that are well-suited to being replaced by technology (Autor et al. 2003; Acemoglu and Autor 2011; Autor and Price 2013; Autor 2015). These type of jobs include clerical and administrative support, crafting, and operative jobs.

Many workers laid off from disappearing jobs may adapt by finding jobs with different requirements, but some workers with significant medical conditions or impairments may instead apply for SSDI—just as they might do when laid off during a recession. The impact of job mismatches on SSDI applications depends on how well workers with health conditions in declining jobs can adapt to the demands of other jobs. While this study cannot directly measure to what extent the “job mismatch” may contribute to the growth of SSDI applications, it is among the first to provide the information on attributes of jobs that SSDI applicants had before they applied for benefits, and this information sheds light on the employment prospects of people with disabilities as well as how changes in SSDI applications are related to changes in job requirements.

### **In what types of jobs did SSDI applicants work before seeking benefits?**

SSA has stored data collected from SSDI applicants for over a decade in what is called its Structured Data Repository (SDR). The SDR contains data from virtually all applicants to SSDI and Supplemental Security Income (SSI). Using a machine-learning algorithm (see Data and Methods box) on a sample of records from the SDR, the study team transformed open-ended occupational information filled in by the applicant or an SSA representative interviewing the applicant (for example, “waiter,” “truck mechanic,” or “helps kindergarten teacher”) into Standard Occupation Classification (SOC) codes. The applicants reported the jobs they had in the last 15 years and the study used the information of the most recent job.

In 2007 and 2014, SSDI applicants’ occupations were more likely to be blue-collar than white-collar jobs, with only about five percent of applicants reporting working in management positions. Table 1 lists the 20 most common jobs held by SSDI applicants.

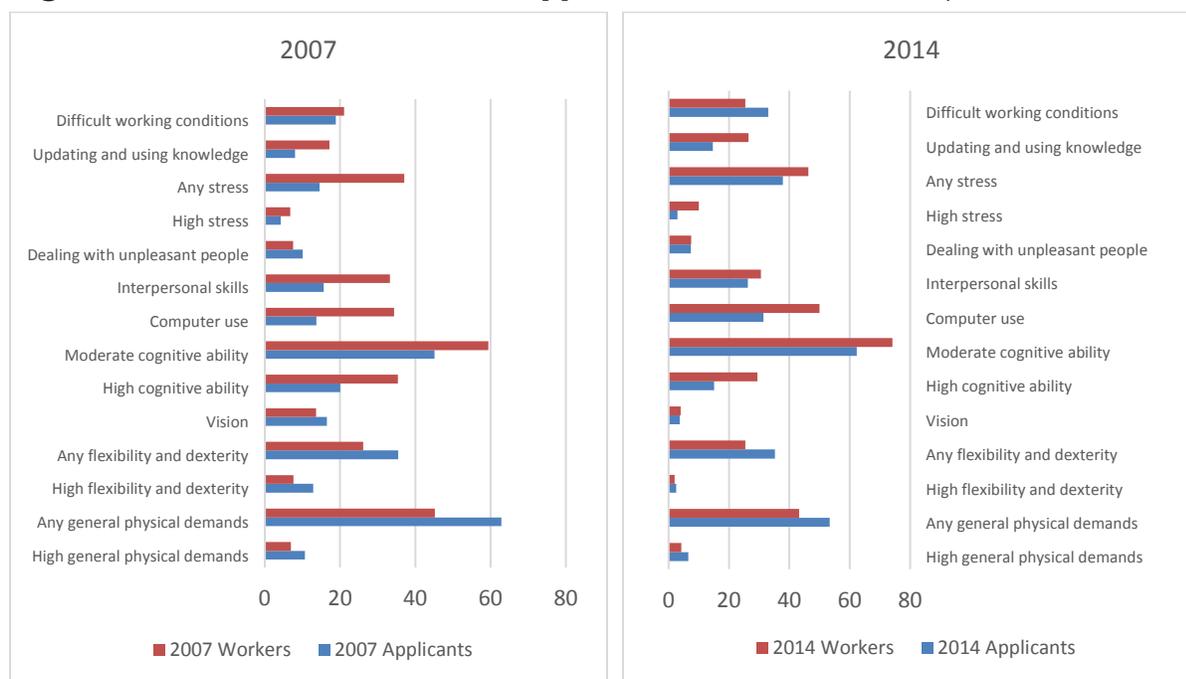
**Table 1. Top 20 most common jobs held by SSDI applicants (2007 and 2014)**

	Occupation	Mean (%)	SD (%)
1	Production workers	5.81	0.11
2	Building cleaning workers	5.45	0.11
3	Nursing, psychiatric, and home health aides	4.92	0.10
4	Driver/sales workers and truck drivers	4.46	0.10
5	Cashiers	4.42	0.10
6	Miscellaneous managers	3.56	0.09
7	Retail salespersons	2.92	0.08
8	Cooks and food preparation workers	2.73	0.08
9	Laborers and material movers, hand	2.49	0.07
10	Customer service representatives	2.13	0.07
11	Waiters and waitresses	1.93	0.06
12	Secretaries and administrative assistants	1.60	0.06
13	Assemblers and fabricators	1.43	0.06
14	Stock clerks and order fillers	1.40	0.05
15	Miscellaneous protective service workers	1.17	0.05
16	Multiple machine tool setters, operators, and tenders, metal and plastic	1.15	0.05
17	Miscellaneous health diagnosing and treating practitioners	1.02	0.05
18	Office clerks, general	0.99	0.05
19	Miscellaneous health care support occupations	0.96	0.05
20	File clerks	0.94	0.04

Source: Authors' calculations using the SDR sample.

### **How did the job attributes of SSDI applicants differ from those of all workers in the same years?**

Relative to the overall workforce, SSDI applicants were more likely to hold physically demanding jobs and less likely to hold jobs with high cognitive demands, requiring significant computer use, or needing strong interpersonal skills. This was true in both 2007 and 2014 (Figure 1). SSDI applicants were more likely to report jobs that required physical demands; in 2007, nearly 11 percent reported working in jobs that had high physical demands and about 63 percent had jobs that had some level of physical demands compared with 7 percent and 45 percent, respectively, among all workers. Relative to all workers, SSDI applicants were less likely to hold jobs requiring high or moderate demands; 20 percent had held jobs with high cognitive demands and about 45 percent had jobs with moderate cognitive demands, compared with 35 percent and 59 percent for all workers, respectively. SSDI applicants were also much less likely than all workers to have held jobs that required working with computers (14 percent versus 34 percent) or updating and using knowledge (8 percent versus 17 percent). In 2007, only 16 percent of pre-application jobs of SSDI applicants required strong interpersonal skills, but 10 percent of these jobs involved dealing with unpleasant or angry people. The corresponding numbers for all workers are 33 percent and 7 percent, respectively. In addition, SSDI applicants were less likely than all workers to hold stressful jobs or jobs with difficult working conditions.

**Figure 1. Job attributes of SSDI applicants and all workers, 2007 and 2014**

Source: Authors' calculations using O\*NET linked to the CPS sample and O\*NET linked to the SDR sample.

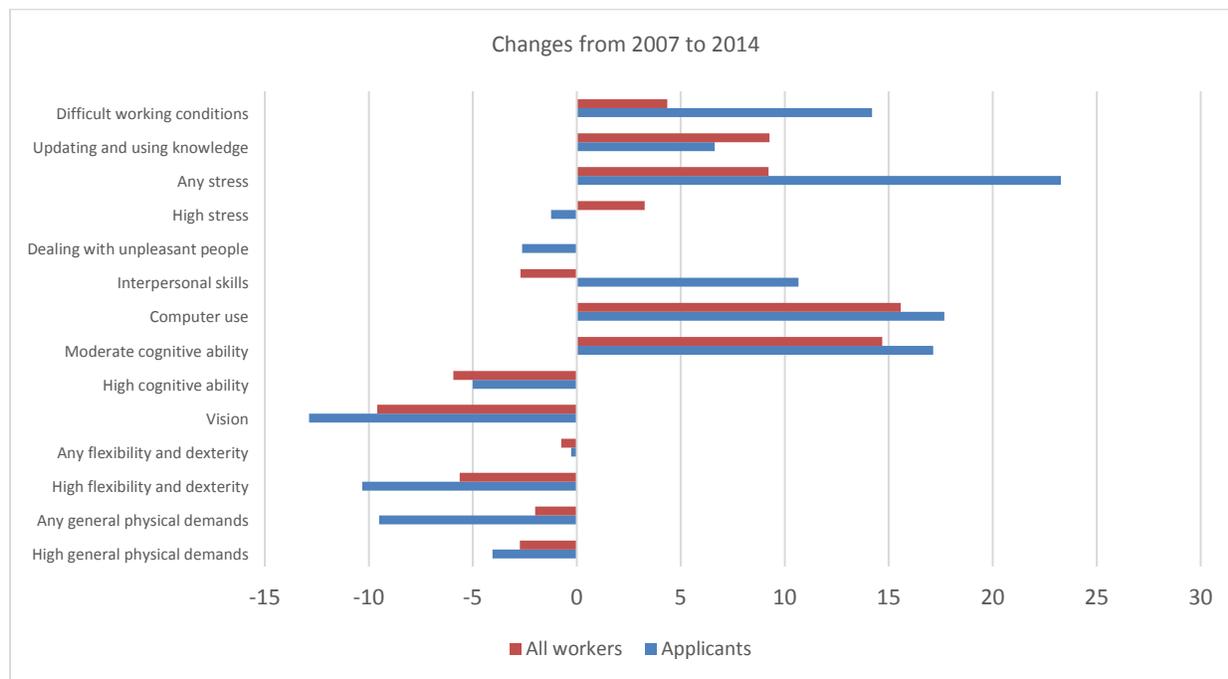
When examining the changes of job attributes for SSDI applicants overtime, the study found that in 2007, the physical demands of pre-SSDI jobs were more important, on average, than the mental demands for SSDI applicants, but by 2014 the mental demands had become as important. Most notably, “moderate cognitive ability” surpassed general physical ability as an important job attribute (62 percent versus 53 percent), and computer use (31 percent) and stress (38 percent) became about as important as flexibility and dexterity (35 percent). Pre-application jobs became more skilled but also more likely to have difficult or hazardous work conditions (33 percent).

### How did the profile of jobs change from 2007 to 2014 for SSDI applicants compared to all workers?

From 2007 to 2014, most job attributes changed in the same direction for all workers and SSDI applicants, with a few attributes changing substantially more for SSDI applicants than for all workers (Figure 2). For instance, compared to all workers, the study found a larger increase for SSDI applicants in the share of jobs that require mental ability, including jobs involving moderate cognitive demands (a 17 percentage points increase among applicants compared to 14 percentage points among all workers) and computer use (18 percentage points to 15 percentage points). The study also found the share of jobs with physical demands declined by more for SSDI applicants than for all workers. For example, SSDI applicants experienced a four percentage-point decline in the share of jobs with high physical demands, a 9.5 percentage-point decline in the share of jobs with any physical demands, and a 10 percentage-point decline in the share of jobs with high flexibility and dexterity; the corresponding numbers for all workers are 2.7 percentage points, 2 percentage points, and 5.6 percentage points.

The attributes that declined more for applicants than for all workers were those that were more common among SSDI applicants in 2007, whereas the attributes that increased more for applicants than for all workers were attributes that were less common among SSDI applicants in 2007. Although SSDI applicants remained more likely than all workers to have held low-skill jobs with high physical demands, they were increasingly likely to have had skilled jobs with lower physical demands than in the past. Overall, the distribution of job attributes for SSDI applicants converged with the distribution for all workers.

**Figure 2. Changes in job demands from 2007 to 2014, SSDI applicants versus all workers**



Source: Authors' calculations using O\*NET linked to the CPS sample and O\*NET linked to the SDR sample.

The study also compared the trends in job demands by initial SSDI application decision, and found that people whose SSDI applications were initially accepted were more likely than those whose applications were initially denied to hold jobs involving high physical demands, visual acuity, or difficult working conditions. By 2014, most differences in the prevalence of job attributes between initially awarded and denied applicants had diminished, including both physical and mental requirements. However, applicants who were initially denied were still less likely to have held jobs requiring high cognitive ability or updating and using knowledge.

### Implications for Policy

At first blush, the sharp decline in physically demanding jobs and the increase in skilled jobs, including jobs requiring cognitive ability, updating and using knowledge, or computer use, among SSDI applicants seem to bode well for the employability of people with disabilities. Over time, this change could depress SSDI applications. That conclusion is premature, however, because it ignores the effects of labor market dynamics: declining jobs in some fields, increasing

jobs in others, and changes in job requirements may influence SSDI applications from workers whose jobs are affected by those dynamics.

Even though pre-application jobs have become more skilled over time, many SSDI applicants held “middle-skill occupations,” such as clerks; cashiers; office and administrative workers; package handlers; production staff; craft and repair workers; and operators, fabricators, and laborers. These jobs involve routine tasks and repetitive production activities that are well-suited to being replaced by technology (Autor et al. 2003; Acemoglu and Autor 2011). Hence, just as job losses resulting from the Great Recession induced many workers to apply for SSDI, job losses due to the replacement of middle-skill jobs with technology may account for some growth in SSDI applications.

The findings have implications for efforts to help workers with medical problems stay in the labor force rather than enter SSDI. The high share of SSDI applications from workers with middle-skill jobs that are being replaced by technology suggests that helping such workers make the transition to other jobs, such as skilled jobs with non-routine tasks, would help some stay at work rather than apply for SSDI when they develop a medical problem. Other sorts of interventions are more likely to be appropriate for the many SSDI applicants whose jobs are not being rapidly displaced by technology. For example, some SSDI applicants could benefit from interventions targeted at workers in such jobs might be most effective if they seek to make workplaces more ergonomic and less risky. SSDI applicants whose jobs performed in difficult and hazardous conditions might benefit from this type of change. SSDI applicants who held jobs requiring frequent non-routine manual tasks, such as driver, food preparation worker, carpet installer, or landscaper could benefit from interventions that improve workers’ health and fitness (for example, by encouraging exercise, improving nutrition, and reducing smoking and excessive use of alcohol). Employer-based programs could help ensure that such workers receive, and adhere to, high quality medical treatment and rehabilitation services after first experiencing medical problems. These include the many applicants who held jobs performed in difficult or hazardous conditions who may also be better served with other interventions. They could also help employers provide accommodations and otherwise support return to work (such as through temporary wage supplements).

The findings reported here represent the tip of the iceberg of knowledge that can be obtained by using machine learning to mine the rich occupational data in the SDR. This work was in part designed to be a proof of concept to demonstrate that machine learning techniques could be used to better understand the free-form text provided by SSDI applicants. The findings highlight that changes in job characteristics may have affected application to SSDI over a period of rapid growth in benefit claims. The algorithm we developed could be further used to recode the large volume of open-ended occupation responses in the SDR and in other data sources, thereby supporting numerous future studies that could draw on this job information.

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## **Data and Methods: Using Machine Learning to Code Occupational Data from Free-Form Text**

The study team developed a machine-learning algorithm to recode open-ended responses into SOC categories. Our coding effort represents a proof-of-concept study for the proposition that machine learning can be used to successfully map occupational information from the SDR to SOC codes and that the algorithm developed can be used in the future to produce statistics on the job attributes of SSDI applicants. Therefore, rather than using all SSDI applicant records in the SDR, we obtained a de-identified data file from SSA that included randomly sampled SSDI applicants: 25,000 observations each from 2007 and 2014.

Using a supervised learning approach, we started by having a subject matter expert manually code a random sample observations, creating what is known as the training file. A Natural Language Processing program then used the training file to, in essence, teach itself how to code the remaining observations, with some help from a supervising technician to resolve ambiguities. After testing and adjustments, we used the program to recode additional records without further training. More details about the specific procedures used to accomplish this are available in Wu (2018).

The approach worked well; we were able to convert the occupation information to SOC codes for 90 percent of the sample. For the other 10 percent, the free-form text indicated that an applicant was unemployed, or the job title was uninterpretable. The most frequent entries for this 10 percent included unknown, temp, various jobs, odd jobs, owner, helper, homemaker, and self-employed. The results indicated reliability of over 80 percent at the SOC minor-group level, which compares well to the reliability of trained human coders completing similar tasks— normally around 70 percent.

After converting the occupation information of SSDI applicants to SOC codes, the study team linked these SOC codes to job attribute codes from the U.S. Department of Labor's Employment and Training Administration O\*NET. We used multiple waves of O\*NET data: O\*NET 19.0 (2014 wave) and O\*NET 10.0 (2007 wave). Using an approach developed by Johnson (2004), we created summary measures of job attributes critical to job performance. These included physical demands; cognitive demands; technical, interpersonal, and other skill demands; and difficult workplace conditions. We identified the job attributes of the working age population at the same time. To do this, we used data from the March 2007 and 2014 data from the CPS—a large household survey of noninstitutionalized civilians conducted by the U.S. Census Bureau for the Bureau of Labor Statistics. Our CPS sample included more than 150,000 workers ages 18 to 61.