Social Security Disability Insurance Enrollment and Health Care Employment

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Objective. To examine the relationship between Social Security Disability Insurance (SSDI) enrollment and health care employment.

Data Sources. State-year level data from government and other publicly available sources for all states (2000–2014).

Study Design. Population-weighted linear regression analyses model associations between each health care employment measure and each SSDI enrollment measure (i.e., SSDI overall, physical, or mental health enrollment rates), controlling for factors associated with health care employment, state fixed effects, and secular time trends.

Data Collection. Data are gathered from publicly available sources.

Principal Findings. A one standard deviation increase in SSDI enrollment per 100,000 population is associated with a statistically significant 2.6 and 4.5 percent increase in the mean employment rate per 100,000 population for health care practitioner and technical occupations and health care support occupations, respectively. The size of this relationship varies by the type of disabling condition for SSDI enrollment (physical versus mental health).

Conclusions. Social Security Disability Insurance enrollment is significantly associated with health care employment at the state level. Quantifying the magnitude of this relationship is important given high SSDI enrollment rates as well as evolving policy and demographic shifts related to the SSDI program.

Key Words. Health care employment, workforce, Social Security Disability Insurance

The U.S. health care industry has been a recent driver of the nation's economy; from 2000 through 2016, private health care and social assistance employment increased from 13 to 19 million jobs, a 51 percent increase (Bureau of Labor Statistics 2017). The Bureau of Labor Statistics (2014) projects that health care will continue to be among the fastest growing industries in the economy, creating an additional four million new jobs between 2012 and 2022 (Bureau of Labor Statistics 2014). Proper estimation of health care

employment models is critical as these models serve to identify appropriate educational training program expansions and/or contractions, guide policy incentives for workforce distribution across occupations and across geographic regions, and identify potential employment gaps or surpluses.

Current models predicting health care employment consider supply and demand factors. Supply is influenced by provider training opportunities and workforce participation decisions of existing workers; demand influences include demographic factors and health status characteristics (Health Resources and Services Administration 2016). Health care utilization also impacts the demand for health care employment (Health Resources and Services Administration 2016); utilization varies by age (Bureau of Labor Statistics 2014), gender (Bertakis et al. 2000), socioeconomic status (Åhs and Westerling 2006), geography (Arcury et al. 2005), health insurance coverage (Card, Dobkin, and Maestas 2004), and local and national policy trends (Sturm and Pacula 1999; Chen, Scheffler, and Chandra 2011; Hofer, Abraham, and Moscovice 2011).

Enrollment in Social Security Disability Insurance (SSDI) may be related to health care demand and thus associated with health care employment; however, no previous research explores the association between SSDI enrollment and the size of the health care workforce. We seek to estimate the magnitude and direction of this relationship to determine whether the inclusion of SSDI enrollment as a factor related to health care demand would improve future health care workforce models.

Social Security Disability Insurance is a federal employment-tested disability program that requires twenty calendar quarters of work history in the most recent 10 years to qualify for benefits; those under age 31 are required to have obtained one half the number of quarters since age 21, with a minimum number of six quarters. Program enrollees must have a physical and/or mental health disabling condition expected to last 12 months, or result in death, that precludes them from engaging in existing employment or pursuing new work opportunities. Once enrolled, periodic review of the qualifying condition is required to maintain benefits through the program (Social Security Administration 2015b). Demographic factors influence disability determinations; for example, younger age (i.e., under age 45) is seen as a beneficial

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attribute allowing for adjustment to other forms of paid work (Social Security Administration 2008).

From 2000 to 2014, SSDI enrollment increased from 5 to 9 million persons, a 78 percent increase (Social Security Administration 2015a). In 2014, musculoskeletal system and connective tissue disorders represented the largest share of SSDI claims, followed by mental disorders (Social Security Administration 2015a). Policy changes over time impact the diagnoses represented among SSDI claims. For example, mental disorder listing expansions enacted in 1986, and revised in 2010, increased the number of persons with mental disabilities qualifying for SSDI (Social Security Administration 2015b).

The cause of SSDI enrollment growth is multifactorial, with significant proportions of the growth in enrollment from 1970 to 2008 being explained by population growth, an aging Baby Boomer generation (i.e., persons born between 1946 and 1964) entering disability-prone ages, and an increasing proportion of females insured by disability programs (Pattison and Waldron 2013). Research also suggests that worsening economic conditions (Autor and Duggan 2003; Schmidt and Sevak 2004; Autor 2011; Cutler, Meara, and Richards-Shubik 2012) and availability of alternative labor market (Mueller, Rothstein, and von Wachter 2013) and welfare-based cash assistance arrangements (Schmidt and Sevak 2004; Hansen, Bourgois, and Drucker 2014) may affect SSDI applications and associated program enrollment. While SSDI applicants and/or enrollees may receive Medicaid and/or Medicare benefits if they meet program eligibility requirements (Centers for Medicare and Medicaid Services 2015a, c), uninsurance rates are higher for this population (Riley 2006; Sommers 2006; Livermore, Stapleton, and Claypool 2009).

Social Security Disability Insurance enrollment requires initial and ongoing exposure to the health care system to apply for and maintain benefits (Social Security Administration 2015b). Prior to application, an individual must receive a covered diagnosis for a physical or mental health condition from a qualifying health care provider (Social Security Administration 2015b). Select physical (i.e., primary care physicians, physician assistants) and mental health providers (i.e., psychiatrists, mental health counselors, mental health, and substance abuse social workers) diagnose the disabling condition. Evidence of treatment within the past 90 days is often required for program eligibility. Upon SSDI enrollment, periodic reviews are performed to determine continued eligibility; this may require review of additional treatment evidence (Social Security Administration 2015b). In addition to utilization specific to application for and receipt of SSDI, SSDI enrollment rates may be an

indicator of increased morbidity over consistently measured health status indicators used in health care workforce models.

Despite high SSDI enrollment rates, no studies have considered the relationship between SSDI enrollment and the health care workforce. Understanding predictors of the health care workforce is important to improve workforce models as well as to support programs and policies related to workforce distribution; examples include policies related to loan repayment and immigration visas used in addressing physician geographic maldistribution as well as increasing training opportunities and the use of economic incentives (Johnson et al. 2003; Rosenthal, Zaslavsky, and Newhouse 2005; Aneja et al. 2011; Olfson 2016). We examine associations between SSDI enrollment rates and health care employment rates at the state-year level, controlling for other factors associated with health care employment.

METHODS

Data

Annual statewide average data are collected from a variety of administrative sources for all fifty states for the 2000–2014 period. All data are measured at the state-year level.

Occupational employment data are obtained from the Bureau of Labor Statistics' (BLS) Occupational Employment Statistics program (Bureau of Labor Statistics 2015b). Health care practitioner and technical occupations include health care providers such as physicians (i.e., family and general practitioners), physician assistants, and psychiatrists. Health care support occupations include occupations such as home health aides, occupational therapy assistants, and physical therapy assistants. Community support occupations include occupations such as substance abuse and behavioral health disorder counselors, mental health counselors, and mental health and substance abuse social workers. Occupational classifications by BLS do not align with providers who can diagnose covered disabling conditions, but many specific occupations within the health care practitioner and technical occupations as well as the community support occupations can diagnose disabling conditions.

Social Security Disability Insurance enrollment data are obtained from the Social Security Administration (Social Security Administration 2015a). Three SSDI measures used include (1) total SSDI enrollment rates, (2) SSDI enrollment rates associated with physical health (PH) diagnoses, and (3) SSDI enrollment rates associated with mental health (MH) diagnoses.

Health insurance coverage measures include Medicaid and Medicare enrollment; data are obtained from the Centers for Medicare and Medicaid Services (2015b) and the Kaiser Family Foundation (2016a). Uninsured rates are obtained from the U.S. Census Bureau (2015b).

Social welfare and labor market protection program information include State Unemployment Insurance (SUI) and Temporary Assistance for Needy Families (TANF) enrollment rates; data are obtained from the U.S. Department of Labor's Employment and Training Administration and U.S. Department of Health and Human Services' Agency for Children and Families, respectively (U.S. Department of Health and Human Services 2015a, b; U.S. DOL Employment and Training Administration 2015a, b).

Measures of population-level health status include indicators of the percent of the population reporting fair or poor health, the percent of population classified as obese, and the percent of population who are active smokers; data are obtained from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2015a). Age-adjusted mortality rates for persons aged 25–64 are also used; data are obtained from the Centers for Disease Control and Prevention's Vital Statistics program (Centers for Disease Control and Prevention 2015c). Inpatient hospitalization rates per 100,000 population are included as a measure of health care utilization; data are obtained from the Kaiser Family Foundation (2016b).

Demographic controls include population race (i.e., white, black, other races), ethnicity (i.e., Hispanic, non-Hispanic), sex, and age group (i.e., <45, 45–49, 50–54, 55–59, 60–64, 65+) measures; these are obtained from the Centers for Disease Control and Prevention's Bridged Race Population Statistics program (Centers for Disease Control and Prevention 2015b). The Social Security Administration's vocational guideline standards consider applicant age in the disability determination process; we use the same age categories in our analyses for consistency. Unemployment and poverty rate data are obtained from the BLS Local Area Unemployment Statistics program and the U.S. Census Bureau, respectively (Bureau of Labor Statistics 2015a; U.S. Census Bureau 2015a).

Employment, enrollment, mortality, and demographic data are converted to rates per 100,000 population using population data from the Centers for Disease Control and Prevention's Bridged Race Population Statistics program (Centers for Disease Control and Prevention 2015b).

Statistical Analyses

Population-weighted descriptive statistics analyses are performed to analyze trends in study measures over the 2000–2014 study period.

Population-weighted regression analyses are used to model associations between each health care employment measure and the selected SSDI measures (i.e., either SSDI overall or SSDI physical [PH] and mental health [MH] enrollment rates, depending on the model), controlling for social welfare and labor market protection program enrollment, health insurance coverage, health status, health care utilization, demographic, and socioeconomic characteristics.

The following models are estimated using ordinary least-squares regression:

$$\begin{aligned} Employment_{it} = & \beta_0 + \beta_1 SSDI_{it} + \beta_2 Welfare_{it} + \beta_3 Insurance_{it} \\ & + \beta_4 Health\ Status_{it} + \beta_5 Utilization_{it} \\ & + \beta_6 SES_{it} + \beta_7 Demographics_{it} + \alpha_i + t_i + t_i^2 + e_{it}, \end{aligned} \quad (1)$$

where the outcome, *Employment*, is health care employment measured by a number of specific categories and types of employment as described previously. The subscript *i* represents the state, and *t* represents the year of data. *SSDI* is SSDI overall, MH, or PH enrollment rates; *Welfare* is social welfare (i.e., TANF) and labor market protection (i.e., SUI) enrollment rates; *Insurance* is health insurance coverage characteristics (i.e., uninsured, Medicaid, and Medicare enrollment rates); *Health Status* is population mortality and morbidity characteristics (i.e., age-adjusted adult mortality rates, percent reporting fair or poor health status, percent obese, percent who are active smokers); *Utilization* is health care utilization characteristics (i.e., inpatient hospitalization rate); *SES* is socioeconomic status characteristics (i.e., unemployment and poverty rates); and *Demographics* are racial, ethnic, gender, and age characteristics (i.e., black and other races, Hispanic ethnicity, female gender, and <45, 45–49, 50–54, 55–59, 60–64, and 65+ age groups). State fixed effects (α) control for time-invariant state-specific characteristics; linear and quadratic secular time trends (*t* and *t*²) are included.

We conducted two sensitivity analyses to further explore the relationship between SSDI enrollment and health care employment. The first is a model in which we use prior year SSDI enrollment in our estimates of current year health care employment, using the current year controls described for our main models. The second sensitivity analysis includes a measure that indicates the percentage of SSDI recipients also receiving income from a second

government disability insurance program (Supplemental Security Income [SSI]) for low-income individuals. Eligible persons may receive SSI benefits beginning the month after a successful SSDI application until the five-month SSDI benefit waiting period ends. Persons may also receive SSI benefits after the five-month waiting period provided that they continue to meet the program's means-based testing criteria.

Regression analyses are population-weighted by the size of each state's total population. Robust standard errors are used. The Sargan–Hansen test is performed to determine the appropriateness of using a state fixed-effects model versus a random-effects model (Schaffer and Stillman 2016). All analyses were performed using *STATA* 13 (StataCorp., College Station, TX). An α of 0.05 is considered statistically significant. We also highlight relationships at the significance level of .10 in the tables due to the relatively small sample size with the inclusion of state fixed effects.

RESULTS

Descriptive Statistics

Results show increasing trends over the 2000–2014 period in employment rates for health care practitioner and technical occupations (15.0 percent increase), health care support occupations (14.7 percent), and community support occupations (16.1 percent; Table 1). Physician assistants and occupational therapy assistants have the largest increases among examined health care practitioner and technical occupations and health care support occupations, respectively. Mental health counselors show the largest increase among examined community support occupations, with a 61.4 percent increase. SSDI enrollment also shows increasing trends (Figure 1), with SSDI enrollment rates increasing 52.1 percent between 2000 and 2014. Differences exist between SSDI mental health (MH) and physical health (PH) enrollment; in 2000, there were an average of 1,135 and 2,187 SSDI-MH and SSDI-PH enrollees per 100,000 population, respectively, increasing 54.3 and 50.9 percent to 1,752 and 3,301 per 100,000 population, respectively, in 2014.

Regression Analyses

Using the Sargan–Hansen test, we find the fixed-effects estimator is preferred in all models; thus, state fixed effects are used in study analyses.

Table 1: Descriptive Statistics and Trends

	2000–2014 Time Period				Trends			
	Number of Observations	Mean	Standard Deviation	Minimum	Maximum	Mean 2000	Mean 2014	% Change 2000–2014
Health care employment per 100,000 population								
Health care practitioner and technical occupations	750	2,290.7	354.7	1,564.8	3,487.6	2,137.0	2,458.7	15.0
Primary care physicians	733	37.3	16.3	11.1	139.0	46.7	38.9	−16.7
Physician assistants	732	23.5	10.7	3.1	85.5	19.5	28.7	46.8
Psychiatrists	664	7.2	4.1	0.9	29.8	6.9	7.8	13.6
Health care support occupations	750	1,189.3	244.3	673.7	1,942.9	1,076.6	1,234.9	14.7
Home health aides	738	251.5	161.6	52.7	877.7	198.9	249.9	25.6
Occupational therapy assistants	713	8.1	4.2	2.0	21.6	5.7	10.1	78.6
Physical therapy assistants	742	20.2	7.6	4.1	45.4	15.6	24.1	54.4
Community support occupations	747	581.7	164.3	265.5	1,310.3	519.3	602.9	16.1
Substance abuse and behavioral health disorder counselors	740	24.3	12.4	4.9	82.4	19.9	26.7	34.1
Mental health counselors	734	32.2	20.7	4.6	123.8	23.1	37.3	61.4
Mental health and substance abuse social workers	728	36.6	18.1	5.9	148.4	28.2	36.8	30.6
Social Security Disability Income (SSDI) enrollment per 100,000 population (age 18–64)								
SSDI	750	4,259.5	1,305.6	1,926.9	9,619.6	3,322.2	5,052.4	52.1
SSDI Mental health (MH)	750	1,511.9	447.2	658.3	3,484.2	1,135.3	1,751.6	54.3
SSDI Physical health (PH)	750	2,747.7	926.2	1,171.1	6,709.6	2,186.9	3,300.9	50.9
Social welfare and labor market protection program enrollment in percent								
Adult Temporary Assistance for Needy Families (TANF)	749	0.46	0.31	0.01	1.71	0.70	0.32	−54.3

continued

Table 1: *Continued*

	<i>Number of Observations</i>	<i>2000–2014 Time Period</i>				<i>Trends</i>		
		<i>Mean</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean 2000</i>	<i>Mean 2014</i>	<i>% Change 2000–2014</i>
State Unemployment Insurance (SUI)	750	2.13	0.85	0.45	5.64	1.45	1.62	12.2
<i>Health insurance enrollment in percent</i>								
Medicaid	750	15.4	4.6	5.7	33.0	11.6	21.9	89.5
Medicare	750	14.8	2.2	5.6	22.5	14.0	16.6	18.6
Uninsured	750	14.4	4.4	3.3	24.7	13.1	11.7	–10.6
<i>Morbidity, mortality, and health care utilization</i>								
Percent obese (age 18+)	749	25.5	3.8	14.2	35.9	20.4	28.9	41.9
Percent reporting fair/poor health (age 18 +)	749	16.6	2.8	9.4	25.8	15.3	17.8	16.8
Percent active smoker (age 18+)	749	19.8	3.8	9.1	32.6	22.3	17.4	–22.1
Age-adjusted mortality rate per 100,000 (age 16–64)	750	343.8	58.4	241.6	530.9	364.4	334.4	–8.3
Inpatient hospitalization rate per 100,000	750	115.0	18.4	69.0	165.0	120.0	103.5	–13.7
<i>Socioeconomic characteristics in percent</i>								
Unemployment	750	6.4	2.1	2.3	13.7	4.0	6.2	54.5
Poverty	750	13.4	3.0	4.5	23.1	11.3	14.8	30.4
<i>Demographic characteristics in percent</i>								
Race								
Whites	750	80.2	8.3	29.6	97.9	81.8	78.7	–3.8
Blacks	750	13.4	7.9	0.4	38.0	12.9	13.8	7.0
Other races	750	6.4	6.0	0.8	67.9	5.3	7.5	42.2

continued

Table 1: Continued

	Number of Observations	2000–2014 Time Period				Trends		
		Mean	Standard Deviation	Minimum	Maximum	Mean 2000	Mean 2014	% Change 2000–2014
Ethnicity								
Hispanic ethnicity	750	15.3	12.5	0.7	47.7	12.6	17.4	37.4
Sex								
Female gender	750	50.8	0.6	47.4	52.0	50.9	50.8	−0.3
Age group								
<45 age group	750	62.0	3.5	51.1	74.4	65.4	59.3	−9.4
45–49 age group	750	73	0.5	5.1	8.8	72	6.6	−8.5
50–54 age group	750	6.9	0.5	4.8	8.7	6.3	7.1	12.4
55–59 age group	750	6.0	0.7	3.6	8.1	4.8	6.7	40.4
60–64 age group	750	4.9	0.8	2.8	7.4	3.8	5.8	51.3
65+ age group	750	12.9	2.0	5.7	19.1	12.4	14.5	16.6

Note: Observations are at the state-year level. Descriptive statistics are population-weighted.

Figure 1: Average Annual Percent Change in Social Security Disability Insurance Enrollees per 100,000 Population (2000–2014). (A) SSDI; (B) SSDI-MH; (C) SSDI-PH [Color figure can be viewed at wileyonlinelibrary.com]

Results from the regression analyses show that SSDI enrollment is positively and significantly associated with health care employment for health care practitioner and technical occupations and health care support occupations, but is not significantly associated with community support occupations (Table 2, Panel A). A one unit increase in SSDI enrollment per 100,000 population is associated with a 0.05 and 0.04 unit increase in the employment rate per 100,000 population for health care practitioner and technical occupations and health care support occupations, respectively. To place into context, a one standard deviation increase in SSDI enrollment per 100,000 population is associated with a 2.6 and 4.5 percent increase in the mean outcome over the period for both of these measures, respectively. This would translate into a nationwide increase (based on 2014 employment) of 190,906 additional

Table 2: Associations between Social Security Disability Income (SSDI) Enrollment and U.S. Health Care Employment (2000–2014)

	<i>Health Care Practitioner and Technical Occupations per 100,000 Population</i>	<i>Health Care Support Occupations per 100,000 Population</i>	<i>Community Support Occupations per 100,000 Population</i>
<i>Panel A</i>			
SSDI enrollees per 100,000 population	0.0459**	0.0414**	0.0080
Standard error	(0.0149)	(0.0184)	(0.0125)
N	748	748	745
<i>Panel B</i>			
SSDI Mental health enrollees per 100,000 population	0.176**	−0.0263	0.0694**
Standard error	(0.0405)	(0.0432)	(0.0269)
SSDI Physical health enrollees per 100,000 population	−0.00284	0.0668**	−0.0151
Standard error	(0.0192)	(0.0232)	(0.0163)
N	748	748	745

Note: ** indicates statistically significant at the 0.05 level. Models represent population-weighted regression analyses with state fixed effects, linear and quadratic time trends, and robust standard errors. Models control for state-year level social welfare and labor market protection program enrollment (i.e., TANF and SUI enrollment per 100,000), health insurance coverage (i.e., Medicaid enrollees, Medicare enrollees, and uninsured individuals per 100,000), morbidity (i.e., percent obese, percent reporting fair or poor health status, percent smoker), mortality (i.e., age-adjusted mortality rate, age 16–64), health care utilization (i.e., inpatient hospitalization rate per 100,000), and socioeconomic (i.e., unemployment and poverty) and demographic characteristics (i.e., black and other races, Hispanic ethnicity, female gender, and <45, 45–49, 50–54, 55–59, 60–64, and 65 + age groups).

employees in health care practitioner and technical occupations and 172,189 additional employees in health care support occupations associated with a one standard deviation increase in SSDI enrollment.

The relationship between SSDI enrollment and health care employment differs for SSDI physical (PH) and mental health (MH) enrollment (Table 2, Panel B). The SSDI-MH enrollment rate is positively and significantly associated with the employment rate for health care practitioner and technical occupations and community support occupations. The SSDI-PH enrollment rate is positively and significantly associated with the employment rate for health care support occupations.

The SSDI enrollment rate is positively and significantly associated with the employment rate for home health aides and physical therapy assistants (Table 3, Panel A). Results vary in the association between SSDI-MH and SSDI-PH measures and occupational employment (Table 3, Panel B). The SSDI-MH enrollment rate is positively and significantly related to physician assistant, occupational therapy assistant, mental health counselor, and mental health and substance abuse social worker employment rates. A one unit increase in SSDI-MH enrollment per 100,000 population is associated with a 0.01, 0.003, 0.02, and 0.02 unit increase in the employment rate per 100,000 population for physician assistants, occupational therapy assistants, mental health counselors, and mental health and substance abuse social workers, respectively. To place in context, a one standard deviation increase in SSDI-MH enrollment per 100,000 population is associated with a 15.4, 14.5, 21.5, and 20.8 percent increase in the mean outcome over the period for each of these measures, respectively. This would translate into a nationwide increase (based on 2014 employment) of 11,554; 3,747; 22,082; and 24,218 additional employees, respectively, for each of these occupational classifications associated with a one standard deviation increase in SSDI enrollment. The SSDI-PH enrollment rate is positively and significantly associated with home health aide and physical therapy assistant employment rates, and negatively and significantly associated with primary care physician employment rates.

The first sensitivity analysis examining the association between prior year SSDI enrollment (total, and broken down by disability type) and current year health care employment shows broadly similar results (Table S1, Panels A and B in Appendix SA2), although several of the associations observed are no longer statistically significant due to smaller effect size magnitudes and larger standard errors. Specifically, the association between prior year SSDI enrollment and health care support occupational employment is no longer statistically significant; the association between SSDI-MH enrollment and

Table 3: Associations between Social Security Disability Income (SSDI) Enrollment and U.S. Health Care Employment (2000–2014)

	Health Care Practitioner and Technical Occupations			Health Care Support Occupations			Community Support Occupations		
	Primary Care Physicians per 100,000 Population	Physician Assistants per 100,000 Population	Psychiatrists per 100,000 Population	Home Health Aides per 100,000 Population	Occupational Therapy Assistants per 100,000 Population	Physical Therapy Assistants per 100,000 Population	Substance Abuse and Behavioral Health Disorder Counselors per 100,000 Population	Mental Health Counselors per 100,000 Population	Mental Health and Substance Abuse Social Workers per 100,000 Population
<i>Panel A</i>									
SSDI enrollees per 100,000 population	−0.00548*	0.00129	−0.000628	0.0547**	−0.0000332	0.00320**	0.00153	0.0000908	0.000309
Standard error	(0.00281)	(0.00144)	(0.000554)	(0.0169)	(0.000568)	(0.000793)	(0.00195)	(0.00265)	(0.00240)
<i>N</i>	732	730	664	736	711	740	738	732	726
<i>Panel B</i>									
SSDI Mental health enrollees per 100,000 population	0.00764	0.00811**	0.000559	−0.0263	0.00263**	0.00309*	0.00479	0.0155**	0.0170**
Standard error	(0.00652)	(0.00330)	(0.00153)	(0.0417)	(0.00119)	(0.00182)	(0.00401)	(0.00647)	(0.00548)

continued

Table 3: Continued

	Health Care Practitioner and Technical Occupations			Health Care Support Occupations			Community Support Occupations		
	Primary Care Physicians per 100,000 Population	Physician Assistants per 100,000 Population	Psychiatrists per 100,000 Population	Home Health Aides per 100,000 Population	Occupational Therapy Assistants per 100,000 Population	Physical Therapy Assistants per 100,000 Population	Substance Abuse and Behavioral Health Disorder Counselors per 100,000 Population	Mental Health Counselors per 100,000 Population	Mental Health and Substance Abuse Social Workers per 100,000 Population
SSDI Physical health enrollees per 100,000 population	-0.0104**	-0.00129	-0.00105	0.0850**	-0.00100	0.00325**	0.000316	-0.00556	-0.00586*
Standard error	(0.00354)	(0.00169)	(0.000816)	(0.0219)	(0.000719)	(0.00106)	(0.00251)	(0.00397)	(0.00323)
N	732	730	664	736	711	740	738	732	726

Note: * and ** indicate statistically significant at the 0.10 and 0.05 levels. Models represent population-weighted regression analyses with state fixed effects, linear and quadratic time trends, and robust standard errors. Models control for state-year level social welfare and labor market protection program enrollment (i.e., TANF and SUI enrollment per 100,000), health insurance coverage (i.e., Medicaid enrollees, Medicare enrollees, and uninsured individuals per 100,000), morbidity (i.e., percent obese, percent reporting fair or poor health status, percent smoker), mortality (i.e., age-adjusted mortality rate, age 16-64), health care utilization (i.e., inpatient hospitalization rate per 100,000), and socioeconomic (i.e., unemployment and poverty) and demographic characteristics (i.e., black and other races, Hispanic ethnicity, female gender, and <45, 45-54, 55-59, 60-64, and 65 + age groups).

community support occupational employment is significant at the 10 percent level rather than the 5 percent level. Additionally, for associations between SSDI enrollment (total, and broken down by disability type) and more specific employment categories, there are changes in significance and direction of the relationship for nonsignificant associations (Table S2, Panels A and B in Appendix SA2).

The second sensitivity analysis examining associations between SSDI enrollment and health care employment while controlling for SSDI-SSI dual enrollees shows broadly similar results in direction and magnitude (Table S3); the association with health care support occupational employment is no longer statistically significant. The coefficient on the percent of SSDI enrollees who are dually enrolled in the SSI program is inconsistent in sign and significance.

DISCUSSION

Results show that SSDI enrollment is associated with health care employment for a range of health care occupations; in particular, SSDI enrollment rates are positively and significantly associated with broad classes of health care employees and have small and varied specific associations with particular employment groups. There are differences in these associations by SSDI enrollment type based on whether the qualifying disability is mental versus physical health related. SSDI enrollment was significantly associated with health care employment even when controlling for changes in health care employment across states over time, time-invariant state-level factors, socioeconomic and demographic factors, health insurance coverage, and social welfare and labor market protections.

Social Security Disability Insurance enrollment, particularly by type of disability, should be considered when developing health care employment models, both nationally and at the state and region levels. For example, our results show that SSDI-MH enrollment rates are positively associated with employment of physician assistants, although SSDI-PH enrollment does not show a significant association; the overall association between physician assistant employment and SSDI enrollment was not significant. Given that the training duration for physician assistants is shorter than that of physicians and supply is less constrained due to the increasing availability of training programs, physician assistant supply may more readily respond to potential changes in health care demand related to SSDI enrollment than physician

supply. Based on existing training availability and anticipated program expansions, employment of physician assistants is expected to increase by 72 percent from 2010 to 2025 (Hooker, Cawley, and Everett 2011). Physician assistants serve an increasingly important role in diagnosis and treatment of both physical and mental health disorders (Stange 2014); continued training of high numbers of physician assistants may be supported if SSDI enrollment, particularly due to mental health conditions, continues to increase at the state and/or national levels.

In contrast to physician assistants, SSDI-MH enrollment rates were not associated with primary care physician employment, whereas there is a negative and significant association between SSDI-PH and primary care physician employment. Rising health care utilization may require an additional 52,000 primary care physicians by 2025 (Pettersen et al. 2012); however, increasing the numbers of primary care physician providers will be constrained by availability of medical school and physician residency programs and related training opportunities. These constraints on training availability may explain why associations between physician employment and SSDI enrollment are weaker than employment classifications such as physician assistants that require shorter and/or more accessible training.

We find SSDI-MH enrollment is associated with employment rates of mental health counselors and mental health and substance abuse social workers with no statistically significant association with psychiatrist employment rates. Psychiatrist employment, in general, has not been keeping up with the overall pace of population growth in the United States (Bishop et al. 2016). Nonphysician mental health providers (i.e., mental health counselors and mental health and substance abuse social workers) represent an increasing share of the mental health workforce (Pellegrini and Rodriguez-Monguió 2014). Mental health workforce imbalances—such as an undersupply of psychiatrists and psychologists—may be a barrier to optimal treatment of mental illness (Pellegrini and Rodriguez-Monguió 2014; Bishop et al. 2016). However, increased and ongoing training of nonphysician mental health providers may be a potential solution to shortages of providers to treat mental illness (Olfson 2016). As SSDI-MH enrollment rates are positively associated with nonphysician mental health providers, understanding the implications of these distributional workforce changes for patient care is important. Employment increases for nonphysician mental health providers are possible due to increasing training opportunities, such as expanded social worker training programs (Council on Social Work Education 2016).

Social Security Disability Insurance enrollment and SSDI-PH-specific enrollment were positively associated with employment for physical therapy assistants (SSDI) and home health aides (SSDI-PH). Low barriers to entry may encourage employment increases for these providers. Disabling physical health conditions may require continuing treatment and/or rehabilitative care beyond what is estimated with current nationally available morbidity measures. Further, demand for continuing treatment and rehabilitative care may increase as SSDI enrollees become eligible for Medicare once the two-year waiting period is exhausted and/or Medicaid due to Medicaid expansion for low-income adults after the Affordable Care Act (Centers for Medicare and Medicaid Services 2015a, c). Research suggests that increasing Medicaid and Medicare spending as a share of overall health care spending is significantly associated with employment growth for these health care support occupations (Pellegrini, Rodriguez-Monguió, and Qian 2014).

Current government (Health Resources and Services Administration 2016) and academic (Hooker, Cawley, and Everett 2011; Petterson et al. 2012) health care workforce models do not consider SSDI enrollment as a factor related to health care employment; given our findings, this appears to be a limitation of current models. Understanding the association between current SSDI enrollment and health care employment is important as evolving disability policy and demographic shifts may have implications for the larger health care system and related employment.

Changes in eligibility based on disabling conditions and occupational classifications may affect the number of individuals eligible for SSDI. For example, mental health disorder eligibility expansions were implemented in January 2017, allowing more mental diagnoses to qualify for SSDI benefits (Federal Register 2010). Additionally, the Social Security Administration (SSA) is revising occupational classifications used to determine SSDI eligibility (Social Security Administration 2016a); if implemented, new classifications and job descriptions may change eligibility standards. Demographic shifts may also impact SSDI enrollment as increased aging of the Baby Boomer generation may increase SSDI enrollment given that they are currently in the age group (50–64 year olds) who disproportionately receive SSDI benefits. However, there is some evidence that SSDI enrollment is leveling off with this demographic shift, rather than continuing to increase (Social Security Administration 2016b). The first six birth-year cohorts of the Baby Boomer generation have reached normal retirement age and transitioned from disability to retiree benefits. Remaining Baby Boomer birth cohorts are currently in the most disability-prone age category; however,

they will be making the transition to the retiree benefit program in upcoming years. Thus, SSDI enrollment rates may grow more modestly in future years than they did during the analysis period of 2000–2014 (Social Security Administration 2016b). Although there is some discussion as to whether aging, in itself, is a main cause of rising health care demand (Reinhardt 2003), worsening morbidity and associated disabling conditions are often associated with advancing age (Centers for Disease Control and Prevention 2015a). To isolate associations between SSDI enrollment and health care employment, we control for confounding effects of advancing age and state-level morbidity characteristics; our results show statistically significant associations between SSDI enrollment and health care employment across a range of health care occupations.

This study has several limitations. First, the use of state-year data may mask policy and regulatory differences between states. State-specific factors that influence health care employment include licensing regulations and training opportunities. In addition, while SSDI is a federal program, it is not administered consistently across states. For example, in 1999, a program for single decision maker authority was launched in nineteen states allowing disability examiners to process select disability applications without medical consultation (Social Security Administration 2016b). To account for these limitations, we utilize state fixed-effects models to control for omitted variables that vary across states but not over time. Second, we are limited in our ability to establish temporal precedence of the results and to eliminate the possibility of reverse causality in which expanded health care employment might lead to a reduction in SSDI enrollment. We include a sensitivity analysis in which we examine the association between current year health care employment and prior year SSDI enrollment and find broadly similar results. This analysis, as with our main regression estimates, also includes a variable measuring state-level (non health care specific) unemployment rates. The consistency of the findings is suggestive of SSDI enrollment influencing health care employment (rather than health care employment influencing SSDI enrollment), but it does not establish a causal relationship. Third, limited measures of health care utilization are available at the state level for the full analytic period, so we are limited to using inpatient hospitalization rates as a measure of health care utilization. Inpatient utilization may not be representative of outpatient and skilled nursing and rehabilitative utilization, which comprise the majority of health care utilization (York, Kaufman, and Grube 2013). To address this, we have included many other measures correlated with health care demand and utilization. Fourth, a second government disability

insurance program, SSI, may also be associated with health care employment. Disabled individuals can enroll in the SSI program either by itself or dually with SSDI, depending on eligibility. We cannot fully analyze associations between health care employment and SSI due to data availability; state-level SSI data are unavailable for the full study period and are not separated by disability categories. We conduct a sensitivity analysis in which we control for the percent of SSDI enrollees dually eligible for SSDI and SSI and find generally similar results, although associations between dual eligibility and health care employment are inconsistent.

In conclusion, we find that health care employment is significantly associated with SSDI enrollment at the state level over the 2000–2014 time period, after controlling for a number of factors related to health care demand. Further, the relationship between SSDI enrollment rates and the U.S. health care workforce varies based on physical as opposed to mental health SSDI enrollment. Quantifying the magnitudes of these associations shows the importance of incorporating SSDI enrollment rates into official health care workforce models as evolving disability policy and demographic shifts may result in changes to SSDI enrollment.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the supporting information tab for this article:

Appendix SA1: Author Matrix.

Appendix SA2:

Table S1: Associations between Prior Year Social Security Disability Income (SSDI) Enrollment and Current U.S. Healthcare Employment (2001–2014).

Table S2: Associations between Prior Year Social Security Disability Income (SSDI) Enrollment and Current U.S. Healthcare Employment (2001–2014).

Table S3: Associations between Social Security Disability Income (SSDI) Enrollment, Dual SSDI-SSI Enrollment Percentage, and U.S. Healthcare Employment (2001–2014).