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Workplace Injuries and the Take-Up of Social Security Disability Benefits

by Paul O'Leary, Leslie I. Boden, Seth A. Seabury, Al Ozonoff, and Ethan Scherer*

Workplace injuries and illnesses are an important cause of disability. State workers' compensation programs provide almost $60 billion per year in cash and medical-care benefits for those injuries and illnesses. Social Security Disability Insurance (DI) is the largest disability insurance program in the United States, with annual cash payments to disabled workers of $95 billion in 2008. Because injured workers may also receive DI benefits, it is important to understand how those two systems interact to provide benefits. This article uses matched state workers' compensation and Social Security data to study the relationship between workplace injuries and illnesses and DI benefit receipt. We find that having a lost-time injury substantially increases the probability of DI receipt, and, for people who become DI beneficiaries, those with injuries receive DI benefits at younger ages. This relationship remains robust even after we account for important personal and work characteristics.

Introduction

A substantial proportion of disability in the United States is caused by injuries and illnesses that arise because of an individual's work (Leigh and others 2000; Reville and Schoeni 2004; Smith and others 2005). State workers' compensation programs provide cash benefits and medical-care benefits for work-related injuries and illnesses, but people with residual disability from workplace injuries may also be eligible for Social Security Disability Insurance (DI) and related Medicare benefits. Although workers' compensation and DI are the two largest social insurance programs targeting people with disabilities, there is a lack of understanding of how the systems interact and influence worker behavior. This article uses matched state workers' compensation and Social Security data to estimate whether workplace injuries and illnesses increase the probability of receiving DI benefits, the extent of any increase that occurs, and, whether people who become DI beneficiaries receive benefits at younger ages than the typical DI beneficiary.

Workers' compensation systems provide medical and cash benefits to workers injured on the job. Workers' compensation insurance or self-insurance is mandatory for well over 90 percent of employees in all states except Texas (Sengupta, Reno, and Burton 2011) and begins on the first day of employment. By statute, workers' compensation benefits typically cover all necessary medical expenses and part of lost earnings related to workplace injuries. Most workers' compensation cases are medical-only cases, with no payment of cash benefits to replace lost earnings. To be eligible

Selected Abbreviations

DER	Detailed Earnings Record
DI	Disability Insurance
EIN	employer identification number
IRS	Internal Revenue Service
MBR	Master Beneficiary Record
MEF	Master Earnings File

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Selected Abbreviations—*Continued*

PPD	permanent partial disability
PTD	permanent total disability
SSA	Social Security Administration
WCA	Workers' Compensation Administration (New Mexico)

for cash benefits, a worker must have a temporary disability exceeding the state's waiting period, which varies from 3 to 7 days, or must have a permanent disability. Statutory replacement of lost earnings for temporary disabilities is typically two-thirds of lost earnings, capped at a maximum that varies by state. Temporary disability benefits are paid until the workers' compensation system regards the worker as having reached maximum recovery from the injury. If the worker can return to employment at the preinjury earnings level, cash benefits for temporary disability cease. If the worker still has permanent functional impairment or lost earnings capacity, the employer or insurer may be responsible for permanent disability benefits. In turn, permanent disabilities can be either total (with virtually no residual earning capacity) or partial (where residual earning capacity remains). State systems for paying permanent partial disability (PPD) benefits vary widely (see Burton (2005) and Barth and Niss (1999)), and describing those systems is outside the scope of this article. In most states, however, PPD benefits are evaluated as a percentage of total disability. That percentage is then applied either to a statutory number of weeks of benefits (for example, $400 per week paid for 10 percent of 500 weeks equals 50 weeks) or to a weekly benefit rate that is paid for a set number of weeks (for example, 10 percent of $400 per week paid for 500 weeks). In some states, PPD benefits are paid based on the difference between current earnings and preinjury earnings (wage loss).

Most employers or insurers pay workers' compensation without contest, with benefits determined by the payer applying their respective state's laws and regulations. If a dispute arises about work-relatedness—when temporary disability benefits should end, the extent of permanent disability, or some other unresolved issue—it is adjudicated in almost all states by hearing officers or administrative law judges.

In this study, we examine DI outcomes for workers' compensation cases from New Mexico. During the study period, the New Mexico workers' compensation waiting period for temporary disability benefits was 7 days. The maximum weekly benefit was 85 percent of the state average weekly wage until 2000, when it was raised to 100 percent. To categorize injury severity, we classify workers' compensation cases by the highest level of disability payment (from low to high: medical-only, temporary disability, PPD, and permanent total disability (PTD)). About 70 percent of workers' compensation cases in New Mexico involved only medical benefits. Of lost-time cases, 73 percent were for temporary disability only, and 27 percent involved PPD. Less than 0.5 percent of lost-time cases resulted in payment of PTD benefits.

DI benefits may also be available to injured workers, although coverage of injuries is narrower in scope. First, DI benefits are only available to workers with a total disability expected to last at least 12 months or end in death. In that sense, those benefits are similar to workers' compensation for workers with PTDs. If anything, the workers' compensation definition appears more stringent because under that system permanent total disability is expected to last throughout the work life. However, the relationship in practice is determined by the decision-making process of the two systems, which is not completely codified in law or regulation. Of course, workers' compensation covers a much wider range of injuries, including those involving no lost time from work, those involving short-term disability, and those involving PPD.

Unlike workers' compensation benefits, DI benefits are available to individuals (and their families) only after they have established a sufficient work history.[1] Despite the close relationship between employment history and DI, we know very little about the extent to which individuals' employment experiences contribute to disability and eventual receipt of disability benefits covered under the Social Security Administration (SSA). Those experiences include injuries at work.

The formal relationship between DI and workers' compensation is governed by a legally mandated offset program. The offset—which Congress included in the original 1956 Social Security disability program and then rescinded in 1958 and reestablished in 1965 (Reno, Williams, and Sengupta 2003)—limits the amount paid to injured workers receiving benefits from both DI and workers' compensation to a maximum of 80 percent of the worker's preinjury average earnings. Depending on the state, either SSA or the state reduces benefits such that the combined DI and workers' compensation benefits do not exceed

80 percent of prior earnings.[2] In New Mexico, DI benefits are reduced if the 80 percent cap is exceeded.

The stakes in understanding how Social Security's DI program and workers' compensation interact are high because they comprise the two largest disability benefit programs in the United States. Workers' compensation paid benefits to 4 million workers in 2008 at a total cost approaching $60 billion, almost equally split between cash and medical benefits. DI in 2008 was nearly three times the size of workers' compensation, with 7.4 million disabled-worker beneficiaries at a cost of $95 billion in cash benefits, while Medicare health-care benefits for people with disabilities who were younger than age 65 totaled over $54 billion (Sengupta, Reno, and Burton 2011; SSA 2011a, 2011b).[3] Both the DI and workers' compensation programs have been growing in the past two decades, but the growth in workers' compensation has been modest in comparison to DI. From 1987 through 2008, workers' compensation cash benefits increased by 65 percent while DI cash benefits grew by 403 percent (Sengupta, Reno, and Burton 2011; SSA 2011a[4]).

There is evidence that the effect of work-related injuries on the eventual receipt of DI benefits could be significant. Reville and Schoeni (2004) used data from the 1992 Health and Retirement Survey to estimate the proportion of disabilities caused by work. Using a narrow definition—disability caused by injury at work—they estimated that 17 percent of the disabled population aged 51–61 attributed their disability to work. That proportion grew to 36 percent under a broader definition of work-relatedness. The proportion attributing their disability to work was almost identical among those receiving DI benefits. The authors indicated that work-related limitations are a substantial contributor to overall disability rates and that DI is an important source of insurance for work-related disability. Given that work and work-related hazards are significant contributors to long-term disabilities, it is noteworthy that workers' compensation has not grown at a similar rate when compared with DI. There are differing views on the various causes of the growth in the DI rolls, but there is some consensus that much of that growth can be explained by simple inflation, the expanded labor force participation of women, and changes in disability policy in the late 1980s that led to increased awards, especially for younger individuals (Rupp and Stapleton 1995; Burkhauser and Daly 2002; Autor and Duggan 2006). Although DI and workers compensation programs differ in important ways, they serve the same populations and face many of the same demographic, social, and economic changes. As such, it is interesting that the growth rates exhibit such different patterns.

Researchers have hypothesized that workers' compensation and DI do not move together because injured workers substitute one program's benefits for the other's, as the relative value or ease of obtaining benefits changes. Sengupta, Reno, and Burton (2011) examined DI and workers' compensation cash benefits per $100 of wages in the 1980–2007 period and found that the trends for the two programs were nearly mirror opposites of each other. As cash benefits as a percentage of covered wages rose for workers' compensation from 1980 through 1991, there was a corresponding decline for DI. Then as the percentage of covered wages leveled out and subsequently declined for workers' compensation from 1992 through 2007, the authors noted movement of comparable magnitude for DI in the opposite direction. Other researchers have examined these potential substitution effects and have found that declines in the statutory cash benefit levels of workers' compensation and their more restrictive eligibility rules were both associated with increases in DI applications from 1985 through 1999 (Guo and Burton 2008).[5] Guo and Burton further suggested that such changes have reduced employer safety incentives and efficiency by shifting injury costs from employers, who have the ability to affect injury risks, to SSA, which does not. However, a recent paper by McInerney and Simon (2012) did not support the Guo and Burton results. McInerney and Simon examined the relationship between DI and workers' compensation receipt within states over time. They found that the overall inverse relationship between DI and workers' compensation payments did not hold within states. Instead, the authors concluded that the increases in DI occurred in states other than those with reductions in workers' compensation.

While changes in workers' compensation laws may or may not have contributed to the large increase in receipt of DI benefits, workplace injuries almost certainly add to the DI rolls. We test that hypothesis and examine the size of any workers' compensation effect on the DI program. Further, we examine the extent to which the large sizes of the two programs lead to significant DI costs. This research adds to the evidence of a causal linkage between work-related injuries and DI by using survival analyses to estimate the time-specific probability of receiving DI among people with workers' compensation injuries.

Beyond access to workers' compensation coverage and the way those benefits interact with DI benefits, states also differ in terms of the kinds of injuries covered and the level of benefits provided. Understanding the linkage between workers' compensation benefits and the DI program could help SSA in developing cooperative programs with states to improve incentives to minimize the long-term severity of injuries. This could improve retention of workers in the labor market and reduce costs for the DI program. In this analysis, we look at the extent to which injuries on the job in New Mexico ultimately lead to receipt of DI benefits.

SSA maintains some information on workers' compensation claims to manage the offset provisions. However, the workers' compensation benefits data maintained by SSA are self-reported, and there are no existing automated data matches with states.[6] For reported workers' compensation benefits, SSA individually verifies the type and amount with the workers' compensation provider before adjusting DI payments, but there are no means for SSA to check for unreported workers' compensation claims. In our analysis, we match New Mexico state workers' compensation data to Social Security administrative data and Internal Revenue Service (IRS) earnings data. This provides a unique, rich data resource that allows us to integrate many details about both the nature and timing of the workers' compensation injury and any DI benefits that may result.

Using our matched data, we examine the proportion of injured workers who have received workers' compensation benefits and who eventually receive DI benefits and the age at which they transition to Social Security benefits. We also examine the extent to which employer and individual characteristics affect the propensity for workers' compensation injuries leading to DI benefits and the timing of those benefits. This information should improve our understanding of the relationship between workplace injuries and receipt of DI benefits.

Data

The New Mexico Workers' Compensation Administration (WCA) provided us with data on all cases with injury dates from 1992 through 2001 for which workers' compensation benefits were paid (N = 214,230). The data included information on the characteristics of the injured worker, the injury and the employer, compensated time lost from work, and benefits paid. New Mexico has a 7-day waiting period for temporary disability benefits, so cash benefits are only paid for cases involving more than 7 days lost from work or for permanent disability. From 1992 through 2001, there were 63,689 lost-time cases (30 percent of the total). The remaining 150,541 cases (70 percent) comprised workers who received only medical-care benefits.

Thirty-eight percent of the WCA sample had more than one workplace injury from 1992 through 2001. That is important because the first injury might causally affect the occurrence and impact of subsequent injuries. Because we do not observe individuals before 1992, some of the injuries, particularly in the early years of our sample, may not have been the first injury. For that reason, we removed workers whose first observed injury occurred in 1992 or 1993 as a compromise between reducing the number of subsequent injuries included in the analysis and maintaining sample size. In our data, 22 percent of workers have more than one injury, and 49 percent of second injuries occur within 2 years of the first injury.

We excluded injuries in 2001 to provide a longer observation period after the date of initial injury.[7] This offers a clearer picture of the final status of cases. Finally, we eliminated death claims. After those exclusions, 156,961 cases in the workers' compensation file remained. Our sample consisted of 44,675 lost-time cases and 112,286 medical-only cases—categorized by the highest level of disability benefits paid. About 8 percent of lost-time cases included a lump-sum payment. We categorized those as PPD cases unless PTD benefits were paid, at which point we considered them to be PTD cases.

For people receiving DI benefits, eligibility for DI terminates at full Social Security retirement age. At full retirement age, workers are also no longer eligible for new DI benefits. In both cases, workers can receive Social Security retirement benefits instead. To provide an adequate postinjury observation period, we excluded workers aged 55 or older at the date of injury. We also excluded workers with a reported age younger than 15. After those restrictions, our sample consisted of 140,951 injury cases, of which 101,645 were medical-only and 39,306 were lost-time cases.

Using Social Security's Enumeration Validation System, based on the master files of Social Security number (SSN) holders and SSN applications (NUMIDENT), we verified the SSNs of injured workers using the WCA-provided SSN, name, date of birth, and sex of each injured worker. The NUMIDENT is a computer database that contains an abstract of the information submitted for SSN applications. Approximately 96 percent of our sample has valid SSNs. Using the validated SSN, we linked each worker to his or her Detailed Earnings Record (DER) from Social Security's Master Earnings File (MEF), retrieving annual earnings through the end of 2009. SSA derives the MEF data from IRS Form W-2, quarterly earnings records, and annual income tax forms.[8] Those data include regular wages and salaries for Federal Insurance Contribution Act–covered and noncovered workers, tips, self-employment income, and deferred compensation. There may be multiple sources of earnings in any given year. Using the DER, we determined the "employer of injury." If the employer identification number (EIN) in the WCA file matched any of the EINs in the IRS data for that year, we used that EIN. In cases where none of the EINs matched, or the WCA EIN was missing in the WCA file, we used the IRS EIN that represented the highest earnings in the year of injury.

We kept one injury record for each injured worker and considered the index injury to be the first lost-time injury in the data. If a worker incurred exclusively medical-only injuries, we considered the first of those as the index injury. We also dropped cases for which the initial receipt of DI benefits preceded the index injury. That reduced our analytic sample to 98,148 cases, of which 65,705 (67 percent) were medical-only and 32,443 (33 percent) were lost-time.

We then matched the injured workers in our sample with validated SSNs to data from Social Security's Ticket Research File (TRF).[9] The TRF draws data from various Social Security administrative files into a single record for each beneficiary who has received benefits based on disability since 1996.[10] For our analysis, we focus primarily on data from the Master Beneficiary Record (MBR) as contained in the TRF. The MBR contains information about all recipients of Old-Age, Survivors, or Disability Insurance cash benefits. It includes their dates and types of eligibility, payment amounts, and other demographic and benefit characteristics. We matched injured workers in the sample to the TRF to determine whether they began receiving DI benefits between the date of injury and the end of 2009, based on the date SSA determined those individuals to be eligible to receive DI cash benefits.[11] The eligibility date for DI receipt provides us with the dependent variable in the survival analysis. Death is a censoring event, so we also used the Social Security Death Master File from the NUMIDENT to derive dates of death.[12]

Methods

To measure the impact of workplace injuries on DI receipt directly, we must observe an individual's probability of receiving DI under both injured and uninjured circumstances. However, it is impossible to observe workers simultaneously as both injured and uninjured. Instead, we used the cumulative hazard of receipt of DI for medical-only workers to estimate the counterfactual probability of receiving DI absent an injury. By "cumulative hazard," we mean the probability (as a function of time T) that an individual will receive DI by time T after the date of injury. In the analysis, we measure time in 3-month increments, although our results are presented in a scale of years. Because medical-only cases involve 7 or fewer days off work, the underlying severity of the injuries is low and should result in little to no long-term physical impairment. Thus, we expect that the underlying risk of long-term total disability for workers with medical-only injuries should be approximately equal to that of an uninjured worker. We can approximate the increased hazard of DI receipt from lost workday injuries by estimating the difference between the probability of DI receipt for workers with lost-time injuries and those of workers with medical-only injuries.[13]

All analyses were performed using SAS 9.2.[14] We derived separate Kaplan-Meier curves to estimate the length of time to DI receipt for workers with lost-time and medical-only injuries. We also derived age-specific Kaplan-Meier curves because age is strongly and positively related to disability (Chart 1). Although the Kaplan-Meier curves have the advantage of being nonparametric and easy to interpret, they fail to account for potentially confounding covariates.

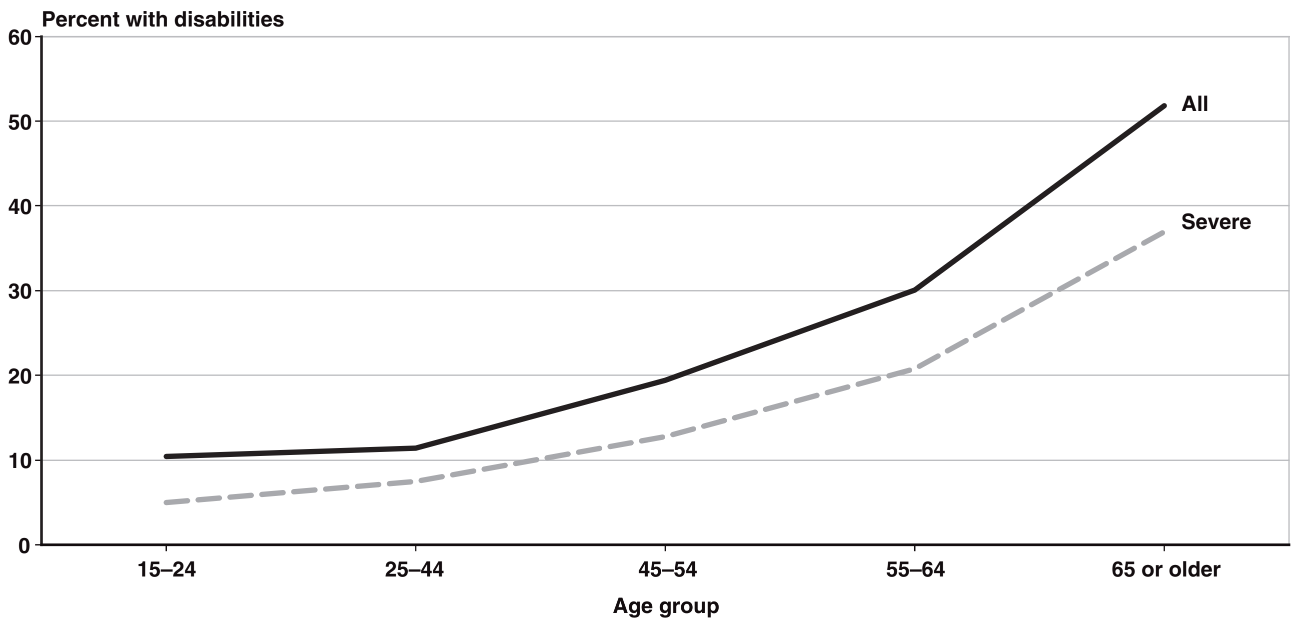
To account for other covariates, we estimated Cox proportional hazards models for workers with lost-time and medical-only injuries, controlling for the employer's size and 2-digit industry category; the injured worker's sex, his or her preinjury earnings category, and age category; and injury severity as measured by workers' compensation benefit categories. Those categories are medical-only, temporary disability of less than 8 weeks, temporary disability of at least 8 weeks, PPD, and PTD. We chose to distinguish workers with more than 8 weeks off work because research suggests that lost earnings are much larger for such workers as compared with workers with less lost time (Boden and Galizzi 1999). The Cox model allows us to estimate the length of time to DI receipt for lost-workday injuries relative to medical-only injuries. We interpret hazard ratios estimated from this model as the relative likelihood of receiving DI benefits at any point in time for a particular subgroup relative to its reference group.

A key assumption of the Cox proportional hazards model is that the hazard ratio is constant over time. We tested the proportional hazards assumption by adding interactions between time and the other covariates to the basic model. We used two separate time variables: a linear trend and a dummy variable for more than 5 years after injury. For variables violating the proportionality assumption, we reestimated the Cox model separately for medical-only and lost-time cases, stratifying on those variables to derive cumulative hazard curves for the lost-time cases.[15] In addition, we estimated the counterfactual cumulative hazard by applying the medical-only estimates to the covariate values of the lost-time cases, providing a predicted probability of DI receipt if the lost-time injuries had been medical-only cases.

Finally, we estimated the Cox model for all workers in our sample, allowing the hazard to vary by severity group based on workers' compensation benefit status. From this, we derived cumulative hazard curves comparing expected probability of DI receipt for the population of injured workers had they experienced injuries of differing severity.

All survival models were right-censored using the earliest of four dates: the date of full retirement age

Chart 1.
Relationship between age and disability: US population, 2005



SOURCE: Bureau of the Census, Americans with Disabilities: 2005, Table D-1, http://www.census.gov/hhes/www/disability/sipp/disable05.html.

NOTES: Disability is defined based on the supplemental questionnaires on adult functional limitations in the Survey of Income and Program Participation.

A person is defined as having a nonsevere disability if he or she—

- Had difficulty performing one or more functional activities, which include seeing, hearing, speaking, lifting/carrying, using stairs, walking, or grasping small objects
- Had difficulty with one or more activities of daily living (ADLs), which include getting around inside the home, getting in or out of bed or a chair, bathing, dressing, eating, and toileting
- Had difficulty with one or more instrumental ADLs, which include going outside the home, keeping track of money and bills, preparing meals, doing light housework, taking prescription medicines in the right amount at the right time, and using the telephone
- Had one or more specified conditions: a learning disability or some other type of mental or emotional condition

A person is defined as having a severe disability if he or she—

- Used a wheelchair, a cane, crutches, or a walker
- Was unable to perform or needed help to perform one or more of the functional activities
- Was unable to perform or needed help to perform one or more ADLs
- Had one or more specified conditions: a developmental disability or Alzheimer's disease
- Had any other mental or emotional condition that seriously interfered with everyday activities
- Had a condition that limited the ability to work around the house or made it difficult to remain employed

when individuals are no longer eligible for DI benefits, the date of death, the first date after injury when the person was ineligible for benefits because of insufficient work credits, and the end of the observation period (December 31, 2009). We censored at the first date of ineligibility because take-up of DI benefits is not possible during periods of ineligibility. Even though people may later have become eligible for benefits and some information would be lost, these are censored outcomes and thus should not bias estimates of the hazard ratio.

We did not adjust for what is known as the *disability freeze*. Technically, workers who are insured for DI at the time of their injury would not lose DI-insured status in subsequent months if their work or earnings dropped because of their disability. SSA uses recent work credits to establish DI-insured status, but SSA freezes the insured status and benefit levels for DI and retirement benefits at the predisability levels if an individual's earnings while disabled in the period prior to DI award would make him or her ineligible for benefits or reduce the level of benefits he or she would receive. We do not make this adjustment in the analysis for two reasons. First, the disability freeze applies to any SSA defined disability—one that prevents substantial gainful activity and are expected to last for 12 months or end in death. Most workers' compensation PTD cases would likely qualify, but many PPD cases may qualify as well, as would other disabilities that are present at the time of injury or occur after the workers' compensation injury. We have no means of accurately applying the disability freeze for all injured workers so we apply it to none of them. Second, ignoring the disability freeze is the more conservative approach in that fewer injured workers would be insured for DI at any given point in time postinjury. As described later, we find that eligibility has little effect on our findings under this extreme case, so adjusting for the disability freeze would not substantially affect the results.

Results

Table 1 provides descriptive statistics for medical-only and lost-time cases. The first column reports the average for all claims, while the third and fifth columns report the averages for the medical-only and lost-time

Table 1.
Summary statistics for New Mexico workplace injuries, 1994–2000

Characteristic	All claims: Average	All claims: Standard deviation	Medical-only cases: Average	Medical-only cases: Standard deviation	Lost-time cases: Average	Lost-time cases: Standard deviation
Individual						
Age (years)	34.5	9.9	33.9	9.9	35.7	9.7
Female (%)	0.37	0.48	0.39	0.49	0.34	0.47
Employer						
Number of employees	32,410	161,381	30,238	155,883	36,810	171,898
Median	532		611		415	
Public sector (%)	0.13	0.33	0.14	0.35	0.10	0.30
Claim (%)						
Medical-only	0.67	0.47	1.00	0.00	0.00	0.00
Temporary disability, less than 8 weeks	0.19	0.39	. . .	. . .	0.57	0.50
Temporary disability, at least 8 weeks	0.05	0.22	. . .	. . .	0.16	0.37
Permanent partial disability	0.09	0.28	. . .	. . .	0.27	0.44
Permanent total disability	0.001	0.04	. . .	. . .	0.004	0.07
Earnings, year before injury (2007 $)	23,044	20,264	23,792	21,441	21,530	17,544
Median	19,409		20,071		18,144	
Proportion receiving DI within—						
5 years of injury	0.03	0.17	0.02	0.14	0.05	0.22
10 years of injury [a]	0.07	0.25	0.05	0.22	0.10	0.30
Number of observations	98,148		65,705		32,443	

SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

NOTE: . . . = not applicable.

a. Some workers were no longer eligible for DI benefits by the end of the 10-year period. They were not included in the calculation.

cases, respectively. On average, people with lost-time injuries were older, worked in larger firms, worked in the private sector, had lower earnings, and were less likely to be female than those with medical-only injuries. Both 5 years and 10 years after injury, the proportion of people with lost-time injuries who had become DI beneficiaries was about double that for medical-only cases. We can see this relationship graphically in Chart 2, which shows separate Kaplan-Meier curves for medical-only and lost-time cases. Some of the disparity in the probability of DI receipt may be related to differences in characteristics between the medical-only and lost-time groups.

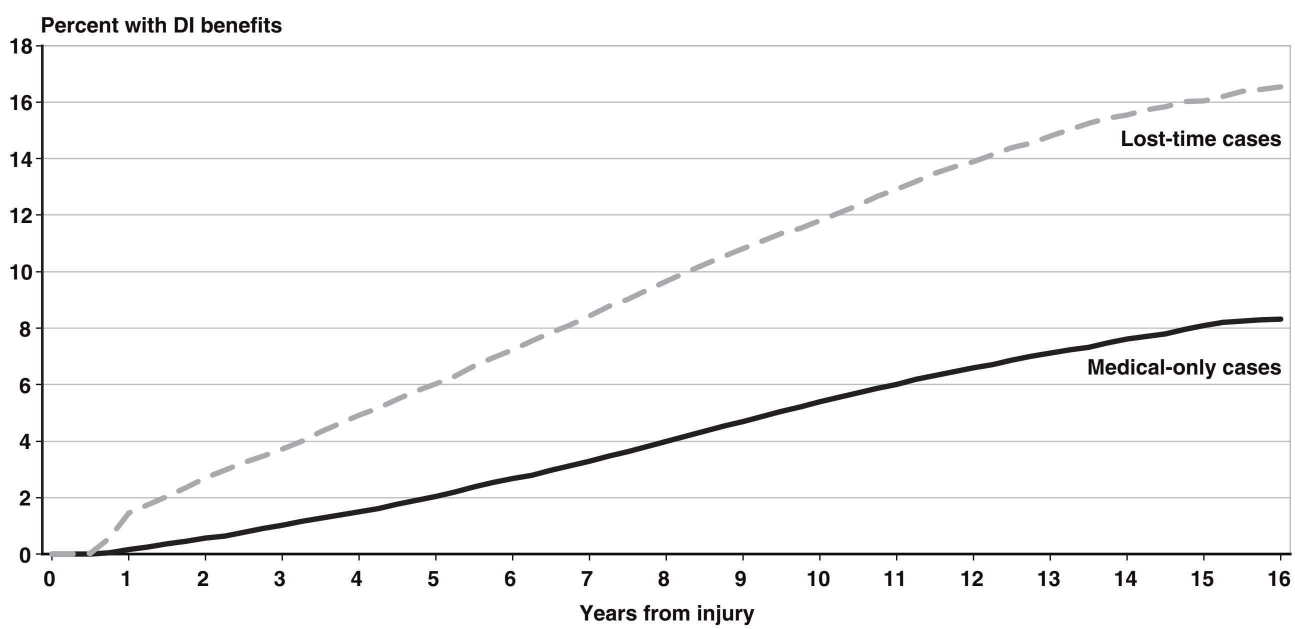
Because age is so strongly associated with disability (Chart 1), we stratified our sample by 10-year age groups to derive age-specific Kaplan-Meier curves (Chart 3). The curves show that the length of time to DI receipt differs substantially by age group. They also show that, within an age group, workers with lost-time injuries have a substantially greater probability of receiving DI benefits than those with medical-only injuries at all postinjury points in time.

To account for differences in other relevant covariates, we estimated separate Cox proportional hazard models for medical-only and lost-time cases. Age group had the largest impact on receipt of DI, followed by the preinjury income category. (Estimated hazard ratios are available on request.) When testing for proportionality, we found significant interactions between age and the 5-year dummy variable, but not for the interaction between age and a time trend. In neither case was the time interaction for any of the preinjury income categories statistically significant.

Because the proportional hazards assumption did not seem to hold for age, we estimated the Cox model stratified by age group. We display the estimated hazard ratios and their confidence intervals for covariates stratified by age group in Table 2. For both lost-time and medical-only cases, the probability of receiving DI benefits was significantly higher for people employed in the mining industry than for other industries and for people in lower earnings categories. Estimated hazard ratios were lower for women and for workers in the smallest industry group. Aside from mining, several other industry groups had statistically significant hazard ratios for the medical-only cases, but for lost-time injuries, only the hazard ratio for mining was significant.

To simulate the counterfactual—what would have happened if workers with lost-time injuries instead

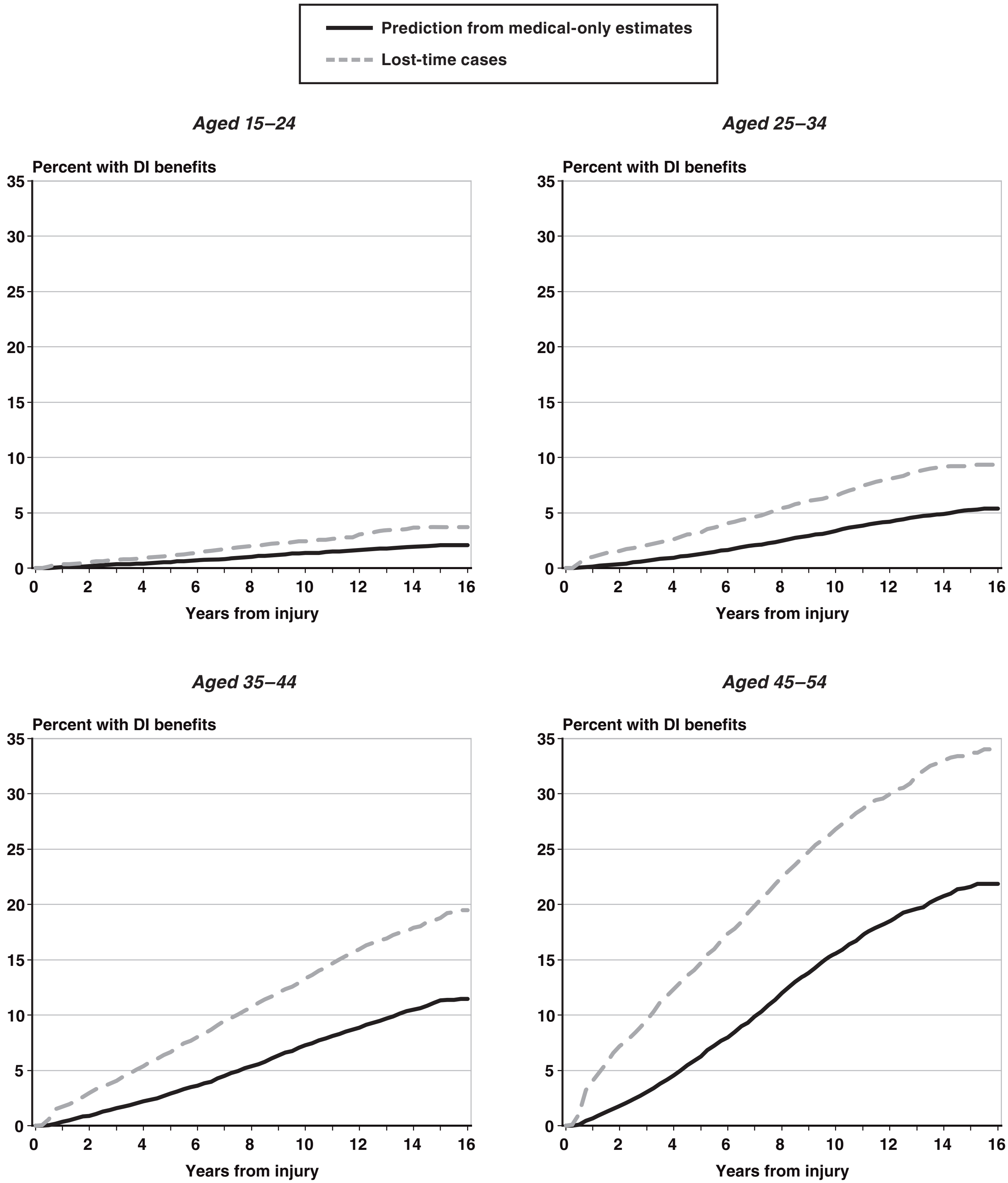
Chart 2.
Receipt of DI benefits among medical-only and lost-time cases: Kaplan-Meier curves



SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

NOTE: 95 percent confidence intervals around the cumulative failure curves in this chart are narrow—generally within 5 percent of the cumulative failure rate.

Chart 3.
Receipt of DI benefits among medical-only and lost-time cases, by age group: Kaplan-Meier curves



SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

NOTE: 95 percent confidence intervals around the cumulative failure curves in this chart are narrow—generally within 5 percent to 10 percent of the cumulative failure rate.

had medical-only injuries—we predicted the hazard from the medical-only proportional hazards estimate, using the covariates of the lost-time cases. We display the estimated curves reflecting length of time from injury to initial receipt of DI benefits in Chart 4.[16] The Cox model estimates for both lost-time and medical-only cases are similar to the corresponding Kaplan-Meier estimates (Chart 2), although somewhat higher.

With the exception of the youngest age group (15–24), the probability of DI receipt averages about twice as high for lost-time cases as for medical-only cases over the 9 to 15 postinjury years we observe. Moreover, the impact of a lost-time injury seems to be about the same as the impact of a 10-year increase in age. This can be seen by comparing the medical-only cumulative hazard function for an age group with the lost-time cumulative hazard function of the preceding age group (for example, lost-time cases for the 25–34 group closely match medical-only cases for the 35–44 group). We also see this in Table 3, which shows the 15-year cumulative probability of receiving DI benefits for medical-only and lost-time cases by age group.

Lost-time cases cover a broad range, from workers who were off work for only 8 days and returned without any documented continuing work-related disability to those who were declared permanently and totally disabled. To see the extent to which workers' compensation disability categories were associated

Table 2.
Proportional hazards estimates of DI receipt for New Mexico workers, injury dates 1994–2000

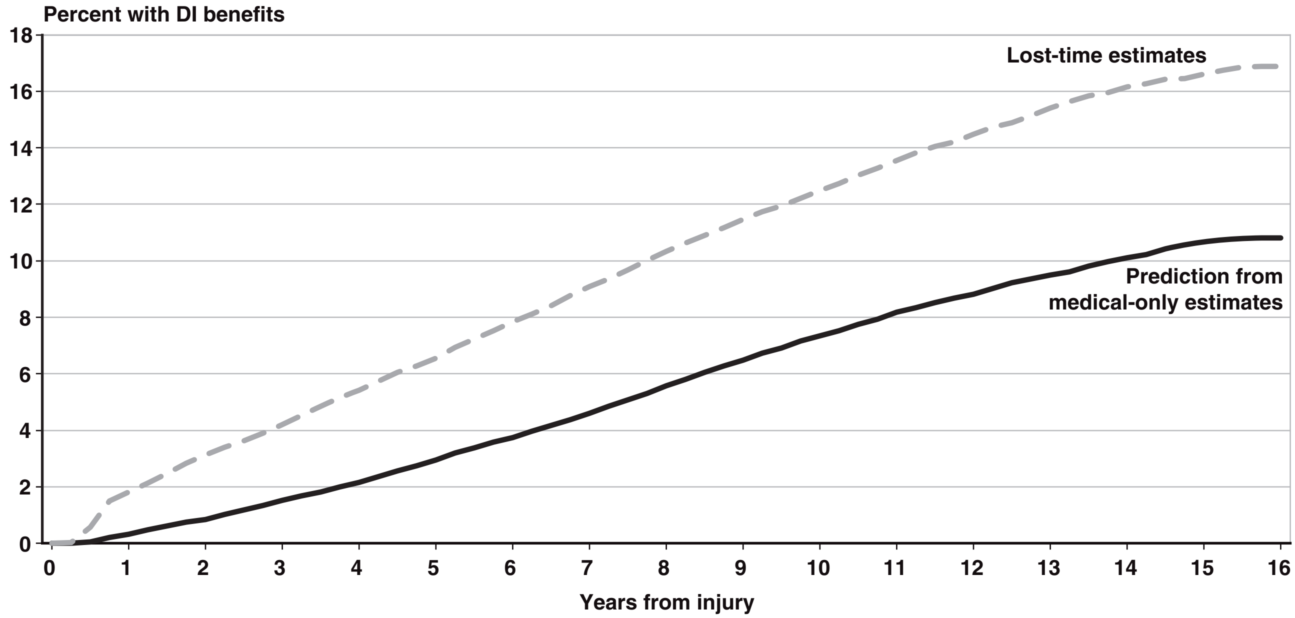
Characteristic	Medical-only cases: Hazard ratio	Medical-only cases: 95 percent confidence interval	Lost-time cases: Hazard ratio	Lost-time cases: 95 percent confidence interval
Individual				
Female	0.82	0.77–0.88	0.90	0.84–0.97
Male (reference group)	. . .	. . .	. . .	. . .
Employer				
1–100 employees	0.88	0.81–0.96	0.89	0.82–0.97
101–500 employees	0.93	0.86–1.01	1.02	0.95–1.11
501–1,000 employees	0.92	0.82–1.03	1.00	0.89–1.12
1,000 employees or more (reference group)	. . .	. . .	. . .	. . .
Earnings, year before injury (2007 $)				
0–9,999	2.40	2.11–2.73	1.56	1.38–1.77
10,000–19,999	2.38	2.11–2.68	1.45	1.28–1.64
20,000–29,999	1.79	1.58–2.02	1.83	1.60–2.08
30,000–39,999	1.43	1.25–1.63	1.18	1.03–1.34
40,000–49,999	1.26	1.09–1.46	1.15	0.99–1.34
50,000 or more (reference group)	. . .	. . .	. . .	. . .
Industry				
Agriculture, fishing, forestry	0.72	0.52–0.99	1.19	0.80–1.75
Mining	1.42	1.18–1.73	1.27	1.07–1.52
Construction	1.17	1.01–1.35	1.00	0.86–1.17
Nondurable manufacturing	1.02	0.85–1.24	0.94	0.77–1.14
Durable manufacturing	1.15	0.96–1.37	1.17	0.97–1.41
Transportation	0.99	0.85–1.16	1.03	0.88–1.21
Wholesale	1.02	0.84–1.24	1.02	0.82–1.24
Retail	1.10	0.96–1.26	1.07	0.93–1.24
Finance, insurance, real estate	0.96	0.75–1.24	1.09	0.95–1.34
Services	1.04	0.90–1.21	1.00	0.86–1.18
Health	1.20	1.03–1.40	1.09	0.92–1.29
Law, education, social services	0.92	0.80–1.45	1.05	0.90–1.22
Government (reference group)	. . .	. . .	. . .	. . .

SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

NOTES: Estimates are stratified by age. Because we stratified by age, no hazard ratios are estimated for age groups.

. . . = not applicable.

Chart 4.
Cox proportional hazards estimates of the impact of lost-time injuries on the receipt of DI benefits



SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

Table 3.
Percentage receiving DI benefits 15 years after injury: Kaplan-Meier estimates

Age group	Medical-only cases	Lost-time cases
15–24	3.0	4.9
25–24	5.5	10.1
35–44	10.9	20.0
45–54	20.3	34.4

SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

with DI receipt, we estimated Cox models separately for four workers' compensation lost-time severity groups and for medical-only cases, again stratifying within the model for age group (Chart 5). We found that increasing workers' compensation severity was associated with a higher cumulative probability of DI receipt. However, two of the severity groups had excess risks that differed from our prior expectations. First, even the lost-time group with less than 8 weeks of temporary disability benefits had a substantially greater probability of receiving DI benefits than did the medical-only group. Second, the group classified by the New Mexico workers' compensation system as permanently and totally disabled had less than a 30 percent probability of DI receipt, even 15 years postinjury. Because there were only 137 injured workers from our sample with PTDs, estimates for that group are imprecise.

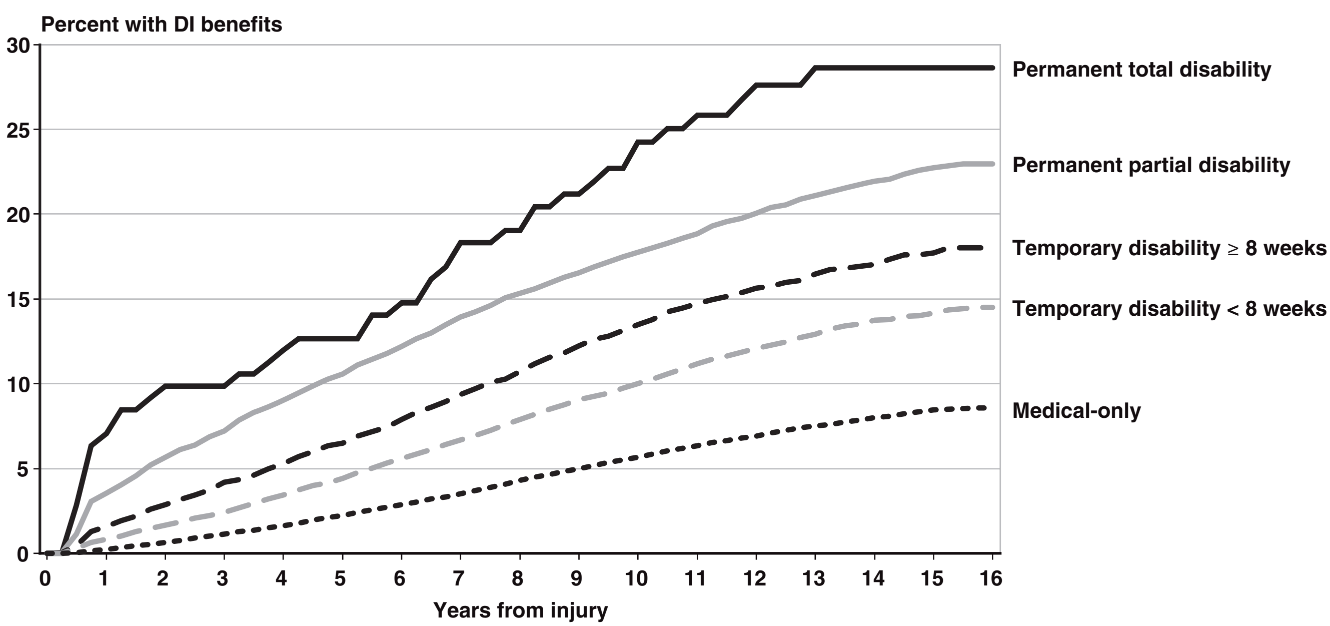
Discussion and Conclusions

This study offers a new perspective on the relationship between work-related disability and DI. We begin with people who experienced injuries at work and who qualified for workers' compensation benefits. In this population, only 21 percent was considered to have permanent disabilities, and only 0.5 percent was considered permanently and totally disabled. We then examined whether our sample population incurred an increased risk of long-term total disability, as measured by receipt of DI benefits. We found that a lost-time workplace injury doubled the probability of receiving DI benefits over the 9 to 15 year follow-up period. By 10 years after injury, 6 percent of workers with medical-only injuries had received DI benefits compared with 12 percent of workers with lost-time injuries (Chart 2). From this new perspective, we also see the aging effect of disability in a new way. Research has shown that older workers with mounting physical or mental limitations tend to regard disability benefits as an early retirement option (see for example, Bound and Burkhauser (1999)). What we find here is that a workplace injury affects transition to DI in a consistent manner across all age groups: Workers with injuries in one age group have a pattern of DI risk that mimics noninjured workers in the next older group. That is, the impact of a lost-time injury on the transition to DI is virtually the same as aging by 10 years.

These findings suggest that the rates of long-term total disability associated with workplace injuries are substantial. In particular, injured workers incur long-term total disability more often than could reasonably be inferred from the 0.5 percent of lost-time cases classified as permanent and total by workers' compensation. It is possible that, by including all lump-sum cases as PPD, some PTD cases that were settled with a lump-sum payment were misclassified as PPD, but this quite likely explains at most a small fraction of the disparity we have seen between medical-only and lost-time cases. Another possible explanation for our findings is that there are delayed impacts of injury on health. Work-related disability may interact with other health problems that develop over time to intensify functional limitations and affect employability. Alternatively, changing labor market conditions or other exogenous factors could lead to job loss, after which the limitations caused by the injury could make it more difficult to find a new job. Both of these explanations may be distant in time from the original injury and hard to link causally. Nevertheless, they may well be the long-term consequences of workplace injury.

It may appear counter-intuitive that even workers who had not received permanent disability benefits—even those receiving temporary disability benefits for less than 8 weeks—had an excess cumulative probability of receiving DI benefits. There are several possible reasons for this finding. One is that some people in this group experienced long-term impairments, but did not receive permanent disability benefits. Another is that the injury or the subsequent workers' compensation experience led some people in this group to miss a raise or promotion or to lose their jobs, with subsequent long-term loss of competitiveness in the labor market. Future employment or health shocks might then make it more difficult to remain employed. Studies of lost earnings of workers injured in Washington state and Wisconsin provide evidence of long-term losses consequent to injuries classified as temporarily disabling (Boden, Reville, and Biddle 2005).

Chart 5.
Cox proportional hazards estimates of the impact of lost-time injuries on the receipt of DI benefits, by workers' compensation severity group



SOURCE: Authors' analysis of New Mexico workers' compensation claims from 1994 through 2000 matched to Social Security administrative data.

NOTE: In the small permanent total disability sample (N = 139), no new DI cases were observed more than 13 years after injury.

For temporary and permanent total disability workers' compensation cases, there has long been agreement that the adequacy benchmark is two-thirds of pretax earnings (National Commission on State Workmen's Compensation Laws 1972). A consensus document promulgated by the Council of State Governments (1974)—the Model Act, revised—specifies pretax replacement rates of 55 percent to 65 percent for PPDs, a standard used in a recent book by the National Academy of Social Insurance (Hunt 2004).

Recent studies estimating the proportion of lost earnings replaced by workers' compensation for long-term temporary disability and PPD cases consistently show workers' compensation replacing well under half of long-term losses. Those studies include Boden and Galizzi (1999), Reville (1999), and Reville and others (2001). Delayed poor labor market outcomes could also partially explain why workers' compensation replaces only a small fraction of lost earnings. Disability determination typically occurs within 1 or 2 years postinjury. In many cases, claimants have agreed to settle their PPD claims and, once settled, they cannot reopen them. Injured workers who have not settled their claims may not be aware that they can request additional benefits if their long-term losses are greater than initially expected. Finally, it may be extremely difficult to demonstrate the relationship between the injury and labor market difficulties that occur years in the future. As a consequence, workers' compensation systems are unlikely to adjust benefits for such delayed effects of injury.

Delayed postinjury effects raise concern about the design of workers' compensation benefits: Perhaps workers' compensation agencies should reexamine benefit payments several years after the initial benefit determination. In circumstances where earnings are much lower than originally anticipated, the agencies could consider the possible link to the workplace injury. If a link is established, then the agencies could increase cash benefits commensurate with the updated unexpected earnings losses.

Currently, however, workers' compensation often provides replacement levels that fall short of its own ideals. In those cases, DI potentially acts as backup insurance, reducing the financial burden of the long-term consequences of workplace injuries on the most severely disabled. This is an important contribution to the welfare of those individuals with disabilities. However, it also implies that the replacement levels for workers' compensation may be providing suboptimal incentives to minimize work injuries. Employers, who are in the best position to improve workplace safety, do not bear the full costs of those injuries and therefore have a reduced incentive for prevention. Instead, employers shift some of the costs to workers and to the DI program, which workers and employers fund through payroll taxes that are not risk adjusted. This implies that current incentives for workplace safety and return-to-work policies operating through workers' compensation are inadequate. Moreover, the scale of this inadequacy is potentially quite large.

Our analysis shows that workers' compensation lost-time injuries are responsible for about half of all new DI awards for the workers who incurred those injuries. Our data included an average of 4,600 lost-time New Mexico cases per year, of which about 700 ended up on the DI rolls. Because half of these cases can be attributed to New Mexico lost-time injuries, we can say lost-time injuries in the state generally increased DI receipt by 350 cases per year. Comparing these figures to Social Security published statistics, we find that on average, these new awards represented 7 percent of all new DI awards in New Mexico over the relevant years they could occur (SSA, various issues, 1995–2010).[17]

If this New Mexico experience holds on average for other years and for the rest of the country, then 7 percent of the roughly 1 million new DI beneficiaries in 2010 (SSA 2011a, Table 35) would be due to workers compensation injuries. That would amount to 70,000 new DI awardees in 2010. Annual benefits averaged $13,500 for workers in 2010 (SSA 2011a, Table 36). Newsome and Parent (2008) found that, primarily because of offsets, benefits for people who receive workers' compensation or public disability benefits (PDBs) were about 6 percent lower than for other beneficiaries.[18] Applying that reduction to 2010 benefit levels implies an estimated first-year additional cost of $889 million to Social Security because of workers' compensation injuries. Further, Social Security actuarial estimates suggest that for DI beneficiaries with our gender mix and our average DI starting age of 47, we can expect new beneficiaries that come from workers' compensation injuries to remain on the DI rolls for 13½ years (Zayatz 2011, Tables 24A and 24B). Given that the typical discount rate used for federal DI benefits is more than offset by cost-of-living increases in benefit levels, a conservative present value estimate of DI benefit costs related to workers compensation injuries is roughly $12 billion for each new annual cohort. Adding Medicare costs would nearly double that figure.

Because we do not know whether the New Mexico experience for injuries from the 1990s is representative of the rest of the country or more recent spans of time, we present the previous figures only to be illustrative. Still, those figures demonstrate that the significant size of these programs means that the impact of workplace injuries on DI costs is likely to be substantial.

Given these potentially large costs, there may be a need for additional programs that reward employers for injury prevention or that otherwise help to reduce the delayed effects of injuries for workers of all ages. Autor and Duggan (2010) recently proposed a mandated private disability insurance program that would cover both occupational and nonoccupational disabilities. This program would provide wage-replacement benefits and extra incentives for compliance with workplace accommodations mandated by the Americans with Disabilities Act and for vocational rehabilitation. It would begin 90 days after the onset of disability. For workplace injuries, this program would seem to duplicate some of the features of workers' compensation and present problems of integration (for example, integration of wage-replacement benefits).

Oregon has two programs designed to improve retention, return to work, and hiring of injured workers. All Oregon workers with accepted claims are eligible for the Employer-at-Injury Program (EAIP). The program subsidizes employers who offer modified or light-duty jobs to get people back to work. Employers are also eligible for a wage subsidy of 50 percent of preinjury wages or 50 percent of wages in the modified job, whichever is less. The subsidy is available for up to 66 work days. The EAIP also reimburses employers for worksite modification and for tools, equipment, and clothing not usually supplied by the employer. Oregon's Preferred Worker Program (PWP) provides incentives to hire permanently disabled workers who cannot return to regular employment (Department of Consumer and Business Services, Oregon, n.d.). Employers hiring workers enrolled in the PWP can receive 50 percent of wage reimbursement for up to 6 months and up to $25,000 for tools, equipment, and redesign of the work site. Also, employers pay no workers' compensation premiums for preferred workers. In addition, if preferred workers have new workers' compensation claims during the 3 years after they enroll in the PWP, the program reimburses all related costs. No studies have been done to determine whether these programs are effective, and perhaps such studies might be a first step in determining whether comparable programs would be justified in other states.

Washington State has a PWP that is similar to Oregon's. Also, in 2011, Washington initiated its Stay at Work program, which covers injured workers released to restricted work activity by their health-care providers. For workers assigned to light-duty jobs, this program reimburses employers for up to half of the injured workers' wages and for the cost of training, tools, and clothing needed for those jobs.

Our findings also make a case for increased research on and incentives for the prevention of workplace injuries and illnesses. Workers' compensation premiums may provide prevention incentives (Tompa, Trevithick, and McLeod 2007), but benefit levels and access to benefits have been a concern for several decades (Burton and Spieler 2001). As a result, US employer costs per $100 of payroll in 2008 were only 61 percent of what they were in 1990 (Sengupta, Reno, and Burton 2011). Another avenue to reduce workplace injuries and illnesses is strengthening and providing more resources for workplace safety regulation. The resources of the Occupational Safety and Health Administration are very limited compared with the number of workplaces it is tasked with inspecting.

There are some limitations of the current study. We have analyzed data from only one state, so we do not know whether the results will hold in other states with different labor market conditions and workers' compensation systems. In addition, we have used workers with medical-only injuries as controls, implicitly assuming that those relatively minor injuries have no long-term consequences on disability. Also, a number of potential confounders, like education and preinjury health status, are not available in our data. Still, this analysis provides a first step toward enhancing our understanding of the issue, and we plan to address these limitations in future studies.

Finally, this study only addresses injuries for which workers' compensation benefits were paid. Studies have consistently shown that many injured workers do not receive workers' compensation benefits (Burton and Spieler 2001; Azaroff, Levenstein, and Wegman 2002; Rosenman and others 2006; Boden and Ozonoff 2008; Bonauto and others 2010). Moreover, Reville and Schoeni (2004) found that 29 percent of people aged 51–61 with a disabling work injury reported receiving DI benefits at their time of interview, but only 12 percent had ever received workers' compensation benefits. For injured workers who never receive workers' compensation benefits, DI effectively becomes the sole social insurance program for occupational injuries and illnesses.

Notes

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[1] Social Security insures individuals for disabled-worker benefits, if they have worked long enough and recently enough in Social Security–covered employment. The number of work credits (also known as quarters of coverage) a person needs to qualify for benefits depends on the individual's age at disability onset. Generally, an individual needs 40 work credits, of which he or she must earn 20 in the 10 years ending with the year of disability onset. Younger workers may qualify with fewer credits. A person can earn up to four work credits per year. The amount of earnings required for a credit increases each year as general wage levels increase. In 1994, one work credit was earned for each $620 in annual covered earnings, up to a maximum of four credits annually. In 2010, workers could earn one work credit for each $1,120 in covered earnings.

[2] In most states, SSA reduces DI benefits so that the combined Social Security and workers' compensation benefits do not exceed 80 percent of prior earnings. However, in 15 "reverse offset" states, the workers' compensation program reduces the benefit to meet the 80 percent rule.

[3] This excludes disabled widow(er)s and adult disabled children, as well as benefits to nondisabled dependents. Total DI benefits paid to disabled workers is our calculation (SSA 2011a, Table 3). Costs for "disabled persons" in 2008 were $54.0 billion for hospital and medical insurance combined (SSA 2011b, Table 8B2).

[4] For DI workers only, data based on authors' calculations using SSA (2011a, Table 3).

[5] For descriptions of these workers' compensation changes, see Burton and Spieler (2001), Boden and Ruser (2003), and Spieler and Burton (2012).

[6] In December 1999, the Government Accountability Office reported, "Thus far, SSA has been able to obtain online access to State WC data in just five States," http://oig.ssa.gov/sites/default/files/audit/full/pdf/A-04-98-64002.pdf (p. iii). These are not batch data matches, but rather states where SSA has some limited online access to workers' compensation information. The only batch match SSA has conducted with a state was a two-phase match with Texas workers' compensation data in September 2001 and March 2002. The match worked, but encountered several problems with the data structure, format, and completeness (based on internal SSA correspondence, December 14, 2011).

[7] This marginally increases the proportion of workers with multiple injuries to 23 percent.

[8] See Olsen and Hudson (2009). SSA maintains the MEF subject to IRS disclosure rules as detailed in Section 6103 of the Internal Revenue Code. Consistent with those rules, only SSA employees had access to individual DER records for this project.

[9] SSA initially developed the TRF to support SSA's evaluation of the Ticket to Work program, but TRF data are useful for a broad range of disability/employment topics.

[10] Although we only include individuals who received DI from 1996 forward, we know the start dates for those who began receiving benefits before 1996. This raises the possibility that we might miss those who both started and terminated benefits between 1994 and 1996. Such exits could only occur because of transition to Social Security retirement, medical recovery, or death. Because we exclude workers aged 55 or older at the date of injury, we do not lose anyone to Social Security retirement. Because of work incentives, no one could terminate because of work within such a short time frame. In only a minority of cases, where SSA expects to see medical improvement, does the agency review medical eligibility within 3 years of awarding benefits. These are the only cases that could lead to a termination for medical recovery. For those people who started receiving benefits between 1996 and 2009, only six had a medical termination within 24 months, and, at most, two had such a termination in any 2-year period. A medical termination by 1996 for those who started receiving benefits between 1994 and 1996 is thus very unlikely. After applying our other data restrictions, we found that no workers injured between 1994 and 1996 had died before 1996.

[11] This eligibility date differs from the date insured status began and may also differ from the first DI benefit date. SSA determines insured status based on the individual's quarters of coverage over his or her work history. To be eligible for cash benefits, the individual must be both insured and disabled under the SSA disability definition. Because of processing lags, the agency often pays initial cash benefits after the date of eligibility. In such cases, the first payment SSA makes to the beneficiary will include retroactive payments back to the initial eligibility date.

[12] The NUMIDENT file includes information received from family members and other sources including funeral director reports, all state and territorial bureaus of vital statistics, and the Veterans Administration.

[13] We examined the sensitivity of our results to restricting the medical-only injury group to people with a single medical-only injury. This led to virtually no difference in our results.

[14] SAS 9.2 (2002-2003, SAS Institute, Cary, NC).

[15] We use SAS Proc Phreg to derive the cumulative hazard curves for the lost-time cases. Because it is not possible to plot survival curves directly through this procedure, we use the baseline option to output a data set for the survival function from which we produce survival functions for specific covariate patterns.

[16] In fact, using the medical-only covariates would have made virtually no difference in the cumulative hazard curves. At all observed durations, the predicted medical-only curve using lost-time covariates differed by less than 0.3 percent from the curve using medical-only characteristics (not shown).

[17] For the proportion of new DI cases that are due to lost-time injuries each year, we divide the attributable injuries for a given year by the average DI awards over the period such awards occurred. Thus for 1994 injuries, we divide by the average DI awards in New Mexico for the 1994–2009 period, while for injuries in 2000, we divide by the average DI awards for the 2000–2009 period.

[18] Newsome and Parent (2008) found that about 11 percent of all DI beneficiaries with initial entitlement dates from January 2003 through June 2004 also received workers' compensation or PDBs. (Per SSA (2011a, Table 31), we also know that about 85 percent of such beneficiaries are those with state workers' compensation benefits.) On average, beneficiaries who receive workers' compensation or PDBs have higher average indexed monthly earnings, but because of the offset provision, those who receive workers' compensation or PDBs received initial benefits that were 94 percent of the benefits of those without workers' compensation or PDBs ($916 as compared with $983 for the 2003–2004 period examined).

References

Autor, David H., and Mark G. Duggan. 2006. "The Growth in the Social Security Disability Rolls: A Fiscal Crisis Unfolding." *Journal of Economic Perspectives*, American Economic Association 20(3): 71–96 (Summer).

———. 2010. *Supporting Work: A Proposal for Modernizing the U.S. Disability Insurance System.* Washington, DC: Center for American Progress and The Hamilton Project (December).

Azaroff, Lenore S., Charles Levenstein, and David H. Wegman. 2002. "Occupational Injury and Illness Surveillance: Conceptual Filters Explain Underreporting." *American Journal of Public Health* 92(9): 1421–1429.

Barth, Peter S., and Michael Niss. 1999. *Permanent Partial Disability Benefits: Interstate Differences.* Cambridge, MA: Workers Compensation Research Institute.

Boden, Leslie I., and Monica Galizzi. 1999. "Economic Consequences of Workplace Injuries and Illnesses: Lost Earnings and Benefit Adequacy." *American Journal of Industrial Medicine* 36(5): 487–503.

Boden, Leslie I., and Al Ozonoff. 2008. "Capture-Recapture Estimates of Nonfatal Workplace Injuries and Illnesses." *Annals of Epidemiology* 18(6): 500–506.

Boden Leslie I., Robert T. Reville, and Jeff Biddle. 2005. "The Adequacy of Workers' Compensation Cash Benefits." In *Workplace Injuries and Diseases: Prevention and Compensation: Essays in Honor of Terry Thomason*, edited by Karen Roberts, John F. Burton Jr., and Matthew M. Bodah, 37–68. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Boden, Leslie I., and John W. Ruser. 2003. "Workers' Compensation 'Reforms,' Choice of Medical Care Provider, and Reported Workplace Injuries." *Review of Economics and Statistics* 85(4): 923–929.

Bonauto, David K., Joyce Z. Fan, Thomas W. Largo, Kenneth D. Rosenman, Mandy K. Green, Jaime K. Walters, Jennifer Flattery, and others. 2010. "Proportion of Workers Who Were Work-Injured and Payment by Workers' Compensation Systems—10 States, 2007." *Morbidity and Mortality Weekly Report* 59(29): 897–900.

Bound, John, and Richard V. Burkhauser. 1999. "Economic Analysis of Transfer Programs Targeted on People With Disabilities." In chapter 51 of *Handbook of Labor Economics*, ed. 1, vol. 3, no. 3, edited by O. Ashenfelter and D. Card, 3417–3528. North-Holland: Elsevier.

Burkhauser, Richard V., and Mary C. Daly. 2002. "Policy Watch: U.S. Disability Policy in a Changing Environment." *The Journal of Economic Perspectives* 16(1): 213–224.

Burton, John F., Jr. 2005. "Permanent Partial Disability Benefits." In *Workplace Injuries and Diseases: Prevention and Compensation: Essays in Honor of Terry Thomason*, edited by Karen Roberts, John F. Burton Jr., and Matthew M. Bodah, 69–116. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Burton, John F., Jr., and Emily A. Spieler. 2001. "Workers' Compensation and Older Workers." In *Ensuring Health and Income Security for An Aging Workforce,* edited by Peter P. Budetti, Richard V. Burkhauser, Janice M. Gregory, H. Allan Hunt, 41–83. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Council of State Governments. 1974. *Workmen's Compensation and Rehabilitation Law (Revised)*. Lexington, KY: Council of State Governments.

Department of Consumer and Business Services, Oregon. n.d. *Preferred Worker Program*. Salem, OR: Workers' Compensation Division. http://www.cbs.state.or.us/wcd/rdrs/rau/pwp/top_pwp.pdf.

Guo, Xuguang (Steve), and John F. Burton Jr. 2008. "The Relationship Between Workers' Compensation and Disability Insurance." In *Labor and Employment Relations Association Series: Proceedings of the 60th Annual Meeting*, edited by Adrienne E. Eaton, 25–32. Champlain, IL: Labor and Employment Relations Association.

Hunt, H. Allan, ed. 2004. *Adequacy of Earnings Replacement in Workers' Compensation Programs: A Report of the Study Panel on Benefit Adequacy of the Workers' Compensation Steering Committee, National Academy of Social Insurance.* Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

Leigh, J. Paul, Steven B. Markowitz, Marianne Fahs, Philip J. Landrigan. 2000. *Costs of Occupational Injuries and Illnesses*. Ann Arbor MI: University of Michigan Press.

McInerney, Melissa P., and Kosali I. Simon. 2012. "The Effect of State Workers' Compensation Program Changes on the Use of Federal Social Security Disability Insurance." *Industrial Relations* 51(1): 57–88 (January).

National Commission on State Workmen's Compensation Laws. 1972. *The Report of the National Commission on State Workmen's Compensation Laws*. Washington, DC: Government Printing Office.

Newsome, Ronda, and Rene Parent. 2008. "Characteristics of Disabled-Worker Beneficiaries Receiving Workers' Compensation or Public Disability Benefits Compared With Disabled-Worker Beneficiaries Without These Additional Benefits." Research and Statistics Note No. 2008-01. http://www.socialsecurity.gov/policy/docs/rsnotes/rsn2008-01.html.

Olsen, Anya, and Russell E. Hudson. 2009. "Social Security Administration's Master Earnings File: Background Information." *Social Security Bulletin* 69(3): 29–45.

Reno, Virginia, Cecili Thompson Williams, and Ishita Sengupta. 2003. "Workers' Compensation, Social Security Disability Insurance, and the Offset: A Fact Sheet." *Social Security Bulletin* 65(4): 3–6.

Reville, Robert T. 1999. "The Impact of a Disabling Workplace Injury on Earnings and Labor Force Participation." In *The Creation and Analysis of Linked Employer-Employee Matched Data*, *Contributions to Economic Analysis*, edited by J. C. Haltiwanger and others, 147–173. New York: Elsevier Science, North-Holland.

Reville, Robert T., Leslie I. Boden, Jeff E. Biddle, and Christopher Mardesich. 2001. *An Evaluation of New Mexico Workers' Compensation Permanent Partial Disability and Return to Work*. RAND Monograph Report. Santa Monica, CA: RAND Corporation.

Reville, Robert T., and Robert F. Schoeni. 2004. "The Fraction of Disability Caused at Work." *Social Security Bulletin* 65(4): 31–37.

Rosenman, Kenneth D., Alice Kalush, Mary Jo Reilly, Joseph C. Gardiner, Mat Reeves, and Zhehui Luo. 2006. "How Much Work-Related Injury and Illness Is Missed by the Current National Surveillance System?" *Journal of Occupational and Environmental Medicine* 48(4): 357–365.

Rupp, Kalman, and David C. Stapleton. 1995. "Determinants of the Growth in the Social Security Administration's Disability Programs—An Overview." *Social Security Bulletin* 58(4): 43–70.

Sengupta, Ishita, Virginia Reno, and John F. Burton Jr. 2011. *Workers' Compensation: Benefits, Coverage, and Costs, 2009*. Washington, DC: National Academy of Social Insurance.

Smith, Gordon S., Helen M. Wellman, Gary S. Sorock, Margaret Warner, Theodore K. Courtney, Glenn S. Pransky, and Lois A. Fingerhut. 2005. "Injuries at Work in the US Adult Population: Contributions to the Total Injury Burden." *American Journal of Public Health* 95(7): 1213–1219

[SSA] Social Security Administration. Various issues, 1995–2010. *Annual Statistical Supplement to the Social Security Bulletin, [1994–2009]*. Washington DC: Office of Retirement and Disability Policy, Office of Research, Evaluation, and Statistics.

———. 2011a. *Annual Statistical Report on the Social Security Disability Insurance Program, 2010*. Washington, DC: Office of Retirement and Disability Policy, Office of Research, Evaluation, and Statistics.

———. 2011b. *Annual Statistical Supplement to the Social Security Bulletin, 2010*. Washington, DC: Office of Retirement and Disability Policy, Office of Research, Evaluation, and Statistics.

Spieler, Emily A., and John F. Burton Jr. 2012. "The Lack of Correspondence Between Work-Related Disability and Receipt of Workers' Compensation Benefits." *American Journal of Industrial Medicine* 55(6): 487–505.

Tompa, Emile, Scott Trevithick, and Christopher McLeod. 2007. "Systematic Review of the Prevention Incentives of Insurance and Regulatory Mechanisms for Occupational Health and Safety." *Scandinavian Journal of Work Environment and Health* 33(2): 85–95.

Zayatz Tim. 2011. "Social Security Disability Insurance Program Worker Experience." Actuarial Study No. 122. SSA Pub. No. 11-11543. Baltimore, MD: Social Security Administration, Office of the Chief Actuary.

Longitudinal Patterns of Medicaid and Medicare Coverage Among Disability Cash Benefit Awardees

by Kalman Rupp and Gerald F. Riley*

This article explores the role of the Social Security Disability Insurance (DI) and Supplemental Security Income (SSI) cash benefit programs in providing access to public health insurance coverage among working-aged people with disabilities, using a sample of administrative records spanning 84 months. We find that complex longitudinal interactions between DI and SSI eligibility determine access to and timing of Medicare and Medicaid coverage. SSI plays an important role in providing a pathway to Medicaid coverage for many low-income individuals during the 29-month combined DI and Medicare waiting periods, when Medicare coverage is not available. After Medicare eligibility kicks in, public health insurance coverage is virtually complete among awardees with some DI involvement. Medicaid coverage continues at or above 90 percent after 2 years for SSI-only awardees. Many people who exit SSI retain their Medicaid coverage, but the gap in coverage between stayers and those who leave SSI increases over time.

Introduction

In the United States (US), four public programs form the pillars of the safety net for working-aged people with substantial disabilities: Social Security Disability Insurance (DI), Supplemental Security Income (SSI), Medicare, and Medicaid. The interactions among the four programs are complex and little understood. They are important because access to cash benefits and health insurance coverage is essential to the well-being of people with severe disabilities. In addition, the availability of those benefits, or lack thereof, creates complex economic incentives with implications for labor markets, government budgets, and the functioning of the overall economy.[1] To our knowledge, this study is the first effort to link individual-level data from all four of these major US social safety net programs—DI, SSI, Medicare, and Medicaid—and to analyze longitudinal patterns of interactions among them in a unified analytic framework.

DI is a social insurance program available to people who have not reached the Social Security full retirement age (currently age 66), who meet categorical eligibility criteria as disabled, and who have sufficient recent work experience to qualify as "DI insured" prior to the start of receiving cash benefits. DI entitlement begins after a 5-month waiting period following the onset of disability. SSI is a means-tested federal/state cash assistance program—with optional state supplements—that provides cash benefits to elderly people aged 65 or older and to nonelderly people deemed disabled based on criteria identical to the

Selected Abbreviations

CMS	Centers for Medicare and Medicaid Services
DI	Disability Insurance
SSA	Social Security Administration
SSI	Supplemental Security Income

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rules used in the DI program. Unlike DI, SSI does not require prior work experience to qualify. Because SSI is a welfare program of last resort for a person determined disabled, onset is presumed to be the month immediately prior to application. In that sense, there is no waiting period for SSI.

Medicare is a federal social insurance program that provides health insurance coverage to most elderly people aged 65 or older, to DI beneficiaries after a 24-month waiting period, and to individuals with end-stage renal disease (Box 1).[2] Most DI beneficiaries who are no longer eligible to receive cash benefits because of work will continue to receive at least 93 consecutive months of Hospital Insurance (Part A—no premium payment requirement); Supplemental Medical Insurance (Part B), if enrolled; and Prescription Drug Coverage (Part D), if enrolled.[3]

Medicaid is jointly funded by federal and state governments and provides health insurance coverage to several target populations with low income and assets, including elderly people aged 65 or older, people younger than age 65 with disabilities (including most SSI eligibles), and others (Box 2).[4] Categories of people covered by Medicaid vary from state to state, and there is no waiting period for Medicaid coverage to begin. The Medicaid means test for disabled people is similar, but not identical, to the SSI means test and may vary by state. In some states, individuals are determined eligible for Medicaid based on less restrictive financial eligibility criteria than what is required for SSI, while a few other states do have Medicaid eligibility rules that are more stringent. In most states, SSI recipients are categorically eligible for Medicaid. Some states provide automatic Medicaid enrollment; others require separate application. Importantly, Medicaid beneficiaries who are no longer eligible for SSI payments may be eligible to continue Medicaid coverage if they still meet the disability requirement, need Medicaid benefits to continue to work, and satisfy some additional requirements.[5] The Centers for Medicare and Medicaid Services (CMS) administers Medicare, while Medicaid is administered by the state, with some federal oversight by CMS.

It is important to note that individuals younger than age 65 with severe disabilities sometimes have access to Medicare or Medicaid coverage without eligibility for DI or SSI benefits. For example, Medicaid coverage is available to disabled individuals without SSI if they qualify for Medicaid through medically needy programs or if they are institutionalized or have a need for care under home and community-based services waivers, various state programs, and other means (CMS 2011).

Box 1.
Medicare program highlights

Medicare is a health insurance program authorized under the Social Security Act for—

- People aged 65 or older
- People with Social Security Disability Insurance (DI), usually after a 24-month waiting period on the DI rolls
- People of all ages with end-stage renal disease

People whose DI benefits are discontinued because of work but who still have disabling impairments are provided continued Medicare coverage for at least 93 months after the first month of no DI benefits.

Medicare Part A covers inpatient care in hospitals and skilled nursing facilities, as well as home health and hospice services. Part A coverage is provided to DI beneficiaries premium free.

Medicare Part B covers outpatient care, including services of physicians, therapists, clinics, hospital outpatient departments, clinical laboratories, and so forth. Enrollment in Part B is voluntary and requires payment of a monthly premium. Most Medicare beneficiaries enroll in Part B.

Medicare Part C is the Medicare Advantage (MA) program, under which Medicare benefits are provided by managed care contractors. Enrollment in the MA program is voluntary.

Medicare Part D, the prescription drug program, began in 2006 and provides prescription drug coverage. Enrollment in Part D is voluntary and requires payment of a monthly premium. Low-income subsidies are available for persons with low income and assets. Over 70 percent of DI beneficiaries with Medicare were enrolled in Part D in 2009.

For more information on the Medicare program, see http://www.medicare.gov.

Box 2.
Medicaid program highlights

Program features

Medicaid provides health insurance to various population groups characterized by low income and assets, including certain individuals with severe disabilities. The program is jointly funded by federal and state governments and is administered by the states. Medicaid covers acute care, pharmacy, and long-term-care services, including nursing home stays. Some Medicaid eligibles may have coverage that is restricted to certain categories of services. There is no premium for Medicaid coverage, but there can be limited cost sharing for some services.

SSI and Medicaid

Most disabled individuals who are eligible for Supplemental Security Income (SSI) payments qualify for Medicaid, but eligibility criteria vary by state. There is no waiting period for Medicaid coverage. SSI recipients typically qualify for "full" coverage. Those who have earnings too high for an SSI cash payment may be eligible for continued Medicaid under Section 1619(b) of the Social Security Act if they continue to meet the disability screen and some other criteria.

For more information on the Medicaid program, see http://www.medicaid.gov.

The focus of this article is on interactions between the Social Security Administration's (SSA's) two disability programs—DI and SSI—and the two public health insurance programs—Medicare and Medicaid. A recent article by Rupp and Riley (2011) demonstrated the importance of longitudinal interactions between SSA's disability programs, but did not explicitly consider the public health insurance connection. This piece focuses on the ways in which complex longitudinal interactions between the two disability cash benefits programs affect Medicaid coverage, especially during the 24-month Medicare waiting period[6] of the DI program (Riley 2004, 2006; Livermore, Stapleton, and Claypool 2010). Access to Medicare among disabled people is an important concern in recent policy discussions of Medicare and for assessing the potential of the Patient Protection and Affordable Care Act to remedy some of the perceived problems (Cubanski and Neuman 2010). In that context, it is important that we assess overall public health insurance coverage considering both Medicare and Medicaid. The next section of the article outlines our research focus. We then discuss the data and methodology, followed by our analysis of the empirical results. Finally, we close with a summary of our conclusions and issues for future research.

Research Focus

Our fundamental purpose for conducting this analysis is to demonstrate how longitudinal patterns of DI and SSI benefit eligibility affect access to and timing of Medicaid and Medicare coverage among disabled people. It is important to determine whether severely disabled individuals are eligible for DI or SSI benefits or both because the two programs provide dramatically different paths toward public health insurance coverage. DI provides Medicare coverage only after a 24-month waiting period (with some exceptions[7]), which is in addition to the 5-month waiting period for DI benefit eligibility. SSI usually provides access to Medicaid, but not Medicare coverage.

In contrast to Medicare, Medicaid eligibility can be retroactive up to 3 months prior to application. Some people may be eligible for both DI and SSI cash benefits on a monthly basis, resulting in dual eligibility for both Medicare and Medicaid in many cases. In such situations, Medicare is the primary health insurer and Medicaid covers beneficiary cost sharing and certain services (primarily nursing home care and other long-term care services) that Medicare does not cover. Consequently, eligibility for Medicaid and Medicare benefits depends in part on the timing and sequence of eligibility for SSI and/or DI benefits. There are some clear longitudinal patterns of SSI and DI program participation as a result of interactions between SSI and DI benefit eligibility rules, particularly the 5-month waiting period for DI and the counting of Social Security as unearned income in the SSI program. Those common patterns of disability program participation in turn affect patterns of entry into and exit from the public health insurance programs.

Rupp and Riley (2011) identified and classified the following five longitudinal patterns that are responsible for about 98 percent of all first-ever disability awards for DI, SSI, or both: DI-only; SSI-only; DI-only transitioning to joint DI/SSI benefit eligibility; SSI-only transitioning to DI-only serial benefit eligibility; and SSI-only transitioning to joint SSI/DI benefit eligibility. We use a refined version of that classification. Our refinement arises from a longer follow-up period available for the present study, allowing us to observe additional DI-only to joint DI/SSI benefit eligibility transitions. According to our classification, *DI-only benefit eligibility* means that the person first became eligible to receive DI benefits and never gained SSI payment eligibility over the 72-month, postaward observation window starting with the first month of DI benefit eligibility. *DI-only transitioning to joint DI/SSI benefit eligibility* means that the person started as DI-only during the month of award and became eligible for an SSI payment at least for 1 of the postaward months observed. *SSI-only benefit eligibility* means that the person first became eligible to receive SSI payments and never gained DI benefit eligibility over the postaward observation window. *SSI-only transitioning to DI-only serial benefit eligibility* means that the person started as an SSI-only eligible during the first month and lost SSI payment eligibility when DI benefit eligibility began after the 5-month DI waiting period, as a result of the Social Security benefit offset in the SSI income test. *SSI-only transitioning to joint SSI/DI benefit eligibility* is similar to serial eligibility in that DI kicks in after the 5-month waiting period, but differs because the beneficiary maintains his or her SSI payment eligibility afterward at least for 1 month. In those situations, the DI benefit does not completely offset the SSI payment the person was entitled to prior to the first month of DI eligibility.

The five longitudinal patterns of disability benefit eligibility provide different pathways to Medicaid and Medicare. Specifically, we predict the following clear patterns of relationships between disability benefit eligibility and Medicaid coverage:

- The DI-only longitudinal pattern of benefit eligibility is expected to be associated with generally low levels of Medicaid coverage.
- The DI-only transitioning to joint DI/SSI benefit eligibility is expected to be associated with a monotonic increase in Medicaid coverage arising from SSI entry, reflecting loss of income or spend-down of assets among some people who originally failed the SSI means test.
- The SSI-only longitudinal pattern of benefit eligibility is expected to be associated with relatively high Medicaid coverage over time.
- The pattern of SSI-only transitioning to DI-only serial benefit eligibility is expected to display a peak of Medicaid coverage around the end of the 5-month DI waiting period, with a sharp decline to follow the loss of SSI payment eligibility.
- The pattern of SSI-only transitioning to joint SSI/DI benefit eligibility is expected to display a similar increase up to the end of the 5-month DI waiting period, but with no sharp decline afterward.

With respect to Medicare coverage, we expect virtually complete coverage for all but the SSI-only group after the end of the 24-month Medicare waiting period. Finally, we expect that exits to nonbeneficiary status will affect Medicaid coverage, especially early exits from SSI eligibility status, while exits from the DI program after 2 years are expected to have virtually no effect on Medicare coverage. The anticipated Medicaid trend is the result of early exits from SSI that usually occur because of the loss of SSI income eligibility arising from the DI benefit being countable income. Later exits are more likely to be work related, and, as previously noted, allow for continued Medicaid coverage according to Section 1619(b) of the Social Security Act.[8] Exits from the DI program after the Medicare waiting period are rare, and as we discussed earlier, in many cases Medicare eligibility is protected for a 93-month period after DI exit.[9] For this analysis, we followed a cohort of new entrants to DI and SSI and tracked their patterns of participation in the Medicare and Medicaid programs.

Data Sources and Methodology

This study is based on the linkage of SSA and CMS administrative records and uses descriptive tabulations and multiple regression. The following sections provide more detail on the data and methodology.

Data

Our study is based on (1) Social Security administrative records covering the universe of DI and SSI beneficiaries and (2) CMS records covering the universe of Medicare and Medicaid enrollees. The use of administrative records for this analysis is particularly important because survey data are generally of poor quality where participation in the four programs of interest is concerned, and small sample sizes also severely limit the feasibility of analyzing the month-to-month dynamics that are so central to the research questions of interest in this article.[10]

We first created a 10 percent sample of disability beneficiaries from Social Security's Ticket Research File (TRF), which is compiled from a variety of Social Security record systems on disability program applicants and awardees. The TRF currently contains roughly 20 million observations. A description of the TRF and the Social Security source files was presented in a previous study (Rupp and Riley 2011). We created a "finder file" of Social Security numbers and basic identifying information from the TRF. CMS used that finder file to pull enrollment records from the Medicare Enrollment Data Base and the Medicaid Analytic Extract record systems. The CMS extract files then were merged with the Social Security records extract. The study sample consisted of first-ever disability program entrants who were alive and aged 18–64 during the first-ever month of benefit entitlement for either DI, SSI, or both sometime in 2000. Notable features of the sample are that it does not include any adults who received SSI disability benefits as a child,[11] and it does not include any first-ever awardees for DI or SSI who had a previous enrollment spell in the other program. The subsample of DI awardees was limited to "primary beneficiaries." It was designed to exclude two special categories, "disabled adult child" beneficiaries and "disabled widow(er)" beneficiaries. Those restrictions assured that we focused on an adult awardee cohort that had its first disability benefit eligibility spell in 2000. This sample design facilitates a clear picture of how disability benefit caseload dynamics strategically affect Medicaid and Medicare eligibility. Our sample of 68,798 observations is identical to the sample used by Rupp and Riley (2011). However, we added Medicaid and Medicare files for each disability awardee at the individual level, covering a period that includes the 12-month preaward period and a 72-month follow-up period, starting with the first month of disability benefit eligibility. Table 1 provides summary data on demographic,[12] diagnostic, and programmatic characteristics of our sample.

In this study, we measure Medicare coverage by a variable denoting Part A coverage. All DI beneficiaries who qualify for Medicare are automatically eligible for Part A, while Part B is a matter of choice and comes with a monthly premium for people who do not qualify for Medicaid. Approximately 90 percent of Medicare DI beneficiaries are enrolled in Part B. Our Medicaid enrollment figures refer only to individuals with "full Medicaid" coverage and do not include less than full coverage situations, such as qualified Medicare beneficiaries (QMB)–only and specified low-income Medicare beneficiaries (SLMB)–only who are enrolled in more limited programs for dual eligibles (Box 3). This decision was partially motivated by the evolving nature of these other program components. Moreover, these program design changes are unrelated to the key issues of interest in this article.

Methods

Our analysis is based on (1) monthly person-level records containing individual characteristics measured at the month of first disability benefit eligibility and (2) time-varying data on DI and SSI benefit eligibility and Medicaid and Medicare coverage. We use health insurance coverage data for 12 months prior to first disability award and the subsequent 72-month period. Much of our analysis is based on detailed monthly trends over the combined 84 months of longitudinal data on disability benefit eligibility and Medicaid and Medicare coverage. Our key technique is logistic regression applied to repeated cross-sections of disability awardees.

Table 1.
Selected sample characteristics

Characteristic	Percent	Standard error
Demographic		
Aged 18–30	9.6	0.1
Aged 46–64	63.0	0.2
Women	48.1	0.2
White, non-Hispanic race/ethnicity [a]	70.8	0.2
Other race/ethnicity [a]	27.8	0.2
Most frequent SSA primary diagnoses		
Musculoskeletal	25.5	0.2
Mental [b]	22.6	0.2
Circulatory	12.2	0.1
Neoplasms	9.2	0.1
Nervous	7.9	0.1
Longitudinal pattern of benefit eligibility		
DI-only	60.3	0.2
DI-only to joint DI/SSI	9.6	0.1
SSI-only	15.7	0.1
SSI-only to DI-only serial	4.4	0.1
SSI-only to joint SSI/DI	8.1	0.1
Any other pattern	1.9	0.1
N	68,798	. . .

SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

NOTE: . . . = not applicable.

a. Variable reflects measurement error, arising from the fact that prior to 1980 the source data file did not contain data by Hispanic ethnicity. As a result, the percentage "White, non-Hispanic" reflects upward bias, while the reverse is true for "Other race/ethnicity." See Scott (1999) for detail on the measurement issue.

b. Not including intellectual disability.

Box 3.
Medicaid and Medicare: Dual eligibility highlights

Coverage and funding

Medicare beneficiaries can qualify for Medicaid coverage if they have limited income and assets. For individuals with Medicare and Medicaid coverage, referred to as dual eligibles, Medicare is the primary payer if a given service is covered by both programs. Medicaid pays for Medicare premiums and cost sharing for persons who are also enrolled in Medicare.

Dual eligibles with limited Medicaid coverage

Some dual eligibles have limited Medicaid coverage if their income or assets do not meet the means test to qualify for full Medicaid benefits. For example, those eligible for qualified Medicare beneficiary (QMB) benefits receive coverage for Medicare cost sharing requirements (deductibles and coinsurance) and Part B monthly premiums, but not for services not covered by Medicare. Those eligible for special low-income Medicare beneficiary (SLMB) benefits receive coverage for Part B monthly premiums, but not for Medicare cost sharing or services not covered by Medicare.

For more information on dual eligibility, see http://www.medicaid.gov.

Results

In this section, we present the empirical results pertaining to the relationship between Medicaid and Medicare coverage and longitudinal patterns of disability benefit coverage. That is followed by the analysis of the role of disability program exits in affecting Medicaid coverage and factors affecting persistent Medicaid nonparticipation. Chart 1 compares Medicaid coverage for the five longitudinal pattern groups. Appendix Table A-1 provides more detail at selected time points. The results are generally consistent with our hypotheses and show subgroup differences of substantial magnitude. Medicaid coverage for the *DI-only* pattern group is consistently low and shows only a slight upward trend during the first 2 years. It remains essentially flat after the end of the Medicare waiting period.

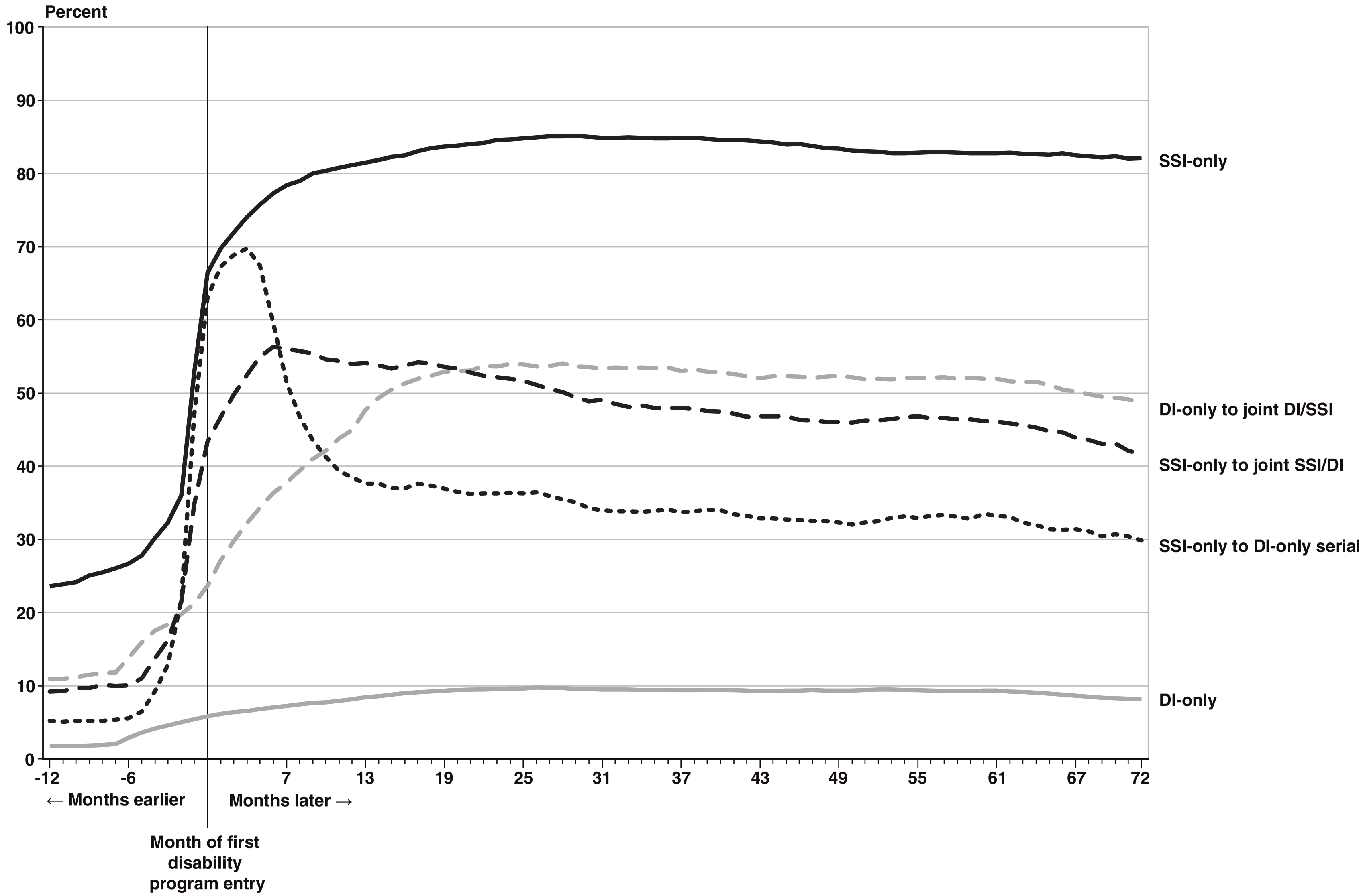
As expected, the *SSI-only* pattern group has consistently the highest rate of Medicaid coverage. A substantial minority (about 25 percent) have been covered by Medicaid 12 months prior to the first month of SSI payment eligibility.[13] Thus, SSI plays no role in establishing Medicaid coverage for that subgroup, although it may help people in the group retain their Medicaid eligibility if they cease to meet criteria for Medicaid coverage for another reason. Medicaid coverage sharply increases around the month of SSI entry, reaching 78 percent by month 6 and continuing with over 80 percent of coverage for most of the remaining months. Much of the remaining roughly 15–20 percent gap at any month afterward is attributable to SSI recipients who exited for reasons other than death or reaching age 65, as we will detail later in the article. The trends for the three longitudinal pattern groups with both DI and SSI involvement are between the DI-only and SSI-only trend lines for Medicaid coverage, but each trend displays a distinct shape consistent with longitudinal interactions between DI and SSI. All three of those groups start at low levels of Medicaid coverage 12 months prior to disability entry.

Medicaid coverage substantially increases during the months immediately preceding SSI entry and afterward. As expected, *serial entrants* show a very sharp increase in Medicaid coverage during the 3 months prior to SSI entry (the period of Medicaid coverage retroactivity) and shortly afterward, peaking at month 5 with 70 percent coverage. However, Medicaid coverage of serial entrants sharply declines during the months immediately following the peak—when DI kicks in and SSI eligibility ceases. Thus, SSI coverage during the DI waiting period is clearly very important for serial entrants, but for many, Medicaid coverage is temporary. Nevertheless, the level of Medicaid coverage is above 30 percent for this group until month 72, suggesting a more permanent attachment to Medicaid for some.

SSI/DI joint entrants show a sharp, but somewhat less spectacular increase in Medicaid coverage around the time SSI eligibility begins until a peak of about 57 percent during month 6. However, the decline of Medicaid coverage thereafter is more muted, and over 40 percent of those entrants are covered by Medicaid even at the end of the observation period.

Finally, *DI entrants with subsequent SSI involvement* show a gradual increase in Medicaid coverage during the first 2 years, peaking at 56 percent around month 24. Medicaid coverage stays above 50 percent for most of the remainder of our follow-up period. Note that there is a marked increase in Medicaid coverage beginning in month (-5), which corresponds to the beginning of the DI waiting period, despite the fact that SSI eligibility does not begin until after DI eligibility. Thus, some of that group of awardees is able to access Medicaid outside of SSI. Those people are categorically disabled during month (-6) according

Chart 1.
Percentage of survivors aged 18–64 with full Medicaid coverage, from 12 months before to 72 months after disability program entry, by longitudinal pattern group



SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

to criteria that are common to both programs, and they may have incomes low enough to meet the Medicaid means test. This may occur in states that have Medicaid financial eligibility criteria that are less restrictive than SSI (Kaiser Commission on Medicaid and the Uninsured 2010).

One may ask whether longitudinal patterns continue to be predictive of Medicaid coverage after various characteristics, such as demographics and primary diagnosis of awardees, are controlled for in a multivariate regression framework. The results of that test are shown in Table 2. We present estimates from logistic models of Medicaid coverage at various time points before and after the month of award. We assess the association between longitudinal patterns of disability program participation and Medicaid coverage after adjustments for demographic[14] and diagnostic characteristics. In addition, we include state indicators in the models to control for heterogeneity related to state-level variables. The table presents odds ratios and their estimated precision. The key finding from the "Longitudinal pattern" section of the table is that any involvement with SSI substantially increases the odds of Medicaid coverage. That pattern is consistent with the unadjusted differences we observed in Chart 1, and suggests that the striking differences presented in the chart are not artifacts of the association between coverage pattern and demographic or diagnostic variables or state of residence. The multivariate results strengthen the evidence that the link between longitudinal pattern

Table 2.
Results of logistic regressions on factors affecting Medicaid coverage 3 months before and 3 and 24 months after disability (DI and/or SSI) award in 2000

	Model 1: Month -3			Model 2: Month +3			Model 3: Month +24		
Independent variable	Odds ratio	Standard error	P > z	Odds ratio	Standard error	P > z	Odds ratio	Standard error	P > z
Demographic									
Aged 18–30	2.05	0.09	0.00	1.91	0.07	0.00	2.27	0.09	0.00
Aged 31–45	1.91	0.06	0.00	1.56	0.04	0.00	1.62	0.04	0.00
Aged 46–64 (reference category)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Women	1.61	0.04	0.00	1.17	0.03	0.00	1.47	0.03	0.00
Men (reference category)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Missing sex	1.38	0.22	0.04	1.26	0.19	0.13	1.77	0.56	0.07
White non-Hispanic race/ethnicity [a] (reference category)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Other race/ethnicity [a]	1.42	0.04	0.00	1.30	0.03	0.00	1.47	0.04	0.00
Missing race/ethnicity [a]	0.78	0.09	0.03	0.94	0.10	0.56	0.94	0.10	0.60
Diagnostic									
Circulatory	1.57	0.08	0.00	1.69	0.07	0.00	1.38	0.06	0.00
Congenital	0.52	0.18	0.07	0.96	0.25	0.88	0.81	0.23	0.45
Digestive	1.47	0.13	0.00	1.73	0.13	0.00	1.47	0.12	0.00
Endocrine	1.45	0.12	0.00	1.44	0.10	0.00	1.52	0.10	0.00
Genitourinary	1.58	0.14	0.00	2.79	0.21	0.00	1.49	0.12	0.00
Infectious and parasitic	1.53	0.14	0.00	2.56	0.21	0.00	1.91	0.16	0.00
Injuries	1.32	0.10	0.00	1.46	0.09	0.00	1.14	0.07	0.04
Musculoskeletal (reference category)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Neoplasms	1.22	0.07	0.00	1.98	0.09	0.00	1.07	0.07	0.28
Nervous	1.02	0.06	0.71	1.24	0.06	0.00	0.98	0.05	0.67
Other	1.35	0.21	0.06	1.11	0.16	0.49	0.99	0.14	0.96
Mental [b]	1.35	0.06	0.00	1.40	0.05	0.00	1.34	0.05	0.00
Respiratory	1.42	0.11	0.00	1.64	0.10	0.00	1.39	0.08	0.00
Intellectual disability [c]	1.07	0.08	0.34	1.25	0.08	0.00	1.36	0.10	0.00
Missing diagnosis	1.31	0.11	0.00	1.01	0.08	0.95	0.76	0.06	0.00

(Continued)

Table 2.
Results of logistic regressions on factors affecting Medicaid coverage 3 months before and 3 and 24 months after disability (DI and/or SSI) award in 2000—*Continued*

Independent variable	Model 1: Month -3			Model 2: Month +3			Model 3: Month +24		
	Odds ratio	Standard error	P > z	Odds ratio	Standard error	P > z	Odds ratio	Standard error	P > z
Longitudinal pattern									
DI-only [d] (reference category)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
DI-only to joint DI/SSI	3.81	0.16	0.00	5.44	0.20	0.00	10.33	0.35	0.00
SSI-only	8.44	0.30	0.00	37.21	1.23	0.00	50.45	1.90	0.00
SSI-only to DI-only serial	2.77	0.17	0.00	34.31	1.62	0.00	5.23	0.25	0.00
SSI-only to joint SSI/DI	3.62	0.17	0.00	15.42	0.57	0.00	10.68	0.39	0.00
State dummies [e] (New York state is reference category)	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Number of observations	67,690			67,254			62,316		
Likelihood ratio Chi^2 (77) [f]	10,678.33			28,392.11			29,192.76		
Probability > Chi^2	0.0000			0.0000			0.0000		
Pseudo R^2	0.2139			0.3652			0.3782		
Log likelihood	-19,612.65			-24,676.06			-23,997.92		

SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

NOTES: Sample of first-ever disability (DI and/or SSI) program entrants in 2000 who were aged 18–64 during the first month of payment eligibility. "State-only" SSI first awardees are not included. At month +3 and month +24, the sample is limited to survivors younger than age 65. "Month 1" is defined as first-ever month of positive payment eligibility for program of first award. Immediately preceding that month is "month -1."

. . . = not applicable.

a. Variable reflects measurement error, arising from the fact that prior to 1980 the source data file did not contain data by Hispanic ethnicity. As a result, the percentage "White, non-Hispanic" reflects upward bias, while the reverse is true for "Other race/ethnicity." See Scott (1999) for detail on the measurement issue.

b. Not including intellectual disability (formerly known as mental retardation).

c. Formerly known as mental retardation.

d. DI-only is the reference group. "SSI/DI simultaneous" entrants and "Other" awardees are included in the multinomial logit model, but results are not presented here.

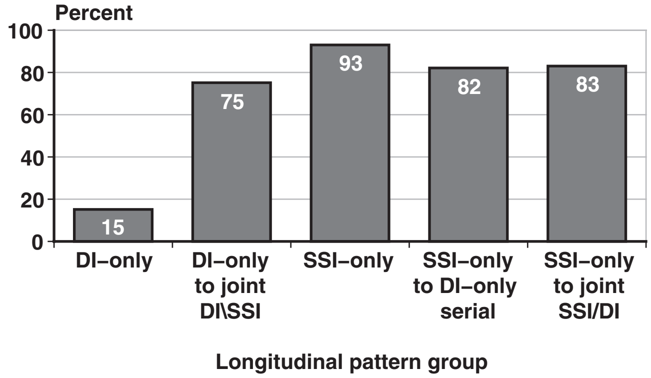
e. All states (except New York) and the District of Columbia are included. Puerto Rico may be omitted from some models. A residual category represents US territories.

f. Except model 3 where likelihood ratio Chi^2 (78) is applicable.

of disability benefit eligibility and Medicaid coverage is an important aspect of access to Medicaid in its own right. The results in Table 2 also show that the contrast in Medicaid access compared with the DI-only group is strongest for the SSI-only group for all three time points. Nevertheless, the table also suggests that demographic and diagnostic characteristics also matter, albeit the variation in relative odds is less dramatic.

Although Table 2 shows factors affecting Medicaid participation at selected time points, a somewhat different question is whether awardees are ever covered by Medicaid during the first 24 months after first disability benefit award. After all, Medicaid is the only major public health insurance program potentially available to all but a few awardees during that period.[15] Chart 2 shows the importance of longitudinal patterns from that perspective. The sample frame includes all calendar year 2000 first-ever disability awardees. The dependent variable is Medicaid coverage at least for 1 month between months 1 and 24 and prior to reaching age 65. Medicaid coverage during the first 24 months is clearly driven by the presence or absence of SSI involvement. Only 15 percent of the DI-only pattern group had any involvement with the Medicaid program during the period corresponding to the 24-month Medicare waiting period. Some Medicaid involvement is almost universal in the SSI-only group, while all three groups with concurrent involvement are much closer to SSI-only Medicaid involvement compared with the DI-only group.

Chart 2.
Percentage of awardee cohort ever covered by Medicaid during the first 2 years starting from the first month of disability benefit eligibility



SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

NOTES: Statistics are based on a 10 percent sample of all first-ever disability awardees in 2000. Not all sample members were at risk of Medicaid coverage prior to age 65 for the full 24-month observation period. Over 1 percent exited the sample because of reaching age 65. An additional 8 percent died before reaching either age 65 or the end of the observation period.

Because disability program participation is clearly affected by exits from disability benefit status (as well as reentries), it is worthwhile to look at the relationship between *current* cash benefit eligibility status at selected time points and Medicaid coverage. Table 3 provides that information by longitudinal pattern during month 24 and month 72. The first time point represents the last month prior to the start of Medicare eligibility for all of the groups with some DI involvement, while month 72 represents the longest time horizon we can use in the current analysis. We highlight a few important findings from this table. First, *current* SSI involvement (second column) is associated with very high Medicaid coverage for all three pattern groups where SSI involvement is feasible at month 24 and month 72 (DI-only to joint DI/SSI, SSI-only, and SSI-only to joint SSI/DI). The SSI-only pattern has clearly the highest degree of Medicaid coverage at both time points (90 percent at month 24 and 95 percent at month 72). However, differences by pattern category at month 72 are very small. Second, while DI-only *current* status (first column) is generally associated with low probabilities of Medicaid coverage, there are substantial differences by pattern. There is a large gap between the rate of Medicaid coverage for the DI-only pattern group (less than 10 percent) and the other longitudinal pattern groups with 30–43 percent Medicaid coverage. Current DI-only status does not explain those differences. This suggests that many disabled beneficiaries are able to retain Medicaid eligibility after termination of SSI payments. Third, consistent with our expectations, Medicaid coverage is the lowest among people who exited the disability rolls (third column), reflecting the *current* status of neither DI nor SSI benefit eligibility. However, the data also show substantial differences by pattern group. Almost half of the people who exited the SSI-only group by month 24 (47 percent) are still covered by Medicaid. The corresponding figure is only 6 percent for those who exited the DI-only group. Thus, longitudinal patterns matter, even after controlling for current benefit eligibility status.

While Medicaid coverage is relatively low among people who exited the cash benefit program(s) in all longitudinal pattern categories, as a practical matter, nonbeneficiaries form a sizable subgroup *only* within the SSI-only longitudinal pattern group. About 13 percent of SSI-only awardees were in nonbeneficiary status at month 24 and 21 percent at month 72. In contrast, the other longitudinal pattern groups had only 1–3 percent in nonbenefit status at month 24 and 4–9 percent at month 72 (authors' calculation). Because of the relative importance of exits to nonbeneficiary status among the SSI-only group, we present detail on trends in Medicaid coverage for that longitudinal pattern group separately for those who are receiving SSI payments and those who are not at various points in time (Chart 3).

The data clearly show an upward trend in Medicaid coverage among people who are in SSI program status at the given point in time and a downward trend among those who are not SSI program participants. Both series are affected by duration dependence. Importantly, 95 percent of people who are on SSI at month 72 are covered by Medicaid. The corresponding figure is 36 percent for those who are off SSI at that point. Thus, a large portion of the 15–20 percent observed Medicaid noncoverage among the SSI-only group seems to be attributable to those who exited the SSI rolls and did not die or reach age 65 by the given month. Members of that group, on average, are expected to have relatively good health. Some may no longer be disabled or they fail to meet the requirements of Section 1619b of the Social Security Act for some other reasons.

Table 3.
Percentage of people with full Medicaid coverage at selected time points after the first month of benefit eligibility, by longitudinal pattern and benefit eligibility status at months 24 and 72

Longitudinal pattern [a]	DI-only Percent	DI-only Standard error	SSI-only or both DI and SSI Percent	SSI-only or both DI and SSI Standard error	Neither Percent	Neither Standard error	Total [b] Percent	Total [b] Standard error	Number of observations
				Percentage with full Medicaid coverage at month 24					
DI-only	9.7	0.2	. . .	. . .	6.0	1.0	9.6	0.2	37,423
DI-only to joint DI/SSI	43.1	0.8	73.9	0.9	29.4	4.8	54.0	0.6	6,359
SSI-only	. . .	. . .	90.3	0.3		1.4	84.7	0.4	9,291
SSI-only to DI-only serial	36.8	0.9	. . .	. . .	23.6	5.0	36.4	0.9	2,681
SSI-only to joint SSI/DI	38.3	0.8	83.3	0.9	18.8	4.9	52.0	0.7	5,315
				Percentage with full Medicaid coverage at month 72					
DI-only	8.3	0.2	. . .	. . .	7.4	0.8	8.2	0.2	27,739
DI-only to joint DI/SSI	34.0	0.8	90.5	0.8	19.7	2.4	48.6	0.7	5,557
SSI-only	. . .	. . .	94.6	0.3	35.9	1.2	82.1	0.5	7,382
SSI-only to DI-only serial	31.3	1.1	. . .	. . .	14.9	2.7	29.9	1.0	2,045
SSI-only to joint SSI/DI	29.6	0.8	93.6	0.8	17.4	2.4	41.6	0.7	4,509

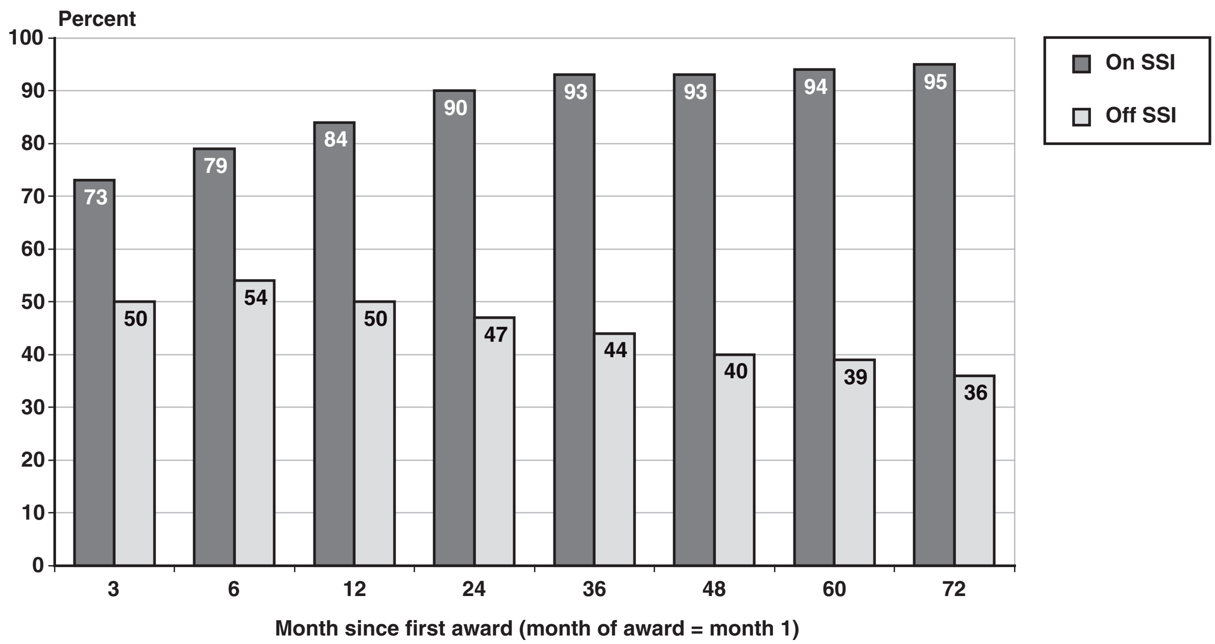
SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

NOTE: . . . = not applicable.

a. For the 72-month period starting with month of initial disability award.

b. Includes survivors younger than age 65 during given month.

Chart 3.
Percentage of survivors younger than age 65 with full Medicaid coverage among those alive at selected time points, by SSI payment eligibility status during given month: SSI-only awardees



SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

Chart 4 displays overall public health insurance coverage (as measured by Medicaid and/or Medicare coverage) for the five longitudinal pattern groups. Appendix Table A-2 provides more detail at selected time points. For the period prior to the month of award and the subsequent 2 years, the longitudinal pattern group trends are essentially driven by the Medicaid trends we have seen before. Medicare coverage is extremely rare prior to the end of the Medicare waiting period. However, for all but the SSI-only group, Medicare coverage jumps to 100 percent after the end of the combined DI and Medicare waiting period—29 months from the disability onset.[16] The temporal patterns of Medicaid and Medicare coverage associated with the five pattern groups provide important evidence for the relevance of longitudinal patterns of disability benefit eligibility in understanding the relative level and composition of public health insurance coverage among disability cash benefit awardees.

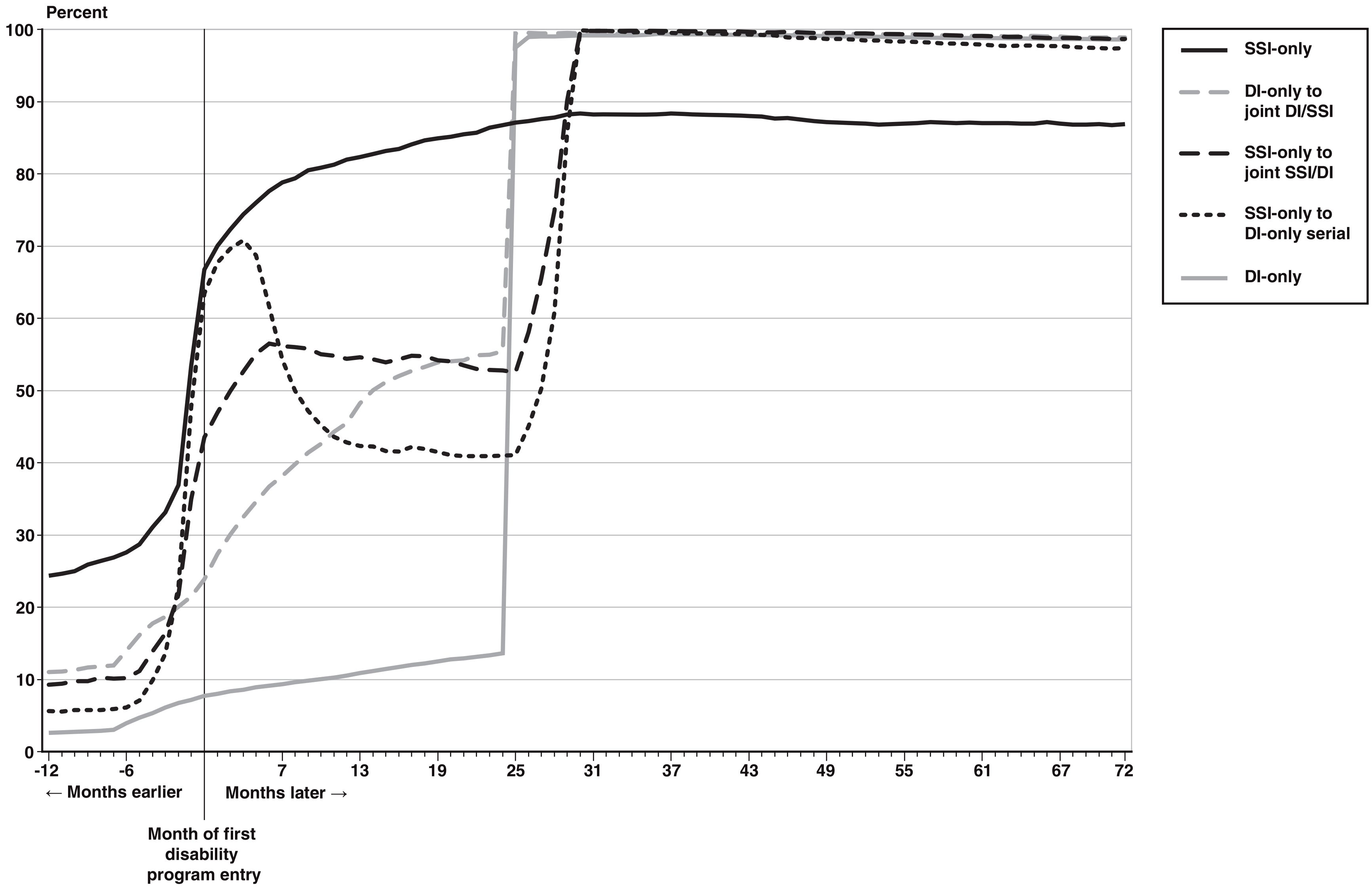
Conclusions

Our study is the first-ever effort to link, at the individual level, administrative records data from four of the largest and highly interrelated US public safety net programs—DI, SSI, Medicare, and Medicaid—and to analyze the month-to-month dynamics of interactions among them. The findings demonstrate that longitudinal patterns of disability benefit eligibility are important in explaining public health insurance coverage and display relationships that can be expected based on program rules affecting interactions among the four major federal programs for working-age adults with disabilities. To summarize, we highlight three points here: (1) SSI involvement (or the lack of) is the principal determinant of the level of public health insurance coverage during a roughly 2-year period after the first month of first disability benefit coverage for all subgroups; (2) the lead of the SSI-only group in *public* health coverage disappears after the first 24 months of disability benefit coverage, and in contrast to all of the other longitudinal pattern groups, a small portion stays without either Medicaid or Medicare coverage thereafter; and (3) people who are involved with both the SSI and DI programs at some point have more access to public health insurance compared with the DI-only group for two reasons. First, they have much higher levels of Medicaid coverage prior to the end of the Medicare waiting period. Second, many continue to benefit from dual Medicare and Medicaid coverage after Medicare begins.

Despite the significant roles played by Medicare and Medicaid, there are still some gaps in public health insurance coverage for beneficiaries in the SSI and DI programs. DI-only beneficiaries (who are not eligible for SSI) seldom have Medicaid or Medicare coverage during the 29 months that comprise the DI and Medicare waiting periods. Among people with SSI eligibility during the DI waiting period, some lose their Medicaid benefits when SSI eligibility is terminated because of the initiation of DI benefits. Typically this loss of Medicaid coverage occurs shortly after the completion of the 5-month DI waiting period. For those individuals, a substantial temporal gap of public health insurance exists after the cessation of Medicaid coverage and the start of Medicare coverage. Lastly, SSI eligibility does not always guarantee Medicaid eligibility, leaving some without a public source of health insurance if they are not eligible for DI or are in the Medicare waiting period.[17] Some disabled beneficiaries have other sources of health insurance, but for those that do not, lack of health insurance can severely impair access to health care (Riley 2006; Weathers and others 2010).

Several important issues remain for further analysis. One issue is the question of how implementation factors—such as delays in the SSA disability determination process, the use of more restrictive Medicaid criteria in the 209(b) states, and autoenrollment—affect the extent and timing of Medicaid coverage.[18] Another question of importance is how the patterns of Medicaid and Medicare coverage translate into utilization and program cost patterns. In addition, there is a need to reassess overall health insurance coverage among disabled people in light of the patterns identified in this article, but also to consider information on private sources of health insurance that were unobserved in the administrative data sets used for this study. Finally, the ongoing reforms to increase overall health insurance, particularly the expansion of Medicaid coverage and other important planned changes under the Affordable Care Act, will require the reassessment of links between disability cash benefits and public health insurance coverage. Expanding Medicaid coverage among nondisabled adults may weaken the role of SSI in providing access to health insurance in the future.

Chart 4.
Percentage of survivors aged 18–64 with Medicare Part A or full Medicaid coverage, from 12 months before to 72 months after disability program entry, by longitudinal pattern group



SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

Appendix

Table A-1.
Percentage of people with full Medicaid coverage among survivors aged 18–64 of longitudinal pattern groups, by selected months before and after first month of disability program entry

Month (month 1 = month of disability program entry) [a]	Number of observations	Longitudinal pattern [b]							Total
		DI-only	DI-only to joint DI/SSI	SSI-only	SSI-only to DI-only serial	SSI-only to joint SSI/DI	SSI/DI simultaneous	Other pattern	
-12	68,798	1.8	11.0	23.6	5.2	9.2	7.1	18.6	7.0
-6	68,798	2.9	13.8	26.7	5.5	10.1	11.5	19.8	8.6
Month of entry	68,798	5.8	23.7	66.4	63.1	43.4	47.8	54.5	23.5
2	68,599	6.1	27.2	69.8	67.3	46.8	50.0	57.8	25.0
3	68,361	6.4	29.8	72.0	68.9	49.7	51.2	59.8	26.1
4	68,038	6.6	32.3	74.1	69.8	52.5	49.8	61.0	26.9
5	67,710	6.8	34.4	75.7	67.4	54.9	49.9	63.5	27.6
6	67,349	7.0	36.3	77.3	59.5	56.3	49.0	64.7	27.9
7	66,983	7.2	37.8	78.4	51.4	56.0	48.7	67.1	27.9
8	66,663	7.5	39.4	78.9	46.8	55.7	47.8	67.8	28.1
9	66,373	7.6	41.0	80.0	43.5	55.4	46.1	68.8	28.3
10	66,071	7.8	42.1	80.4	41.3	54.6	45.5	68.8	28.4
11	65,784	8.0	43.8	80.8	39.3	54.4	45.6	69.6	28.6
12	65,497	8.2	44.9	81.1	38.4	54.0	45.2	69.4	28.9
18	63,800	9.2	52.4	83.5	37.3	54.1	46.1	71.9	30.6
24	62,316	9.6	54.0	84.7	36.4	52.0	44.5	72.4	31.0
25	66,663	7.5	39.4	78.9	46.8	55.7	47.8	67.8	31.0
26	66,373	7.6	41.0	80.0	43.5	55.4	46.1	68.8	31.1
27	66,071	7.8	42.1	80.4	41.3	54.6	45.5	68.8	31.0
28	65,497	8.2	44.9	81.1	38.4	54.0	45.2	69.4	31.0
29	65,198	8.4	47.7	81.5	37.7	54.1	45.0	69.0	30.8
30	60,755	9.6	53.5	85.0	34.2	48.9	41.5	74.1	30.7
36	59,138	9.4	53.5	84.8	34.0	48.0	43.4	71.9	30.6
48	55,479	9.4	52.2	83.5	32.5	46.1	42.4	69.5	30.3
60	51,752	9.4	51.9	82.8	33.5	46.2	40.8	67.8	30.5
72	48,286	8.2	48.6	82.1	29.9	41.6	37.0	66.2	29.1

SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

NOTES: Sample of first-ever disability (DI and/or SSI) program entrants in 2000 who were aged 18–64 during the first month of payment eligibility. "State-only" SSI first awardees are not included. "Month 1" is defined as first-ever month of positive payment eligibility for program of first award. Immediately preceding that month is "month -1." Because the sample frame was defined on the basis of benefit status in month 1, sample members were alive and younger than age 65 during the preceding 12 months; some may have been age 17 during prior months. The data for months 2 through 72 reflect only survivors younger than age 65 at given month.

a. Months corresponding to 12-month intervals 1 year before and 6 years after program entry are in bold. More detailed monthly information is given around important programmatic milestones.

b. Detailed classification of longitudinal cash benefit eligibility patterns during the 72-month period.

Table A-2.
Percentage of people with full Medicare Part A and/or Medicaid coverage among survivors aged 18–64 of longitudinal pattern groups, by selected months before and after first month of disability program entry

Month (month 1 = month of disability program entry) [a]	Number of observations	Longitudinal pattern [b]							Total
		DI-only	DI-only to joint DI/SSI	SSI-only	SSI-only to DI-only serial	SSI-only to joint SSI/DI	SSI/DI simultaneous	Other pattern	
-12	68,798	2.6	11.1	24.4	5.7	9.3	7.8	20.8	7.7
-6	68,798	3.9	14.0	27.6	6.1	10.2	12.1	22.0	9.4
Month of entry	68,798	7.7	23.9	66.7	63.5	43.5	48.3	54.9	24.7
2	68,599	8.0	27.4	70.0	67.8	46.9	50.6	58.2	26.2
3	68,361	8.4	30.1	72.3	69.6	49.9	52.2	60.0	27.4
4	68,038	8.6	32.5	74.4	70.8	52.7	51.2	61.2	28.3
5	67,710	8.9	34.6	76.1	68.7	55.1	51.4	63.9	29.1
6	67,349	9.1	36.7	77.6	61.6	56.5	50.6	65.1	29.4
7	66,983	9.4	38.2	78.8	54.3	56.2	50.5	67.7	29.5
8	66,663	9.6	39.8	79.4	50.0	56.0	49.8	68.6	29.7
9	66,373	9.8	41.4	80.5	47.2	55.8	48.2	69.8	30.0
10	66,071	10.0	42.6	80.9	45.2	55.1	47.7	70.0	30.1
11	65,784	10.2	44.3	81.3	43.6	54.9	47.8	70.8	30.4
12	65,497	10.5	45.5	82.0	42.8	54.4	47.6	71.2	30.7
18	63,800	12.3	53.3	84.7	41.9	54.7	48.4	74.5	33.0
24	62,316	13.6	55.5	86.8	41.0	52.8	46.9	76.4	34.2
25	62,073	97.5	99.4	87.1	41.0	52.5	99.3	77.2	89.7
26	61,803	99.0	99.5	87.3	45.1	58.1	99.6	78.4	91.3
27	61,546	99.0	99.5	87.6	50.3	65.6	99.5	78.7	92.3
28	61,272	99.1	99.5	87.8	60.8	74.9	99.5	81.1	93.6
29	60,998	99.1	99.5	88.2	85.7	90.1	99.6	83.2	96.1
30	60,755	99.2	99.5	88.3	99.9	99.8	99.7	84.4	97.6
36	59,138	99.4	99.4	88.3	99.5	99.8	99.7	91.0	97.7
48	55,479	99.1	99.4	87.3	98.8	99.5	99.3	93.7	97.4
60	51,752	98.8	99.1	87.1	98.0	99.1	98.1	95.0	97.0
72	48,286	98.6	98.9	86.9	97.4	98.7	97.3	97.7	96.8

SOURCES: Authors' calculations from Social Security and Centers for Medicare and Medicaid Services administrative records.

NOTES: Sample of first-ever disability (DI and/or SSI) program entrants in 2000 who were aged 18–64 during the first month of payment eligibility. "State-only" SSI first awardees are not included. "Month 1" is defined as first-ever month of positive payment eligibility for program of first award. Immediately preceding that month is "month -1." Because the sample frame was defined on the basis of benefit status in month 1, sample members were alive and younger than age 65 during the preceding 12 months; some may have been age 17 during prior months. The data for months 2 through 72 reflect only survivors younger than age 65 at given month.

a. Months corresponding to 12-month intervals 1 year before and 6 years after program entry are in bold. More detailed monthly information is given around important programmatic milestones.

b. Detailed classification of longitudinal cash benefit eligibility patterns during the 72-month period.

Notes

Acknowledgments: We appreciate the expert assistance of Francoise Becker and Charles Herboldsheimer for generating and analyzing the data files used in this article. Numerous colleagues at the Social Security Administration and the Centers for Medicare and Medicaid Services have been helpful with their review and comments. We are especially thankful for thoughtful suggestions from Paul Davies. Eric French provided useful discussant comments on an earlier version of the article at the 2011 Annual Meetings of the Allied Social Sciences Association.

[1] For instance Cogan, Hubbard, and Kessler (2008) were concerned about the effect of Medicare for disabled people on the market for private insurance. Yelowitz (1998) addressed the effect of Medicaid on SSI participation.

[2] Note also that under Section 10323 of the Patient Protection and Affordable Care Act (Public Law 111-148), the secretary of the Department of Health and Human Services may also deem individuals exposed to environmental health hazards eligible for Medicare coverage. See http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/html/PLAW-111publ148.htm.

[3] For further detail, see http://www.socialsecurity.gov/redbook/index.html.

[4] Swartz (2008) reviewed the evolution of American attitudes and policy toward public health insurance for the poor. Dorn (2008) demonstrated the high prevalence of uninsured status among poor and near-poor nondisabled adults who were neither pregnant nor caring for dependent children.

[5] For further detail, see http://www.socialsecurity.gov/disabilityresearch/wi/1619b.htm.

[6] SSA is sufficiently concerned about health insurance coverage during the Medicare waiting period to have initiated the Accelerated Benefits Demonstration. For early results, see Weathers and others (2010).

[7] Individuals with amyotrophic sclerosis and transplant patients do not face a waiting period. Similar rules apply to end-stage renal disease patients; the waiting period is 3 months for dialysis patients, but is eliminated if those patients immediately undergo training for home dialysis. For details, see https://www.cms.gov/employerservices/04_endstagerenaldisease.asp.

[8] See http://www.socialsecurity.gov/disabilityresearch/wi/1619b.htm.

[9] For details on continued Medicare eligibility after the cessation of DI benefits for work-related reasons, see http://www.socialsecurity.gov/disabilityresearch/wi/medicare.htm.

[10] Huynh, Rupp, and Sears (2002) and Sears and Rupp (2003) reported substantial measurement error in data on DI and SSI in the Survey of Income and Program Participation. Davern and others (2009) demonstrated systematic underreporting of Medicaid coverage in the Current Population Survey.

[11] Health insurance coverage among young adults with childhood SSI experience is important, but outside the scope of our current analysis. See DeCesaro and Hemmeter (2009) for detail on health insurance coverage among SSI children.

[12] Some caution is needed in interpreting the race/ethnicity variable. This variable from Social Security administrative records is known to reflect some nonsampling error (Scott 1999). The nonsampling error arises from the fact that race and ethnicity are not measured separately in the administrative records, and the content of the variable has changed over time. Prior to 1980, the source data did not contain data on Hispanic ethnicity. As a result, the percentage shown in the table for the "White, non-Hispanic" category reflects upward bias, while the reverse is true for the "Other" category.

[13] Only 14.3 percent of this subgroup was covered for the reason of being "disabled, including blind." An additional 9 percent was covered by Medicaid as a "child" and less than 1 percent as an "unemployed adult." The overwhelming majority was classified as being covered for "other" reasons.

[14] Note that the race/ethnicity variable from Social Security administrative records is known to reflect nonsampling error (Scott 1999). Therefore, some caution is needed in the interpretation. While the point estimates from our regression models may be somewhat sensitive to this nonsampling error, we believe that the pattern of our estimated odds ratio results is not affected by this measurement error in a substantial way.

[15] As noted previously, the 24-month Medicare waiting period is substantially shortened or waived for certain DI awardees.

[16] Note that our anchoring point is the first month of benefit eligibility. For the DI-only group, that happens to be right after the completion of the 5-month DI waiting period. Thus, the jump to 100 percent Medicare coverage occurs during month 25. For the other groups with concurrent involvement, there appears some lag relative to our anchoring point, but that simply reflects the fact that SSI starts during the DI waiting period for these people. Nevertheless, the end of the combined DI and Medicare waiting period is always 29 months after disability onset for all four groups with DI involvement.

[17] In 11 states known as "209(b) states," both the financial and nonfinancial eligibility criteria can be more restrictive than the federal SSI standard, as long as the criteria are no more restrictive than the rules that were in place in 1972 (Kaiser Commission for Medicaid and the Uninsured 2010).

[18] Ungaro and Federman (2009) provided evidence that the restrictiveness in the Medicaid eligibility determination process has a negative effect on Medicaid enrollment among the elderly.

References

[CMS] Centers for Medicare and Medicaid Services. 2011. *Medicaid Eligibility—Overview.* http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Eligibility/Eligibility.html.

Cogan, John F., R. Glenn Hubbard, and Daniel P. Kessler. 2008. "The Effect of Medicare Coverage for the Disabled on the Market for Private Insurance." NBER Working Paper No. 14309. Cambridge, MA: National Bureau of Economic Research.

Cubanski, Juliette, and Patricia Neuman. 2010. "Medicare Doesn't Work as Well for Younger, Disabled Beneficiaries as It Does for Older Enrollees." *Health Affairs* 29(9): 1725–1733.

Davern, Michael, Jacob A. Klerman, Jeannete Ziegenfuss, Victoria Lynch, and George Greenberg. 2009. "A Partially Corrected Estimate of Medicaid Enrollment and Uninsurance: Results From an Imputational Model Developed Off Linked Survey and Administrative Data." *Journal of Economic and Social Measurement* 34(4): 219–240.

DeCesaro, Anne, and Jeffrey Hemmeter. 2009. "Unmet Health Care Needs and Medical Out-of-Pocket Expenses of SSI Children." *Journal of Vocational Rehabilitation* 30(3): 177–199.

Dorn, Stan. 2008. *Millions of Low-Income Americans Can't Get Medicaid: What Can Be Done?* AARP Research Report #2008-13. Washington, DC: AARP Public Policy Institute (September). http://assets.aarp.org/rgcenter/health/2008_13_medicaid.pdf.

Huynh, Minh, Kalman Rupp, and James Sears. 2002. "The Assessment of Survey of Income and Program Participation (SIPP) Benefit Data Using Longitudinal Administrative Records." SIPP Working Paper No. 238. Washington, DC: Census Bureau.

Kaiser Commission on Medicaid and the Uninsured. 2010. *Medicaid Financial Eligibility: Primary Pathways for the Elderly and People with Disabilities*. http://www.kff.org/medicaid/upload/8048.pdf.

Livermore, Gina A., David C. Stapleton, and Henry Claypool. 2010. "Health Care When Workers Need It Most: Before and After Entry Into the Social Security Disability Insurance Program." *Inquiry* 47(2): 135–149.

Riley, Gerald F. 2004. "The Cost of Eliminating the 24-Month Medicare Waiting Period for Social Security Disabled-Worker Beneficiaries." *Medical Care* 42(4): 387–394.

———. 2006. "Health Insurance and Access to Care Among Social Security Disability Insurance Beneficiaries During the Medicare Waiting Period." *Inquiry* 43(3): 222–230.

Rupp, Kalman, and Gerald F. Riley. 2011. "Longitudinal Patterns of Participation in the Social Security Disability Insurance and Supplemental Security Income Cash Benefit Programs for People With Disabilities." *Social Security Bulletin* 71(2): 25–51.

Scott, Charles G. 1999. "Identifying the Race or Ethnicity of SSI Recipients." *Social Security Bulletin* 62(4): 9–20.

Sears, James, and Kalman Rupp. 2003. "Exploring Social Security Payment History Matched With the Survey of Income and Program Participation." Paper presented at the 2003 Research Conference of the Federal Committee on Statistical Methodology, Arlington, VA (November 17–19). http://www.fcsm.gov/03papers/SearsRupp.pdf.

Swartz, Katherine. 2008. "Health Care for the Poor: For Whom, What Care, and Whose Responsibility?" IRP Discussion Paper No. 1354-08. Madison, WI: Institute of Research on Poverty. http://www.irp.wisc.edu/publications/focus/pdfs/foc262l.pdf.

Ungaro, Ryan, and Alex D. Federman. 2009. "Restrictiveness of Eligibility Determination and Medicaid Enrollment by Low-Income Seniors." *Journal of Aging & Social Policy* 21(4): 338–351.

Weathers II, Robert R., Chris Silanskis, Michelle Stegman, John Jones, and Susan Kalasunas. 2010. "Expanding Access to Health Care for Social Security Disability Insurance Beneficiaries: Early Findings From the Accelerated Benefits Demonstration." *Social Security Bulletin* 70(4): 25–47.

Yelowitz, Aaron S. 1998. "The Impact of Health Care Costs and Medicaid on SSI Participation." In *Growth in Disability Benefits: Explanations and Policy Implications,* edited by Kalman Rupp and David C. Stapleton, 109–133. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research, Upjohn Institute Press.

Income Replacement Ratios in the Health and Retirement Study

by Patrick J. Purcell*

This article describes the income replacement ratio as a measure of retirement income adequacy and identifies several issues analysts must consider when calculating a replacement ratio. The article presents the income replacement ratios experienced by participants in the original sample cohort of the Health and Retirement Study (HRS), who were born between 1931 and 1941. Replacement ratios are shown by the respondent's birth cohort, age when first classified as retired in the HRS, and preretirement income quartile. Median replacement ratios fall as the retirement period grows longer.

Introduction

Income typically falls in retirement, and the timing and extent of that decline concerns policymakers. Social Security benefits and the tax preferences granted to pensions and retirement savings plans represent a substantial commitment of the nation's economic resources to assuring that retirees can maintain a satisfactory standard of living. If income from Social Security, pensions, and savings do not allow retirees to maintain their preretirement standard of living (or a slightly more modest one), they will face difficult and perhaps unexpected choices about reducing or eliminating certain kinds of expenditures. Some retirees might become more dependent on their adult children for financial support. Others might apply for means-tested benefits, placing further strains on a federal budget that already runs substantial annual deficits.

Assessing the adequacy of retirement income is necessarily a subjective process. The federal poverty threshold provides one measure of income adequacy. However, because its primary purpose is to determine eligibility for means-tested benefit programs, the poverty threshold represents only a minimally adequate income.[1] Although the poverty threshold—or a multiple of the threshold—is a useful benchmark for some income analyses, retirement income is more typically viewed in terms of how it compares with income before retirement. Financial advisors often suggest that near-retirees should estimate the fraction of preretirement income they will need to be reasonably comfortable and independent in retirement.

The income replacement ratio—retirement income expressed as a percentage of preretirement income—has become a familiar metric among financial planners and economists for assessing the adequacy of retirement income. If the ratio exceeds a given target, an individual or couple is likely to have enough income to maintain the preretirement standard of living. Exactly what this target ratio should be, however, and which measures of income to include in calculating the ratio, continue to be debated.

The proportion of preretirement income needed to maintain one's standard of living in retirement varies

Selected Abbreviations

CPI-U	Consumer Price Index for all Urban Consumers
HRS	Health and Retirement Study
MINT	Modeling Income in the Near Term
SSA	Social Security Administration

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according to individual circumstances. Lower-income workers typically need a higher replacement ratio than average-income workers because they spend a higher proportion of their income on necessities such as food, clothing, housing, transportation, and medical care. Higher-income workers, too, may need higher replacement ratios to maintain their preretirement standard of living, especially if their retirement plans include substantial spending on recreation and leisure activities. For some households, a replacement ratio of 65 percent may be adequate, while others may require a replacement ratio of 90 percent or more to maintain their desired standard of living. Of course, before one can evaluate the adequacy of any income replacement ratio, it is essential to know which sources of retirement income and preretirement income—the numerator and denominator of the ratio, respectively—will be used to construct the ratio.

Although the income replacement ratio is a relatively simple concept, it can be difficult to construct. For example, because hours of work and total annual earnings can change from year to year, the preretirement income component ideally should reflect average annual income over several years. Financial planners typically focus on the replacement ratio for an individual client, but economists are more interested in the range of replacement ratios across the population and in the mean or median values that indicate the typical replacement ratio among retirees.

Estimating the mean or median income replacement ratio among current retirees requires collecting income data for a representative sample of individuals over a period long enough to approximate their typical preretirement and retirement incomes. Income data from the Health and Retirement Study (HRS) meet those requirements. The HRS is conducted among a representative sample of Americans aged 51 or older, and it collects comprehensive income data from survey participants every 2 years.

This article estimates income replacement ratios for members of the original sample cohort of the HRS, who were born between 1931 and 1941. The members of the original HRS cohort were first interviewed in 1992. The data analyzed for this article are from HRS interviews through the ninth wave of the survey, which was fielded in 2008. Replacement ratios are shown for all HRS respondents who worked full-time (or worked part-time and were not retired) in three consecutive waves of the survey, and whose retirement income was observed in at least one subsequent wave of the survey.[2] Before presenting estimated replacement ratios for retirees in the HRS, the article describes some of the most important issues that arise when calculating a ratio. After discussing these theoretical and practical considerations, replacement ratios are calculated using four alternative measures of retirement income:

1. Household income;
2. Shared household income;
3. Shared household income plus the potential income from using 80 percent of nonhousing financial assets to purchase an annuity; and
4. Shared household income plus the potential income from using 80 percent of all financial assets (including home equity) to purchase an annuity.

Replacement ratios based on shared household income are then analyzed by retiree birth cohort, age at retirement, and preretirement income quartile. A regression analysis then examines the effects of selected demographic and economic variables. The article concludes with a summary of findings and a brief discussion of policy issues.

Constructing an Income Replacement Ratio

Thirty years ago, Alan Fox of the Social Security Administration (SSA) noted that "at first glance, the concept of an earnings replacement rate is simple: it is the ratio of retirement benefits to preretirement earnings. This change approximates the change in living standards at retirement, since for most persons earnings are the primary source of preretirement income, while pension benefits are the primary income source after retirement" (Fox 1982). Constructing an income replacement ratio, however, raises a number of questions. As Fox stated, "debate can arise over virtually every aspect of the replacement rate calculation." For example:

- Which years of income should be included in the denominator?
- Should preretirement income be in nominal dollars, or be price-indexed or wage-indexed to a particular year?
- Should preretirement and retirement income be measured before or after taxes?

Earnings are the largest source of preretirement income for most people. For some purposes, a replacement ratio might include only preretirement earnings in the denominator and pensions and Social Security benefits in the numerator. An *earnings* replacement ratio such as this is especially useful for assessing the adequacy of income from pensions and Social Security and for illustrating any shortfall that must be filled by savings or other sources of retirement income. Nevertheless, many households have multiple sources of income before and after retirement. Some people work part-time for several years after they retire from full-time employment; for them, earnings continue to be an important source of income. To include only earnings in the denominator of the replacement ratio and only pensions and Social Security benefits in the numerator would give an incomplete picture of the change in total income that follows retirement. In order to provide a comprehensive view of how income changes after retirement, the replacement ratios constructed for this article include all sources of income both before and after retirement, as reported in the HRS.

The Denominator: Preretirement Income

The analyst's judgment and the goal of his or her research play a large role in determining which sources of preretirement income to include in the replacement ratio, and for what period to measure that income. Because this article aims to estimate total income in retirement as a ratio of total income before retirement, all sources of preretirement income are included in the denominator. Nevertheless, because earnings are the largest source of preretirement income for most workers, it is especially important for the replacement ratio to represent a worker's preretirement earnings accurately.

Earnings in the final year of work may not reflect typical earnings because many people cut back on hours of work just before retirement.[3] Like final-year earnings, peak-year earnings may not be representative of a worker's preretirement earnings. For many families, annual earnings peak in the same years that they are paying for their children's college education, boosting their savings rate to prepare for retirement, or both. If workers save a substantial amount of their peak earnings or spend it on their children, peak-year earnings may overstate the income they will need in retirement to maintain their accustomed standard of living.[4]

An annual average of earnings over several years before retirement, rather than final-year earnings, peak-year earnings, or earnings in any single year may be most representative of preretirement earnings. To calculate Social Security replacement ratios for newly retired workers, Grad (1990) averaged workers' earnings over the 5 years prior to claiming Social Security benefits. Scholz and Seshadri (2009), using data from the HRS, included the average of earnings and other income in the ninth through fifth years preceding retirement in the denominator of their income replacement ratio.

Every 2 years, HRS respondents are surveyed about their income in the calendar year preceding the interview. In this article, the preretirement income in the denominator of the replacement ratio is the average of total annual individual or shared couple income in the three waves before retirement. Whether respondents are identified as retired depends on their answers to several questions about their labor force participation. Workers with wage, salary, or self-employment income are classified as retired if they were not working full-time and reported that they considered themselves fully or partly retired.

Indexed or Nominal Income?

One can measure preretirement income in nominal dollars or index it to a particular year, such as the year for which retirement income is counted. Economists often use a price index so that incomes from different years reflect relative purchasing power. Alternatively, some analysts index past earnings to the present using a wage index.[5] For example, Social Security bases retired-worker benefits on the worker's earnings through age 60 indexed to national average wages (earnings after age 60 are counted in nominal dollars). For purposes other than calculating Social Security benefits, however, past earnings are more commonly indexed to prices.[6,7] This article indexes income to 2007 dollars using the Consumer Price Index for all Urban Consumers (CPI-U).

Pretax or After-tax Income?

Analysts also question whether preretirement and retirement income should be measured before or after income taxes have been subtracted. After-tax income may be the more appropriate measure because that is the amount actually available for consumption. Average tax rates usually are lower after retirement, both because income typically is lower and because Social Security and some pensions are taxed at lower rates than are wages and salaries. Therefore, a replacement ratio computed on after-tax income will be higher than one based on pretax income. Smith (2003) estimated that for a median-income household, a replacement ratio computed on after-tax income would be about 20 percent higher than one computed on pretax income. He also noted, however, that data on after-tax income are not widely available. Most household surveys inquire about income before taxes, so studies of income replacement ratios usually measure pretax income.[8] The replacement ratios estimated for this article are based on the pretax incomes that respondents reported in the HRS.

When Does Retirement Begin?

Constructing an income replacement ratio requires the analyst to determine when a person has retired. This can be difficult, because paid employment does not always end as soon as retirement begins. Munnell and Soto (2005a) observe that because many people who leave full-time employment continue to work part-time for several years before permanently retiring from paid employment, "it is often impossible to define precisely the work/retirement divide."

Because of the difficulty of determining the exact point when retirement begins, some analysts have defined retirement as beginning in the year that an individual first receives Social Security benefits. Others have calculated replacement ratios for subjects at age 67 or 70, by which time most people have retired.[9] This article defines work and retirement according to a methodology developed by the analysts who produced public-use files containing HRS data. The variable that summarizes an HRS respondent's labor force status is described in the methods section of the article.

The Numerator: Retirement Income

Depending on the specific research objectives, the replacement ratio's retirement income component might be limited to pensions and Social Security, or it might be a more comprehensive measure. In this article, both the numerator and the denominator of the replacement ratio represent total household income, as reported in the HRS. This broad definition presents the most complete picture of the change in income that occurs when a worker retires. Retirement income is observed for each wave (through wave 9) in which a respondent was classified as retired in the HRS. Estimating replacement ratios for successive waves of the survey revealed how the ratios changed as the retirement period elapsed. One key finding is that replacement ratios tend to fall in the first several years of retirement. Therefore, replacement ratios observed shortly after retirement might not indicate retirees' longer-term income security.

Previous Research

Over the past 30 years, many economists have studied income replacement ratios using both administrative data and household surveys.[10] A number of studies have estimated the proportion of preretirement income replaced by Social Security benefits (Fox 1979, 1982; Grad 1990; Mitchell and Phillips 2006; Biggs and Springstead 2008). Some analysts have calculated replacement ratios based on both Social Security benefits and pension income (Fox 1982; Grad 1990). A few studies have estimated total income replacement ratios; those ratios attempt to account for all sources of income before and after retirement. However, comparing replacement ratios across studies, even conceptually similar ratios, is difficult because of differences in data and methods.

Estimates of Total Income Replacement Ratios

Butrica, Smith, and Iams (2012) estimated amounts and sources of income at age 67 using the SSA's Modeling Income in the Near Term (MINT) model, which matches Social Security earnings records to results of the Census Bureau's Survey of Income and Program Participation. The authors calculated two replacement ratios based on earnings from ages 22 through 67, with couples sharing earnings in the years they were married. For the first ratio, shared earnings were wage-indexed to age 67; for the second ratio, shared earnings were price-indexed to age 67. For wage-indexed earnings, the authors estimated that the median replacement ratio at age 67 would fall from 95 percent for persons born 1926–1935 to 84 percent for those born 1966–1975. For price-indexed earnings, they estimated that median replacement ratios at age 67 would be nearly the same for the 1926–1935 birth cohort (109 percent) and the 1966–1975 birth cohort (110 percent).

Biggs and Springstead (2008) used MINT data to estimate replacement ratios for individuals aged 64–66 in 2005. Using wage-indexed career-average earnings, they estimated a median total income replacement ratio of 106 percent.

Smith (2003) used data from both the Current Population Survey and the Panel Study of Income Dynamics to estimate total income replacement ratios over the period 1977–1999. He estimated that the average pretax income replacement ratio at age 70 fell from 67 percent in 1977 to 60 percent in 1981 before steadily increasing to 74 percent in 1999. He also estimated that after-tax replacement ratios would be about 20 percent higher than pretax replacement ratios for an average earner.

Munnell and Soto (2005a) used HRS data to estimate replacement ratios based on all sources of income, including imputed rent for homeowners. They found that using a comprehensive measure of income both before and after retirement resulted in average replacement ratios of career-average earnings of 79 percent for couples and 89 percent for single persons. Among those without pensions, replacement ratios were 62 percent for couples and 63 percent for singles. Replacement ratios based on the highest 5 years of earnings among the last 10 years were about 15 percentage points lower than were those based on career average earnings.

Total Household Income and Shared Household Income

People aging into their late 50s and beyond are likely to experience certain events that could reduce household income. Two such events are retirement—of either the worker or his or her spouse—and the spouse's death. As Smith (2003) observed, "the most salient demographic change between preretirement and postretirement years is changing marital status—largely a consequence of increasing mortality rates with age." Household income also tends to decline as individuals age because they eventually leave the workforce. Many retirees continue to work part-time for a few years, but almost all eventually completely retire from paid employment. In addition, some time after retiring, many people begin to spend the savings that provided them with interest or dividend income. All of those factors—mortality among household members, departure from paid employment, and reduction in income-producing assets—can cause household income to fall. On the other hand, the total income available to the surviving member of a married couple may be more than one-half of the amount that the couple received when both spouses were alive. The shared income of a married couple—their total income divided by two—will often decline by a smaller percentage than total household income upon the death of a spouse. Thus, shared income better approximates the income available to each household member than total income (Getzen 2010). For that reason, after Table 1 presents comparative replacement ratios for both total household income and shared income, subsequent tables focus solely on shared income.

Can Home Equity Provide Retirement Income?

Homeowners who have paid off their mortgages, and thus own their homes outright, benefit from in-kind income in the form of imputed rent—the amount they would have to pay in rent or mortgage payments if they did not own their homes. Some economists have argued that measures of retirement income should include the value of imputed rent realized by homeowners (Munnell and Soto 2005c). If one counts imputed rent as income, it should be included in both the numerator and the denominator of the replacement ratio because homeowners realize imputed rent both before and after retirement.

Estimated values of imputed rent are "very sensitive to the assumption about the rate of appreciation in home prices and rents and the [interest] rate used to discount future rents back to the present" (Munnell and Soto 2005a). That sensitivity is problematic because the period studied in this article included a substantial runup in home prices from the late 1990s through 2006, followed by an unprecedented crash in home prices over the next 2 years.[11] In addition, this period saw long-term interest rates fall to their lowest levels since the 1950s, a condition that may not be sustained if large federal budget deficits eventually begin to exert upward pressure.[12] Consequently, estimates of imputed rent based on recent experience would be highly uncertain. For those reasons, the replacement ratios calculated for this article omit imputed rent.

Homeowners also have the option to convert equity in their homes to income through a reverse mortgage or by selling their homes and using the proceeds to purchase annuities. To date, however, reverse mortgages remain relatively uncommon among retirees, and most retired homeowners remain in their homes rather than "downsizing" to an apartment, at least until advanced age or the death of a spouse makes keeping a house too burdensome.[13] Nevertheless, home equity is an important *potential* source of retirement income. Homeowners who convert their equity into income could achieve higher replacement ratios than renters with the same cash income but no home equity. To illustrate the potential contribution of financial assets and home equity to retirement income, Table 1 includes replacement ratio estimates respectively assuming the use of 80 percent of nonhousing assets and 80 percent of all household assets (including home equity) to purchase an immediate annuity. As noted above, home prices were unusually volatile during 1998–2008, rising swiftly until 2006 and then dropping sharply. Therefore, the estimated replacement ratio effects of annuitizing financial assets including home equity should be interpreted cautiously.

Individual, Family, or Household Income?

Replacement ratio calculations can be based on individual income, family income, or household income. The HRS reports individual income for the respondent and his or her spouse. "Household income" in the HRS is the combined income of married couples, omitting the income of other household members. Panel A of Table 1 shows replacement ratios based on the HRS concept of household income, and panel B shows replacement ratios based on shared income, defined as one-half of the combined income of married couples while both spouses are alive. If the respondent's spouse dies during the year, all remaining household income is attributed to the respondent for that year. Replacement ratios are based on individual income for unmarried respondents and on shared income for couples because when a spouse dies, household income typically declines by less than half. Using total household income rather than shared income for married couples would tend to overstate the decline in the replacement ratio that occurs with the death of a spouse.[14]

Present Analysis

This article extends previous work on replacement ratios in several respects. First, it uses the most recent available HRS data to calculate replacement ratios for recent retiree cohorts. Second, it exploits the longitudinal design of the HRS to produce estimates of replacement ratios for as many as 5 of the first 10 years of retirement (multiple observations of retirement income reveal how replacement ratios change over time). Third, it estimates the replacement ratio effect of using financial assets and home equity to purchase annuities at the time of retirement. Finally, multivariate analysis examines how birth cohort, age when first classified as retired, year when first classified as retired, and relative position in the preretirement income distribution are related to first-year total income replacement ratios.

What is an Adequate Replacement Ratio?

Opinions vary on how high the replacement ratio must be to provide a retirement standard of living that compares with the preretirement level. Differing expectations about health care expenses, travel and leisure activities, housing arrangements, and financial support of family members may mean that two households with the same preretirement income will have different income requirements in retirement. Most analysts agree, however, that people "need less than their full preretirement income to maintain their standard of living once they stop working" (Munnell and Soto 2005a). There are at least three reasons why households need less income in retirement:

1. Income taxes are lower after retirement because income is typically lower, and because some sources of retirement income, such as Social Security benefits, are taxed at lower rates than earnings.
2. Retirees no longer need to save for retirement or, usually, for their children's education.
3. Work-related expenses are substantially reduced or eliminated altogether.

How much less income retirees need to maintain their standard of living will vary from household to household. Munnell and Soto (2005b) noted that "the range of studies that have examined this issue consistently find that middle class people need between 65 and 75 percent of their preretirement earnings to maintain their life style once they stop working." According to Scholz and Seshadri (2009), "typical advice suggests that replacement rates should be 70 to 85 percent of preretirement income."[15]

Lower-income households typically need higher replacement ratios than middle-income households because they spend a larger proportion of their incomes on necessities. Higher-income households, too, might need higher replacement ratios than middle-income households if they expect to spend substantial sums on recreation and leisure activities. For any given household, however, these generalizations may not hold.

The Data

This article analyzes data from the HRS, a nationally representative survey of Americans aged 51 or older, first fielded in 1992. The University of Michigan's Institute for Social Research developed the HRS with support from the National Institute on Aging and the SSA. Survey participants provide information about their employment, income, assets, pension plans, health insurance, disabilities, physical health, cognitive functioning, and health care expenditures. Respondents are interviewed every 2 years. This study uses data collected from the original HRS sample cohort, whose members were born in 1931–1941, in interviews from wave 1 (fielded in 1992) through wave 9 (2008). The original HRS sample includes 10,376 respondents, of whom 9,814 participated in the first wave of the survey in 1992.[16] Replacement ratios were estimated only for the 2,194 respondents who were observed to be working full-time, or were working part-time and not retired, in at least three consecutive waves of the HRS before the first wave in which they were classified as retired. Because the timing of retirement is crucial to this analysis, the terms "retired" and "retirement" refer specifically and exclusively to the period beginning with the first interview (or wave) in which a respondent is observed (or classified) as retired in the HRS.

In cooperation with the SSA and the National Institute on Aging, the RAND Corporation has produced public-use files that include much of the data collected through the HRS in a format that is easily accessible to researchers and policy analysts. This article is based on the author's analysis of data in the RAND HRS files.[17]

The HRS reports income individually for the respondent and his or her spouse and in total for married couples. In the HRS, household income comprises individual income only for unmarried respondents and the combined income of both spouses in married-couple households; any income of other household members is excluded. The HRS collects information on money income from almost all sources, including earnings; public and private pensions and annuities; unemployment benefits; workers' compensation; veteran's benefits; cash welfare benefits, such as Supplemental Security Income; Social Security benefits; business or farm income; self-employment income; dividends, interest, rent, royalties, and other asset income; alimony; lump sums from insurance, pensions, or inheritances; and income from annuities and regular withdrawals from individual retirement accounts. Income reported on the HRS also includes the cash value of benefits received through the Supplemental Nutrition Assistance Program, formerly the food stamp program. HRS income does not include transfers received from family or friends outside the household or realized capital gains from the sale of stocks, bonds, and other assets.

HRS respondents report income for the calendar year preceding the interview. All income values in this article are indexed to 2007 dollars based on the annual percentage change in the CPI-U. Observations have been weighted using HRS sample weights and are representative of the civilian noninstitutionalized population born in 1931–1941.

Methods

Because the analysis focuses on the change in total income at retirement, the sample was limited to respondents who made the transition from work to retirement after the HRS began. In the original HRS cohort, 5,365 respondents worked in at least one of the first eight waves and were retired in at least one later wave. Because an income replacement ratio should be based on a representative measure of preretirement income, ratios were estimated only for the 2,194 respondents who were observed to be working full-time, or working part-time and not retired, in at least three consecutive HRS waves before the first wave in which they were retired. For members of that sample, replacement ratios were estimated for each wave in which the respondent was retired. For a respondent who worked full-time or part-time in each of the first three waves and reported that he or she was retired in each later wave, retirement income was observed in up to five waves.[18] Respondents' labor force status in each wave was determined by the value of the variable RwLBRF in the RAND HRS data set. RAND derived this variable from respondents' replies to questions about paid employment, disability, and retirement status. In each wave, the respondent was classified as either:

1. working full-time,
2. working part-time,
3. unemployed,
4. partly retired,
5. retired,
6. disabled, or
7. not in the labor force.

In cases of an individual working for pay and also reporting being fully or partly retired, RAND used answers to multiple questions to classify the respondent's labor force status. According to the RAND HRS documentation,

> A respondent can give evidence of working, being retired, and disability alone or in combination with other statuses. RwLBRF attempts to pull information from several sources, and sort through the discrepancies. Working and retirement take precedence in its derivation. If the respondent is working full-time, RwLBRF is set to this status. If he/she is working part-time and mentions retirement, RwLBRF is set to partly retired. If there is no mention of retirement, RwLBRF is set to working part-time. If the respondent is not working but is looking for a full-time job, RwLBRF is set to unemployed. If he/she is looking for a part-time job and mentions retirement, RwLBRF is set to partly retired. If looking for a part-time job and there is no mention of retirement, RwLBRF is set to unemployed. If the respondent is not working and not looking and there is any mention of retirement, RwLBRF is set to retired. If retirement is not mentioned and a disabled employment status is given, RwLBRF is set to disabled. Otherwise, RwLBRF is set to "not in the labor force" (St. Clair and others 2010, 965).[19]

As noted earlier, replacement ratios were estimated only for respondents who were observed to be working full-time, or working part-time and not retired, in at least three consecutive waves before the first wave in which they were retired. Retirement income was observed in up to five waves for 2,194 HRS respondents, yielding 6,599 observations of annual retirement income, or an average of 3.0 observations per respondent.[20]

For this analysis, preretirement income consists of income observed from all sources in the last three HRS waves in which the respondent worked full-time or worked part-time and was not retired. Because the survey took place every 2 years, these observations in most cases represent 3 of the last 6 years of preretirement income. For example, for a respondent who was employed full-time in the first three HRS waves (1992, 1994, and 1996) and retired in the fourth wave (1998), preretirement income is the average of the respondent's income in 1991, 1993, and 1995 because the HRS asks about income in the year preceding the interview. In some cases, the income reported in the respondent's first wave as a retiree included income from the last year of full-time employment. For instance, if a respondent reported working full-time in wave 4 (1998) and was retired in wave 5 (2000), the income reported in wave 5 (for 1999) could have been from a full year of full-time employment, a partial year of full-time employment followed by retirement, or a full year of retirement. For that reason, 1999 was not counted as a retirement year—and no replacement ratio was calculated—if the respondent reported that he or she worked that year. Instead, to reduce the likelihood of counting income from the last year of full-time work as retirement income during the respondent's first retirement wave, that worker's replacement ratio calculations began with HRS wave 6. Ratios were then estimated for all later waves in which that respondent continued to be retired.

In each interview, HRS respondents report their current labor force status and their income in the year before the interview. A respondent who was not retired in wave *N* and who was retired in wave *N+1* may or may not have been retired in the year between the two waves. Thus, the year of the wave *N+1* interview could have been the respondent's first or second year of retirement. Therefore, in the tables, years of retirement are labeled as "first or second year," "third or fourth year," and so on.

Results

Table 1 shows income replacement ratios at the 75th, 50th (median), and 25th percentiles for members of the original HRS cohort who worked in at least three consecutive waves and were retired in at least one subsequent wave. In panel A, the numerator of the replacement ratio is real total household income in a

Table 1.
Replacement ratios by percentile and year in retirement: Four measures of retirement income

Percentile	First or second year	Third or fourth year	Fifth or sixth year	Seventh or eighth year	Ninth or tenth year
			Panel A: Total household income		
75th	1.013	0.884	0.839	0.789	0.787
Median	0.733	0.635	0.599	0.555	0.537
25th	0.480	0.424	0.401	0.402	0.393
			Panel B: Shared household income		
75th	1.033	0.895	0.855	0.807	0.807
Median	0.735	0.646	0.607	0.580	0.576
25th	0.485	0.433	0.414	0.413	0.408
			Panel C: Shared household income plus annuitized value of nonhousing assets		
75th	1.288	1.155	1.117	1.053	1.052
Median	0.900	0.799	0.774	0.754	0.738
25th	0.610	0.569	0.552	0.545	0.547
			Panel D: Shared household income plus annuitized value of all assets		
75th	1.413	1.281	1.255	1.193	1.207
Median	0.997	0.890	0.869	0.820	0.829
25th	0.679	0.631	0.622	0.627	0.605

SOURCE: Author's calculations using HRS.

NOTE: Ratios are based on CPI-U 2007 dollars.

given year of retirement, and the denominator is the average of preretirement total household income in the three HRS waves before the respondent's first wave of retirement. In panels B, C, and D, the numerator and denominator reflect individual income for unmarried respondents and shared income for married respondents. The replacement ratio in panel C indicates the retirement income effect of using 80 percent of the respondent's household financial assets (excluding home equity) to purchase an annuity. Panel D shows the retirement income effect of using 80 percent of all of the respondent's household financial assets, including home equity, to purchase an annuity.

Panel A shows that the median replacement ratio for total income in the first or second year of retirement was 0.733. One-fourth of households had replacement ratios of 1.013 or higher and one-fourth had replacement ratios of 0.480 or less. Panel A also illustrates how replacement ratios fell over time, especially during the first 7 to 8 years of retirement. The median replacement ratio fell to 0.635 in the third or fourth year of retirement, to 0.599 in the fifth or sixth year, and to 0.555 in the seventh or eighth year. The sharp decline from 0.733 to 0.555 over the first four 2-year intervals of retirement may reflect conditions that are more likely to occur in the earlier years of retirement than in later years. Such conditions could include receipt of lump-sum pension settlements upon retirement, working part-time or working more hours part-time in the first few years of retirement, and the timing of a spouse's retirement relative to the respondent's date of retirement. It is also possible that income from the last year of full-time employment is mistakenly attributed to income in the first wave of retirement in some cases, despite the methodological precaution mentioned earlier.

Results for panel B, in which income of unmarried people is attributed solely to the individual respondent but the income of married respondents is one-half of the couple's income, are similar to those in panel A. Panel B's slightly higher median values in years seven and eight and years nine and ten of retirement do not differ significantly from those in panel A. One reason that replacement ratios for shared income resemble those for total household income even after several years of retirement is that, although household income usually falls after the death of a spouse, it typically falls by less than one-half.

Panel C shows that income replacement ratios (based on shared income for married respondents) would increase if the respondent used 80 percent of the household's nonhousing assets to purchase an immediate income annuity upon retirement. Single respondents were assumed to purchase a level, single-life annuity and married respondents were assumed to purchase a level, joint and survivor annuity with a 100-percent survivor benefit.[21] Because assets used to purchase annuities would no longer generate interest and dividends, the increase in income generated by using 80 percent of nonfinancial assets to buy an annuity was offset in part by a proportional reduction in interest and dividend income. If all of the households in this sample had used 80 percent of their nonhousing assets to purchase income annuities, their median replacement ratios would have been about 15 to 17 percentage points higher, on average, than those in panel B over the first 10 years of retirement.

Home equity is another potential source of retirement income for the four-fifths of US householders aged 65 or older who own their homes (Census Bureau 2012a, Table 15). For many, the equity in their homes is the most valuable asset that they own.[22] Panel D shows the replacement ratio effect of using 80 percent of home equity in addition to 80 percent of household nonhousing assets to purchase immediate annuities. Doing so would raise median replacement ratios over each of the first five HRS waves of retirement to levels about 24 to 26 percentage points higher than those in panel B. Nevertheless, pretax income replacement ratios at the 25th percentile, even using 80 percent of all assets (including home equity) to purchase annuities, would range from just 60 percent to 68 percent.

Most of the median replacement ratios in panels A and B of Table 1 are lower than the minimum ratio of 70 percent that financial planners often recommend. As noted earlier, however, these replacement ratios are based on pretax income. Smith (2003) estimated that for a median-income household, replacement ratios calculated on after-tax income would be about 20 percent higher than ratios based on pretax income. Applying that estimate to panel B would raise the median ratios from 0.735 to 0.882 in the first or second year of retirement and from 0.537 to 0.691 in the ninth or tenth year of retirement.

In both panels A and B, replacement ratios at the 75th percentile exceeded 100 percent in the first or second year of retirement, but fell by 15 to 16 percentage points by the fifth or sixth year of retirement. On an after-tax basis, however, even the lowest replacement ratio at the 75th percentile in panel A (0.787 in the ninth or tenth year of retirement) would be equivalent to a replacement ratio of 0.944. On the other hand, at the 25th percentile, the average replacement ratios over the observed years of retirement in panels A and B ranged from 0.393 to 0.485. Even after adjusting for taxes, those ratios ranged only from 0.472 to 0.582. Thus, at least one-quarter of retirees had real after-tax income in retirement that was less than 60 percent of their average income in the last several years of full-time work.

Replacement Ratios by Birth Cohort

Because of differences in lifetime earnings, replacement ratios might differ by birth cohort. Table 2 shows replacement ratios separately for HRS respondents born in the 6 years from 1931 through 1936 and those born in the 5 years from 1937 through 1941. The earlier cohort would have entered the labor force mainly in the early to mid-1950s, while most of the later cohort would have entered the labor force in the late 1950s and early 1960s. Both groups would have experienced the rapid growth in incomes of the 1960s and the "stagflation" era of the 1970s during the first half of their careers. However, members of the earlier cohort reached retirement age during 1993–2001—boom years for the economy and the stock market—and members of the later cohort did so during 1999–2006.[23] The latter period included the peak of the "tech bubble" on Wall Street and the decline in stock market values and slower growth in household incomes that followed the collapse of tech stocks. Income replacement ratios for these cohorts might differ because of the differing economic conditions when each group reached retirement age.

Median replacement ratios for retirees born 1931–1936 were higher than those of the 1937–1941 cohort. The difference—about 3 percentage points over the first 10 years of retirement, on average—is not statistically significant. At the 75th percentile, replacement ratios of the earlier cohort ranged from 1.052 in the first or second year of retirement to 0.830 in the ninth or tenth year of retirement. Among the later cohort, replacement ratios at the 75th percentile ranged from 1.019 in the first or second year of retirement to 0.800 in the ninth or tenth year of retirement. At the 25th percentile, replacement ratios for the earlier cohort ranged from a high of 0.508 to a low of 0.407, while for the later cohort they ranged from a high of 0.477 to a low of 0.387.

One of the conditions for selecting the study sample was that a respondent's preretirement income had to be observed in at least three waves, meaning that wave 4, fielded in 1998, would be the earliest in which retirement data could be collected. The youngest age at which the oldest members of the 1931–1936 birth cohort could meet this requirement is 67, and the youngest age at which the youngest members of the 1937–1941 birth cohort could meet it is 57. The slightly lower replacement ratios observed for the 1937–1941 birth cohorts in some cells of Table 2 could be due in part to the age differences brought about by this sample selection process. Respondents in the 1931–1936 birth cohort who retired in their late 50s or early 60s were more likely to be excluded from the sample than respondents in the 1937–1941 cohorts who retired at those relatively young ages.

Replacement Ratios by Age When First Classified as Retired

Age at retirement affects eligibility and benefit amounts for both Social Security and pensions. Although Social Security retired-worker benefits are first available at age 62, benefits claimed before reaching full retirement age are paid at a permanently reduced rate. Many

Table 2.
Replacement ratios by birth cohort and year in retirement

Cohort and percentile	First or second year	Third or fourth year	Fifth or sixth year	Seventh or eighth year	Ninth or tenth year
Born 1931–1936					
75th	1.052	0.928	0.869	0.842	0.830
Median	0.755	0.670	0.613	0.600	0.577
25th	0.508	0.450	0.440	0.419	0.407
Born 1937–1941					
75th	1.019	0.864	0.849	0.754	0.800
Median	0.716	0.622	0.601	0.551	0.574
25th	0.477	0.423	0.387	0.403	0.422

SOURCE: Author's calculations using HRS.

NOTE: Ratios are based on shared income in CPI-U 2007 dollars.

public- and private-sector defined benefit pensions allow early retirement, typically beginning at age 55, although in most cases early retirement triggers an actuarial reduction in benefits.[24] Age at retirement therefore might affect retirement income and replacement ratios. Table 3 shows replacement ratios for respondents according to their age in the first HRS wave in which they were classified as retired. The median replacement ratio in the first or second year of retirement for those who retired before reaching age 62 was 71 percent. In later years of retirement, replacement ratios for those who retired before age 62 ranged from 53 percent to 57 percent. Among those who retired at ages 62 to 64, the median replacement ratio was 74 percent in the first or second year of retirement, 68 percent in the third or fourth year, and between 59 percent and 62 percent in the fifth through tenth years. The median replacement ratios of those who retired at ages 62 to 64 differed little from those who were aged 65 or older, and no variances were statistically significant. This may be because higher-income workers, on average, retire at later ages and have lower replacement ratios than lower-income workers, as discussed in the next section.

Replacement Ratios by Preretirement Income Quartile

Higher-income workers generally have lower income replacement ratios in retirement than middle-income and lower-income workers, in part because of Social Security's progressive benefit formula. Social Security benefits replace a larger percentage of earnings for lower-wage workers, who are less likely to have a pension plan. Although higher-income workers are more likely to have retirement income from sources besides Social Security, their income from these sources is often relatively modest.

Table 4 shows replacement ratios according to the respondent's preretirement household income quartile. Quartiles were determined by averaging household income in the first three preretirement waves for all members in the final sample, then ranking respondents according to their position relative to the average income of all members of the sample. In the first three waves of the HRS, 98 percent of the respondents in the final study sample were working full-time, or were working part-time and were not retired. The remainder were unemployed or temporarily not in the labor force. None were retired in any of the first three HRS waves.

Table 4 shows that in the first or second year of retirement, median replacement ratios differed little by preretirement income quartile. In later years, however, the median replacement ratios in the highest preretirement income quartile were lower than the median replacement ratios in the lowest three quartiles. Comparing the highest and lowest income quartiles, for example, the median replacement ratio in the highest quartile ranged from 59 percent in the third or fourth year of retirement to 51 percent in the ninth or tenth year. In the lowest quartile, the median replacement

Table 3.
Replacement ratios by age at retirement and year in retirement

Age at retirement [a] and percentile	First or second year	Third or fourth year	Fifth or sixth year	Seventh or eighth year	Ninth or tenth year
Younger than 62					
75th	1.006	0.824	0.800	0.754	0.791
Median	0.713	0.554	0.574	0.531	0.548
25th	0.449	0.362	0.372	0.394	0.382
62–64					
75th	0.999	0.911	0.849	0.807	0.807
Median	0.736	0.682	0.615	0.590	0.598
25th	0.488	0.469	0.402	0.445	0.444
65 or older					
75th	1.072	0.899	0.889	0.843	0.862
Median	0.738	0.645	0.628	0.599	0.553
25th	0.493	0.451	0.440	0.414	0.391

SOURCE: Author's calculations using HRS.

NOTE: Ratios are based on shared income in CPI-U 2007 dollars.

a. Respondent's age in the first wave of the HRS in which he or she was observed as being retired. Retirement usually has commenced before the interview date; thus, actual age at retirement is younger in most cases.

ratio ranged from 70 percent in the third or fourth year of retirement to 60 percent in the ninth or tenth year. Differences in median replacement ratios across the lower three quartiles, however, were relatively small, and most were not statistically significant.

The effect of Social Security's progressive benefit formula can be seen in Table 5, which shows the median share of income received from Social Security by retirees in the HRS according to preretirement income quartile. Among the 2,194 members of the sample—including those not receiving Social Security—the median share of income from Social Security in the first or second year of retirement was 23.1 percent. The proportion of total income received from Social Security was lowest for those with preretirement income in the highest income quartile and was highest for those whose preretirement income was in the lowest income quartile. Among those in the highest preretirement income quartile, the median share of income received from Social Security in the first or second year of retirement was only 7.7 percent. Among those in the lowest preretirement income quartile, however, the median share of income received from Social Security in the first or second year of retirement was 44.0 percent. The proportion of household income received from Social Security by HRS respondents whose preretirement income was in the lowest quartile rose substantially in later years of retirement. That

Table 4.
Replacement ratios by preretirement household income quartile and year in retirement

Preretirement income quartile and percentile within quartile	First or second year	Third or fourth year	Fifth or sixth year	Seventh or eighth year	Ninth or tenth year
Fourth (highest) quartile					
75th	1.033	0.854	0.759	0.724	0.800
Median	0.718	0.593	0.524	0.502	0.506
25th	0.478	0.361	0.325	0.338	0.306
Third quartile					
75th	1.001	0.889	0.869	0.789	0.823
Median	0.751	0.664	0.631	0.546	0.610
25th	0.523	0.467	0.451	0.431	0.444
Second quartile					
75th	1.042	0.915	0.855	0.872	0.786
Median	0.730	0.653	0.621	0.631	0.598
25th	0.467	0.462	0.460	0.462	0.464
First quartile					
75th	1.084	0.963	0.957	0.956	0.907
Median	0.738	0.695	0.672	0.687	0.601
25th	0.471	0.490	0.493	0.482	0.458

SOURCE: Author's calculations using HRS.

NOTE: Ratios are based on shared income in CPI-U 2007 dollars.

Table 5.
Median share of household retirement income from Social Security by preretirement income quartile and year in retirement

Preretirement income quartile	First or second year	Third or fourth year	Fifth or sixth year	Seventh or eighth year	Ninth or tenth year
Fourth (highest) quartile	0.077	0.211	0.289	0.288	0.333
Third quartile	0.211	0.365	0.403	0.439	0.422
Second quartile	0.306	0.483	0.526	0.530	0.591
First quartile	0.440	0.663	0.709	0.720	0.778
All respondents	0.231	0.406	0.449	0.480	0.484

SOURCE: Author's calculations using HRS.

NOTE: Ratios are based on shared income in CPI-U 2007 dollars.

reflects the diminishing share of income from earnings as retirees gradually leave part-time jobs and rely more heavily on Social Security benefits.

Multivariate Analysis

This section presents the results of a regression analysis that controls for the effects of the characteristics shown in Tables 2 through 4 and for several other demographic and economic variables. Among the sample of retirees from the HRS, the median replacement ratio for shared income in the first observed year of retirement income was 0.735 (Table 1, panel B). A logistic regression tests the effects of a range of variables on the probability that a respondent's income replacement ratio in the first wave of retirement exceeds the sample's median ratio. The value of the dependent variable is equal to 1 if the respondent's replacement ratio exceeds the sample median of 0.735 and 0 otherwise.

The independent variables in the regression include the respondent's birth cohort, age when first classified as retired, and the calendar year of the HRS wave when the respondent was first classified as retired. The regression therefore controls for the effects of birth cohort, retirement age, and retirement year on replacement ratios. The regression also includes other economic and demographic independent variables, described later. Table 6 presents complete results of the regression.

Table 6.
Logistic regression on median replacement ratio

Independent variable	Marginal effect	Standard error
Birth cohort = 1931–1936 (omitted)		
Birth cohort = 1937–1941	-0.0365	0.0071
Retired before age 62 (omitted)		
Retired at age 62 to 64	0.0330	0.0064
Retired at 65 or older	0.0930**	0.0180
First year of retirement = 1998, wave 4 (omitted)		
First year of retirement = 2000, wave 5	-0.0030	0.0006
First year of retirement = 2002, wave 6	-0.0110	0.0021
First year of retirement = 2004, wave 7	0.0529	0.0102
First year of retirement = 2006, wave 8	0.0945**	0.0183
First year of retirement = 2008, wave 9	0.0351	0.0068
Male	-0.0150	0.0029
Married at retirement	0.0856*	0.0166
White, Non-Hispanic	0.0209	0.0040
High school or less (omitted)		
Some college	0.0021	0.0004
College graduate	0.0321	0.0062
Fourth preretirement income quartile (omitted)		
Third preretirement income quartile	0.0761*	0.0147
Second preretirement income quartile	0.1259*	0.0244
First (lowest) preretirement income quartile	0.2083*	0.0403
Ratio of Social Security to household income	-0.2625*	0.0508
Household had earned income in retirement	0.2413*	0.0467
Household had pension income in retirement	0.1042*	0.0201

SOURCE: Author's calculations.

NOTES: The marginal effect shows the change in the probability based on a one-unit change a given variable, assuming that all other independent variables are held constant at their mean values.

Dependent variable is income replacement ratio in first year of observed retirement income > 0.735.

Observations = 2,194; observations with replacement ratio > 0.735 = 1,097 (50%).

Log Likelihood: -1,320; R^2 = .1675; maximum rescaled R^2 = 0.2233.

Association of predicted probabilities and observed responses: concordant = 73.8%, discordant = 25.9%, tied = 0.2%.

* = statistically significant at the 0.01 level.

** = statistically significant at the 0.05 level.

Table 2 showed that the median first-year replacement ratio for respondents born from 1937 to 1941 (0.716) was about four percentage points lower than the first-year replacement ratio for those who were born from 1931 to 1936 (0.755).[25] In the logit model, the relationship between birth cohort and the likelihood that the respondent's first-year income replacement ratio was greater than the median is not statistically significant.

Table 3 showed that the median first-year replacement ratios for individuals aged 62–64 and 65 or older in their first wave of retirement (0.736 and 0.738, respectively) were slightly higher than those for respondents aged younger than 62 (0.713). The regression estimates in Table 6 show that the first-year replacement ratio for a respondent aged 65 or older in the first wave of retirement was significantly more likely (by 9.3 percentage points) to exceed the median of 0.735 than that of a respondent who retired before age 62. In other words, all else being equal, those who retired at 65 or older had higher income replacement ratios than those who retired before age 62.

Table 4 showed that retirees with preretirement income in the highest income quartile had a lower median first-year replacement ratio than those in the lower three quartiles. The regression results show that, when controlling for the other variables, retirees with preretirement income in the lower three quartiles were more likely to have a first-year income replacement ratio that exceeded the full-sample median ratio than were those in the highest quartile. Compared with an HRS respondent with preretirement income in the highest (fourth) quartile, one in the third quartile was 7.6 percentage points more likely to have a first-year income replacement ratio greater than 0.735. For those in the second and the first income quartiles, the probabilities of having first-year replacement ratios above the median were 12.6 and 20.8 percentage points higher, respectively, than that of a respondent in the top quartile.

The regression included dummy variables indicating the HRS wave in which the individual was first classified as retired. In order to observe at least 3 years of preretirement income, wave 4 (fielded in 1998) was the first in which any members of the sample were observed as retired. Compared with respondents who retired in wave 4 (the omitted category in the regression), only those who retired in wave 8 (fielded in 2006) had a significantly different probability (9.4 percentage points more likely) of having a first-year replacement ratio above the full-sample median.

The model also included three economic and four demographic independent variables. The economic variables were dummies indicating whether the individual had earned income in the first or second year of retirement, whether he or she had pension income, and whether Social Security's share of his or her household income exceeded the full-sample median proportion.

As expected, respondents with earned income in retirement had higher replacement ratios than those without. Those who had wage, salary, or business income were 24.1 percentage points more likely than those with no earnings to have a first-year income replacement ratio above the median. Also as expected, when controlling for other variables, respondents who had income from a pension were more likely (by 10.4 percentage points) than those with no pension to have a replacement ratio greater than 0.735.

Among members of the full sample, the median share of first-year retirement income provided by Social Security benefits was 23.1 percent. Respondents who received more than 23.1 percent of income from Social Security were 26.2 percentage points less likely to have a first-year income replacement ratio above the median ratio of 0.735. For career-long low-wage workers, Social Security replaces about 55 percent of career-average earnings, and earnings represent the great majority of their preretirement income. Retirees who receive a relatively large share of household income from Social Security typically have few other sources of income, and with other things being equal, they are less likely to have an income replacement ratio above the median.

The model's other demographic variables included the respondent's sex, race and ethnicity, marital status at retirement, and education. Of these variables, only the respondent's marital status in the first retirement wave proved to be statistically significant. Compared with single, divorced, or widowed respondents, those who were married in their first retirement wave were 8.6 percentage points more likely to have had a first-year income replacement ratio that exceeded the 0.735 median.

Summary and Discussion

Understanding the change in income after retirement is important to policymakers because if Social Security, pensions, and savings do not provide adequate retirement income, the health and well-being of the elderly population could be at risk. In addition, retired people who cannot support themselves financially might have few options other than to accept financial assistance from their adult children or to apply for means-tested government benefits. The latter would further strain a federal budget already in deficit.

One widely used measure of retirement income adequacy is the replacement ratio, which expresses retirement income as a percentage of preretirement income. Estimating income replacement ratios for recent retirees requires income data that cover a number of years to provide a representative sample. Because the HRS is a nationally representative longitudinal survey of older Americans and measures numerous sources of income over many years, data from this survey can be used to estimate income replacement ratios in retirement.

This study looked at income replacement ratios among the original cohort of HRS participants, all of whom were born between 1931 and 1941. Replacement ratios were estimated for HRS respondents who worked during at least three consecutive waves of the survey and were retired in one or more subsequent waves through the ninth wave, which was fielded in 2008. Annual retirement income was observed in up to five waves of the survey for each of the 2,194 members of the sample. Based on individual income for unmarried respondents and shared income for married respondents, the median replacement ratio in the first or second year of retirement was 0.735. One-fourth of respondents had initial replacement ratios above 1.033, and one-fourth had replacement ratios that were less than 0.485 in their first retirement wave. The median replacement ratio fell to 0.646 in the second retirement wave and to 0.607 in the third.

The estimated replacement ratios presented here were based on pretax income. Because some forms of retirement income, such as Social Security, are less subject to income taxes than earnings, after-tax replacement ratios are usually higher than pretax replacement ratios. By one estimate, after-tax ratios would be about 20 percent higher than pretax ratios for a middle-income retiree.

For most people, the main sources of retirement income are pensions, Social Security, and, for younger retirees, earnings from part-time employment. More than one-half of persons aged 65 or older also own some financial assets and about four-fifths of older Americans are homeowners. Financial assets provide income in the form of interest and dividends and homeownership provides noncash income in the form of imputed rent. Financial assets and home equity could provide more income, and could raise income replacement ratios, if a greater proportion of those assets were used to purchase annuities.

Relatively few retirees use their financial assets to purchase annuities, and most homeowners continue to live in their homes until increasing frailty or the death of a spouse makes maintaining a house too difficult. Nevertheless, financial assets and home equity represent a substantial potential source of income to many retirees. If, upon retirement, the retirees in this sample had converted 80 percent of their nonhousing assets into immediate annuities, the income from these annuities would have raised the median first-year income replacement ratio from 0.735 to about 0.900. Annuitizing 80 percent of all assets including home equity would have raised the median first-year replacement ratio to almost 1.0, about 26 percentage points above the baseline median replacement ratio of 0.735.

A number of household and individual characteristics appear to influence income replacement ratios in retirement. Other things being equal, retirees in this sample were less likely to have a first-year replacement ratio above the median if they retired before age 62, or if their preretirement household income was in the top quartile. They also were less likely to have a first-year replacement ratio above the median if they received greater shares of their income from Social Security than the median share among the full sample. Those with earnings in retirement, with income from pensions, and who were married when they retired were more likely to have an income replacement ratio above the median than were those with no earnings, with no pensions, and who were unmarried at retirement, respectively.

The replacement ratios estimated for this study included only people who were members of the original HRS cohort, all of whom were born between 1931 and 1941. Members of later birth cohorts are likely to have different lifetime earnings profiles and will probably have somewhat different sources of income in retirement. For example, women born in the 1940s and 1950s had higher labor force participation rates than those who were born in the 1930s. Workers who were born after 1960 will be less likely to retire with a defined benefit pension than those who were born earlier. For those and other reasons, income replacement ratios of later birth cohorts will likely differ from those of the cohort analyzed here.

As the HRS continues to collect information from individuals who are making the transition from full-time work to retirement, analysts will be able to study trends in income replacement ratios and to further investigate the individual and household characteristics that appear to affect this and other measures of retirement income adequacy.

Appendix

Table A-1.
Characteristics of HRS original cohort members: Percentage distributions within three groupings

Characteristic	Full sample	Worked and later retired [a]	Study sample [b]
Birth cohort			
1931–1936	51.3	49.4	42.7
1937–1941	48.7	50.6	57.3
Sex			
Men	47.2	51.0	52.1
Women	52.8	49.0	47.9
Race/ethnicity			
White, not Hispanic	71.3	74.5	76.8
Black, not Hispanic	17.1	15.7	14.7
Hispanic	9.3	8.0	6.7
Other	2.3	1.9	1.9
Education			
College graduate	16.7	19.3	21.9
Some college	18.9	20.2	20.5
High school diploma or equivalent	37.7	38.4	38.5
No high school diploma	26.8	22.1	19.2
Marital status [c]			
Married	73.6	75.0	76.8
Divorced or separated	15.2	15.2	13.7
Widowed	6.5	5.8	5.6
Never married	4.7	4.0	3.9
Labor force status [c]			
Works full-time	55.1	76.4	85.8
Works part-time	10.1	13.9	13.0
Unemployed	2.3	1.9	1.2
Partly retired	3.6	2.2	0.0
Fully retired	13.7	1.8	0.0
Other not in labor force	15.3	3.8	0.0
Number in sample	10,376	5,363	2,194
Median income [d] ($)	57,969	66,900	70,687

SOURCE: Author's calculations using HRS.

NOTE: Rounded components of percentage distributions may not sum to 100.0.

a. Respondent worked in one or more HRS waves and was partly or fully retired in at least one subsequent wave.

b. Respondent worked in three or more consecutive HRS waves and was partly or fully retired in at least one subsequent wave.

c. Reflects status in wave 1.

d. In CPI-U 2007 dollars.

Table A-2.
Percentage distribution of original HRS cohort members by labor force status and HRS wave: Three groupings

HRS wave	Worked full-time	Worked part-time	Unemployed	Partly retired	Fully retired	Other not in labor force	Number of respondents
				Full sample			
1	55.0	10.1	2.3	3.6	13.7	15.3	9,814
2	48.8	9.4	2.0	5.5	21.2	13.0	8,889
3	42.0	7.3	1.2	7.8	27.1	14.6	8,540
4	35.4	6.9	0.7	9.6	32.5	14.9	8,243
5	28.5	6.0	0.5	10.9	38.6	15.4	7,781
6	20.7	5.5	0.3	11.9	47.5	14.1	7,531
7	15.6	4.4	0.2	13.6	55.6	10.6	7,228
8	11.3	3.4	0.0	13.2	63.0	9.1	6,856
9	9.3	2.8	0.1	12.5	67.2	8.2	6,545
				Worked and later retired [a]			
1	76.4	13.9	1.9	2.2	1.8	3.8	5,205
2	66.0	13.4	2.1	5.5	9.3	3.8	4,990
3	54.9	9.7	1.4	9.5	19.3	5.1	4,985
4	42.7	8.8	0.7	12.9	30.0	4.9	5,048
5	31.8	7.5	0.5	15.0	39.3	6.0	4,894
6	20.6	6.6	0.3	16.2	50.6	5.7	4,852
7	13.2	4.9	0.2	18.9	58.9	4.0	4,702
8	6.8	3.3	0.0	18.5	68.1	3.3	4,482
9	4.2	1.8	0.0	17.4	73.6	2.9	4,282
				Study sample [b]			
1	84.4	12.8	1.2	0.0	0.0	1.6	2,154
2	84.7	13.4	0.7	0.0	0.0	1.1	2,135
3	86.0	13.4	0.2	0.0	0.0	0.5	2,157
4	64.8	10.9	0.3	8.9	13.4	1.7	2,179
5	46.6	9.3	0.0	14.4	26.5	3.2	2,158
6	31.1	8.4	0.0	17.9	39.4	3.1	2,109
7	19.4	6.3	0.0	22.4	49.5	2.5	2,062
8	10.1	4.3	0.0	23.8	59.8	1.9	1,985
9	5.3	2.2	0.0	22.2	68.7	1.5	1,877

SOURCE: Author's calculations using HRS.

NOTES: Excludes 562 HRS participants who did not respond in wave 1 of the survey.

Rounded components of percentage distributions do not necessarily sum to 100.0.

a. Respondent worked in one or more HRS waves and was partly or fully retired in at least one subsequent wave.

b. Respondent worked in three or more consecutive HRS waves and was partly or fully retired in at least one subsequent wave.

Table A-3.
Median household income of original HRS cohort members by HRS wave and labor force status: Full sample (in 2007 dollars)

HRS wave and percentile within wave	Worked full-time	Worked part-time	Unemployed	Partly retired	Fully retired	Other not in labor force	All respondents
1st wave							
75th	105,577	90,624	70,385	101,197	70,989	67,968	93,645
Median	68,877	54,374	36,703	61,322	38,538	34,241	57,969
25th	40,970	29,151	16,765	30,208	16,947	12,687	30,208
2nd wave							
75th	109,053	94,140	57,096	91,572	69,943	65,660	93,923
Median	69,816	56,811	28,548	57,096	37,683	32,117	56,168
25th	42,205	27,121	10,957	30,211	16,992	12,316	28,548
3rd wave							
75th	113,736	103,657	69,219	107,372	71,219	61,987	94,238
Median	72,574	55,385	35,827	63,394	40,436	31,684	55,460
25th	43,978	28,434	12,316	33,471	20,489	12,208	28,499
4th wave							
75th	117,499	94,716	75,254	89,033	67,495	53,728	87,767
Median	71,330	54,050	37,202	54,822	39,582	27,828	50,364
25th	41,824	26,464	18,017	32,595	19,399	11,906	25,954
5th wave							
75th	119,624	102,655	113,232	93,786	69,586	54,160	86,954
Median	73,663	53,044	49,971	55,899	41,246	26,782	49,390
25th	42,980	30,538	12,422	32,049	22,076	11,135	25,310
6th wave							
75th	120,043	99,957	53,816	88,496	63,338	51,677	77,151
Median	68,918	57,261	35,058	52,998	36,376	26,818	43,752
25th	42,038	32,118	18,483	30,641	20,131	12,593	23,961
7th wave							
75th	127,656	121,588	90,960	90,152	61,234	52,306	75,285
Median	74,040	57,662	42,096	52,700	35,620	26,611	42,228
25th	44,601	30,719	21,595	32,252	19,628	12,463	22,802
8th wave							
75th	122,138	104,136	--	89,798	58,776	49,981	70,425
Median	69,546	53,510	--	52,915	34,706	25,608	40,213
25th	44,239	32,821	--	31,532	19,111	12,868	21,633
9th wave							
75th	123,368	116,248	--	85,200	57,800	50,076	66,896
Median	68,576	62,900	--	51,584	33,757	26,016	38,488
25th	39,880	41,508	--	32,627	18,578	13,307	21,000

SOURCE: Author’s calculations using HRS.

NOTE: -- = not available.

Table A-4.
Median household income of original HRS cohort members by HRS wave and labor force status: Respondents who worked and later retired (in 2007 dollars)

HRS wave and percentile within wave	Worked full-time	Worked part-time	Unemployed	Partly retired	Fully retired	Other not in labor force	All respondents
1st wave							
75th	107,716	94,673	71,504	93,292	90,392	68,281	103,501
Median	72,117	55,239	39,290	66,747	47,475	40,051	66,900
25th	42,963	30,688	20,101	36,025	23,170	16,332	38,498
2nd wave							
75th	107,974	95,868	63,621	92,963	92,127	66,701	105,745
Median	71,041	58,102	34,861	59,293	56,649	37,476	65,364
25th	43,576	29,341	15,339	31,375	28,615	15,978	37,102
3rd wave							
75th	112,201	101,818	77,780	104,355	83,595	68,084	103,153
Median	73,328	54,639	39,121	61,526	49,416	39,807	64,103
25th	44,419	27,796	19,250	33,076	24,777	13,326	35,497
4th wave							
75th	117,567	94,813	--	88,494	73,574	54,682	95,897
Median	72,579	55,474	--	55,881	44,580	29,362	57,417
25th	42,895	26,997	--	34,341	22,681	12,680	31,171
5th wave							
75th	117,278	98,024	--	95,723	72,042	58,879	93,107
Median	73,748	52,881	--	56,444	42,885	26,876	53,548
25th	41,760	31,258	--	32,553	23,661	12,318	28,757
6th wave							
75th	113,797	98,732	--	87,905	67,030	48,357	82,351
Median	68,610	55,004	--	53,600	39,409	25,711	47,400
25th	42,243	31,825	--	31,384	22,594	13,387	26,936
7th wave							
75th	117,441	115,892	--	91,125	64,667	47,316	79,192
Median	72,997	56,341	--	53,232	38,452	23,878	44,888
25th	42,511	32,386	--	32,612	21,407	11,654	25,232
8th wave							
75th	105,092	89,337	--	90,615	61,153	52,332	70,493
Median	61,428	50,196	--	54,122	36,024	21,980	41,106
25th	39,524	31,724	--	31,600	20,585	10,381	23,325
9th wave							
75th	92,943	95,008	--	88,712	58,896	43,572	65,380
Median	52,252	55,852	--	52,684	34,876	25,278	38,760
25th	29,480	39,024	--	33,324	20,064	10,248	22,216

SOURCE: Author's calculations using HRS.

NOTES: Reflects respondents who worked in one or more HRS waves and were partly or fully retired in at least one subsequent wave.

-- = not available.

Table A-5.
Median household income of original HRS cohort members by HRS wave and labor force status: Study sample (in 2007 dollars)

HRS wave and percentile within wave	Worked full-time	Worked part-time	Unemployed	Partly retired	Fully retired	Other not in labor force	All respondents
1st wave							
75th	110,259	95,155	--	--	--	--	107,692
Median	72,499	58,241	--	--	--	--	70,687
25th	45,312	30,963	--	--	--	--	41,688
2nd wave							
75th	112,051	94,208	--	--	--	--	109,767
Median	71,370	57,096	--	--	--	--	69,229
25th	44,101	30,255	--	--	--	--	41,966
3rd wave							
75th	116,065	106,154	--	--	--	--	113,736
Median	74,297	55,385	--	--	--	--	72,642
25th	46,448	30,120	--	--	--	--	43,328
4th wave							
75th	121,862	97,063	--	87,046	89,156	--	111,600
Median	74,439	56,860	--	64,345	54,307	--	68,453
25th	44,724	30,088	--	37,825	28,457	--	39,096
5th wave							
75th	124,220	104,593	--	97,411	77,141	64,306	106,332
Median	77,538	52,997	--	59,005	43,850	26,722	61,489
25th	43,442	31,209	--	35,713	23,855	13,416	33,752
6th wave							
75th	119,162	94,423	--	89,618	69,459	47,211	89,748
Median	69,901	54,534	--	52,419	40,597	28,215	51,535
25th	42,818	30,384	--	33,118	23,839	15,285	29,215
7th wave							
75th	120,273	110,844	--	97,086	68,817	52,465	89,584
Median	72,218	54,333	--	56,394	39,600	24,850	49,619
25th	43,029	32,040	--	35,669	22,734	14,818	28,847
8th wave							
75th	105,754	93,179	--	97,966	66,776	--	78,313
Median	61,065	52,874	--	60,249	38,247	--	45,589
25th	43,330	35,499	--	35,279	22,639	--	27,238
9th wave							
75th	100,300	--	--	103,113	60,000	--	72,000
Median	52,252	--	--	60,900	35,736	--	41,096
25th	28,700	--	--	36,872	21,704	--	24,244

SOURCE: Author's calculations using HRS.

NOTES: Reflects respondents who worked in three or more consecutive HRS waves and were partly or fully retired in at least one subsequent wave.

-- = not available.

Table A-6.
Distribution of retirement observations, by first HRS wave of retirement income and number of waves in which respondent was retired

Number of HRS waves during which respondent was retired	First HRS wave in which respondent is observed as retired (and interview year)						Total
	4 (1998)	5 (2000)	6 (2002)	7 (2004)	8 (2006)	9 (2008)	
1	485	497	435	353	261	163	2,194
2	390	395	365	295	206	…	1,651
3	340	355	316	254	…	…	1,265
4	305	331	273	…	…	…	909
5	278	302	…	…	…	…	580
Total observations	1,798	1,880	1,389	902	467	163	6,599

SOURCE: Author's calculations using HRS.

NOTES: Observations reflect respondents who worked full-time or part-time in three consecutive waves and were partially or fully retired in one or more subsequent waves.

… = not applicable.

Notes

[1] In 2010, the poverty threshold for an individual aged 65 or older was $10,458, while the poverty threshold for an elderly couple was $13,194 (Census Bureau 2012b).

[2] Retirement can be defined according to an individual's employment status, main sources of income, or both. The methods section presents the definition of retirement used for this analysis.

[3] There are exceptions. For example, some state and local government defined benefit pensions are based on final-year earnings, providing a strong financial incentive for workers to boost their final-year hours of work and earnings.

[4] Scholz and Seshadri (2009) suggest that couples and singles with children will have lower target replacement ratios than people without children because much of the preretirement spending of parents did not represent consumption by the parents.

[5] Because of increases in the marginal productivity of labor, wages tend to rise faster than prices in the long run.

[6] Defined benefit pensions often are based on an average of nominal earnings over the last 5 years of work with the employer. Some defined benefit plans average earnings over the participant's entire period of employment with the plan sponsor, again without indexing past earnings to the present.

[7] Biggs and Springstead (2008) argue against using wage-indexed earnings in the denominator of the replacement ratio because "a wage-indexed average … overstates [the] real earnings level in past years." Experts have debated the relative merits of price indexing and wage indexing earnings in the context of proposed Social Security reforms. Some analysts have suggested using a mixture of price indexing and wage indexing known as "progressive price indexing."

[8] In the HRS, household income is counted before income taxes and payroll taxes have been subtracted and after transfer payments—such as Social Security, SSI, unemployment insurance, and workers' compensation—have been received. This measure is sometimes referred to as "pretax, posttransfer" income.

[9] Butrica, Smith, and Iams (2012), for example, used income at age 67 to represent retirement income.

[10] Most studies refer to "replacement rates." This article uses "ratios" rather than "rates;" in the present context, the terms are synonymous. When discussing replacement ratio values, this article uses quotients (to three decimal places) and percentages interchangeably.

[11] From the first quarter of 1998 to the second quarter of 2006, the Case-Shiller home price index rose by 122 percent. From the second quarter of 2006 to the fourth quarter of 2008, the index fell by 27 percent.

[12] The average yield on newly issued 10-year US Treasury Notes, for example, fell from 6.35 percent in 1997 to 3.26 percent in 2009. Other long-term interest rates also fell during that period.

[13] Munnell and Soto (2005a) find that "people do not appear interested in tapping their home equity for non-housing consumption."

[14] Consider a couple with preretirement income of $80,000, retirement income of $50,000 when both are alive and income of $30,000 for the surviving spouse. On a total income basis, the replacement ratio falls from .625 to .375 upon the death of the spouse. Converting all dollar amounts to shared income by dividing by two, the values are $40,000, $25,000, and $30,000, respectively. Upon the death of the spouse, the replacement ratio of shared income increases from .625 to .750.

[15] In both cases, the authors appear to be referring to replacement ratios based on pretax income.

[16] In the Appendix, Table A-1 shows sample characteristics for three groups: the full wave 1 sample; a subsample of respondents who were employed (and not self-reported

as retired) in at least one wave, and were retired in one or more later waves; and the study sample—respondents who were employed in at least three consecutive waves and were retired in at least one later wave. For those same groupings, Table A-2 shows labor force status by wave, and Tables A-3, A-4, and A-5 show median income by labor force status and wave.

[17] For more information on the HRS and the RAND HRS files, see http://www.rand.org/labor/aging/dataprod.html. Complete documentation of RAND HRS Version J, the data file used for this analysis, is presented in St. Clair and others (2010).

[18] For a few respondents who were first retired in wave 4 (1998), retirement income was observable in six waves. However, the wave 9 observation for those individuals was dropped because of the small size of that sample.

[19] RAND classified respondents who worked 35 or more hours per week for 36 or more weeks per year as working full-time.

[20] Appendix Table A-6 shows the number of observations in each wave.

[21] Most retirees do not purchase annuities. These estimates illustrate the income that could be realized if 80 percent of assets were used to purchase an annuity. A level annuity maximizes immediate income, but because the amount of income remains level for life, its value will be eroded by inflation. Annuity income estimates were derived by dividing the value of financial assets at retirement by the annuity factors in effect in December 2010 for single men, single women, married men, and married women by age at retirement (see http://www.immediateannuity.com for annuity factors).

[22] Retirees who sell their homes might have to pay rent if they move to an apartment, reducing the net income they would realize from the sale of the home. Another option is a reverse mortgage (for a detailed description, see http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/hecm/rmtopten).

[23] In this analysis, "retirement age" is between 62 (the youngest at which an individual can claim Social Security retirement benefits) and 65 (the minimum age to qualify for full retirement benefits for individuals born before 1938. Full retirement age for those born 1938–1941 ranges from 65 years and 2 months to 65 years and 8 months).

[24] Moreover, relatively few defined benefit plans provide cost-of-living adjustments, so the real value of pension income falls over time.

[25] This difference was not statistically significant.

References

Biggs, Andrew, and Glenn Springstead. 2008. "Alternate Measures of Replacement Rates for Social Security Benefits and Retirement Income." *Social Security Bulletin* 68(2): 1–19.

Butrica, Barbara A., Karen E. Smith, and Howard M. Iams. 2012. "This is Not Your Parents' Retirement: Comparing Retirement Income Across Generations." *Social Security Bulletin* 72(1): 37–58.

Census Bureau. 2012a. *Housing Vacancies and Homeownership (CPS/HVS). Annual Statistics: 2007.* Washington, DC: Census Bureau. http://www.census.gov/hhes/www/housing/hvs/annual07/ann07ind.html.

———. 2012b. *Poverty Thresholds.* Washington, DC: Census Bureau. http://www.census.gov/hhes/www/poverty/data/threshld/.

Fox, Alan. 1979. "Earnings Replacement Rates of Retired Couples: Findings From the Retirement History Study." *Social Security Bulletin* 42(1): 17–39.

———. 1982. "Earnings Replacement Rates and Total Income: Findings from the Retirement History Study." *Social Security Bulletin* 45(10): 3–23.

Getzen, Thomas E. 2010. *Health Economics and Financing, 4th Edition.* New York, NY: John Wiley & Sons.

Grad, Susan. 1990. "Earnings Replacement Rates of New Retired Workers." *Social Security Bulletin* 53(10): 2–19.

Mitchell, Olivia S., and John W.R. Phillips. 2006. "Social Security Replacement Rates for Own Earnings Benchmarks." *Benefits Quarterly* 22(4): 37–47.

Munnell, Alicia H., and Mauricio Soto. 2005a. "The House and Living Standards in Retirement." Issue Brief No. 39. Chestnut Hill, MA: Center for Retirement Research at Boston College.

———. 2005b. "How Much Preretirement Income Does Social Security Replace?" Issue Brief No. 36. Chestnut Hill, MA: Center for Retirement Research at Boston College.

———. 2005c. "What Replacement Rates Do Households Actually Experience in Retirement?" CRR Working Paper No. 2005-10. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Scholz, John Karl, and Ananth Seshadri. 2009. "What Replacement Rates Should Households Use?" MRRC Research Paper No. 2009-214. Ann Arbor, MI: University of Michigan Retirement Research Center.

Smith, James P. 2003. "Trends and Projections in Income Replacement During Retirement," *Journal of Labor Economics* 21(4): 755–782.

St. Clair, Patricia, Darlene Blake, Delia Bugliari, Sandy Chien, Orla Hayden, Michael Hurd, Serhii Ilchuk, Fuan-Yue Kung, Angela Miu, Constantijn Panis, Philip Pantoja, Afshin Rastegar, Susann Rohwedder, Elizabeth Roth, Joanna Carroll, and Julie Zissimopoulos. 2010. *RAND HRS Data Documentation, Version J.* Santa Monica, CA: RAND Corporation. http://hrsonline.isr.umich.edu/modules/meta/rand/randhrsj/randhrsj.pdf.

Shifting Income Sources of the Aged

by Chris E. Anguelov, Howard M. Iams, and Patrick J. Purcell*

Traditional defined benefit pensions, once a major source of retirement income, are increasingly giving way to tax-qualified defined contribution (DC) plans and individual retirement accounts (IRAs). This trend is likely to continue among future retirees who have worked in the private sector. This article discusses the implications of those trends for the measurement of retirement income. We conclude that Census Bureau's Current Population Survey (CPS), one of the primary sources of income data, greatly underreports distributions from DC plans and IRAs, posing an increasing problem for measuring retirement income in the future. The CPS and other data sources need to revise their measures of retirement income to account for periodic (irregular) distributions from DC plans and IRAs.

Introduction

In the United States, retirement incomes are supported largely by three pillars: Social Security benefits, employer-provided pensions, and personal savings (including nonhousing wealth and home equity).[1] Some individuals continue working in retirement to supplement their income, but most older Americans discontinue full-time work. A relatively small proportion of retirees also receive income from welfare programs, such as Supplemental Security Income. This article discusses the prevalence of personal retirement savings plans in 2009, the increase in personal retirement account assets among the older population in the past two decades, and the implications of these trends for the accurate measurement of the income of the aged in the Census Bureau's Current Population Survey (CPS).

Since the early 1960s, the Social Security Administration (SSA) has published information on the income of the aged. Early reports were based on SSA surveys conducted in 1963, 1968, and 1972; since 1976, reports have been based on the CPS Annual Social and Economic Supplement. The share of aged people's income attributable to pensions rapidly increased in the 1960s and 1970s, peaking at 20 percent in 1992 and again in 2004. After 2004, the pension share of income gradually decreased to 18 percent in 2009 and 2010 (Federal Interagency Forum on Aging Related Statistics 2012, Table 9a; SSA 2012).

Pension income's decreasing share of total income for the aged partly reflects the traditional defined benefit (DB) plan's decreasing share of total retirement assets. Over half of the $17.8 trillion in total retirement assets at the end of the fourth quarter of 2011 were held in individual retirement accounts (IRAs) and defined contribution (DC) retirement plans ($4.9 trillion and $4.5 trillion, respectively) (Investment Company Institute 2012; Federal Retirement Thrift Investment Board 2012). Based on these data, the share of retirement assets held in traditional DB plans and annuities decreased from 59 percent in 1992 to 47 percent in 2011. The decreasing proportion of assets in traditional pensions and the increasing share of total retirement assets in IRAs and DC retirement plans could partly

Selected Abbreviations

BLS	Bureau of Labor Statistics
CPS	Current Population Survey
DB	defined benefit
DC	defined contribution
IRA	individual retirement account

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Selected Abbreviations—*Continued*

NCS	National Compensation Survey
PEU	primary economic unit
SCF	Survey of Consumer Finances
SIPP	Survey of Income and Program Participation
SSA	Social Security Administration

account for the decreasing share of pension income in the income of the aged because the CPS appears to undercount distributions from DC plans.

Income has historically been underreported in household surveys, and several studies have concluded that pension income is underreported in the CPS (Bosworth, Burtless, and Anders 2007; Roemer 2000; Schieber 1995). Woods (1996) observes that the Census Bureau did not consider IRA distributions to be income in the 1990 CPS, and Czajka and Denmead (2011) conclude that the CPS does not clearly ask about distributions from retirement accounts such as IRAs and DC plans.

The CPS measures IRA distributions as money income if they occur "regularly," like annuity payments. However, because most IRA distributions are irregular, they are not measured as income in the CPS. In addition, very few DC plan participants take their retirement distributions as annuities (Brown and others 2008). Excluding periodic (irregular) distributions misses much of the money distributed from IRAs and DC plans that supports retirement consumption. As retirees increasingly rely on periodic distributions from DC plans and IRAs, the problem of underreporting pension income in the CPS could become increasingly serious.

Although much of the money distributed from retirement accounts is not captured in the CPS, the Internal Revenue Service records distributions from tax-qualified retirement accounts (such as DC plans and standard IRAs) and considers them to be taxable deferred income.[2] When traditional employer-offered DB plans were more prevalent, most pension income was received as annuity payments and was counted as income by the CPS and other household surveys.[3] Because of the shift from DB pensions to tax-qualified retirement savings plans over the past 30 years, much retirement income has gradually disappeared from survey-based measures of the income of the aged. Distributions from retirement accounts are not accurately measured by surveys that were designed in an era dominated by DB pensions.

Analysts have documented that substantial distributions from IRAs are not measured in the CPS. Tax records indicate that hundreds of billions of dollars are withdrawn from retirement savings plans in a calendar year. Bryant, Holden, and Sabelhaus (2011) estimate from tax records that DC plan and IRA taxable distributions for persons older than age 60 were $529 billion in 2007. These tax-recorded distributions are substantially greater than those recorded in household surveys. Looking at withdrawals from IRAs in 2006, Sabelhaus and Schrass (2009, 20) estimate that the CPS recorded withdrawals of only $6.4 billion, while the Federal Reserve Board's Survey of Consumer Finance (SCF) recorded $95.2 billion, and an Investment Company Institute survey recorded $71.6 billion. From 2006 tax records, the authors estimate that all tax returns recorded $124.7 billion in distributions from IRAs, and tax returns for primary taxpayers aged 55 or older recorded $105.7 billion in distributions. Czajka and Denmead (2011) compare distributions from IRAs and DC accounts reported in the CPS to Internal Revenue Service administrative data on payouts, SCF data on distributions, and data on retirement plan withdrawals from the Census Bureau's Survey of Income and Program Participation (SIPP). The authors document substantial underreporting in the CPS, as the other data sources all indicate substantially greater distributions and payouts.

If longstanding trends in employer-sponsored retirement plans persist, the share of income attributable to traditional DB pensions will continue to diminish in the future. Consequently, estimates of the income of the aged based on the CPS will show increasing shares from other sources such as Social Security. In addition, the income of the aged is likely to appear to decline among the upper half of the income distribution, where pension income historically has concentrated (Federal Interagency Forum on Aging Related Statistics 2012, Table 9b).

Current Pension Status

To assess the importance of DC plans and IRAs in the current labor force, and hence to future retirees, we use three different surveys: The National Compensation Survey (NCS), the SIPP, and the SCF. Even though three different organizations conduct these surveys using different sample frames, respondents, and questions, their results all indicate the rising importance of tax-qualified retirement savings accounts.

The Bureau of Labor Statistics (BLS) conducts the NCS. Both the NCS and the SIPP collect data indicating the type of retirement plan (either DB or DC) for current workers. The NCS, a nationally representative survey of employers in the private sector and in state and local government, asks employers to report the retirement plan characteristics for their employees. The SIPP is a nationally representative household survey of labor force participants that includes questions on respondents' retirement plan characteristics. We adjust the reported SIPP data on DC plans with matched W-2 tax records following the methodology of Dushi and Iams (2010). Both the NCS and the SIPP provide national estimates of the type of pension available to employees and of employee participation. The most recent SIPP data are for summer 2009 and we compare them to NCS data for 2009.[4]

The third survey, the SCF, is conducted by the National Opinion Research Center for the Federal Reserve Board. The SCF is considered the best survey for estimates of wealth, in part because its sample frame comprises a nationally representative sample of primary economic units (PEUs) supplemented by additional high-income families selected from income tax records (Cagetti and De Nardi 2008; Meijer, Karoly, and Michaud 2010). The SCF data provide evidence of the rising prevalence and value of tax-qualified retirement savings accounts over the past two decades.

Offer, Participation, and Take-up Rates

The majority of US full-time workers are offered a retirement plan by their employers (Table 1). About three-quarters of private sector full-time workers and more than 90 percent of state and local government full-time workers are offered a plan. The percentage of all employees who participate in a retirement plan is the participation rate. The denominator of the participation rate includes all workers, whether offered a plan or not. The percentage of employees with employer plan offers who are actually enrolled in the plan is called the "take-up rate" (Dushi and Iams 2010). Participation and take-up rates vary between private- and public-sector workers and by work hours. Rates are higher among full-time workers than part-time workers and they are higher among state and local government workers than among private-sector workers. The highest participation and take-up rates are found among full-time public-sector workers.

Table 2 shows that the DC plan was the type most widely held among full-time private-sector workers, with about one-half to three-fifths participating (51 percent in NCS, 61 percent in SIPP). Only about one-quarter (24 percent) of full-time private-sector workers participated in a DB plan. By contrast, the majority of full-time state and local government workers participated in a DB plan (87 percent in NCS, 73 percent in SIPP), and one-fifth to two-fifths

Table 1.
Pension plan offer, participation, and take-up rates by sector of employment, full- or part-time status, and data source, 2009 (in percent)

Hours of work and data source	Offer rate	Participation rate	Take-up rate
		Private sector	
Full-time			
NCS	76	61	80
SIPP	75	66	88
Part-time			
NCS	39	22	55
SIPP	50	32	65
		State and local government	
Full-time			
NCS	99	95	96
SIPP	93	88	95
Part-time			
NCS	41	37	89
SIPP	74	52	70

SOURCE: BLS (2009); authors' calculations based on the wave 3 topical module of the SIPP 2008 panel matched to W-2 records.

NOTE: SIPP respondents are asked whether a plan is offered to anyone at the firm where they are employed, regardless of whether it is offered to the respondent.

Table 2.
Pension plan participation rate by type of plan, sector of employment, full- or part-time status, and data source, 2009 (in percent)

Hours of work and data source	DB	DC
	Private sector	
Full-time		
NCS	24	51
SIPP	24	61
Part-time		
NCS	9	16
SIPP	17	20
	State and local government	
Full-time		
NCS	87	20
SIPP	73	41
Part-time		
NCS	34	5
SIPP	44	45

SOURCE: BLS (2009); authors' calculations based on the wave 3 topical module of the SIPP 2008 panel matched to W-2 records.

participated in a DC plan (20 percent in NCS, 41 percent in SIPP).

Participation in DC Plans

In 2009, about 68 percent of all wage and salary workers younger than age 65 worked for employers that offered DC plans, and nearly 57 percent participated in them (Table 3). That represents a take-up rate of about 83 percent. The participation rate varies by age, marital status, education, sex, race/ethnicity, and earnings level. Younger workers, unmarried workers, those with less education, non-Hispanic black workers, Hispanic workers, and those in the lower income quartiles all had below-average participation rates. Perhaps most striking, workers whose 2008 earnings were in the lowest earnings quartile had a participation rate in 2009 of only about 25 percent, while those with earnings in the top quartile had a participation rate of about 81 percent.[5] Take-up rates for workers in the lowest quartile were also much lower than average.

Table 3.
Tax-qualified retirement savings DC plan offer, participation, and take-up rates: All wage and salary workers younger than age 65, by selected characteristics, 2009 (in percent)

Characteristic	Offer rate	Participation rate	Take-up rate
Total	67.9	56.6	83.4
Age			
55–64	70.3	60.2	85.6
45–54	72.2	62.8	87.0
35–44	70.5	59.9	85.0
Under 35	61.3	47.4	77.3
Marital status			
Married	71.2	61.0	85.7
Never-married, widowed, or divorced	62.3	50.0	80.3
Education			
College graduate	78.6	69.4	88.3
Some college	68.5	55.8	81.5
High school or less	58.4	46.2	79.1
Sex			
Men	68.6	58.2	84.8
Women	67.2	55.0	81.8
Race and ethnicity			
White, non-Hispanic	70.7	59.6	84.3
Black, non-Hispanic	63.5	50.0	78.7
Hispanic	53.1	43.9	79.7
Other non-Hispanic	67.5	57.9	85.8
Individual earnings in 2008			
Highest quartile	86.9	81.3	93.6
Second quartile	77.3	67.3	67.1
Third quartile	66.0	52.7	79.8
Lowest quartile	41.5	25.3	61.0

SOURCE: Authors' calculations based on the wave 3 topical module of the SIPP 2008 panel matched to W-2 records.

Contributions to DC Plans

For DC plans, both the participation and contribution rates are much higher among higher earners. Table 3 shows the relationship between contributions and earnings reported by SIPP respondents at a given time among a cross section of the population, using 2008 earnings quartiles. Table 4 shows the relationship between contributions and earnings using 10-year annual real average earnings ranked by decile. Table 4 uses earnings data from employer-provided W-2 records for 1996 through 2007 matched to results from the 2004 SIPP panel and indexed using the Consumer Price Index for Urban and Clerical Workers (CPI-W). These matched earnings data, which we believe are more accurate than self-reports, reveal noticeably higher participation and contribution rates among workers with higher earnings. The participation rate rises sharply from almost 6 percent in the first (lowest) earnings decile to nearly 51 percent in the sixth decile, and continues to rise to about 78 percent in the tenth (highest) decile. The contribution rate (the percentage

Table 4.
Participation and contribution rates in DC plans, by 1997–2006 annual average earnings decile (in percent)

10-year annual average earnings decile	Participation rate	Contribution rate
1st (lowest)	5.5	3.4
2nd	15.8	4.0
3rd	26.6	4.0
4th	35.6	4.3
5th	42.7	4.6
6th	50.6	5.1
7th	53.2	5.3
8th	62.0	6.1
9th	69.6	7.4
10th (highest)	77.7	7.1
Number of observations	21,235	9,350

SOURCE: Dushi, Iams, and Tamborini (2011).

NOTES: Estimates are for workers aged 35-61 with W-2 tax record earnings in 2006, weighted using 2004 SIPP weights. Ten-year average reflects W-2 tax record real inflation indexed (CPI-W) earnings from 1997 to 2006.

All earnings are inflation-adjusted to 2006 dollars. The rates in each cell are calculated for that cell subsample.

of salary contributed to a DC account) increases from about 3 percent in the lowest decile to more than 7 percent in the highest two deciles (Dushi, Iams, and Tamborini 2011).

Account Balances

Tax-qualified retirement accounts—such as IRAs and 401(k)-type DC plans—are growing in prevalence and value. Most money held in DC accounts upon job termination at older ages is "rolled over" to IRAs, and most IRA money reflects rollovers rather than direct investments (Sabelhaus and Schrass 2009; Holden and Schrass 2010; Bryant, Holden, and Sabelhaus 2011). Some DB plans also offer lump-sum distributions (BLS 2009, 2010). SIPP data show that the proportion of individuals holding either an IRA or a DC account increased from less than one-quarter to over one-third between 1998 and 2009 (Chart 1). The prevalence was much higher among those aged 65–69 than among those aged 70 or older in each year, although the difference between age groups has decreased in recent years.

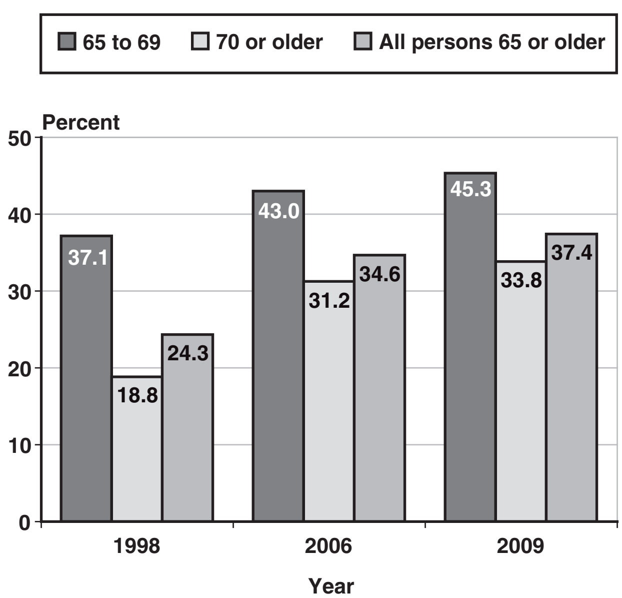
The SCF collects detailed financial data, including holdings in different forms of tax-qualified retirement accounts such as IRAs and employer-sponsored DC plans, every 3 years. The SCF also indicates that tax-qualified retirement savings plans increased over time in both prevalence and value.[6]

SCF data show that the prevalence and value of retirement accounts increased dramatically in the last two decades in younger and older households alike. The prevalence among PEUs headed by a person aged 65 or older increased from about one-fifth in 1992 to about two-fifths in 2007 (Chart 2). The prevalence of tax-qualified retirement accounts is higher among younger households in four of the six periods (Table 5), and the prevalence and value of accounts among PEUs with heads aged 65 or older was higher for those with at least some college education than for those without (Tables 5 and 6).

Among PEUs headed by persons aged 65 or older, the median real value of retirement accounts more than doubled, from $28,900 to $60,800, over the period from 1992 to 2007 (Table 6 and Chart 3). Table 6 also shows that the 55–64 age group generally has the highest median account balances.

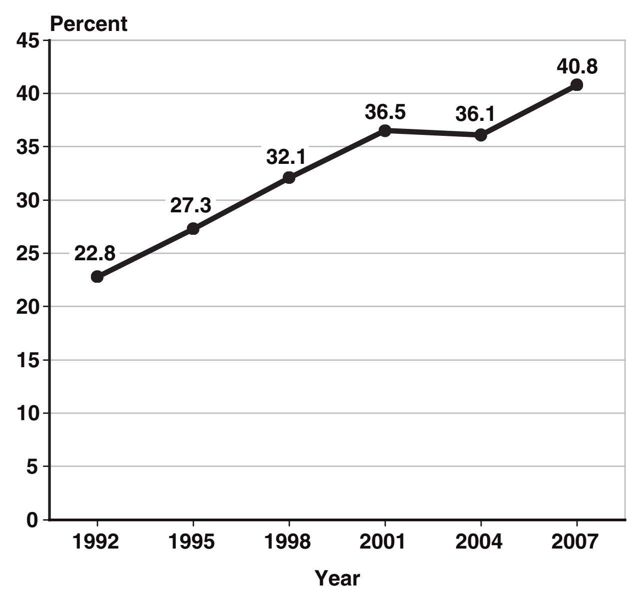
Table 7 shows the proportion of total PEU financial assets that are attributable to tax-qualified retirement account holdings. It reveals that in 2007, larger proportions of financial assets were held in tax-qualified retirement accounts than were held in 1992. The proportion increased more rapidly for PEUs headed by persons aged 65 or older than for those headed by persons aged 45–64. The increases also were strong

Chart 1.
Share of individuals aged 65 or older who have an IRA or 401(k): 1998, 2006, and 2009



SOURCE: Authors' calculations based on SIPP 1996, 2004, and 2008 panels.

Chart 2.
Percentage of households headed by persons aged 65 or older that have financial assets in retirement savings accounts, selected years 1992–2007



SOURCE: SCF.

Table 5.
Percentage of primary economic units with holdings in all tax-qualified retirement savings accounts, by selected characteristics of unit head, selected years 1992–2007

PEU head characteristic	1992	1995	1998	2001	2004	2007
Age						
45–54	51.9	57.4	59.3	63.7	58.2	65.4
55–64	53.1	51.0	58.3	59.8	63.5	61.2
65 or older	22.8	27.3	32.1	36.5	36.1	40.8
Education [a]						
High school diploma or less	16.4	19.9	22.0	23.0	26.3	29.1
Some college or more	37.0	40.4	49.0	57.5	50.2	59.1

SOURCE: SCF.

NOTE: Tax-qualified retirement savings plans include IRAs, Keoghs, and 401(k)-type accounts. All observations are weighted for analysis.

a. Restricted to PEU heads aged 65 or older.

Table 6.
Median assets in all tax-qualified retirement savings accounts held by heads of primary economic units, by selected characteristics of unit head, selected years 1992–2007 (2007 dollars)

PEU head characteristic [a]	1992	1995	1998	2001	2004	2007
Age						
45–54	40,500	37,900	44,600	56,100	61,000	63,000
55–64	43,400	43,300	59,800	64,300	91,200	100,000
65 or older	28,900	36,500	44,600	66,700	60,400	60,800
Education [b]						
High school diploma or less	23,200	24,500	31,800	32,700	32,900	35,000
Some college or more	36,200	54,100	59,800	114,600	93,400	116,000

SOURCE: SCF.

NOTE: Tax-qualified retirement savings plans include IRAs, Keoghs, and 401(k)-type accounts. All observations are weighted for analysis. Values indexed to 2007 dollars with the CPI-U-RS.

a. Restricted to PEUs with positive asset holding values.

b. Restricted to PEU heads aged 65 or older.

among PEUs headed by persons with at least some college education.

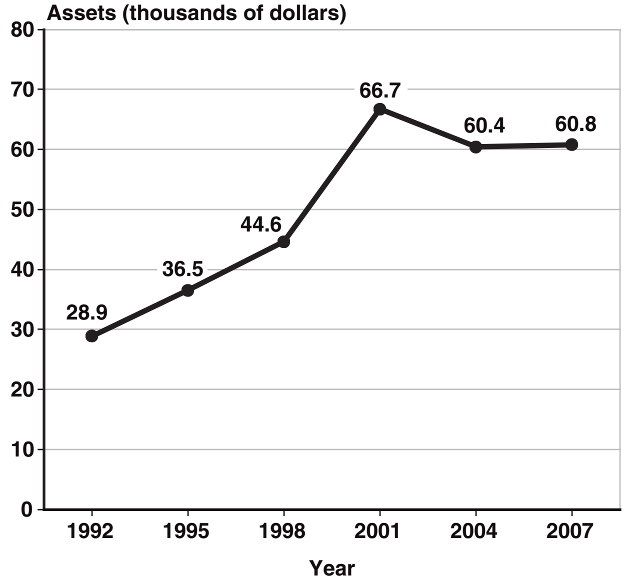
Income from Pensions

In addition to questions about income from traditional DB pension plans, the SIPP asks respondents whether they took distributions from IRAs or 401(k)-type retirement plans.[7] Looking at individual planholders aged 65 or older, almost one-half reported taking a distribution in 1998, and over one-half did so in 2006 (Chart 4). However, by about 10 percentage points, fewer people reported taking a distribution in 2009 than did in 2006. People aged 70 or older are much more likely to have reported distributions from retirement plans than are those aged 65–69. This is due in part to the federal law that requires withdrawals to be taken starting in the year after the account holder reaches age 70½. That law was suspended for 1 year in 2009 to allow retirement accounts to recover from the 2008 stock market crash.

Based on the SIPP data, about one-half of persons aged 65 or older reported DB pension income in 2009 (Chart 5). Younger retirees (aged 65–69) have higher DB pension income than older retirees as measured by means or medians (Chart 6). The lower pension income of older retirees reflects both lower lifetime average earnings and the fact that most DB pensions do not provide cost-of-living adjustments.

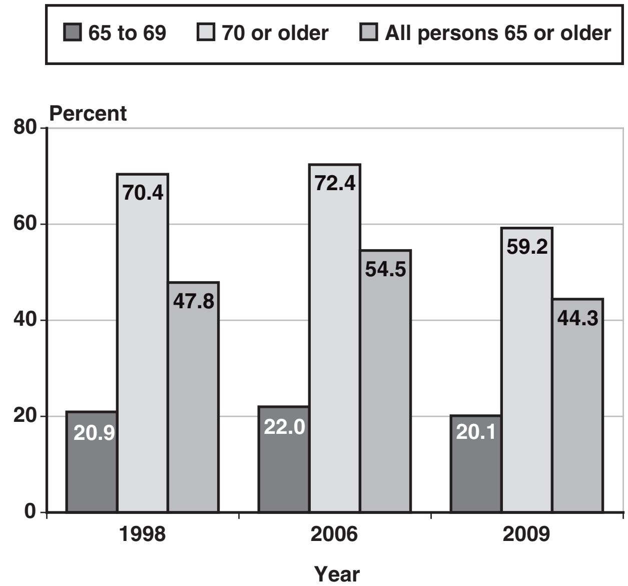
Despite the shift from traditional DB pensions to DC plans over the past 30 years, income among the aged from traditional DB pensions is still much more prevalent and much higher than income from DC plans and IRAs. The proportion of people aged 65 or older with distributions from DC plans and IRAs increased from about one-tenth in 1998 to almost one-fifth in

Chart 3.
Median value of assets held in retirement savings accounts among households headed by people aged 65 or older



SOURCE: SCF.

Chart 4.
Shares of IRA or 401(k) holders aged 65 or older who take withdrawals: 1998, 2006, and 2009



SOURCE: Authors' calculations based on SIPP 1996, 2004, and 2008 panels.

Table 7.
Median ratio of assets held in all tax-qualified retirement savings accounts to overall financial assets of primary economic unit, by selected characteristics of unit head, selected years 1992–2007

PEU head characteristic	1992	1995	1998	2001	2004	2007
Age						
45–54	57.8	55.1	55.2	58.7	67.2	72.4
55–64	46.4	44.4	52.7	45.8	64.0	66.3
65 or older	27.2	33.3	31.0	35.2	34.1	40.5
Education [a]						
High school diploma or less	29.6	32.3	33.1	39.2	35.3	41.6
Some college or more	21.6	33.8	29.4	30.0	33.7	40.1

SOURCE: SCF.

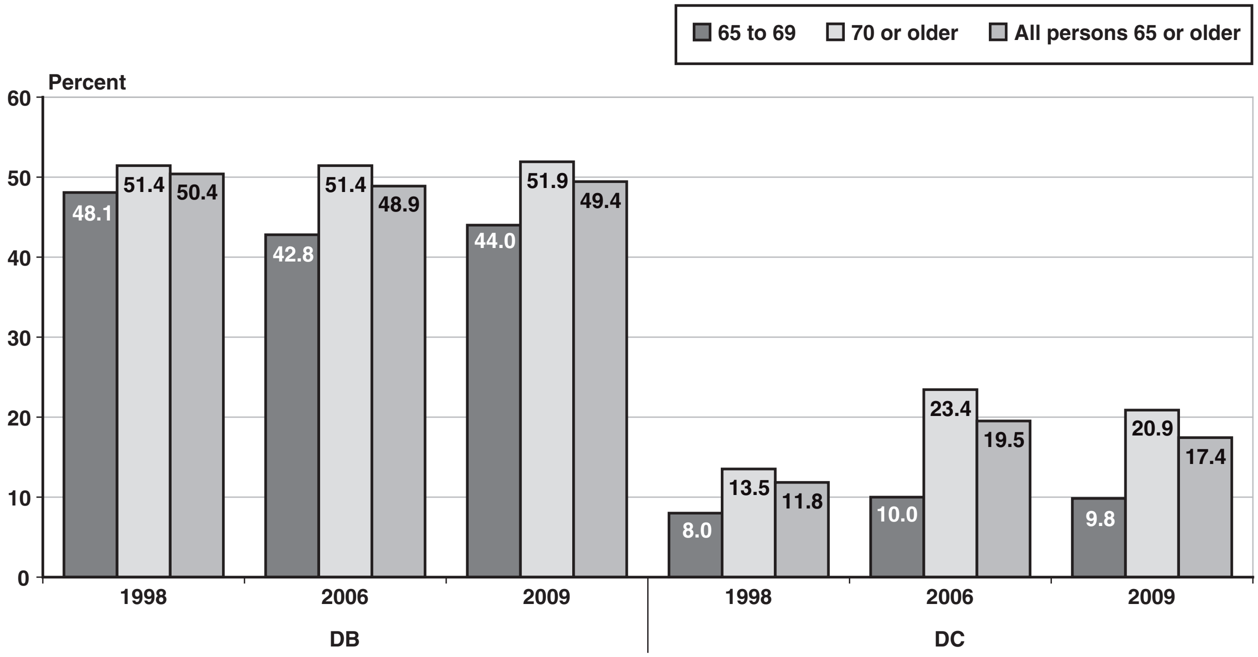
NOTE: Tax-qualified retirement savings plans include IRAs, Keoghs, and 401(k)-type accounts. Financial assets include funds held in bank transaction accounts, certificates of deposits, directly held mutual funds, stocks, bonds, retirement plan investment accounts, savings bonds, cash value of whole life insurance, other managed assets, and other financial assets. All observations are weighted for analysis.

a. Restricted to PEU heads aged 65 or older.

2006 (Chart 5). The proportion then declined slightly, to about 17 percent in 2009. Distributions were more prevalent among those aged 70 or older, and the prevalence declined slightly from 2006 to 2009. At both the mean and median levels, income from DB plans (Chart 6) exceeds distributions from DC retirement savings plans (Chart 7). Future retirees can have higher income from DC plans than current retirees because they will have participated in DC plans for more years than current retirees.

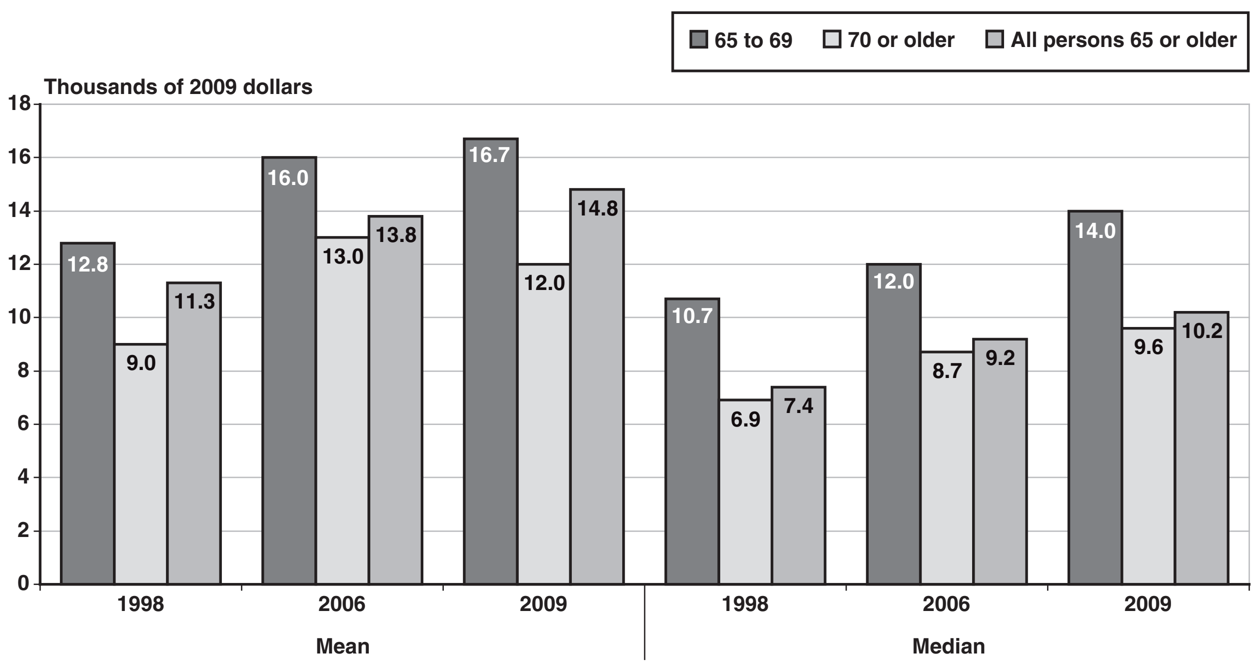
The data suggest that retirement savings plans such as 401(k)-type DC plans and IRAs have increased in importance among the aged over the past two decades as an asset holding and as an income source. The pattern among current full-time workers in 2009 indicates that retirement accounts will have increasing importance among future retirees, and likely will be the predominant retirement income source within a couple of decades.

Chart 5.
Percentage of individuals aged 65 or older who have pension income, by plan type: 1998, 2006, and 2009



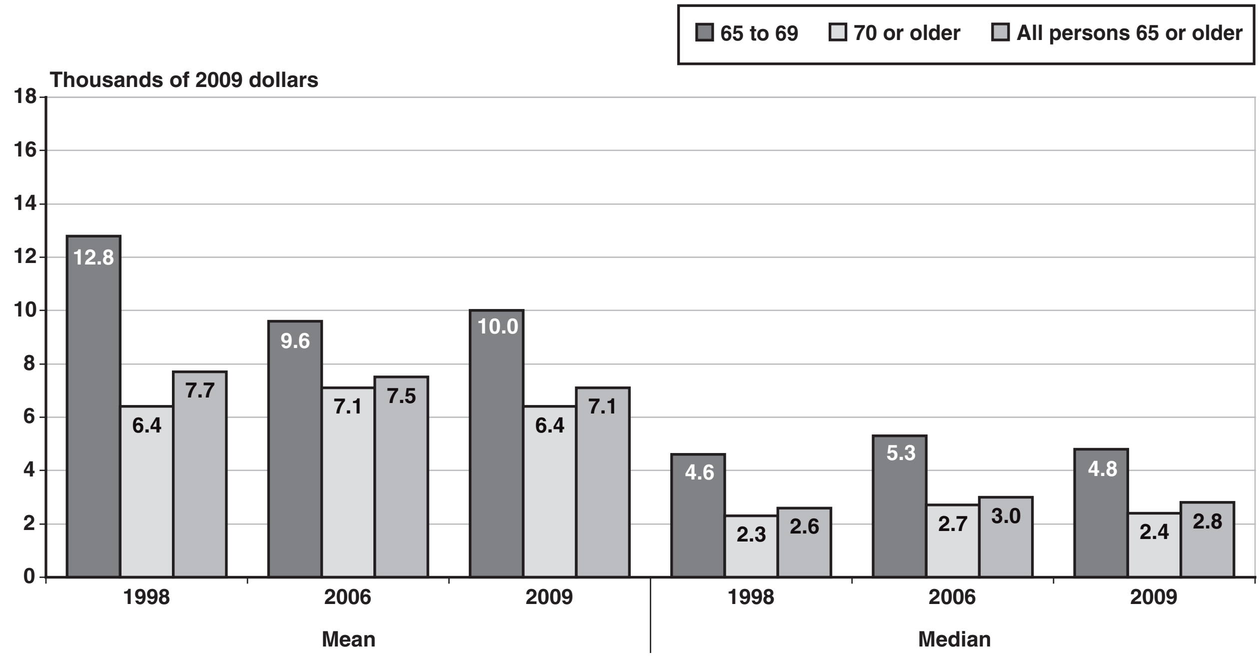
SOURCE: Authors' calculations based on SIPP 1996, 2004, and 2008 panels.

Chart 6.
Mean and median annual DB pension income among people aged 65 or older with a DB pension: 1998, 2006, and 2009



SOURCE: Authors' calculations based on SIPP 1996, 2004, and 2008 panels.

Chart 7.
Mean and median annual DC pension income of people aged 65 or older with an IRA or 401(k): 1998, 2006, and 2009



SOURCE: Authors' calculations based on SIPP 1996, 2004, and 2008 panels.

Conclusion

The data presented in this article show that the tax-qualified retirement savings plan is the predominant plan among workers in the early 21st century. Both the prevalence and value of these accounts have risen dramatically in the past 20 years. The shift toward greater distributions from DC plans and IRAs raises important questions about the accuracy of the CPS measures of the number of households that take such distributions and the proportion of household income derived from such accounts. As Sabelhaus and Schrass (2009, 19) wrote of the CPS: "while IRA withdrawals have risen in importance as a source of retirement income, the most widely cited income measure has failed to capture that growth. Looking ahead, that trend is likely to continue." That measurement gap applies to money withdrawn from all tax-qualified retirement savings plans, not just IRAs. The major nationally representative surveys of household income must accurately measure annual distributions from retirement accounts in order to provide a complete picture of the economic well-being of the aged and the general US population. That may require the survey questions to be revised to inquire more directly about distributions from retirement accounts, whether taken as lump sums, regular distributions, or irregular periodic withdrawals.

Notes

[1] See Holzmann and Hinz (2005) for a discussion of a multipillar approach to old-age income security.

[2] Qualified distributions from Roth IRAs are not taxable because the contributions were taxed in the year they were made. About 40 percent of households with an IRA have a Roth IRA, but Roth IRAs hold only about 5 percent of all IRA assets (Holden and Schrass 2011).

[3] However, the CPS underreported pension income even when most pensioners participated in traditional DB plans.

[4] The SIPP data on type of pension are from the Retirement and Pension Plan topical module (the third wave) in the 2008 panel. We adjust the SIPP survey results with data on deferred contributions in SSA earnings records. SSA and Census Bureau linked the earnings data derived from W-2 payroll tax records for about 90 percent of the SIPP respondents. Prior research has found that SIPP respondents tend to underreport DC plan participation, as indicated by positive deferred contributions in their earnings records (Dushi and Iams 2010).

[5] Workers whose 2008 Form W-2 recorded earnings above \$56,376 were in the top quartile. Workers with earnings less than or equal to \$20,946 were in the lowest earnings quartile. Median earned income in 2008 was \$35,705.

[6] We index the values with the Consumer Price Index for All Urban Consumers (CPI-U-RS); see Bucks and others (2009, Table A.1). The SCF is conducted with the cooperation of the Statistics of Income Division of the Internal Revenue Service. It includes data on household assets and debts, use of financial services, income, demographics, and labor force participation.

[7] The SIPP core asks about all sources of income in the previous 4-month reference period. Merging the core files for three consecutive waves of the survey provides a picture of income sources and amounts over a full year.

References

BLS. *See* Bureau of Labor Statistics.

Bosworth, Barry P., Gary Burtless, and Sarah E. Anders. 2007. "Capital Income Flows and the Relative Well-Being of America's Aged Population." CRRB Working Paper No. 2007-21. Cambridge, MA: Center for Retirement Research at Boston College.

Brown, Jeffrey R., Jeffrey R. Kling, Sendhil Mullainathan, and Marian V. Wrobel. 2008. "Why Don't People Insure Late Life Consumption? A Framing Explanation of the Under-Annuitization Puzzle." *American Economic Review* 98(2): 304–309.

Bryant, Victoria L., Sarah Holden, and John Sabelhaus. 2011. "Qualified Retirement Plans: Analysis of Distribution and Rollover Activity." Pension Research Council Working Paper No. 2011-01. Philadelphia, PA: Pension Research Council.

Bucks, Brian, Arthur Kennickell, Traci Mach, and Kevin Moore. 2009. "Changes in U.S. Family Finances from 2004 to 2007: Evidence from the Survey of Consumer Finances." *Federal Reserve Bulletin* 95(2): A1–A56.

Bureau of Labor Statistics. 2009. *National Compensation Survey: Employee Benefits in the United States, March 2009.* Bulletin 2731. Washington, DC: BLS. http://www.bls.gov/ncs/ebs/benefits/2009/.

———. 2010. *National Compensation Survey: Employee Benefits in the United States, March 2010.* Bulletin 2752. Washington, DC: BLS. http://www.bls.gov/ncs/ebs/benefits/2010/home.htm.

Cagetti, Marco, and Mariacristina De Nardi. 2008. "Wealth Inequality: Data and Models." *Macroeconomic Dynamics* 12 (S2): 285–313.

Czajka, John L., and Gabrielle Denmead. 2011. "What We're Missing: How to Obtain Better Estimates of the Retirement Income of Our Major Household Surveys." Paper presented to the 2011 Association of Policy Analysis and Applied Management, Washington, DC.

Dushi, Irena, and Howard M. Iams. 2010. "The Impact of Response Error on Participation Rates and Contributions to Defined Contribution Pension Plans." *Social Security Bulletin* 70(1): 45–61. http://www.socialsecurity.gov/policy/docs/ssb/v70n1/v70n1p45.html.

Dushi, Irena, Howard M. Iams, and Christopher R. Tamborini. 2011. "Defined Contribution Pension Participation and Contributions by Earnings Levels Using Administrative Data." *Social Security Bulletin* 71(2): 67–76. http://www.socialsecurity.gov/policy/docs/ssb/v71n2/v71n2p67.html.

Federal Interagency Forum on Aging Related Statistics. 2012. *Older Americans 2012: Key Indicators of Well-Being 2012.* Washington, DC: Government Printing Office. http://www.agingstats.gov/agingstatsdotnet/Main_Site/Data/Data_2012.aspx.

Federal Retirement Thrift Investment Board. 2012. "Thrift Savings Fund Statistics." Fairfax, VA: FRTIB. http://www.frtib.gov/pdf/minutes/MM-2012Jan-Att1.pdf.

Holden, Sarah, and Daniel Schrass. 2010. "The Role of IRAs in U.S. Households' Saving for Retirement, 2010." *Research Fundamentals* 19(8). http://www.ici.org/pdf/fm-v19n8.pdf.

———. 2011. "The Role of IRAs in U.S. Households' Saving for Retirement, 2011." *ICI Research Perspective* 17(8). http://www.ici.org/pdf/per17-08.pdf.

Holzmann, Robert, and Richard Hinz. 2005. *Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform.* Washington, DC: The World Bank.

Investment Company Institute. 2012. "The U.S. Retirement Market, Third Quarter 2011." http://www.ici.org/info/ret_11_q3_data.xls.

Meijer, Erik, Lynn A. Karoly, and Pierre-Carl Michaud. 2010. "Using Matched Survey and Administrative Data to Estimate Eligibility for the Medicare Part D Low-Income Subsidy Program." *Social Security Bulletin* 70(2): 63–82. http://www.socialsecurity.gov/policy/docs/ssb/v70n2/v70n2p63.html.

Roemer, Marc I. 2000. "Assessing the Quality of the March Current Population Survey and the Survey of Income and Program Participation Income Estimates, 1990–1996." Washington, DC: Census Bureau. http://www.census.gov/hhes/www/income/publications/assess1.pdf.

Sabelhaus, John, and Daniel Schrass. 2009. "The Evolving Role of IRAs in U.S. Retirement Planning." *ICI Research Perspective* 15(3). http://www.ici.org/pdf/per15-03.pdf.

Schieber, Sylvester J. 1995. "Why Do Pension Benefits Seem So Small?" *Benefits Quarterly* 11(4): 57–70.

[SSA] Social Security Administration. 2012. *Income of the Population 55 or Older, 2010.* Washington, DC: SSA. http://www.socialsecurity.gov/policy/docs/statcomps/income_pop55/index.html.

Woods, John R. 1996. "Pension Benefits Among the Aged: Conflicting Measures, Unequal Distributions." *Social Security Bulletin* 59(3): 3–30. http://www.socialsecurity.gov/policy/docs/ssb/v59n3/v59n3p3.pdf.

The Growth in Applications for Social Security Disability Insurance: A Spillover Effect from Workers' Compensation

by Xuguang (Steve) Guo and John F. Burton, Jr.*

We investigate the determinants of application for Social Security Disability Insurance (DI) benefits in approximately 45 jurisdictions between 1981 and 1999. We reproduce findings of previous studies of the determinants of DI application then test the additional influence of changes to workers' compensation program benefits and rules on DI application rates. Our findings indicate that the programs are interrelated: When workers' compensation benefits declined and eligibility rules tightened in the 1990s, the DI application rate increased.

Introduction

Social Security Disability Insurance (DI) is the largest income-replacement program for nonelderly Americans. The federal DI and Medicare programs provide cash benefits and health care coverage to disabled beneficiaries until they return to work, die, or qualify for Social Security old-age benefits. The number of DI beneficiaries dramatically increased in the late 1980s and 1990s, which drew considerable attention from policymakers and academics. As Chart 1 shows, only about 2.3 percent of adults aged 25–64 were DI recipients in the 1980s, but the figure grew to 3.5 percent by 1999.

Previous Studies

Studies investigating the rise of DI enrollment primarily focus on the incentives to apply. The factors that produce these incentives fall into three categories: (1) the supply of DI benefits, (2) the demand for DI benefits, and (3) the effects of alternative income replacement programs. DI supply is determined by program rules, including the stringency of the eligibility criteria and the generosity of benefits. The demand for DI benefits is largely determined by individuals' characteristics, including health status and financial needs. Alternative programs that also pay cash benefits or cover medical costs for disabled persons (or did so during the 1980s and 1990s) include Supplemental Security Income (SSI), Aid to Families with Dependent Children (AFDC), Temporary Assistance for Needy Families (TANF), and Medicaid.

Selected Abbreviations

ASB	*Annual Statistical Bulletin*
DI	Disability Insurance
NCCI	National Council on Compensation Insurance
PPD	permanent partial disability
PTD	permanent total disability
SSA	Social Security Administration
TTD	temporary total disability
WCPD	workers' compensation permanent disability

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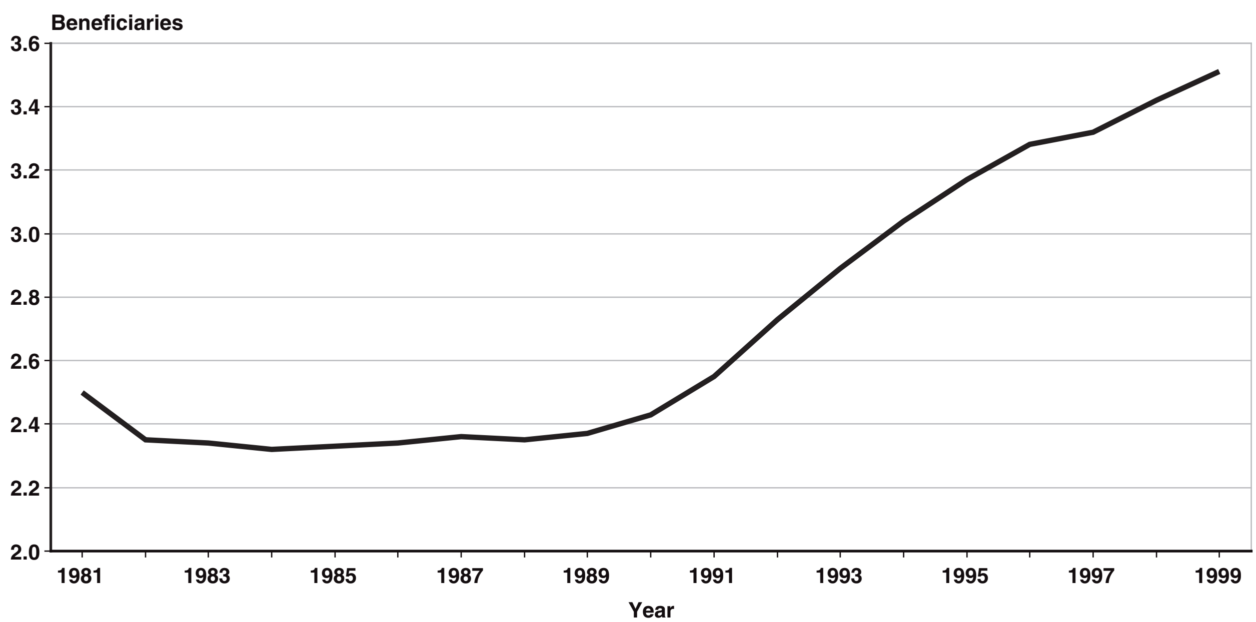
Autor and Duggan (2003) claim that liberalizing the application screening process has been a major cause of the growth in DI application since the early 1980s. Chart 2 shows that the application rate—measured as DI applicants per 100,000 workers—was generally higher in the 1990s than in the 1980s. According to Duggan and Autor (2006), the Social Security Disability Benefits Reform Act of 1984 significantly altered the DI eligibility criteria because it allowed relatively subjective evidence based on an applicant's reported pain and discomfort in lieu of strictly objective medical evidence. In addition, the Social Security Administration (SSA) was directed to relax its strict screening criteria for mental illness and to consider multiple nonsevere ailments in establishing eligibility. Mashaw and Reno (1996b) argued that the "liberalization" of the eligibility criteria in the 1984 legislation remedied overly zealous administrative retrenchment during 1979–1983. Moreover, they found that, despite the growth in DI enrollment in the 1990s, the DI allowance rate (after controlling for changes in the workforce's age and sex distributions) did not return to the peak reached in 1975. The authors concluded that disabled individuals had less access to DI benefits in the 1990s than in the 1970s. Chart 2 shows that the DI acceptance ratio—the number of benefit allowances divided by the number of denials—generally increased from 1981 to 1992, then dropped until the mid-1990s, before rising again after 1995.[1]

Individuals with disabilities are more likely to seek assistance from social insurance programs in an economic downturn than they are in a robust economy. Most empirical studies support this prediction (Autor and Duggan 2003; Kreider 1999; Rupp and Stapleton 1995). The unemployment rate is usually positively correlated with DI application. Soss and Keiser (2006) provide evidence that a state's disability prevalence rate is a factor in DI application rates. They find that as the disability prevalence rate increased by 1 percentage point between 1991 and 1993, the DI application rate increased by 15.4 per 10,000 residents. The disability prevalence rate increases substantially as the population ages. Rupp and Stapleton (1995) estimate that population growth and aging between 1988 and 1992 accounted for a 1.3 percent average annual increase in DI applications. Strand (2002) reveals that women are more likely to apply for DI benefits than men are.

Despite decades of studies, researchers have largely ignored one important aspect of DI: its relationship with workers' compensation. This lack of scholarly attention is particularly striking because the connection between the programs has long been of concern to policymakers in state legislatures and in Congress.

DI (in conjunction with Medicare) is the largest source of cash and medical benefits for workers with disabilities in the United States, and workers' compensation is the second largest source (Sengupta,

Chart 1.
DI beneficiaries as a percentage of adults aged 25–64, 1981–1999



SOURCE: Authors' calculations based on *Annual Statistical Supplement to the Social Security Bulletin* (various editions).

Reno, and Burton 2011, 2). Workers' compensation and DI serve overlapping, although not identical, populations.[2] Both programs provide medical and cash benefits to workers with chronic, severely disabling conditions.

Many workers' compensation claimants have persistent health problems that may eventually also qualify for DI benefit (Baldwin and Johnson 1998; Butler, Johnson, and Baldwin 1995; Mashaw and Reno 1996a). As of December 2010, 13.5 percent of DI beneficiaries had at some time also received workers' compensation (or public disability) benefits, and 7.1 percent were current recipients (Sengupta, Reno, and Burton 2011, Table 17).

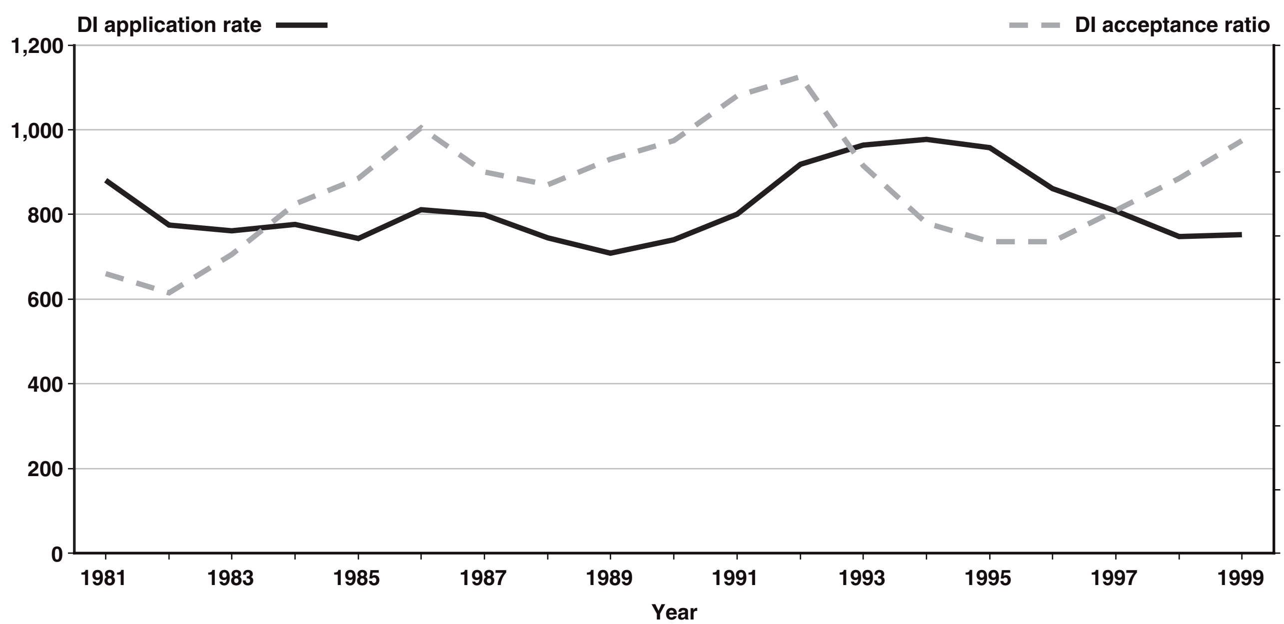
Workers' Compensation in the 1990s

This article examines the effects of workers' compensation program changes on the DI application rate during the 1990s. Each state has a workers' compensation program that provides cash benefits, medical care, and rehabilitation benefits to workers disabled by work-related injuries and diseases. There are no federal standards for workers' compensation and state rules differ considerably on level of benefits, coverage of employers and employees, and eligibility for benefits.[3] Workers' compensation is thus very different from DI, for which coverage rules for employers and workers, eligibility requirements, and benefit levels are determined at the national level.

Workers' compensation is the only significant civilian disability income program, either private or public, that pays benefits to partially or totally disabled workers.[4] However, the criteria used by state workers' compensation programs to determine whether a worker is totally disabled differ from those used by SSA for the DI program. Moreover, it is possible for an injured worker to be found partially disabled by a state workers' compensation program but totally disabled by SSA, and thus eligible for DI benefits. Furthermore, the criteria used to determine extent of disability vary among state workers' compensation programs (Burton 2005). We expect that these differences will systematically affect the DI application rates from state to state.

Reflecting Congressional concern about the relationship between the programs, the payment of DI and workers' compensation benefits has been coordinated since 1965. Specifically, if a person receives both DI and workers' compensation benefits, the combined benefits are limited to 80 percent of the claimant's preinjury wage. Federal law provides a DI benefit reduction or "offset" in order to achieve the 80 percent limit. Initially, states could enact "reverse offset" laws

Chart 2.
DI application rates and acceptance ratios, 1981–1999



SOURCE: Burkhauser and Houtenville (2006).

NOTE: Application rate reflects applicants per 100,000 adults aged 25–64; acceptance ratio equals the number of allowances divided by the number of denials.

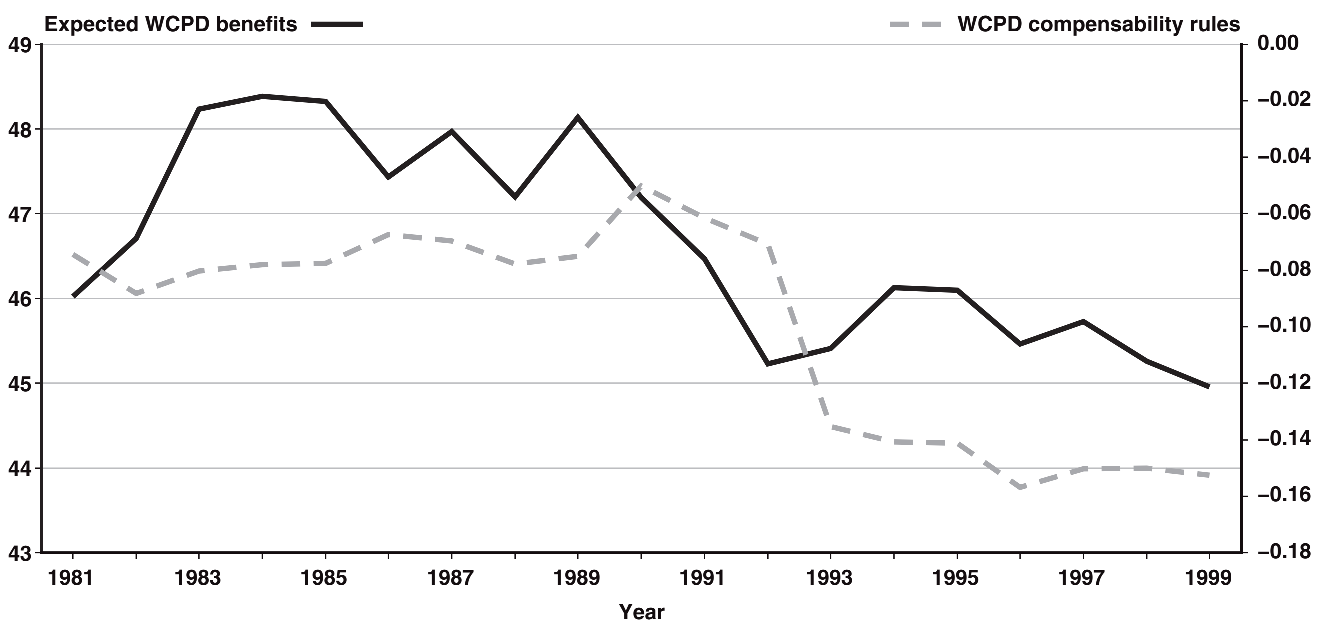
that reduced workers' compensation benefits rather than DI benefits, but in 1981 Congress eliminated that option for states that had not already enacted reverse offset legislation.[5]

Several institutional features of workers' compensation are likely to affect DI applications and awards. For example, many states limit the duration of workers' compensation benefit payments. Variation in the formulas used to calculate the weekly or monthly amounts of workers' compensation benefits may similarly be expected to affect the value of workers' compensation benefits relative to DI benefits, and thus influence the DI application rate. If, for example, a state has very generous workers' compensation benefits, workers may be less likely to apply for DI benefits. Chart 3 shows that the expected benefits for workers' compensation permanent disability (WCPD) claims generally declined in the 1990s.

In addition, workers are more likely to apply for DI benefits if they cannot qualify for workers' compensation benefits. A number of states changed their workers' compensation laws during the 1990s to restrict eligibility for permanent disability benefits (Spieler and Burton 1998). These provisions included limits on the compensability of particular medical diagnoses, such as stress and carpal tunnel syndrome; limits on coverage when the injury involved the aggravation of a preexisting condition; restrictions on the compensability of permanent total-disability cases; and changes in procedural rules and evidentiary standards, such as the requirement that medical conditions be documented by "objective medical" evidence. Burton and Spieler (2001, 2004) suggest that these changes are likely to have a disproportional effect on older workers, who are most likely to apply for DI benefits.

Research indicates that those legislative changes affected the workers' compensation benefits received by injured workers.[6] For example, in 1990, Oregon adopted legislation requiring the work injury to be the "major contributing cause" of disability for the claimant to qualify for workers' compensation benefits. Thomason and Burton (2005) estimate that this and similar changes had reduced the amount of benefits received by Oregon workers by about 25 percent by the mid-1990s. Guo and Burton (2010) find that changes in state compensability rules and increasingly stringent administrative practices were major contributors to the decline in workers' compensation cash benefits during the 1990s. Chart 3 shows the effect of tightening compensability rules for WCPD benefits.

Chart 3.
Estimated effects of workers' compensation program changes, 1981–1999



SOURCE: Authors' calculations.

NOTE: "Expected WCPD benefits" reflects the number of weeks that benefits would replace the average weekly wage in the beneficiary's state. "WCPD compensability rules" represents changes in eligibility rules resulting from legislation or court decisions, expressed as a cumulative index relative to rules in place in 1975; declining values indicate greater stringency.

This article examines whether the developments in WCPD benefits during the 1990s shown in Chart 3 explain a portion of the increase in DI applications shown in Chart 2.

Data and Variables

Three previous studies (Rupp and Stapleton 1995; Autor and Duggan 2003; Soss and Keiser 2006) used state-level data to estimate the extent to which selected DI program and population characteristics determined DI application rates. We employ most of the variables they used, and add two workers' compensation variables.

The previous studies employed different measures of the DI application rate. Rupp and Stapleton used DI applications per insured person, Autor and Duggan used the DI application rate among nonelderly adults, and Soss and Keiser used DI applications per 10,000 residents. Presumably, Rupp and Stapleton's measure is the most accurate, because only insured individuals can apply for DI. However, because we do not have access to state data on the DI-insured population, we turn to the second-best measure, Autor and Duggan's DI applications per 100,000 adults aged 25–64. That measure excludes children and persons aged 65 or older from the application pool. Disabled children or students cannot file independent applications for DI benefits without sufficient working experience. Eligibility for DI benefits is restricted to the insured population younger than the Social Security full retirement age, which was 65 throughout the study's observation period.[7] We obtain the data on 1981–2001 DI applications by state from Burkhauser and Houtenville (2006). In calculating the DI application rate, we account both for those who applied only for DI benefits and those who applied concurrently for DI and Supplemental Security Income payments.

We use two variables to measure the possible effects of workers' compensation programs on DI application rates: expected benefits and compensability rules for WCPD. We describe expected WCPD benefits, a measure of statutory benefits, in detail in Appendix A. Previous users of this variable include Krueger and Burton (1990); Thomason, Schmidle, and Burton (2001); and Guo and Burton (2010). Those studies use an actuarial procedure to calculate the expected cash payments for four types of workers' compensation benefits: temporary total disability (TTD), permanent partial disability (PPD), permanent total disability (PTD), and fatality. The procedure uses information on state workers' compensation laws, federal and state income taxes, Social Security taxes, and state average wages to produce expected workers' compensation cash benefits for each state in each year from 1972 through 1999. The methods of calculating expected benefits assume identical injury composition, life expectancy distribution, and family status in order to insure that interstate variations are due solely to differences in wages and workers' compensation statutory provisions.

Expected WCPD benefits values are expressed as the weighted average of expected benefits for PPD and PTD claims divided by the state's average weekly wage.[8] For example, the value of expected WCPD benefits for New York in 1981 is 61, which means the expected benefits per claim in 1981 were equal to 61 weeks of the state's average weekly wage. The expected benefits variable measures the generosity of a state's workers' compensation benefits. We expect a negative relationship between expected WCPD benefits and the DI application rate because more generous workers' compensation benefits should reduce the incentives to seek other sources of support.

Year-to-year changes in expected WCPD benefits capture statutory changes to the duration and amount of cash benefits, but do not account for changes in eligibility standards or major court decisions that affect eligibility. The second variable, WCPD compensability rules, captures such changes in state rules since 1975. For each state, the National Council on Compensation Insurance (NCCI) estimates the total effects of changes in workers' compensation expected benefits and in statutes or court decisions that affect compensability rules. The difference between these NCCI estimates and our estimates of the effects of changes in expected WCPD benefits reflects the estimated effect of changes in WCPD compensability rules. Appendix B describes WCPD compensability rules in detail.

We calculate accumulated changes in the compensability rules for PPD and PTD benefits using 1975 as the baseline. For example, if a state liberalized its compensability rules by 10 percent in 1989 and 10 percent in 1992, the value of its compensability change is 0 from 1975 through 1988, + 0.1 from 1989 through 1991, and + 0.2 after 1991. We expect a negative relationship between WCPD compensability rules and DI application because workers who qualify for workers' compensation benefits are less likely to apply for benefits from other programs for disabled persons.

As shown in Chart 3, the WCPD compensability rules tightened between 1981 and 1999, which should have resulted in more applications for DI benefits.

We also adopt six independent variables from the previous studies to explain the DI application rate: DI acceptance ratio, DI replacement rate, population median age, disability prevalence, women's share of employment, and unemployment rate. The DI acceptance ratio is equal to the number of DI allowances divided by the number of DI denials. Chart 2 shows national average DI acceptance ratios. In our regressions, we use each state's DI acceptance ratio with a 1-year lag. A higher acceptance ratio may encourage more DI applications in subsequent years. However, more DI applications may result in more stringent acceptance decisions. Although the federal government establishes the general standards for DI eligibility, state agencies make the initial administrative decisions and if DI applications increase, the agency may informally tighten the acceptance criteria to keep the number of awards from increasing too rapidly. As a result, the expected sign of the DI acceptance ratio is uncertain.[9]

The DI replacement rate equals the average monthly DI benefit per disabled worker divided by the state average monthly wage. Median age is self-explanatory. Disability prevalence data are self-reported characteristics from Census Bureau's Current Population Surveys. We could not find a source of nonself-reported information covering our study period. However, most previous studies confirm that self-reported work limitations are strong predictors of DI participation (Burkhauser, Butler, and Weathers 2001/2002; Daly 1998; Rupp and Davies 2004). Women's share of employment is also self-explanatory, as is unemployment rate. Based on previous studies, we expect these last five variables to correlate positively with DI applications.

Two previous studies examine the relationship between workers' compensation and DI. In the first, Guo and Burton (2008) find that the DI application rate increased from 1985 through 1999 as the statutory level of workers' compensation benefits declined and eligibility rules tightened. The authors calculate workers' compensation variables using the weighted average of TTD, PPD, PTD, and fatality benefits. However, most workers' compensation beneficiaries receive only TTD benefits and are unlikely to qualify for DI benefits (which are not provided for temporary disabilities). Thus, the workers' compensation variables used in Guo and Burton (2008) do not provide the best measures of cases that could potentially result in DI applications. By contrast, the variables in the current analysis consider only PPD and PTD claims, which should provide a more precise estimate of the spillover effect to DI. The present analysis also extends the period of coverage to 1981–1999 and reformulates the model to minimize some statistical problems.

In the second study, McInerney and Simon (2012) conclude "it is unlikely that state workers' compensation changes were a meaningful factor in explaining the rise in DI during our study period of 1986 to 2001." One major difference between that study and this article is that we use different variables to measure important features of state programs. McInerney and Simon, for example, use state PPD maximum weekly benefits as a measure of workers' compensation generosity in their regression models. However, PPD maximum weekly benefits are only one of the factors determining the generosity of PPD benefits. Some states base PPD benefits on the degree of injury, while others base them on the extent of lost earning capacity. Most states impose maximum durations or dollar amounts on PPD benefits (unlike PTD benefits, which in many states can continue for life), and these limits vary among states. For example, losing an arm is compensated for 312 weeks in the District of Columbia, but for 224 weeks in Georgia. The eligibility rules for PPD benefits also vary across states. The findings from McInerney and Simon's study may be misleading because using maximum weekly benefits as the sole measurement of generosity is limiting.

This article's two independent variables provide more refined measurements of state workers' compensation programs. The first, expected benefits, relies on actuarial evaluations of state laws for both PPD and PTD benefits. "Expected benefits" considers not only maximum weekly benefits but also minimum weekly benefits, nominal replacement rates (weekly benefit relative to the worker's previous earnings), and the durations of two or more types of PPD benefits (such as scheduled and unscheduled) used in each state.[10] We add the second variable, compensability rules, to capture changes to eligibility rules in state workers' compensation programs. Guo and Burton (2010) find that expected benefits and compensability rules are both statistically significant variables that help explain the decline of workers' compensation benefits in the 1990s. We expect those two variables to estimate the impact of workers' compensation program changes on DI application rates in the 1990s more accurately than the variables used by McInerney and Simon (2012).

Regression Results

We examine the determinants of DI application in three steps. First, we try to replicate the findings from previous studies for the six independent variables: DI acceptance ratio, DI replacement rate, median age, disability prevalence, women's share of employment, and unemployment rate. Second, we add the two WCPD variables (expected benefits and compensability rules) to examine whether changes in program laws and rules also help determine DI application rates. Third, we estimate the extent to which workers' compensation program changes spilled over into higher DI application rates during the 1990s. The first two steps employ fixed-effects regression models. The third step uses a simulation model based on the regression results from the second step.

The investigation covers 46 states from 1981 through 1999.[11] Table 1 shows descriptive statistics for the study variables. Most variables have 969 observations; for WCPD compensability rules, missing values reduce the number of observations to 855.[12] To be consistent across models, we use 855 observations for all variables.[13] A major potential problem for a panel data set is the unobserved variances of the missing variables. Many factors, such as differences in the political environment across states or changes in national attitudes towards disabled persons over time, are difficult or impossible to measure. Those unobserved variances, if correlated with the dependent variable or independent variables, will bias the results of an ordinary least square regression model. Econometricians usually employ one of two techniques to control for the unobserved variables in the panel data: fixed effects or random effects. When the unobserved variances are correlated with the independent variables, a random-effect model is preferred; otherwise, a fixed model is more appropriate (Greene 2011). We ran Hausman tests for our panel data that indicated a fixed-effect model should be more efficient for our regressions.

In the five studies discussed above, Rupp and Stapleton (1995) and Soss and Keiser (2006) use only time fixed-effects models; Autor and Duggan (2003) employ a combination of first-difference observations (which is similar to time fixed-effects) and state fixed-effects; and Guo and Burton (2008) and McInerney and Simon (2012) use both time and state fixed-effects models.

To demonstrate the differences generated by the time and state fixed effects, we present four models for our regression results: model 1 includes neither year

Table 1.
Definitions and descriptive statistics for study variables

Variable	Mean	Standard deviation	Minimum	Maximum
DI application rate [a]	832.00	219.07	343.60	1,765.34
Workers' compensation variables				
Expected WCPD benefits [b]	53.35	32.74	15.61	377.72
WCPD compensability rules [c]	-0.14	0.31	-1.30	0.90
Independent variables				
Prior-year DI acceptance ratio [d]	0.59	0.18	0.24	1.30
DI replacement rate [e]	0.32	0.04	0.18	0.42
Median age (years)	32.75	2.40	24.40	38.70
Disability prevalence	0.08	0.02	0.04	0.15
Women's share of employment	0.46	0.02	0.39	0.52
Unemployment rate	0.06	0.02	0.02	0.16

SOURCES: Burkhauser and Houtenville (2006); SSA; Bureau of Labor Statistics; authors' calculations; Cornell University Rehabilitation Research and Training Center on Disability Demographics and Statistics; and Census Bureau.

NOTES: Data reflect 855 observations in 46 states from 1981 through 1999, except as noted.

a. Applications per 100,000 adults aged 25–64; includes DI-only and concurrent DI and SSI applications.

b. Actuarial value (in 1982–1984 dollars) of PPD and PTD benefits under state workers' compensation statute divided by state average weekly wage.

c. Effective cumulative change since 1975 as a result of statutory changes to and court decisions affecting PPD and PTD benefits.

d. DI claims accepted divided by claims denied in previous year.

e. Average monthly DI benefit divided by average monthly wage.

dummies nor state dummies, model 2 includes year dummies only, model 3 includes state dummies only, and model 4 includes both state and year dummies.[14] Model 4 is our preferred model, because it controls for unobserved variations across states and years. To correct for heteroskedasticity, we employ weighted least-square regressions (using state employment as weights) and robust standard errors for all regression models.

Regressions Excluding Workers' Compensation Variables

Table 2 reports that the DI replacement rate, disability prevalence, and unemployment rate are positively and significantly associated with DI application in all four models. (In model 4, the coefficient on the DI replacement rate is significant at the 0.05 confidence level, the coefficient on disability prevalence is significant at the 0.10 confidence level, and the coefficient on the unemployment rate is significant at the 0.01 confidence level.) The coefficients for women's share of employment are positive and statistically significant in three models (including model 4, where the coefficient is significant at the 0.10 confidence level). The coefficient on median age is not statistically significant at the 0.10 confidence level in the first two models, but is positive and significant in models 3 and 4 at the 0.01 confidence level.

Model 4 replicates the findings in previous studies. The results for the DI acceptance ratio are paradoxical because they are inconsistent across models and the coefficient is not significant at the 0.10 confidence level in our preferred model 4. Guo and Burton (2008) find a significant and negative relationship between state stringency for DI awards and the DI application rate but, as discussed in note 9, that result was probably biased. None of the other four studies investigate the impact of state administrative stringency for DI awards on the number of DI applications. The nature of the relationship between higher acceptance ratios and the DI application rate remains murky despite our best effort.

According to model 4, the coefficient on DI replacement rate is 583.98, meaning that when the DI replacement rate increased by 10 percentage points, 58.4 more individuals per 100,000 nonelderly adults applied for DI benefits. (The mean value for DI applications in our

Table 2.
Alternative regressions examining determinants of DI application during 1981–1999, excluding workers' compensation variables

Variables	Model 1	Model 2	Model 3	Model 4
Prior-year DI acceptance ratio	3.70	-136.14***	153.61***	(42.66)
	(33.15)	(33.20)	(33.01)	(29.88)
DI replacement rate	1,097.15***	1,083.73***	1,660.79***	583.98**
	(159.53)	(148.56)	(341.24)	(247.73)
Median age	4.02	1.19	35.31***	21.38***
	(2.90)	(2.82)	(4.62)	(6.81)
Disability prevalence	6,205.44***	5,409.19***	1,798.05***	515.81*
	(381.72)	(333.30)	(396.00)	(275.16)
Women's share of employment	3,218.80***	2,805.43***	858.15	634.11*
	(452.64)	(407.06)	(537.66)	(350.44)
Unemployment rate	3,000.05***	2,884.85***	3,433.24***	2,632.96***
	(335.71)	(360.75)	(290.43)	(244.80)
Year dummies	No	Yes	No	Yes
State dummies	No	No	Yes	Yes
R-square	0.52	0.65	0.79	0.91

SOURCE: Authors' calculations.

NOTES: Data reflect 855 observations in 46 states from 1981 through 1999.

Data are weighted least-square regressions using state employment as the weight.

The dependent variable is DI applicants per 100,000 nonelderly adults.

Robust standard errors are shown in parentheses.

* = significant at the 0.10 level; ** = significant at the 0.05 level; *** = significant at the 0.01 level.

sample was 832 per 100,000 nonelderly adults.) This result is lower than Autor and Duggan's (2003) finding; however, their examination of the DI replacement rate focuses on low-wage workers, while our measure is the state average replacement rate applicable to all workers. We are not surprised that low-income workers are more likely to apply for DI benefits than are workers overall. Our results also suggest that a 10 percentage point growth in disability prevalence induces 51.6 more applications per 100,000 nonelderly adults, a finding similar to that of Soss and Keiser (2006). Model 4 also indicates that if the median age increases by 1 year, 21.4 more persons of every 100,000 nonelderly adults apply for DI benefits. For every 10 percentage point difference between states in the share of female workers, the state with the higher share receives 63.4 more applications for every 100,000 nonelderly adults. Finally, a 10 percentage point increase in the unemployment rate leads to 263.3 additional DI applications per 100,000 nonelderly adults; that result falls in the range of findings reviewed by Rupp and Stapleton (1995, Chart 4).

Regressions Including Workers' Compensation Variables

In the regressions in Table 3 we include the expected WCPD benefits and WCPD compensability rules variables. The coefficient for expected WCPD benefits is consistently negative and significant (at the 0.01 confidence level in models 1, 3, and 4, and at the 0.05 confidence level in model 2), as expected. Model 4 suggests that when expected WCPD benefits are reduced by an amount equal to 1 week of a state's average weekly wage, DI applications increase by 0.51 per 100,000 nonelderly adults. This means that a state with expected WCPD benefits that were one standard deviation below the national average (as shown in Table 1) had about 33 more DI applications per

Table 3.
Alternative regressions examining determinants of DI application during 1981–1999, including workers' compensation variables

Variables	Model 1	Model 2	Model 3	Model 4
Expected WCPD benefits	-0.73***	-0.37**	-0.82***	-0.51***
	(0.19)	(0.18)	(0.25)	(0.15)
WCPD compensability rules	38.51**	57.06***	-46.98*	-30.95**
	(17.75)	(13.65)	(26.44)	(13.67)
Prior-year DI acceptance ratio	6.61	-151.77***	160.11***	-35.95
	(33.57)	(34.37)	(32.99)	(29.77)
DI replacement rate	1,287.25***	1,312.30***	1,638.04***	597.80**
	(165.67)	(151.57)	(346.86)	(256.49)
Median age	4.88*	1.50	32.35***	17.54***
	(2.88)	(2.83)	(4.71)	(7.02)
Disability prevalence	6,242.58***	5,435.56***	1,764.78***	507.62*
	(380.97)	(334.64)	(391.30)	(272.62)
Women's share of employment	3,339.72***	2,882.38***	1,051.92**	765.88**
	(460.34)	(411.25)	(530.79)	(355.82)
Unemployment rate	2,924.86***	2,737.95***	3,407.37	2,605.93***
	(334.52)	(358.60)	(287.53)	(248.59)
Year dummies	No	Yes	No	Yes
State dummies	No	No	Yes	Yes
R-square	0.53	0.66	0.79	0.92

SOURCE: Authors' calculations.

NOTES: Data reflect 855 observations in 46 states from 1981 through 1999.

Data are weighted least-square regressions using state employment as the weight.

The dependent variable is DI applicants per 100,000 nonelderly adults.

Robust standard errors are shown in parentheses.

* = significant at the 0.10 level; ** = significant at the 0.05 level; *** = significant at the 0.01 level.

100,000 nonelderly adults than a state with benefits that were one standard deviation above the national average.[15] Because the mean DI application rate in our sample was 832 per 100,000 nonelderly adults, the effect of expected WCPD benefits on DI applications is statistically significant but small.

The WCPD compensability rules variable is positively correlated with DI applications in models 1 and 2, contrary to our expectations. However, its coefficient becomes negative when we include state dummies in model 3 (significant at the 0.10 level of confidence) and model 4 (significant at the 0.05 level of confidence). Workers' compensation is a state program and many factors, such as the availability of lawyers who can handle both workers' compensation and DI cases, probably are important to the prevalence of DI applications, but are not measured in any data set. The differences in results among the four models for compensability rules confirm that using state fixed-effect models to control for unobserved state-specific variances is critical for avoiding biased estimates. In our preferred formulation (model 4), the results suggest that the liberalization of state compensability rules by 10 percent relative to 1975 decreases DI applications by 3.1 per 100,000 nonelderly adults. This means that a state with a WCPD compensability rules value that was one standard deviation below the national average had about 19 more DI applications per 100,000 nonelderly adults than a state with a value that was one standard deviation above the national average—again, a relatively small effect.[16]

The results for the nonworkers' compensation variables in Table 3 are similar in significance and magnitude to the coefficients in Table 2. Including workers' compensation variables thus does not affect the results of the six independent variables used in previous studies of the determinants of DI application.

The Spillover from Workers' Compensation Reforms

During the 1990s, the values of the expected WCPD benefits and WCPD compensability rules variables both declined, as shown in Chart 3. These changes, in combination with the coefficients for these two variables (Table 3, model 4), confirm that developments within the workers' compensation program explain a modest portion of the increase in the DI application rate during that decade.

From the 1980s to the 1990s, the national average annual DI application rate increased from 775 to 853 claims per 100,000 nonelderly adults (Table 4), a 10 percent increase. To what extent did workers' compensation reforms spill over into the growth of the DI application rate during that period? In Table 4, we use the regression results from model 4 in Table 3 to estimate each variable's contribution toward the growth of the DI application rate. Table 4's first two columns

Table 4.
Extent of changes in national average DI application rates from the 1980s to the 1990s explained by each variable

Variable	National annual average: 1981–1989	National annual average: 1990–1999	Difference between 1980s and 1990s	Coefficient from model 4	Predicted change [a]	Explained change [b] (%)
DI application rate	775.09	852.54	77.44	…	77.44	…
Expected WCPD benefits	48.29	45.64	-2.65	-0.51	1.35	1.75
WCPD compensability rules	-0.08	-0.12	-0.05	-30.95	1.46	1.89
Prior-year DI acceptance ratio	0.54	0.59	0.05	-35.95	1.81	-2.34
DI replacement rate	0.31	0.30	-0.01	597.81	-6.39	-8.25
Median age	31.55	34.24	2.70	17.54	47.30	61.08
Disability prevalence	0.08	0.08	c	507.62	1.53	1.98
Women's share of employment	0.44	0.46	0.02	765.88	13.43	17.34
Unemployment rate	0.07	0.06	-0.01	2,605.93	-35.09	-45.31

SOURCE: Authors' calculations.

NOTE: … = not applicable.

a. Product of "difference between 1980s and 1990s" and "coefficient from model 4."

b. Equals predicted change in value of variable divided by predicted change in DI application rate (77.44).

c. Less than 0.005.

present the national annual average for each variable during the 1980s and 1990s, respectively. The third column shows the change in value for each variable between the two decades. The fourth column presents the coefficients from model 4 in Table 3. We multiply columns 3 and 4 to obtain the values in column 5, the predicted changes in the DI application rate based on our regression results. Column 6 shows the percentages of the change in DI application rates from the 1980s to the 1990s explained by each variable.

Our results indicate that the aging of the population was the largest contributor to the growth in DI application, and that it accounted for more than one-half the growth of the DI application rate in the 1990s. Women's share of employment was another important factor, associated with about 17 percent of the change in DI application rates between the decades. The DI replacement rate and the unemployment rate generally declined across those two decades, which would have resulted in a lower DI application rate if the values of other independent variables had not changed. The change in the disability prevalence rate was minimal during the period. Thus, the latter three factors were not sources of the higher DI application rates in the 1990s.

Our results suggest that workers' compensation program reforms during the 1990s combined to contribute 3–4 percent of the growth of the DI application rate during that period. Specifically, changes in expected WCPD benefits and WCPD compensability rules respectively explained 1.75 percent and 1.89 percent of the growth of the DI application rate between the 1980s and 1990s.

Conclusions

In this article we attempted to replicate the results of earlier studies of the determinants of interstate differences in DI benefit application rates. Those studies did not include variables measuring aspects of state workers' compensation programs. Our results in Tables 2 and 3 basically confirm the previous findings.

Another purpose of this article was to investigate whether the growth of DI application in the 1990s could be partially explained by changes in state workers' compensation programs. The findings in Table 3 suggest that both expected WCPD benefits and WCPD compensability rules modestly affect the DI application rate. Because the values of both variables declined in the 1990s, the statistical results help explain the increase in the DI application rate during the decade. Our results are consistent with those of Guo and Burton (2008), but differ from those in McInerney and Simon (2012) because we find a small effect of state workers' compensation program changes on DI application, while McInerney and Simon concluded that program changes were unlikely to cause the rise in DI applications. We believe that the results differ because this study relies on better measures of state workers' compensation programs.

Policy Implications

Our findings raise potential concerns about the financial status of the DI Trust Fund. Those concerns stem from the assumption that some of the increased application for DI benefits due to changes in workers' compensation programs during the 1990s resulted in additional DI awards. Although we believe this assumption is reasonable, we have not yet tested the transfer of costs from workers' compensation to DI. Nevertheless, to the extent that increased application for DI benefits results in more DI awards, the changes in the workers' compensation program have contributed modestly to the financial problems of the DI Trust Fund.[17]

Further concerns involve the potential reduction in incentives to improve workplace safety.[18] Workers' compensation programs promote safety by using two types of experience rating to determine employer premiums. The industry-level experience rating establishes a premium rate based largely on prior benefit payments by the industry. The resulting differences in labor costs and prices between industries should shift the composition of national consumption towards safer products. The firm-level experience rating determines the workers' compensation premium for each firm (above a minimum size) by comparing its prior benefit payments with those of other firms in the industry. Firms thus have an incentive to improve safety in order to reduce premiums and remain competitive.

Scholars have debated the safety effects of the workers' compensation program in general and of firm-level experience rating in particular. A survey of the literature by Boden (1995) concludes, "research on the safety impacts has not provided a clear answer to whether workers' compensation improves workplace safety" (p. 285). By contrast, Thomason (2005) asserts that most of the studies he surveyed (11 of 14) found that experience rating improves safety and health and that studies failing to detect the relationship did so because of methodological weaknesses. Thomason concludes that "taken as a whole, the evidence is quite compelling: experience rating works" (p. 26). Guo and Burton (2010) find that the national average of incurred workers' compensation cash benefits declined by 41.6 percent during the 1990s, and over 30 percent of this decline was due to changes in the state workers' compensation programs, such as tightening compensability rules. To the extent that the costs of workplace injuries shift from workers' compensation to workers and their families or to other programs for disabled workers, the safety incentives provided by the workers' compensation program are diluted. Safety incentives have probably also been diluted—to the extent that costs have been shifted from workers' compensation to the DI program—because the former relies on a firm-level experience rating and the latter does not experience-rate the DI payroll tax.[19]

Placing our Results in Context

First, some determinants of DI application are inexorable and are largely beyond the purview of public policy. Population aging and women's increasing workforce participation are examples, which together explain over 70 percent of the increase in the DI application rate during the period we studied.

Second, some determinants of DI application are significantly affected by public policies that are largely based on factors external to the DI program. Examples are policies addressing the unemployment rate, including fiscal and monetary policy. Our results suggest that declining unemployment rates reduced the DI application rate by about 45 percent between the 1980s and 1990s.

Third, the determinants of DI application that are directly affected by public policies at the federal level are largely based on factors internal to the DI program. An example we examined was the DI replacement rate, which essentially measures how adequately DI benefits replace disabled workers' lost earnings. Our results suggest that the decline in the DI replacement rate between the 1980s and 1990s reduced the DI application rate by about 8 percent. Other federal policy tools that can increase or decrease the application rate include changing the stringency of DI benefit eligibility standards.

Fourth, the determinants of DI application affected by state-level public policies include changes in workers' compensation programs. Although the primary purpose of those changes is not to affect DI application rates, they nonetheless have consequences for the DI program. The effects of workers' compensation policy changes on DI application are limited when compared with socioeconomic developments such as the aging workforce and unemployment, and are less important than policy decisions made at the federal level, such as the level of the DI replacement rate. Nonetheless, our findings suggest that changes in the state workers' compensation programs during the 1990s resulted in a modest increase in applications for DI benefits during that period.

Further Research

Several avenues offer promise for further research. One such avenue is to extend the study period. This article limits its examination to the period between 1981 and 1999 because the data for workers' compensation expected benefits and compensability rules for more recent years are not yet available. Another reason we selected that period is that it largely overlaps the 1986–2001 study period of McInerney and Simon (2012), which allows a comparison of the two studies' methodologies, variables, and findings. Nonetheless, the types of changes in workers' compensation programs that affected DI application rates in the 1990s continued into the current century and may have had a greater impact recently. Most of the reforms in the 1990s were in smaller states and thus had a limited effect on the national DI application rate.[20] Since 2000, some states have increased permanent disability benefits; however, many of the workers' compensation reforms that reduced benefits occurred in larger states. California, Florida, and New York accounted for almost one-third of workers' compensation benefit payments as of 2005 (Sengupta, Reno, and Burton 2011, Table 7). Between 2000 and 2009, California reduced PPD benefits by over 60 percent, Florida by almost 20 percent, and New York by about 20 percent (NCCI 2011, Exhibit III). We will study the effects of these changes on DI application rates as soon as the data for the expected WCPD benefits and WCPD compensability rules variables are updated.

Research could also consider aspects of the DI program besides applications. We only examined the effects of workers' compensation program changes on DI application rates because much of the DI program research focuses on the determinants of application. However, workers' compensation program changes can lead to adverse DI program outcomes in addition to higher application rates. Recall that in 2010, 13.5 percent of workers receiving DI benefits were also current or former recipients of workers' compensation or public disability benefits; and for some, DI benefits were reduced by the offset rules (Sengupta, Reno, and Burton 2011, Table 17). For most workers whose DI benefits are limited by the offset rule, a $100 reduction in workers' compensation benefits results in a $100 increase in DI benefits. Our research to date has not considered this type of cost shifting from state workers' compensation programs to the DI program.

Appendix A: Calculating Expected WCPD Benefits

The methodology used to construct the expected WCPD benefits variable is adapted from an actuarial procedure used by the NCCI to evaluate how changes in state workers' compensation laws affect program costs, as measured by benefit payments.[21] The NCCI procedure evaluates statutory changes affecting medical benefits and four types of cash benefits: TTD, PPD, PTD, and fatality. For each type of cash benefits, expected benefits are equal to the product of the average weekly benefit paid to claimants and the average duration of benefit payments in weeks. The NCCI then combines the separate estimates for the four types of expected cash benefits and uses a national distribution of claims by type to estimate an overall average expected cash benefit for all disabling injury and illness claims in each state. For this study, we have calculated expected WCPD benefits based only on PPD and PTD claims because these relatively serious injuries are the types most likely to qualify for DI benefits.

The weekly amount for each type of benefit is calculated based on the state's average weekly wage, the percentage of preinjury wages replaced by the benefit (nominal replacement rate), and the minimum and maximum benefit amounts (which will affect the actual replacement rate for some workers). In addition, we account for the distribution of wages around the state's average weekly wage, which will indicate how many workers are affected by the minimum or maximum weekly benefits. Adjustments are made to the weekly benefit in those states that coordinate workers' compensation benefits with other programs, including DI and Old-Age and Survivors Insurance, and in those few states that index the weekly benefit to the cost of living or the state's average weekly wage.

PTD Duration and Expected Benefits

Some jurisdictions limit the duration or the total dollar amount of PTD benefits. Unless such a limit was specified, we assumed that benefits are payable for life. In either case, we determined the duration of benefits using an age distribution of PTD claimants and mortality information provided by the NCCI. We calculated expected benefit duration for every claimant in the age distribution and then multiplied it by the average weekly benefit amount to obtain total expected PTD benefits.

For states where PTD benefits are offset by DI benefits, we divided the total benefit period into four subperiods. The first is a 6-month waiting period during which we assumed the claimant received no DI benefits. The second is a period during which the DI benefit includes dependent benefits (for those claimants with dependent children). The third is a period after the children have reached majority and during which only the basic DI benefit is paid. The fourth is a period, beginning at age 65, when DI benefits are no longer paid. Benefit durations are calculated for each of these periods, adjusted for mortality and discounted to the present at 3.5 percent. The duration value for each component is then multiplied by the applicable weekly PTD benefit for that period to estimate the present value of lifetime benefits.

For those states in which workers' compensation benefits are reduced ("offset") if the worker receives Old-Age Insurance benefits, we make one benefit duration calculation for a beneficiary through age 64 and another for ages 65 and older. Both benefit duration calculations are adjusted for mortality and discounted at 3.5 percent, and then multiplied by the appropriate weekly benefit (whether offset or not) to obtain the expected total amount of PTD benefits in the state.

PPD Duration and Expected Benefits

Most states recognize two different types of PPDs for workers' compensation: those affecting a particular body part included on a list (or *schedule*) of injuries contained in the statute and those that do not. These injury types are thus called scheduled and nonscheduled PPDs.[22] The maximum duration of scheduled benefits for the physical loss or loss of use of a particular body part is specified by statute. For example, in New York, a worker who loses the use of a leg is entitled to 288 weeks of benefits, while a worker who loses an arm is entitled to 312 weeks of benefits. In the event of a partial physical loss or loss of use of a scheduled body part, benefits are prorated based on the amount specified for the entire loss, so that a New York worker who has suffered a 25 percent loss of an arm is entitled to 78 weeks of benefits.

The basis for nonscheduled PPD benefits—that is, those involving a body part not specifically mentioned in the statute—varies widely among states. Some states base nonscheduled benefits on the permanent-impairment approach, which essentially evaluates the medical consequences of a workplace injury or disease. Other states base nonscheduled benefits on an evaluation of the workplace injury's consequences on the worker's earning capacity. Still other states base nonscheduled benefits on the extent of the worker's actual loss of wages from the workplace injury or diseases. Some states place the same duration limit on all nonscheduled PPD benefits, while the limits vary in other states, depending on the severity of the consequences of the injury (for example, the loss of wage-earning capacity).

For scheduled PPD benefits, and for nonscheduled PPD benefits based on the permanent-impairment or the loss-of-earning-capacity approach, we use a national distribution of PPD claims by body part and degree of permanent impairment provided by the NCCI. For states using the actual-wage-loss approach, we use a distribution based on Berkowitz and Burton (1987) to determine the extent of wage loss associated with a given degree of permanent impairment. This information is then linked to the NCCI's PPD distribution to create a wage-loss distribution for PPD claimants.

Each state's workers' compensation statutory information is then combined with the resulting PPD distribution (wage loss, earning capacity, or permanent impairment) to determine average disability duration. PPD benefit durations are adjusted for mortality and discounted at 3.5 percent. The adjusted average benefit durations are then multiplied by the average weekly benefit to obtain the expected total amount of PPD benefits in the state.

In order to provide consistent estimates across years and states, we use this distribution of cases (based on NCCI data): fatal (0.002357), PTD (0.003162), major PPD (0.085293), minor PPD (0.240863), and TTD (0.668324). Because this study focuses on the more serious injuries, it uses only the PTD, major PPD, and minor PPD weights.

Previous Use of the Expected Benefits Variable

For more than 55 years, the NCCI has used an actuarial procedure to estimate the effect of changes in workers' compensation statutes on the amount of benefits paid.[23] As described in NCCI (2011), the procedure involves calculating the ratio of benefit amounts for a representative group of accidents under the new law to the amounts for the same group of accidents under the old law. The ratios are calculated for seven benefit categories: fatal, PTD, major PPD, minor PPD, TTD, total indemnity (a weighted average of the previous categories), medical, and total (a weighted average of total indemnity and medical). NCCI has published ratios for 1965 and later in Exhibit III of *Annual Statistical Bulletin* (ASB) editions dating from 1982.

There are several limitations to the ratios of benefit level changes published in the ASB. First, the ratios are only calculated when a statute changes. Thus, because New York made no statutory changes between 1998 and 2006, the value shown for those years in the ASB is zero. However, the state's average weekly wage increased during those years, resulting in higher cash benefit payments for many workers. Second, the ratios are calculated each time a state changes its statute. New York changed its cash or medical benefits on three different dates during 2007. Third, ASB only publishes ratios for states with private insurance carriers, and not for those, such as Ohio and Washington, with exclusive state funds. Fourth, the ratios are useful for tracing developments in individual states, but interstate differences in the amounts of benefits cannot be determined. State A may have increased benefits by 15 percent during the 1990s and state B by 5 percent during that decade, but because we do not know how generous the benefits were in each state as of 1990, we do not know whether the difference in total benefits between the states widened or narrowed during the 1990s.

The expected benefits variable is first used for research purposes in Burton (1965). Under the tutelage of Roy Kallop, the NCCI Actuary, Burton adapted the NCCI procedure and prepared Statutory Benefit Indexes (expected benefits) for 25 states (including Ohio and West Virginia, which had exclusive state workers' compensation funds) for 1958 and 1962. Results for 1962 in Burton's "Over-all Benefit Index, Including Medical Benefits" vary from .742 in Alabama to 1.541 in Connecticut. Burton uses the "Over-all Benefit Index, Including Medical Benefits" and the "Over-all Benefit Index, Excluding Medical Benefits" as independent variables (together with other variables, such as an "Index of Legal Generosity") in regressions in which the dependent variable is a measure of the employers' costs of workers' compensation insurance for a uniform set of insurance classes. With observations from all 25 states, the "Over-all Benefit Index, Excluding Medical Benefits" has a regression coefficient of 0.5099 with a standard error of 0.1224, which is significant at the .01 probability level (Burton 1965, Table 47).

Expanding Burton's earlier work on interstate differences in employers' costs of workers' compensation, Krueger and Burton (1990) examine the determinants of two measures of the employers' costs in 29 states for 1972, 1975, 1978, and 1983. The coefficients on the log of expected benefits are positive and highly significant in all 12 regressions, which contain a variety of other independent variables. The authors note: "The results indicate that for either measure of workers' compensation costs we cannot reject the null hypothesis that there is a unit elasticity between costs and benefits, regardless of the set of included regressors" (p. 236).

Thomason, Schmidle, and Burton (2001) examine several topics, including the effects of insurance regulation on the employers' costs of workers' compensation and on workplace safety. The authors calculate expected benefits for each year from 1975 through 1995 for as many as 48 jurisdictions, then compare the results for this expanded data set with Krueger and Burton's 1990 results. The new results produce coefficients for the benefits variable that, in general, are significantly less than 1.0. The authors suggest that the benefit coefficient estimates may be subject to omitted-variable bias and measurement error; however, taken at face value, "the result suggests that a 10 percent increase in benefits results in a 4 percent increase in costs" (p. 108).

Thomason and Burton (2004) discuss several ways to compare the benefits in state workers' compensation programs, including maximum weekly TTD benefits, average weekly TTD benefits, and expected (statutory) benefits. The authors explain the expected benefits methodology and present data on expected benefits over time, among jurisdictions, and relative to the Model Workers' Compensation Act. For example, expected benefits by state in 1998 "ranged from a little more than $30,000 for the average injured worker in the District of Columbia to less than $5,000 for (hypothetically) identical injured workers in Louisiana, a sixfold difference" (p. 81).

Guo and Burton (2010) examine the determinants of interstate differences in workers' compensation cash benefits per 100,000 workers for each year from 1975 to 1999 for 46 jurisdictions (fewer in some years). One of the independent variables is expected benefits for the combination of four types of cash benefits. Among other conclusions, the authors find that "the benefit elasticity (the association between expected benefits and actual benefits payments) was significantly less than 1.0 in both our study periods (1975-89 and 1990-99). One interpretation of these results is that the monitoring and rehabilitation effects for employers are stronger than the reporting effect and duration effects for workers" (p. 353).

Appendix B: Calculating WCPD Compensability Rules

As mentioned earlier, NCCI publishes data on benefit level changes in Exhibit III of the ASB. The exhibit provides estimated increases or decreases in benefits resulting from changes in workers' compensation statutes, medical fee schedules, and significant court decisions. Over the years, the ASB has given separate estimates for these benefit types: fatal, permanent total, major permanent partial (until 2009), minor permanent partial (until 2009), combined permanent partial (since 2000), temporary total, all indemnity (cash) benefits, medical, and total (cash plus medical).

The estimated change in benefits paid combines the effects of three components:

- **Objective changes in benefits,** which consist of changes in weekly benefit amounts or duration of benefits that can be evaluated using the actuarial procedures described in Appendix A.
- **Utilization effect,** which consists of a 10 percent increase in the objective changes in benefits, based on the assumption that higher statutory benefits induce workers to increase the frequency or duration of their claims.
- **Subjective changes in benefits,** which consist of the NCCI's assessment of the effect of court decisions or statutory changes (other than objective changes) on benefits paid. Examples of these subjective changes are given in the methodology section below.

The benefit level changes published in the ASB sometimes reflect the sum of the first two components, sometimes consist of only the third component, and sometimes combine all three. All of the expected-benefits figures discussed in Appendix A consist solely of objective changes in benefits, which we estimated independently but used, to the best of our ability, the NCCI procedure.

Methodology for WCPD Compensability Rules

We offer two examples of the calculation of a compensability rules value for a given state. The examples respectively describe an increase and a decrease in the compensability rules value. Table B-1 presents supporting data.

Montana 1983. The first example involves an increase in the value of compensability rules variable. The court decision mentioned in Table B-1 is *Wight v. Hughes Livestock Co. Inc.,* 664 P.2d 303 (Mont. 1983), which held that when an insurer denies compensability or partially denies benefits and is subsequently found liable for benefits or additional benefits, the insurer is liable for at least a portion of the applicant's attorney's fee. In a separate development, the maximum weekly benefit for PPD increased from $120.50 to $131.50 and the maximum weekly benefits for PTD and TTD increased from $241.00 to $263.00 on July 1, 1983. (TTD benefits are paid to some workers who receive PPD benefits and thus affect the estimates of benefits paid for PPD claims.)

The weighted average of NCCI estimates of the effect of the 1983 Montana changes on PTD, major PPD, and minor PPD benefits paid is a 28.9 percent increase. This increase combines all three benefit change components: objective changes in benefits, the utilization effect, and subjective changes in benefits (the court decision).

We calculate the expected benefits for the workers who received PTD benefits, major PPD benefits, and minor PPD benefits as of January 1, 1983, and January 1, 1984, using the procedure described in Appendix A. We first calculate the percentage increases in these three types of permanent disability benefits between January 1, 1983 and January 1, 1984. We then combine these percentage increases using the weights for the three types of permanent disability cases and estimate that permanent disability benefits in Montana increased by 3.1 percent during 1983. This increase is due solely to objective changes in benefits.

The WCPD compensability rules variable reflects the subjective changes in benefits. We use the term "subjective" because compensability rules values do not rely on a standardized actuarial procedure (such as that used by NCCI to estimate the objective changes in benefits) or a uniform adjustment (such as the 10 percent utilization effect added to the objective changes). Instead, the compensability rules value represents an NCCI judgment about additional factors in a particular state that are likely to affect workers' compensation benefit payments.

To calculate the compensability rules variable, we take the value of benefit level changes published in the ASB and subtract the values of both the objective changes in benefits and the utilization effect. Thus, the WCPD compensability rules value for Montana for 1983 is 28.9 percent (ASB value) minus 3.1 percent (our estimates of objective changes) minus 0.31 percent (utilization effect) = 25.5 percent.

We assume that a change in the compensability rules value reflects a permanent change in the factors that affect workers' compensation benefit payments in a state. We therefore created a data series for each state that begins in 1975 (the first year in our database for most workers' compensation variables) with a compensability rules value of 0. Any changes in the compensability rules after 1975 accumulate. The 25.5 percent increase in the WCPD compensability rules for Montana in 1983 is equivalent to a 0.255 increase in the compensability rules value used in our regressions.

Table B-1.
NCCI estimates of workers' compensation benefit level changes (in percent), by permanent injury type: Two examples

Date	PTD	Major PPD	Minor PPD	Explanation
			Montana 1983	
May 16	26.9	26.9	26.9	Court decision
July 1	6.1	1.8	1.1	Increase in flexible maximum [a]
Total	33.0	28.7	28.0	
			Oregon 1990	
July 1	1.0	0.3	0.3	Increase in flexible maximum [a]
July 1	-5.9	4.9	4.9	Legislation (S.B. 1197)
Total	-4.9	5.2	5.2	

SOURCE: NCCI (1995, Exhibit III).

a. The flexible maximum is a provision in the state's workers' compensation statute that increases or decreases the maximum weekly benefit in proportion to changes in the state's average weekly wage.

Oregon 1990. The second example involves a decrease in the compensability rules value. Table B-1 refers to S.B. 1197, which provided that (1) claims were compensable under the Oregon workers' compensation statute only if work was the "major cause" of the permanent disability or need for treatment—this is known as the major contributing cause requirement—and (2) the worker must provide medical evidence based on "objective findings" in order to establish compensability. Concurrent with these changes in the eligibility requirements for PPD benefits, Oregon increased the maximum weekly benefit for PPD from $145.00 to $305.00 and the maximum weekly benefits for PTD and TTD from $388.99 to $406.54 on July 1, 1990. (As in Montana, TTD benefits are paid to some workers who receive PPD benefits and thus affect the estimates of benefits paid for PPD claims.)

In calculating the WCPD compensability rules for Oregon, we follow the same steps as those described above for Montana. The weighted average of the NCCI estimates of the effects of the 1990 Oregon changes on PTD, major PPD, and minor PPD benefit payments is a 3.9 percent increase. We calculate the expected benefits as of January 1, 1990 and January 1, 1991 using the procedure described in Appendix A. We then calculate the percentage increases in these three types of permanent disability benefits between January 1, 1990 and January 1, 1991. We combine these percentage increases using the weights for the three types of permanent disability cases and estimate that permanent disability benefits in Oregon increased by 39 percent during 1990. This increase is solely due to objective changes in benefits and in particular, the more than doubling of the maximum weekly benefit for PPD benefits.

The WCPD compensability rules value for Oregon for 1990 is 3.9 percent (the ASB value) minus 39 percent (our estimates of objective changes) minus 3.9 percent (utilization effect) = -39.0 percent. The 39.0 percent decrease in the WCPD compensability rules for Oregon in 1990 is equivalent to a 0.39 decline in the compensability rules value used in our regressions.

Compensability Rules Threshold

To avoid measurement errors, we treat an annual change in WCPD compensability rules as zero if the calculated value is less than 2 percent. One reason we use the 2 percent threshold is that we calculate expected benefits for every type of benefit for every state each January 1, while the NCCI calculates the changes in benefits only when the workers' compensation statute has changed or the courts make a significant decision. This means that for New York, we show an increase in PTD benefits every year between 1994 and 1999 because the state average weekly wage, one of the determinants of expected PTD benefits, increased every year. By contrast, the NCCI reported 0.0 percent increases in PTD benefits in New York for every year between 1994 and 1999. We do not consider the difference between our estimates of the change in expected benefits and the NCCI data on changes in benefits during this period in calculating the compensability rules.

The Utilization Effect

As previously explained, we subtract the utilization effect (along with the objective changes in benefits) from the NCCI estimates of the changes in benefit levels published in the ASB to calculate the compensability rules. The evidence on the relationship between expected benefits and employers' workers' compensation costs in the studies surveyed in Appendix A suggests that a utilization effect should not be used to estimate the total effects of changes in state laws on total benefits paid. Krueger and Burton (1990) could not reject the null hypothesis of a unitary elasticity between costs and benefits, and all other previous studies using expected benefits found that actual benefit payments did not increase proportionately with increases in expected benefits.

Previous Use of the Compensability Rules Variable

Guo and Burton (2008) study the determinants of DI applications per 100,000 persons in 45 jurisdictions from 1985 to 1999. In addition to expected benefits, the authors use compensability rules as another independent variable for the combination of four types of cash benefits, which is significant at the .01 level in both regressions explaining the DI application rates.

Guo and Burton (2010) examine the determinants of interstate differences in workers' compensation cash benefits per 100,000 workers for each year from 1975 to 1999 for up to 46 jurisdictions. In addition to expected benefits, the authors use compensability rules as another independent variable for the combination of four types of cash benefits, which is significant at the .05 level in one regression and significant at the .01 level in the other regression explaining changes in incurred workers' compensation cash benefits during the 1990s. Incurred workers' compensation benefits per 100,000 workers declined by 41.6 percent in real terms between 1990 and 1999, and the decline in compensability rules accounted for 6.25 percent of the incurred benefit decline.

Notes

[1] Although one might expect the DI acceptance ratio to be expressed as accepted DI claims divided by total applications, we divide acceptances by denials to avoid statistical biases. See note 9.

[2] Workers' compensation benefits are limited to persons whose disabilities are work-related, while DI pays benefits for both work- and nonwork-related disabilities. However, DI only pays benefits to permanently and totally disabled persons, while workers' compensation programs provide benefits for both totally and partially disabled workers, for both temporary and permanent disabilities, and for fatalities.

[3] The workers' compensation program is elective for employers in Texas.

[4] Accidental death and dismemberment insurance provides benefits if an accident results in an employee's death or certain dismemberments enumerated in the insurance contract.

[5] The type of offset in a state affects the employers' incentives to encourage disabled workers to apply for DI benefits. Both DI and workers' compensation are funded by payroll taxes. The DI tax (part of the Social Security payroll tax) is uniform for all employers. However, workers' compensation premiums for large and medium employers who purchase insurance are linked to the cost of workers' compensation benefits paid to the firms' employees by "experience rating," so that as benefit payments increase, so do the employers' costs. Program costs and benefit payments to workers are also closely related for employers who self-insure. The link between benefits and costs provides an incentive for employers (or their insurance carriers) in reverse offset states to encourage their work-disabled employees to apply for DI benefits. Employers in states with the standard offset rule have less incentive to encourage their workers to apply for DI benefits, because DI awards do not lower workers' compensation benefits and employers' costs.

[6] Research also indicates that the legislative changes in workers' compensation eligibility rules may partially account for the recent decline in reported occupational injury rates (Boden and Ruser 2003).

[7] DI beneficiaries can elect to receive old-age benefits instead of disability benefits beginning at age 62. Conversion to old-age benefits occurs automatically when the beneficiary attains full retirement age.

[8] We focus on PPD and PTD claims because they are more likely to result in applications for DI benefits than are TTD and fatality benefits.

[9] Guo and Burton (2008) is the only study of DI application rates in our survey that includes an independent variable that measures administrative stringency, namely DI acceptance rate (the proportion of applications that were approved), which had a negative coefficient. However, that estimate was biased because the numerator of the dependent variable (DI applications per 100,000 persons) and the denominator of the independent variable (DI acceptances) were the same. To avoid that bias in this study, we use the ratio of DI acceptances to DI denials to measure administrative stringency.

[10] We briefly summarize types of PPD benefits in Appendix A; Burton (2005) discusses them in detail.

[11] The earliest year with data by state for disability prevalence and the DI acceptance ratio (lagged 1 year) is 1981. The latest year with data for expected WCPD benefits and WCPD compensability rules is 1999.

[12] We do not have observations for WCPD compensability rules in six states (Nevada, North Dakota, Ohio, Washington, West Virginia, and Wyoming), which had exclusive state workers' compensation insurance funds during the study period.

[13] To determine if the decline in sample size substantially changes our results, we repeated the regressions shown in Table 2 with the full sample of 969 observations. The pattern and magnitude of most variables are very similar in the two sets of regressions, and a Chow test comparing the coefficients found no significant differences. Thus, reducing sample size does not result in statistically significant changes in our results, indicating that our regressions using 855 observations should be reliable.

[14] We cannot include a dummy variable indicating which states have reverse offset rules (see note 5) because our preferred statistical approach—a fixed-effect model with state and year dummies—cannot include two dummy variables that are invariant in value over all years.

[15] The standard deviation for expected WCPD benefits is 32.74 (Table 1). The difference in DI applications per 100,000 nonelderly adults between states one standard deviation above and below the average is

$$32.74 \times 2 \times 0.51 = 33.39.$$

[16] The standard deviation for WCPD compensability rules is 0.31 (Table 1). The difference in DI applications per 100,000 nonelderly adults between states one standard deviation above and below the average is

$$0.31 \times 2 \times 30.95 = 19.19.$$

[17] The 2012 report of the Social Security Trust Funds states, "the DI Trust Fund fails the Trustees' short-term test of financial adequacy. The Trustees project that the DI trust fund ratio will fall below 100 percent by the beginning of 2013. After 2013, the projected DI trust fund ratio continues to decline until the trust fund is exhausted in 2016" (Board of Trustees 2012, 9).

[18] Burton (2009) provides an extended discussion of the effects of workers' compensation on safety, such as the relationship between risk premiums included in the wages of workers in unsafe firms and workers' compensation premiums. He also examines the moral hazard resulting from workers' compensation's effective reduction in adverse consequences for the employer.

[19] Burkhauser and Daly (2011, 109–113) propose experience rating for DI.

[20] Between the 1980s and 1990s, the weighted national average of expected WCPD benefits declined by 5.4 percent (Table 4), and the unweighted average declined by 8.7 percent (not shown). Likewise, the weighted national average of WCPD compensability rules declined by 4 percentage points and the unweighted national average declined by 8 percentage points during the period.

[21] Thomason, Schmidle, and Burton (2001, Appendix D) and Thomason and Burton (2004, 75–84) describe the methodology in detail.

[22] Burton (2005, 88–95) identifies six distinct systems of PPD benefits used in various states.

[23] Fratello (1955) details the basic procedure.

References

Autor, David H., and Mark G. Duggan. 2003. "The Rise in the Disability Rolls and the Decline in Unemployment." *The Quarterly Journal of Economics* 118(1): 157–205.

Baldwin, Marjorie L., and William G. Johnson. 1998. "Dispelling the Myths about Work Disability." In *New Approaches to Disability in the Workplace,* edited by Terry Thomason, John F. Burton, Jr., and Douglas E. Hyatt, 39–62. Madison, WI: Industrial Relations Research Association.

Berkowitz, Monroe, and John F. Burton, Jr. 1987. *Permanent Disability Benefits in Workers' Compensation.* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

[Board of Trustees] Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds. 2012. *The 2012 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds.* Washington, DC: Government Printing Office.

Boden, Leslie I. 1995. "Creating Economic Incentives: Lessons from Workers' Compensation Systems." In *Proceedings of the Forty-Seventh Annual Meeting.* Madison, WI: Industrial Relations Research Association.

Boden, Leslie I., and John W. Ruser. 2003. "Workers' Compensation 'Reforms,' Choice of Medical Care Provider, and Reported Workplace Injuries." *Review of Economics and Statistics* 85(4): 923–929.

Burkhauser, Richard V., Jack S. Butler, and Robert R. Weathers II. 2001/2002. "How Policy Variables Influence the Timing of Applications for Social Security Disability Insurance." *Social Security Bulletin* 64(1): 52–83.

Burkhauser, Richard V., and Mary C. Daly. 2011. *The Declining Work and Welfare of People with Disabilities: What Went Wrong and a Strategy for Change.* Washington, DC: American Enterprise Institute Press.

Burkhauser, Richard V., and Andrew J. Houtenville. 2006. Unpublished data.

Burton, John F., Jr. 1965. *The Significance and Causes of the Interstate Variations in the Employers' Costs of Workmen's Compensation.* Doctoral dissertation. Ann Arbor, MI: University of Michigan.

———. 2005. "Permanent Partial Disability Benefits." In *Workplace Injuries and Diseases: Prevention and Compensation: Essays in Honor of Terry Thomason,* edited by Karen Roberts, John F. Burton, Jr., and Matthew M. Bodah. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

———. 2009. "Workers' Compensation." In *Labor and Employment Law and Economics,* edited by Kenneth G. Dau-Schmidt, Seth D. Harris, and Orly Lobel. Northampton, MA: Edward Elgar Publishing.

Burton, John F., Jr., and Emily A. Spieler. 2001. "Workers' Compensation and Older Workers." In *Ensuring Health and Income Security for an Aging Workforce,* edited by Peter P. Burdetti, Richard V. Burkhauser, Janice M. Gregory, and H. Allan Hunt, 41–84. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

———. 2004. "Workers' Compensation and Older Workers." *IAIABC Journal* 41(2): 26–30.

Butler, Richard J., William G. Johnson, and Marjorie L. Baldwin. 1995. "Managing Work Disability: Why First Return to Work is Not a Measure of Success." *Industrial and Labor Relations Review* 48(3): 452–469.

Daly, Mary C. 1998. "Characteristics of SSI and DI recipients in the Years Prior to Receiving Benefits." In *Growth in Disability Benefits: Explanations and Policy Implications,* edited by Kalman Rupp and David C. Stapleton, 177–196. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Duggan, Mark G., and David H. Autor. 2006. "The Growth in the Social Security Disability Rolls: A Fiscal Crisis Unfolding." *Journal of Economic Perspectives* 20(3): 71–96.

Fratello, Barney. 1955. "The 'Workmen's Compensation Injury Table' and 'Standard Wage Distribution Table'—Their Development and Use in Workmen's Compensation Insurance Ratemaking." In *Proceedings of the Casualty Actuarial Society* XLII(78): 110–202.

Greene, William H. 2011. *Econometric Analysis, 7th edition.* Upper Saddle River, NJ: Prentice Hall.

Guo, Xuguang (Steve), and John F. Burton, Jr. 2008. "The Relationship Between Workers' Compensation and Disability Insurance." In *Proceedings of the 60th Annual Meeting,* edited by Adrienne E. Eaton, 29–37. Champaign-Urbana, IL: Labor and Employment Relations Association.

———. 2010. "Workers' Compensation: Recent Developments in Moral Hazard and Benefit Payments." *Industrial and Labor Relations Review* 63(2): 340–355.

Kreider, Brent. 1999. "Social Security Disability Insurance: Applications, Awards, and Lifetime Income Flows." *Journal of Labor Economics* 17(4): 784–827.

Krueger, Alan B., and John F. Burton, Jr. 1990. "The Employers' Costs of Workers' Compensation Insurance: Magnitudes, Determinants, and Public Policy." *Review of Economics and Statistics* 72(2): 228–240.

Mashaw, Jerry L., and Virginia P. Reno, editors. 1996a. *Balancing Security and Opportunity: The Challenge of Disability Income Policy.* Washington, DC: National Academy of Social Insurance.

———. 1996b. *The Environment of Disability Income Policy: Program, People, History and Context.* Washington, DC: National Academy of Social Insurance.

McInerney, Melissa, and Kosali Simon. 2012. "The Effect of State Workers' Compensation Program Changes on the Use of Federal Social Security Disability Insurance." *Industrial Relations* 51(1): 57–88.

[NCCI] National Council on Compensation Insurance. 1995. *Annual Statistical Bulletin, 1995 Edition.* Boca Raton, FL: National Council on Compensation Insurance.

———. 2011. *Annual Statistical Bulletin, 2011 Edition.* Boca Raton, FL: National Council on Compensation Insurance.

Rupp, Kalman, and Paul S. Davies. 2004. "A Long-Term View of Health Status, Disabilities, Mortality, and Participation in the DI and SSI Disability Programs." In *Research in Labor Economics, Volume 23: Accounting for Worker Well-Being,* edited by Solomon W. Polochek, 119–183. Amsterdam: Elsevier, JAI Press.

Rupp, Kalman, and David Stapleton. 1995. "Determinants of Growth in the Social Security Administration's Disability Program: An Overview." *Social Security Bulletin* 58(4): 43–70.

Sengupta, Ishita, Virginia Reno, and John F. Burton, Jr. 2011. *Workers' Compensation: Benefits, Coverage, and Costs, 2009.* Washington, DC: National Academy of Social Insurance.

Soss, Joe, and Lael R. Keiser. 2006. "The Political Roots of Disability Claims: How State Environments and Policies Shape Citizen Demands." *Political Research Quarterly* 59(1): 133–148.

Spieler, Emily A., and John F. Burton, Jr. 1998. "Compensation for Disabled Workers: Workers' Compensation." In *New Approaches to Disability in the Work Place,* edited By Terry Thomason, Douglass E. Hyatt, and John F. Burton, Jr., 205–244. Ithaca, NY: Cornell University Press.

Strand, Alexander. 2002. "Social Security Disability Programs: Assessing the Variation of Allowance Rate." ORES Working Paper No. 98. Washington, DC: SSA.

Thomason, Terry. 2005. "Economic Incentives and Workplace Safety." In *Workplace Injuries and Diseases: Prevention and Compensation—Essays in Honor of Terry Thomason,* edited by Karen Roberts, John F. Burton, Jr., and Matthew M. Bodah, 9–35. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Thomason, Terry, and John F. Burton, Jr. 2004. "Statutory Workers' Compensation Benefits, 1972-1998." In *Adequacy of Earnings Replacement in Workers' Compensation Programs: A Report of the Study Panel on the Benefit Adequacy of the Workers' Compensation Steering Committee,* edited by H. Allan Hunt, 67–100. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

———. 2005. "The Effects of Changes in the Oregon Workers' Compensation Program on Employees' Benefits and Employers' Costs." In *Workers' Compensation Compendium 2005-06, Volume One,* edited by John F. Burton, Jr., Florence Blum, and Elizabeth H. Yates, 387–405. Princeton, NJ: Workers' Disability Income Systems, Inc.

Thomason, Terry, Timothy P. Schmidle, and John F. Burton, Jr. 2001. *Workers' Compensation: Benefits, Cost, and Safety under Alternative Insurance Arrangements.* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

OASDI and SSI Snapshot and SSI Monthly Statistics

Each month, the Social Security Administration's Office of Retirement and Disability Policy posts key statistics about various aspects of the Supplemental Security Income (SSI) program at http://www.socialsecurity.gov/policy. The statistics include the number of people who receive benefits, eligibility category, and average monthly payment. This issue presents SSI data for June 2011–June 2012.

The Monthly Statistical Snapshot summarizes information about the Social Security and SSI programs and provides a summary table on the trust funds. Data for June 2012 are given on pages 90–91. Trust fund data for June 2012 are given on page 91. The more detailed SSI tables begin on page 92. Persons wanting detailed monthly OASDI information should visit the Office of the Chief Actuary's website at http://www.socialsecurity.gov/OACT/ProgData/beniesQuery.html.

Monthly Statistical Snapshot

Table 1. Number of people receiving Social Security, Supplemental Security Income, or both
Table 2. Social Security benefits
Table 3. Supplemental Security Income recipients
Table 4. Operations of the Old-Age and Survivors Insurance and Disability Insurance Trust Funds

The most current edition of Tables 1–3 will always be available at http://www.socialsecurity.gov/policy/docs/quickfacts/stat_snapshot. The most current data for the trust funds (Table 4) are available at http://www.socialsecurity.gov/OACT/ProgData/funds.html.

Table 1.
Number of people receiving Social Security, Supplemental Security Income, or both, June 2012 (in thousands)

Type of beneficiary	Total	Social Security only	SSI only	Both Social Security and SSI
All beneficiaries	61,574	53,391	5,416	2,767
Aged 65 or older	39,808	37,743	903	1,162
Disabled, under age 65 [a]	13,909	7,790	4,513	1,606
Other [b]	7,857	7,857	. . .	. . .

SOURCES: Social Security Administration, Master Beneficiary Record, 100 percent data. Social Security Administration, Supplemental Security Record, 100 percent data.

NOTES: Data are for the end of the specified month. Only Social Security beneficiaries in current-payment status are included.

. . . = not applicable.

a. Includes children receiving SSI on the basis of their own disability.

b. Social Security beneficiaries who are neither aged nor disabled (for example, early retirees, young survivors).

CONTACT: (410) 965-0090 or statistics@ssa.gov.

Table 2.
Social Security benefits, June 2012

Type of beneficiary	Beneficiaries		Total monthly benefits (millions of dollars)	Average monthly benefit (dollars)
	Number (thousands)	Percent		
All beneficiaries	56,158	100.0	63,243	1,126.16
Old-Age Insurance				
Retired workers	36,121	64.3	44,545	1,233.21
Spouses	2,287	4.1	1,395	609.76
Children	619	1.1	375	605.49
Survivors Insurance				
Widow(er)s and parents [a]	4,223	7.5	4,898	1,159.93
Widowed mothers and fathers [b]	152	0.3	134	875.85
Children	1,949	3.5	1,532	786.13
Disability Insurance				
Disabled workers	8,707	15.5	9,675	1,111.17
Spouses	165	0.3	49	298.11
Children	1,933	3.4	640	330.97

SOURCE: Social Security Administration, Master Beneficiary Record, 100 percent data.

NOTES: Data are for the end of the specified month. Only beneficiaries in current-payment status are included.

Some Social Security beneficiaries are entitled to more than one type of benefit. In most cases, they are dually entitled to a worker benefit and a higher spouse or widow(er) benefit. If both benefits are financed from the same trust fund, the beneficiary is usually counted only once in the statistics, as a retired-worker or a disabled-worker beneficiary, and the benefit amount recorded is the larger amount associated with the auxiliary benefit. If the benefits are paid from different trust funds the beneficiary is counted twice, and the respective benefit amounts are recorded for each type of benefit.

a. Includes nondisabled widow(er)s aged 60 or older, disabled widow(er)s aged 50 or older, and dependent parents of deceased workers aged 62 or older.

b. A widow(er) or surviving divorced parent caring for the entitled child of a deceased worker who is under age 16 or is disabled.

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Table 3.
Supplemental Security Income recipients, June 2012

Age	Recipients: Number (thousands)	Recipients: Percent	Total payments [a] (millions of dollars)	Average monthly payment [b] (dollars)
All recipients	8,184	100.0	4,495	517.70
Under 18	1,296	15.8	841	623.70
18–64	4,823	58.9	2,796	533.40
65 or older	2,064	25.2	858	414.90

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month.

a. Includes retroactive payments.

b. Excludes retroactive payments.

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Trust Fund Data, June 2012

Table 4.
Operations of the Old-Age and Survivors Insurance and Disability Insurance Trust Funds, June 2012 (in millions of dollars)

Component	OASI	DI	Combined OASI and DI
		Receipts	
Total	109,597	12,957	122,554
Net contributions [a]	48,121	8,169	56,290
Income from taxation of benefits	14	b	14
Net interest	52,431	3,252	55,684
Payments from the general fund	9,031	1,536	10,567
		Expenditures	
Total	57,634	12,367	70,002
Benefit payments	53,232	11,626	64,859
Administrative expenses	263	229	492
Transfers to Railroad Retirement	4,139	512	4,651
		Assets	
At start of month	2,545,865	141,891	2,687,756
Net increase during month	51,962	590	52,552
At end of month	2,597,828	142,481	2,740,309

SOURCE: Data on the trust funds were accessed on July 23, 2012, on the Social Security Administration's Office of the Chief Actuary's website: http://www.socialsecurity.gov/OACT/ProgData/funds.html.

NOTE: Totals may not equal the sum of the components because of rounding.

a. Includes transfers from the general fund of the Treasury under the provisions of P.L. 111-312, P.L. 112-78, and P.L. 112-96.

b. Between -$500,000 and $500,000.

Supplemental Security Income, June 2011–June 2012

The SSI Monthly Statistics are also available at http://www.socialsecurity.gov/policy/docs/statcomps/ssi_monthly/index.html.

SSI Federally Administered Payments

Awards of SSI Federally Administered Payments

Table 1.
Recipients (by type of payment), total payments, and average monthly payment, June 2011–June 2012

Month	Number of recipients				Total payments [a] (thousands of dollars)	Average monthly payment [b] (dollars)
	Total	Federal payment only	Federal payment and state supplementation	State supplementation only		
2011						
June	8,056,968	5,673,253	2,129,163	254,552	4,326,804	499.40
July	8,057,787	5,678,767	2,131,881	247,139	4,292,791	499.10
August	8,108,375	5,717,947	2,143,405	247,023	4,402,772	498.80
September	8,095,000	5,706,884	2,140,867	247,249	4,310,542	498.90
October	8,116,250	5,723,525	2,145,561	247,164	4,307,042	499.10
November	8,130,052	5,733,368	2,149,436	247,248	4,317,569	498.30
December	8,112,773	5,723,660	2,142,730	246,383	4,389,872	501.60
2012						
January	8,156,870	5,761,870	2,154,099	240,901	4,485,655	517.30
February	8,163,730	5,769,485	2,154,099	240,146	4,493,360	515.60
March	8,161,601	5,768,667	2,153,751	239,183	4,507,305	518.60
April	8,185,900	5,980,014	1,981,468	224,418	4,553,734	517.20
May	8,179,285	5,976,689	1,978,456	224,140	4,504,263	516.00
June	8,183,565	5,980,403	1,979,686	223,476	4,494,996	517.70

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month.

a. Includes retroactive payments.

b. Excludes retroactive payments.

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Table 2.
Recipients, by eligibility category and age, June 2011–June 2012

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
2011						
June	8,056,968	1,186,668	6,870,300	1,268,840	4,738,185	2,049,943
July	8,057,787	1,185,550	6,872,237	1,266,495	4,741,273	2,050,019
August	8,108,375	1,187,881	6,920,494	1,277,109	4,775,507	2,055,759
September	8,095,000	1,187,576	6,907,424	1,268,821	4,769,477	2,056,702
October	8,116,250	1,187,884	6,928,366	1,279,042	4,777,386	2,059,822
November	8,130,052	1,189,695	6,940,357	1,280,341	4,784,690	2,065,021
December	8,112,773	1,182,106	6,930,667	1,277,122	4,777,010	2,058,641
2012						
January	8,156,870	1,184,674	6,972,196	1,291,217	4,801,122	2,064,531
February	8,163,730	1,182,828	6,980,902	1,293,648	4,806,424	2,063,658
March	8,161,601	1,158,789	7,002,812	1,288,548	4,807,814	2,065,239
April	8,185,900	1,156,343	7,029,557	1,301,753	4,821,992	2,062,155
May	8,179,285	1,154,369	7,024,916	1,298,404	4,819,531	2,061,350
June	8,183,565	1,154,725	7,028,840	1,296,051	4,823,143	2,064,371

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month.

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Table 3.
Recipients of federal payment only, by eligibility category and age, June 2011–June 2012

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
2011						
June	5,673,253	599,687	5,073,566	1,019,432	3,508,722	1,145,099
July	5,678,767	600,361	5,078,406	1,016,992	3,514,277	1,147,498
August	5,717,947	601,403	5,116,544	1,025,435	3,541,759	1,150,753
September	5,706,884	601,053	5,105,831	1,018,213	3,537,525	1,151,146
October	5,723,525	600,768	5,122,757	1,026,735	3,544,200	1,152,590
November	5,733,368	601,716	5,131,652	1,027,626	3,550,053	1,155,689
December	5,723,660	597,588	5,126,072	1,025,120	3,546,247	1,152,293
2012						
January	5,761,870	600,105	5,161,765	1,036,990	3,567,409	1,157,471
February	5,769,485	599,410	5,170,075	1,039,029	3,572,976	1,157,480
March	5,768,667	598,700	5,169,967	1,034,850	3,575,124	1,158,693
April	5,980,014	620,759	5,359,255	1,069,225	3,705,532	1,205,257
May	5,976,689	619,756	5,356,933	1,066,607	3,705,111	1,204,971
June	5,980,403	619,848	5,360,555	1,064,382	3,709,041	1,206,980

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month.

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Table 4.
Recipients of federal payment and state supplementation, by eligibility category and age, June 2011–June 2012

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
2011						
June	2,129,163	503,725	1,625,438	247,800	1,099,542	781,821
July	2,131,881	504,367	1,627,514	247,913	1,100,843	783,125
August	2,143,405	505,695	1,637,710	250,148	1,107,731	785,526
September	2,140,867	505,717	1,635,150	248,948	1,105,945	785,974
October	2,145,561	506,440	1,639,121	250,739	1,107,144	787,678
November	2,149,436	507,307	1,642,129	251,078	1,108,838	789,520
December	2,142,730	503,839	1,638,891	250,425	1,105,867	786,438
2012						
January	2,154,099	506,553	1,647,546	252,775	1,110,842	790,482
February	2,154,099	505,732	1,648,367	253,139	1,111,028	789,932
March	2,153,751	485,178	1,668,573	252,300	1,110,733	790,718
April	1,981,468	464,224	1,517,244	231,448	1,002,664	747,356
May	1,978,456	463,628	1,514,828	230,607	1,000,704	747,145
June	1,979,686	464,066	1,515,620	230,501	1,000,883	748,302

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month.

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Table 5.
Recipients of state supplementation only, by eligibility category and age, June 2011–June 2012

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
2011						
June	254,552	83,256	171,296	1,608	129,921	123,023
July	247,139	80,822	166,317	1,590	126,153	119,396
August	247,023	80,783	166,240	1,526	126,017	119,480
September	247,249	80,806	166,443	1,660	126,007	119,582
October	247,164	80,676	166,488	1,568	126,042	119,554
November	247,248	80,672	166,576	1,637	125,799	119,812
December	246,383	80,679	165,704	1,577	124,896	119,910
2012						
January	240,901	78,016	162,885	1,452	122,871	116,578
February	240,146	77,686	162,460	1,480	122,420	116,246
March	239,183	74,911	164,272	1,398	121,957	115,828
April	224,418	71,360	153,058	1,080	113,796	109,542
May	224,140	70,985	153,155	1,190	113,716	109,234
June	223,476	70,811	152,665	1,168	113,219	109,089

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month.

CONTACT: (410) 965-0090 or statistics@ssa.gov.

Table 6.
Total payments, by eligibility category, age, and source of payment, June 2011–June 2012 (in thousands of dollars)

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
				All sources		
2011						
June	4,326,804	474,311	3,852,493	793,566	2,702,297	830,942
July	4,292,791	470,353	3,822,438	794,632	2,672,452	825,708
August	4,402,772	472,258	3,930,513	813,172	2,759,910	829,690
September	4,310,542	471,167	3,839,376	793,350	2,688,691	828,502
October	4,307,042	470,973	3,836,069	796,666	2,680,977	829,400
November	4,317,569	472,085	3,845,483	794,923	2,690,450	832,195
December	4,389,872	471,847	3,918,025	812,295	2,744,100	833,478
2012						
January	4,485,655	485,641	4,000,013	834,560	2,791,400	859,695
February	4,493,360	483,930	4,009,431	829,122	2,805,835	858,403
March	4,507,305	473,861	4,033,444	840,343	2,805,783	861,179
April	4,553,734	472,480	4,081,255	854,246	2,841,246	858,242
May	4,504,263	471,239	4,033,025	836,006	2,810,846	857,411
June	4,494,996	471,148	4,023,848	840,932	2,795,762	858,301
				Federal payments		
2011						
June	4,014,482	394,933	3,619,549	780,001	2,527,457	707,024
July	3,996,318	394,926	3,601,392	781,114	2,507,445	707,759
August	4,101,172	396,512	3,704,661	799,301	2,590,777	711,095
September	4,013,322	395,621	3,617,701	779,836	2,523,297	710,189
October	4,010,102	395,379	3,614,723	783,169	2,515,977	710,956
November	4,019,326	396,275	3,623,051	781,365	2,524,690	713,271
December	4,090,280	396,173	3,694,107	798,660	2,577,066	714,555
2012						
January	4,188,344	410,163	3,778,181	820,942	2,626,465	740,937
February	4,195,576	408,576	3,787,000	815,496	2,640,350	739,730
March	4,209,479	400,765	3,808,714	826,685	2,640,451	742,343
April	4,269,524	401,949	3,867,575	841,922	2,683,065	744,536
May	4,221,716	400,877	3,820,839	823,837	2,654,041	743,838
June	4,213,739	400,817	3,812,922	828,851	2,640,199	744,689

(Continued)

Table 6.
Total payments, by eligibility category, age, and source of payment, June 2011–June 2012 (in thousands of dollars)—*Continued*

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
			State supplementation			
2011						
June	312,322	79,378	232,944	13,565	174,840	123,918
July	296,473	75,427	221,047	13,518	165,006	117,949
August	301,599	75,747	225,852	13,872	169,133	118,594
September	297,220	75,546	221,674	13,514	165,394	118,313
October	296,940	75,594	221,346	13,497	165,000	118,443
November	298,243	75,810	222,433	13,558	165,760	118,925
December	299,591	75,674	223,917	13,635	167,034	118,923
2012						
January	297,311	75,478	221,832	13,619	164,935	118,757
February	297,784	75,353	222,431	13,626	165,486	118,673
March	297,826	73,096	224,730	13,658	165,332	118,836
April	284,211	70,531	213,680	12,324	158,181	113,705
May	282,547	70,362	212,185	12,169	156,804	113,574
June	281,258	70,331	210,927	12,082	155,563	113,613

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month and include retroactive payments.

CONTACT: (410) 965-0090 or statistics@ssa.gov.

Table 7.
Average monthly payment, by eligibility category, age, and source of payment, June 2011–June 2012 (in dollars)

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
			All sources			
2011						
June	499.40	398.50	516.90	595.10	515.10	404.00
July	499.10	395.90	517.00	600.20	514.30	401.70
August	498.80	396.10	516.50	597.60	514.20	401.90
September	498.90	396.20	516.60	597.20	514.80	401.90
October	499.10	395.70	516.90	597.70	514.80	401.70
November	498.30	395.90	515.80	592.60	514.70	401.80
December	501.60	397.60	519.40	601.40	517.40	403.20
2012						
January	517.30	408.90	535.70	620.20	533.50	415.20
February	515.60	408.10	533.80	613.60	532.50	414.60
March	518.60	407.90	536.90	624.90	534.40	415.70
April	517.20	406.90	535.40	621.80	532.90	414.60
May	516.00	407.10	534.00	615.90	532.60	414.70
June	517.70	407.30	535.90	623.70	533.40	414.90
			Federal payments			
2011						
June	477.70	357.00	497.60	585.90	494.80	365.90
July	478.80	357.00	498.90	591.00	495.40	365.90
August	478.40	357.10	498.40	588.50	495.20	366.00
September	478.60	357.20	498.60	588.10	495.80	366.10
October	478.80	356.70	498.80	588.50	495.90	365.80
November	477.90	356.80	497.70	583.40	495.70	365.90
December	481.30	358.50	501.30	592.30	498.50	367.30
2012						
January	497.10	369.80	517.80	610.90	514.80	379.50
February	495.40	368.90	515.90	604.30	513.80	378.80
March	498.40	369.00	519.00	615.60	515.70	379.90
April	498.00	369.00	518.50	613.60	515.20	380.00
May	496.80	369.10	517.00	607.70	514.80	380.10
June	498.60	369.30	519.00	615.60	515.70	380.30

(Continued)

Table 7.
Average monthly payment, by eligibility category, age, and source of payment, June 2011–June 2012 (in dollars)—*Continued*

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
			State supplementation			
2011						
June	124.40	134.10	121.30	50.90	131.00	135.80
July	118.60	127.70	115.60	50.60	124.40	129.50
August	118.50	127.80	115.50	50.50	124.30	129.60
September	118.60	127.80	115.50	50.50	124.30	129.60
October	118.40	127.70	115.40	50.40	124.20	129.40
November	118.40	127.70	115.30	50.30	124.10	129.50
December	118.60	128.00	115.50	50.30	124.30	129.70
2012						
January	118.40	127.90	115.30	50.20	124.10	129.70
February	118.30	127.90	115.20	50.20	124.00	129.70
March	118.40	129.30	115.10	50.20	124.10	129.80
April	121.90	130.40	119.10	49.00	129.80	131.30
May	121.80	130.40	119.10	49.00	129.70	131.30
June	121.80	130.40	119.10	49.00	129.70	131.30

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for the end of the specified month and exclude retroactive payments.

CONTACT: (410) 965-0090 or statistics@ssa.gov.

Table 8.
All awards, by eligibility category and age of awardee, June 2011–June 2012

Month	Total	Eligibility category		Age		
		Aged	Blind and disabled	Under 18	18–64	65 or older
2011						
June	84,521	9,092	75,429	16,745	58,558	9,218
July	81,037	9,304	71,733	15,812	55,775	9,450
August	97,369	9,240	88,129	19,128	68,859	9,382
September	83,142	9,819	73,323	16,069	57,114	9,959
October	76,590	9,263	67,327	14,802	52,398	9,390
November	75,818	9,308	66,510	14,913	51,467	9,438
December	89,658	8,858	80,800	17,602	63,052	9,004
2012						
January	80,593	8,814	71,779	16,100	55,531	8,962
February	77,815	9,345	68,470	15,359	52,984	9,472
March	79,400	8,824	70,576	15,892	54,531	8,977
April	91,791	9,483	82,308	18,533	63,606	9,652
May [a]	81,300	9,020	72,280	16,257	55,868	9,175
June [a]	77,178	9,156	68,022	15,856	52,054	9,268

SOURCE: Social Security Administration, Supplemental Security Record, 100 percent data.

NOTE: Data are for all awards made during the specified month.

a. Preliminary data. In the first 2 months after their release, numbers may be adjusted to reflect returned checks.

CONTACT: (410) 965-0090 or statistics@ssa.gov.

Perspectives—Paper Submission Guidelines

The *Social Security Bulletin* is the quarterly research journal of the Social Security Administration. It has a diverse readership of policymakers, government officials, academics, graduate and undergraduate students, business people, and other interested parties.

To promote the discussion of research questions and policy issues related to Social Security and the economic well being of the aged, the *Bulletin* welcomes submissions from researchers and analysts outside the agency for publication in its Perspectives section.

We are particularly interested in papers that:

- assess the Social Security retirement, survivors, and disability programs and the economic security of the aged;
- evaluate changing economic, demographic, health, and social factors affecting work/retirement decisions and retirement savings;
- consider the uncertainties that individuals and households face in preparing for and during retirement and the tools available to manage such uncertainties; and
- measure the changing characteristics and economic circumstances of SSI beneficiaries.

Papers should be factual and analytical, not polemical. Technical or mathematical exposition is welcome, if relevant, but findings and conclusions must be written in an accessible, nontechnical style. In addition, the relevance of the paper's conclusions to public policy should be explicitly stated.

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Authors should submit papers for consideration via e-mail to Michael V. Leonesio, Perspectives Editor, at perspectives@ssa.gov. To send your paper via regular mail, address it to:

Social Security Bulletin
Perspectives Editor
Social Security Administration
Office of Research, Evaluation, and Statistics
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We regard the submission of a paper as your implied commitment not to submit it to another publication while it is under consideration by the *Bulletin*. If you have published a related paper elsewhere, please state that in your cover letter.

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Formatting Guidelines

To facilitate the editorial process, papers submitted for publication must be prepared in Microsoft Word (**except for tables and charts—see below**) and be formatted as outlined below.

- **Title Page**—Papers must include a title page with the paper's title, name(s) of author(s), affiliation(s), address(es), including the name, postal address, e-mail address, telephone and fax numbers of a contact person. Any Acknowledgments paragraph should also be on this page. In the Acknowledgments, reveal the source of any financial or research support received in connection with the preparation of the paper. Because papers undergo blind review, the title page will be removed from referee copies. Eliminate all other identifying information from the rest of the paper before it is submitted. Once papers are accepted for publication, authors are responsible for reinserting self-identifying citations and references during preparation of the paper for final submission.
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- **Text**—Papers should average 10,000 words, including the text, the notes, and the references (but excluding the tables and charts). Text is double-spaced, except notes and references, which are double spaced only after each entry. **Do not embed tables or charts into the text. Create separate files (in the formats outlined in "Tables/Charts" below) for the text and statistical material**. Tables should be in one file, with one table per page. Include charts in a separate file, with one chart per page.
- **End Notes**—Number notes consecutively in the text using superscripts. Only use notes for brief substantive comments, not citations. (See the *Chicago Manual of Style* for guidance on the use of citations.) All notes should be grouped together and start on a new page at the end of the paper.
- **References**—Verify each reference carefully; the references must correspond to the citations in the text. The list of references should start on a new page and be listed alphabetically by the last name of the author(s) and then by year, chronologically. Only the first author's name is inverted. List all authors' full names and avoid using *et al*. The name of each author and the title of the citation should be exactly as it appears in the original work.
- **Tables/Charts**—Tables must be prepared in Microsoft Excel. Charts or other graphics must be prepared in or exported to Excel or Adobe Illustrator. The spreadsheet with plotting data must be attached to each chart with the final submission. Make sure all tables and charts are referenced in the text. Give each table and chart a title and number consecutive with the order it is mentioned in the text. Notes for tables and charts are independent of Notes in the rest of the paper and should be ordered using lowercase letters, beginning with the letter a (including the Source note, which should be listed first). The sequence runs from left to right, top to bottom. The order of the notes

as they appear below the tables or charts is (1) Source, (2) general notes to the table or chart, if any, and (3) letter notes.

For specific questions on formatting, use the *Chicago Manual of Style* as a guide for notes, citations, references, and table presentation.

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Papers that appear to be suitable for publication in Perspectives are sent anonymously to three reviewers who are subject matter experts. The reviewers assess the paper's technical merits, provide substantive comments, and recommend whether the paper should be published. An editorial review committee appointed and chaired by the Associate Commissioner, Office of Research, Evaluation, and Statistics, makes the final decision on whether the paper is of sufficient quality, importance, and interest to publish, subject to any required revisions that are specified in a letter to the author(s). The entire review process takes approximately 12 weeks.

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Questions

Questions regarding the mechanics of submitting a paper should be sent to our editorial staff via e-mail at ssb@ssa.gov. For other questions regarding submissions, please contact Michael V. Leonesio, Perspectives Editor, at perspectives@ssa.gov.

OASDI and SSI Program Rates and Limits, 2012

Old-Age, Survivors, and Disability Insurance

Tax Rates (percent)	
Social Security (Old-Age, Survivors, and Disability Insurance)	
Employers	6.20
Employees [a]	4.20
Medicare (Hospital Insurance)	
Employers and Employees, each [a]	1.45
Maximum Taxable Earnings (dollars)	
Social Security	110,100
Medicare (Hospital Insurance)	No limit
Earnings Required for Work Credits (dollars)	
One Work Credit (One Quarter of Coverage)	1,130
Maximum of Four Credits a Year	4,520
Earnings Test Annual Exempt Amount (dollars)	
Under Full Retirement Age for Entire Year	14,640
For Months Before Reaching Full Retirement Age in Given Year	38,880
Beginning with Month Reaching Full Retirement Age	No limit
Maximum Monthly Social Security Benefit for Workers Retiring at Full Retirement Age (dollars)	2,513
Full Retirement Age	66
Cost-of-Living Adjustment (percent)	3.6

a. Self-employed persons pay a total of 13.3 percent (10.4 percent for OASDI and 2.9 percent for Medicare).

Supplemental Security Income

Monthly Federal Payment Standard (dollars)	
Individual	698
Couple	1,048
Cost-of-Living Adjustment (percent)	3.6
Resource Limits (dollars)	
Individual	2,000
Couple	3,000
Monthly Income Exclusions (dollars)	
Earned Income [a]	65
Unearned Income	20
Substantial Gainful Activity (SGA) Level for the Nonblind Disabled (dollars)	1,010

a. The earned income exclusion consists of the first $65 of monthly earnings, plus one-half of remaining earnings.

Social Security Administration
Office of Retirement and Disability Policy
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