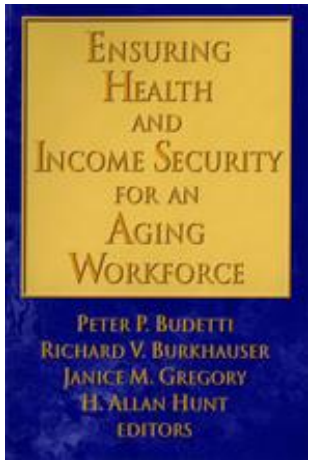
# Permanent Partial Disability from Occupational Injuries




Jeff Biddle
*Michigan State University*

Leslie I. Boden
*Boston University*

Robert T. Reville
*RAND Corporation*

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# Permanent Partial Disability from Occupational Injuries

## Earnings Losses and Replacement in Three States

Jeff E. Biddle
*Michigan State University*

Leslie I. Boden
*Boston University*

Robert T. Reville
*RAND*

Many older workers develop disabling health conditions or suffer disabling injuries. The labor-market consequences of disability can include job loss, reduced income, earlier retirement, and greater reliance on private and social insurance systems to provide income security. One important source of disability is work-related illness and injury. In this chapter, we examine the labor-market consequences of work-related disabling injuries and their relation to the age of the injured in three states: California, Wisconsin, and Washington. We also report estimates of the adequacy of income benefits received for these injuries from workers' compensation.

Earnings losses and related labor-market consequences result from workplace injuries in a number of ways. Most workers who suffer workplace injuries have temporary disabilities: complete recovery from the injury is expected, though some time out of work to recover is often needed, resulting in lost earnings. During that time out of work, workers qualify for temporary disability benefits from workers' compensation, which replaces some of the earnings loss. In some cases, a workplace injury results in a permanent impairment or loss of physical or mental health. This permanent impairment may result in permanent loss of earning capacity and therefore of actual earnings. The permanent impairments incurred on the job do not typically result in the level

of disability that qualifies for SSDI or SSI benefits. Still, income security is often threatened, and the onset of retirement may be substantially hastened by workplace injury and illness.

A considerable amount is spent compensating workers with permanent disabilities from workplace injuries. In California, permanent partial disability (PPD) income benefits for workers' compensation paid in 1997 totaled $1.1 billion, which is more than the total amount paid for the higher number of temporary disabilities. As we will discuss below, this $1.1 billion is only a fraction of the lost earnings of these injured workers. The remaining burden is shouldered by the workers and their families, as well as by other private and social insurance programs.

As the workforce ages, the issue of permanently disabling workplace injuries potentially becomes more significant. While the probability of a workplace injury decreases with age, according to Mitchell (1988), the probability of disabling injuries (and death) increases with age. Recovery from injury often takes longer and is less complete for older workers (Chirikos and Nestel 1989).

This chapter examines the losses experienced by workers with permanent disabilities in three states and compares the adequacy of compensation received from the states' workers' compensation systems. We present evidence that older workers suffer proportionately more injuries with permanently disabling consequences and that the losses suffered by older workers are greater, on average, than those of younger workers. We also find that injury-related non-employment is higher among older workers. Moreover, the older workers in states we have studied appear to recover a smaller proportion of their losses from workers' compensation than do other injured workers.

The data we present come from recent estimates of lost earnings of injured or ill workers in three states: Washington (Biddle 1998), Wisconsin (Boden and Galizzi 1999) and California (Peterson et al. 1997; Reville 1999). We summarize these recent studies and report new information about lost earnings from workplace injuries. The estimates we present use administrative data on workers' compensation claims linked to longitudinal earnings data to directly estimate the earnings losses of injured or ill workers. They follow in the tradition of earlier "wage loss studies" by Johnson, Cullinan, and Curington (1978)

and Berkowitz and Burton (1987). Both of these studies linked claims data to Social Security earnings records.

We begin with a brief description of workers' compensation permanent disability benefits in California, Washington, and Wisconsin. We then present the methodology used to derive estimates of injury-related lost earnings. Next, we describe lost earnings in the three states and how these losses are related to the age of injured workers. Finally, we review estimates of adequacy of workers' compensation benefits and discuss implications for the income security of older workers.

## COMPENSATION FOR PERMANENT PARTIAL DISABILITY

Workers' compensation is a state-based administrative system that provides benefits to workers injured on the job without regard to fault. The benefits are set by formulas that differ from state to state. In California, Wisconsin, and Washington, as in many other states, both temporary total disability (TTD) benefits and permanent partial disability (PPD) benefits are paid. TTD benefits are intended to provide income support during recovery. PPD benefits are intended to compensate workers for the losses associated with a permanently disabling workplace injury.

Setting compensation levels for TTD benefits is relatively straightforward. The goal is income replacement during recovery. Typically, the benefit amount is set at a level lower than the preinjury wage (often two-thirds) to provide the worker with an incentive to maintain safety in the workplace and to return to work when recovery is complete.[1] If injured workers receive temporary disability benefits for all eligible workplace injuries and if these benefits are paid for the full duration of injury-related lost work time, evaluating the adequacy of temporary disability income replacement is straightforward, since it is set by formula. The actual time out of work is usually relatively short—days instead of weeks.

Setting the benefit level and schedule of payments for permanent disability benefits is considerably more difficult. Unlike TTD benefits, PPD benefits are intended to compensate for current and future lost

earnings capacity. The administrative burden and adverse incentive effects of a system that pays injured workers as the losses are experienced (referred to as a *wage loss system*) are regarded in most states as prohibitive. For this reason, most states (including the three states compared in this study) set the benefit level for permanent disabilities prospectively. Formulas are often complex, and the basis of PPD benefits varies from state to state. No states have set the benefit levels or the schedule of payments for PPD benefits with empirical knowledge of the economic consequences of disabling workplace injuries. For this reason, the extent to which PPD benefits achieve the goal of income replacement is unknown.

We compare estimates of the adequacy of income benefits in three states (California, Wisconsin, and Washington). The approaches adopted in these three states to compensating workers with permanently disabling injuries are described below. For a discussion of the method of calculating permanent disabilities benefits in every state, see Barth and Niss (1999).

To estimate the impact of disability from occupational injuries, we estimate the losses experienced by injured workers over the years after the injury in each of the three states.[2] The estimation of losses requires comparing postinjury earnings to a counterfactual: earnings for the same individual while uninjured. Let $y_t^{\mathrm{I}}$ represent the earnings while injured, where I denotes "injured" and the subscript $t$ denotes time from the injury. Let the counterfactual earnings be represented by $y_t^{\mathrm{U}}$, where U denotes "uninjured." For any individual, the undiscounted earnings loss between the time of injury, which we will denote $t = 0$, and some future date, $T$, is

$$\textbf{Eq. 1} \quad \text{earnings loss} = \sum_{t=0}^{T}\left(y_t^{\mathrm{U}} - y_t^{\mathrm{I}}\right)$$

In the next section, we will describe the estimation of earnings losses, which is complicated by the need to estimate the counterfactual $y_t^{\mathrm{U}}$.

To compare the adequacy of benefits across states, we also estimate the fraction of earnings loss that is replaced by benefits for the average PPD case, i.e., the replacement rate:

$$\textbf{Eq. 2} \quad \text{replacement rate} = \frac{\text{benefits}}{\text{earnings loss}}$$

## THE ESTIMATION OF LOSSES

We report the estimates of earnings losses for PPD cases from Reville (1999), Boden and Galizzi (1999), and Biddle (1998). The results have been updated in some cases (for instance with a longer period of postinjury earnings for California than in Reville [1999]), and the analyses have been modified to make estimates as comparable as possible. However, due to data limitations in each state, the comparison groups available and therefore the approaches adopted to estimating losses in those papers and among states in this paper are different. In particular, in each state, a different control group is used. In this section, we describe the statistical problem raised by the estimation of losses and the solution adopted in each of the three states. In future work, we plan to obtain more comprehensive databases in each of these states (and in several others) in order to compare losses among states using identical methods.

The statistical problem in the estimation of earnings losses arises from the unobservability of the counterfactual $y_t^U$ in Eq. 1. If we could observe both injured and uninjured earnings for every injured worker, estimating earnings loss would be straightforward and given by Eq. 1. However, $y_t^U$ cannot be observed, and an estimate, $\hat{y}_t^U$ must be constructed.

At an administrative level, workers' compensation programs must also estimate $y_t^U$ when setting benefits, and typically they use the preinjury earnings. However, particularly for estimating the long-term consequences of permanent disabilities, the preinjury wage is not a satisfactory proxy. First, without the injury, the worker may have experienced wage growth over time, which the preinjury earnings will not measure. Second, if the injury had not occurred, it is possible that the

injured worker would have been unemployed or exited the workforce for different reasons. It is not appropriate to assume that they would have earned the preinjury earnings in every postinjury earnings period.

Instead of using preinjury earnings, we estimate uninjured earnings in the postinjury period using the earnings of a comparison (control) group. This approach draws its inspiration from the training program evaluation literature (Dehejia and Wahba 1996; Heckman and Hotz 1989; Holland 1986; LaLonde 1986). The control group comprises workers who were similar to the injured workers with respect to demographic and economic characteristics but who did not experience a workplace injury during the time period under examination.[3]

Biddle (1998) and Boden and Galizzi (1999) as well as the estimates from Washington and Wisconsin reported below, each used workers with minor injuries as comparison groups. To correct for observed differences between injured workers and controls, a fixed-effect earnings regression model is estimated. Reville (1999) and our estimates for California (reported below) used uninjured workers at the same firm as controls. Observed differences are corrected for using a case-control matching methodology. In the remainder of this section, we describe the particular estimation approach and the data used for each state.

## Washington and Wisconsin

In Biddle (1998) and Boden and Galizzi (1999), as well as in the Washington and Wisconsin estimates reported below, $\hat{y}_t^U$ is estimated from the earnings of workers with minor workplace injuries. The minor injuries used in the Washington study resulted in less than three days out of work and no permanent disability benefits (referred to as medical-only cases). The Wisconsin minor injuries resulted in 8 to 10 days out of work and no permanent disability benefits. In both states, earnings regressions were estimated using longitudinal data on real quarterly earnings for a pooled sample of controls and injured workers. Independent variables included age in the quarter of observation and calendar year and quarter dummies to control for business cycle effects common to the earnings of all workers. Also, pre- and postinjury earnings were allowed to follow different trends depending on the severity of the injury. [5]

The regression coefficients were used to project what the earnings of the injured worker would have been in the quarter of injury and the postinjury quarters, using that worker's estimated fixed effect and the coefficients estimated for the comparison group. The earnings loss estimate for each postinjury quarter was set equal to this earnings projection minus the actual earnings of the injured worker. Quarterly earnings loss estimates for the quarter of injury and 14 subsequent quarters were then discounted at a 2.3 percent rate[5] and summed to produce a single loss figure.

To check the quality of the control group, the preinjury earnings of the controls and the injured workers were compared in both Washington and Wisconsin. In Wisconsin, preinjury differences in quarterly earnings growth[6] between the controls and injured workers were small (under $8) and statistically insignificant (Boden and Galizzi 1999); in Washington, the difference was about $17 per quarter.

In Washington, the claims data are from the Washington Department of Labor and Industries and consist of a sample of workers' compensation injuries from July 1993 to June 1994. The sample includes 8769 medical-only cases and 34,618 workers receiving income benefits (TTD and PPD). The claims data are linked to 21 quarterly reports on earnings provided by employers in the state to the Washington Employment Security Department.[7] The earnings are from six quarters before to 14 quarters after the injury. The Wisconsin claims data provided by the Wisconsin Division of Workers' Compensation are from 1989 and 1990. They are linked to 24 quarterly earnings reports from the Wisconsin Division of Employment Security, ranging from 8 quarters before to as long as 18 quarters after the injury. The sample consists of 6,416 short-term injuries and 47,889 longer-term injuries and injuries involving PPD benefits.

## California

Reville (1999)[8] and the estimates reported below for California used uninjured workers as controls. Each injured worker was matched to up to 10 uninjured workers at the same employer with earnings approximately equal to the preinjury earnings for the injured worker. The mean difference in earnings between the injured and control workers in the quarters after injury was then used to estimate losses.[9] An

estimate of cumulative earnings loss is calculated by summing over time for every worker the earnings loss in every quarter, discounted (at 2.3 percent) to the quarter of injury.

As in Washington and Wisconsin, to test for the quality of the controls, Reville (1999) compared the preinjury earnings of the injured workers to the comparison workers over the years prior to injury. Controls were matched to injured workers based on the four quarters prior to the injury. Eight additional quarters before the first four quarters prior are available for testing the controls. The match was found to be very close, with an average quarterly difference in earnings of only $28, less than 2 percent of the difference found in the quarters following injury.[10]

The claims data are from the California Workers' Compensation Insurance Rating Bureau and consist of workers' compensation PPD claims from injuries during 1993 at insured firms.[11] The data are matched to quarterly earnings data from the fourth quarter of 1989 through the second quarter of 1998 from the California Employment Development Department. Data on 8,107 claims are matched to earnings data for 28,862 uninjured workers.

## PERMANENT PARTIAL DISABILITY BENEFITS IN THREE STATES

The amount paid for temporary disability benefits differs among states. There are, however, only a few dimensions along which temporary disability benefits vary. Benefits are set as a fraction of the preinjury wage, where the fraction varies among states. There are also different maximum and minimum benefits, waiting periods, and maximum numbers of weeks. Most states use the pretax wage as a basis for temporary disability benefits. However, because workers' compensation benefits are not taxed, other states base their benefits on "spendable earnings," which are meant to approximate after-tax earnings. The rules governing temporary disability payments in the three states we examine are summarized in Table 1.

Differences among states in permanent disability benefits are harder to categorize along a few dimensions. This reflects the com-

**Table 1 Summary of Income Benefits in California, Wisconsin, and Washington**

| | |
|---|---|
| **California 1993 income benefits** | |
| TTD weekly amount | 2/3 preinjury pretax wage to maximum of $336 |
| TTD waiting period | 3 days |
| PPD weekly amount | 2/3 preinjury pretax wage to maximum |
| PPD weekly benefit maximum | Maximum: $140 (ratings under 25)<br>$148 (earnings 25 and above) |
| Weeks of PPD benefits | Vary by rating:<br>25th percentile: 24 weeks<br>50th percentile: 50 weeks<br>75th percentile: 96 weeks<br>99th percentile: 426 weeks plus life pension |
| Other income benefit: | |
| Vocational rehabilitation maintenance | 2/3 preinjury pretax wage to maximum of $246 |
| **Wisconsin 1989–90 income benefits** | |
| TTD payment amounts | 2/3 preinjury pretax wage to maximum of $363 (1989) or $388 (1990) |
| TTD waiting period | 3 days (7-day retroactive period) |
| PTD weekly amount | 2/3 preinjury pretax wage to maximum of $125 (1989) or $131 (1990) |
| Weeks of PPD benefits | 10 weeks per percentage point |
| Lump-sum payments of unaccrued benefits generally not allowed | 25th percentile: 13 weeks<br>50th percentile: 28 weeks<br>75th percentile: 60 weeks<br>99th percentile: 526 weeks |
| Other income benefit: | |
| Vocational rehabilitation maintenance | 2/3 preinjury pretax wage to maximum of $363 (1989) or $388 (1990) |

(continued)

**Table 1 (continued)**

| **Washington 1993–94 income benefits** | |
|---|---|
| TTD payment amounts | From 60% to 75% of preinjury pretax wage, depending on marital status and number of dependents; maximum of $2216 per month paid in bimonthly installments |
| TTD waiting period | 3 days |
| PPD payment methods | Total awards based on schedule of injuries and/or percentage disability rating system. If total award exceeds $6600 dollars, monthly payments are made according to TTD payment schedule until full award is paid. |
| Other income benefit: | |
| Vocational rehabilitation maintenance | Ordinary TTD benefits can be received during participation in approved VR program. |

plexity of the problem of setting higher benefits for people with greater disability based on comparing individuals with different injuries.[12] In most states, there are "schedules" that set dollar amounts for particular injuries (such as $27,813 for the loss of a thumb in Washington in 1997), though the schedules differ among states and the ranking of injuries is sometimes reversed in different states. Most states also use some kind of rating system that ranks different injuries on a scale of 1 to 100 depending upon physician impairment ratings or ratings derived from medical descriptions of impairments (such as the fraction of range of motion that is lost in the shoulder).[13] These rating systems are used either for all injuries, as in California, or only for unscheduled injuries. Like the schedules, these rating systems rank different injuries, and the relative ranking of particular injuries in different rating systems can vary. Some states pay different amounts depending upon whether you have returned to work or returned to the at-injury employer. In addition, there are differences in weekly amounts and in the number of weeks that benefits are paid.

In the remainder of this section, we describe more fully the rules determining the size of permanent benefits payments in each of the

three states being examined and present some descriptive statistics on the fraction of claims with permanent disabilities.

## Washington

In Washington, there are statutorily determined PPD award amounts for a list of specified injuries to scheduled body parts (for example, amputation of the leg above the knee). Workers can also be given benefits for unspecified injuries to scheduled body parts. In this case, a rating for the percentage of impairment is multiplied by the scheduled amputation value of the body part. Finally, there are awards for unspecified injuries to unscheduled body parts (including, notably, backs and necks). In these cases, physicians make use of a set of rules and guidelines issued by the Department of Labor and Industry to assign a "percentage of total bodily impairment" caused by the injury. This percentage is then multiplied by a scheduled total bodily impairment value, which was $118,800 as of July 1994. As Table 1 indicates, during the 1993–1994 period, awards below $6,600 (a little over half of all awards) were paid out in a lump sum, while awards greater than that amount were paid out in monthly installments.

Table 2 reports the percentage of injured workers receiving permanent disability awards in various age categories in Washington, Wisconsin, and California. The figures in the cells reflect the ratio of

**Table 2 Share of Workers' Compensation Cases with PPD Benefits by Age Group (%)**

| Sample | Age group | | | |
|---|---|---|---|---|
| | Under 35 | 35–54 | Over 55 | Overall |
| Wisconsin[a] | 14.1 | 21.2 | 27.9 | 18.1 |
| Washington[b] | 17.1 | 27.0 | 39.0 | 23.4 |
| California 1991–96[c] (self-insured) | 37.2 | 47.0 | 49.2 | 44.0 |
| California 1993[d] (insured) | ——— Data unavailable ——— | | | 42.9 |

[a] Wisconsin Division of Workers' Compensation, authors' calculations

[b] Washington Department of Labor and Industries, authors' calculations.

[c] Random sample of self-insured indemnity claims data collected by RAND.

[d] Workers' Compensation Insurance Ratings Bureau data, authors' calculations.

claims receiving PPD awards to all claims with income benefits, that is, all claims involving compensation for lost time and/or PPD benefits. In Washington, 23.4 percent of claims with income benefits in the period examined involved PPD awards. However, this percentage rises with age and is 39 percent for injured workers 55 years or older.

## Wisconsin

Wisconsin has two kinds of PPD benefits, functional impairment benefits and earnings capacity benefits. Functional impairment benefits are based upon a physician impairment rating. Earning capacity benefits are paid only to workers with nonscheduled injuries (typically head, back, or neck injuries) who do not return to work or who are rehired at no more than 85 percent of their former wage. Typically, workers qualifying for earning capacity benefits have not returned to their former employer. Earning capacity benefits use the same formula per percentage point of permanent disability, but the disability percentages tend to be much larger than for functional impairment benefits. They are determined by reports of "vocational experts" on the effect of the impairment on the worker's wage-earning capacity.

Table 1 displays PPD benefit levels in Wisconsin for 1989–1990 injuries. PPD benefits are subject to a maximum weekly benefit of $125 for injuries occurring in 1989 and $131 for those occurring in 1990. This maximum weekly benefit represents just over one-third of the maximum weekly TTD benefit. Each percent of permanent disability of the body as a whole is allocated 10 weeks' benefits. For 1989 injuries, this implies a maximum benefit payment of $1,250 per percentage point of disability. Generally, benefits are paid monthly, so that monthly maximum PPD benefits for 1989–1990 injuries were about $500. Only 18.1 percent of workers with lost-time workers' compensation cases received PPD benefits in Wisconsin in 1989–1990 (Table 2).

## California

California's method for setting permanent disability benefits is distinctive and perhaps the most complex of the three states. All disabili-

ties are described and ranked in a rating system that is unique to California. This rating system includes medical descriptions of impairments as well as work restrictions (such as different ratings for "no heavy lifting" and "no very heavy lifting"). It also includes compensation for "subjectives" such as chronic pain, even in the absence of medical evidence to support it.

As a result of this relatively permissive description of permanent disability, California has a considerably larger fraction of claims with permanent disability. As seen in Table 2, more than 40 percent of individuals receiving income benefit payments also receive permanent disability benefits. As in Wisconsin and Washington, the fraction with permanent disabilities increases with age, so that for workers over 55, almost half receive permanent disability benefits.[14]

California is also unique in the extent to which benefits are adjusted to account for the individual circumstances of the injured worker. On the assumption that the same injury will lead to different losses depending upon the occupation of the injured worker, California's disability rating system assigns different values for the same injury in different occupations. For instance, an injury that affects speech will lead to higher benefits for a radio announcer than for a bricklayer; however, an injury that affects the shoulder will lead to a higher benefit for the bricklayer. Finally, on the assumption that recovery is harder with age, higher benefits are paid for older workers.

Table 1 shows that the maximum benefit levels for temporary and permanent disabilities in California are similar to those in Wisconsin (and difficult to compare with Washington's). The formula for weeks is very complex, with the number of weeks for each additional disability rating point increasing with the disability rating. Using the actual distribution of PPD awards, the table shows the number of weeks of PPD benefits by quartile of award for Wisconsin and California. In general, California has longer periods of PPD than Wisconsin.

## EARNINGS LOSS AND REPLACEMENT RATE ESTIMATES BY STATE

In Table 3, we report the losses for all three states, together with the total income benefits paid, the preinjury average quarterly earnings, and the pretax replacement rate. Total income benefits paid includes temporary total disability and permanent partial disability benefits in all three states. In addition, in California and Wisconsin, injured workers are allowed to accept a cash settlement for the future value of the medical care in exchange for releasing the insurer or employer for any liability for future medica expensesl. This is not allowed in Washington. Finally, all three states pay a vocational rehabilitation (VR) maintenance allowance, which is paid while the worker is unable to work due to participation in VR.[15] Losses are reported in each state for 3.5 years and 10 years after injury. In all three states, the estimates at 3.5 years are based on observed postinjury earnings. Estimates at 10 years are based on projecting the losses an additional 6.5 years, discounted and based on the loss estimated for the final year observed.

Table 3 shows that losses in Washington and Wisconsin are very similar; losses in California appear to be considerably higher. California income benefits paid are also considerably higher than those in Washington and Wisconsin, but not high enough to cover the differences in losses.[16] This is shown in the far right column of Table 3, which reports the pretax replacement rate at 10 years among states. In Washington and Wisconsin, the replacement rate is over 45 percent, while in California, the replacement rate is below 40 percent.[17]

**Table 3 Average Losses by Years from Injury and Pretax Replacement Rate, PPD Cases[a]**

| Sample | Preinjury quarterly earnings ($) | Total income benefits ($) | Losses by years from injury ($) | | Replacement rate of 10-yr. losses |
|---|---|---|---|---|---|
| | | | 3.5 | 10[b] | |
| California | 5,284 | 21,229 | 26,383 | 56,340 | 0.377 |
| Wisconsin | 5,868 | 14,196 | 17,602 | 30,746 | 0.462 |
| Washington | 5,601 | 14,975 | 15,358 | 32,427 | 0.462 |

[a] Dollar values in 1984 dollars.
[b] Projected.

Although useful for comparing among states, the after-tax replacement rate might be preferred as a measure of adequacy because workers' compensation benefits are tax-free. In after-tax dollars, the earnings loss would be 20–30 percent lower, and therefore the replacement rate would be higher. However, two other sources of bias are in the opposite direction. First, the choice of 10 years for the replacement rate is arbitrary. In work in progress by the authors using California data, losses are found to continue at much the same annual level even with seven years of observed postinjury earnings. Since virtually all injured workers have already received all workers' compensation benefits by five years, but losses may continue for many years after that, the replacement rate for longer periods would be lower. Also, fringe benefits are a significant source of compensation.[18] Some fringe benefits are tied to earnings, and others may be lost if the disabled worker cannot return to the preinjury job.[19]

Table 4 shows losses over the observed period of 3.5 years and losses projected to both 6.5 years and 10 years for three age groups. Estimates are reported only for Washington and Wisconsin, because data limitations prevent the calculation of these estimates for California. The table shows that, in both states, losses increase with age. In

**Table 4 Losses by Age Group and State, PPD Cases (1994 $)**

| Sample | Under 35 | 35–54 | Over 55 |
|---|---|---|---|
| Wisconsin | | | |
| Preinjury quarterly earnings | 4,917 | 6,625 | 6,276 |
| Losses (3.5 yr.) | 13,832 | 19,038 | 26,287 |
| Losses (projected 6.5 yr.) | 18,159 | 23,842 | 45,880 |
| Losses (projected 10 yr.) | 24,317 | 30,678 | 56,271 |
| Income benefits received | 12,475 | 15,477 | 15,990 |
| Washington | | | |
| Preinjury quarterly earnings | 4,798 | 6,687 | 7,556 |
| Losses (3.5 yr.) | 14,782 | 15,190 | 17,691 |
| Losses (projected 6.5 yr.) | 22,265 | 22,825 | 30,295 |
| Losses (projected 10 yr.) | 30,383 | 31,110 | 43,969 |
| Income benefits received | 14,790 | 15,650 | 12,428 |

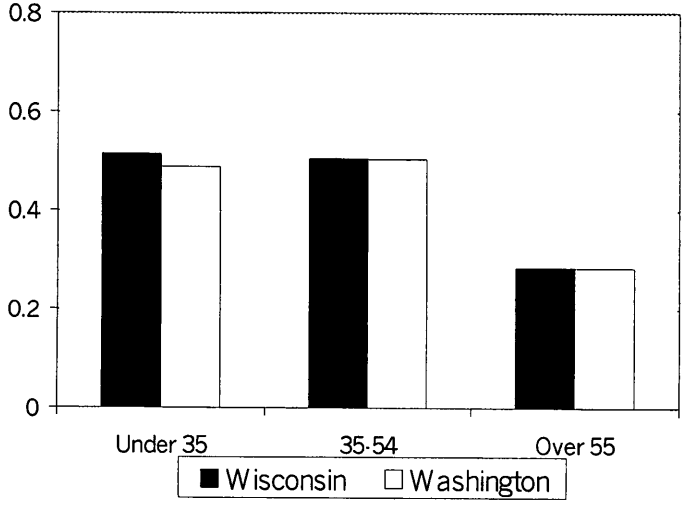
Wisconsin, injured workers under 35 experience losses of $13,832 over the 3.5 years following injury, while workers over 55 experience losses almost twice as large. In Washington, the increase in lost earnings with age is less dramatic, with workers under 35 losing $14,782 over the 3.5 years following injury, and injured workers 55 and over losing an estimated $17,691.

Because earnings increase with age, and higher-paid workers will lose more for the same amount of lost work time, when comparing among age groups it is useful to normalize the lost earnings by preinjury earnings. Dividing the loss by the preinjury quarterly earnings provides a measure of lost earnings in terms of quarters of lost earnings at the preinjury earnings level. Using this measure, the age pattern of losses for injured workers in Wisconsin is different than in Washington. In Wisconsin, workers over 55 lose the equivalent of almost one year of preinjury earnings during the 3.5 years after injury, compared with less than nine months (three quarters) for each of the other two age groups. This suggests that older disabled workers in Wisconsin experience more time out of work following the injury than younger disabled workers. In contrast, the youngest disabled workers in Washington experience the largest earnings losses relative to the preinjury earnings. Injured workers in Washington under 35 experience over nine months (three quarters) of lost preinjury earnings; by comparison, workers over 55 experience less than seven months of losses.

Projecting losses to 10 years after injury produces results for Wisconsin that are qualitatively similar to the losses for 3.5 years: older disabled workers experience considerably larger losses measured absolutely or in months of lost earnings. At 10 years postinjury, months of lost earnings in Washington become similar among age groups. In both states, replacement of lost earnings during the first 10 years after the injury is considerably lower for workers over 55. In Figure 1, the replacement rate of 10-year losses by age group is shown for Washington and Wisconsin. For the two age groups below 55, the replacement rate is approximately one-half. For the injured workers aged 55 and over, the replacement rate in both states is 28 percent.[20]

Our 10-year projections may provide an overstatement of losses for workers over 55, since by age 65, it is likely they will have retired even if they had not been injured and therefore would have received no further earnings losses.[21] For this reason, we also report 6.5-year pro-

**Figure 1 Projected 10-Year Earnings Replacement Rate by Age: Washington and Wisconsin PPD Cases**




jections for losses (3.5 observed years and 3 projected years at the last quarter's average loss), which presumably are less likely to be biased in this manner. The 6.5 year projected replacement rate of 0.41 for Washington and 0.35 for Wisconsin is lower than even the 10-year projected replacement rate for the younger age groups.

The results in Figure 1 and Table 4 suggest that the adequacy of replacement rates is lowest for the oldest injured workers. It should be noted, though, that the 10-year replacement rate provides a limited window during which to observe losses. It is possible that losses beyond the observed period for workers in the oldest age category (over 55) will be considerably lower or nonexistent because many would have retired even had they not been injured. Younger workers may lose less during the first few years but over their lifetime may lose more.[22]

Table 5 reports on how well PPD benefits are tailored to lost earnings. As noted earlier, disability ratings are used in all three states to predict which workers have greater disability so that higher benefits

can be targeted to the most serious cases. If this system were successful, we would expect benefits would increase at least in proportion to losses. To examine this, the table divides the distribution of income benefits into quintiles and calculates the average losses within each quintile. We would expect that the losses would increase with the income benefit quintile. In California, the lowest benefit quintile had losses that are five-sixths the losses of the second lowest quintile; however, benefits in the first quintile are 30 percent of those of the second quintile. An already low replacement rate of 19 percent for the second quintile is far lower than that for the first (7 percent). The results for Washington are even more dramatic. While the highest quintile receives benefits five times larger than those of the lowest quintile, losses are only 25 percent higher. Losses in the second and fourth quintiles are lower than in the first and third, respectively. In contrast, losses in Wisconsin increase monotonically with income benefits, leading to very similar replacement rates in all but the highest quintile.[24]

The relative success in equitably distributing benefits in Wisconsin may be driven by Wisconsin's two-tier system, which pays earnings capacity benefits only to workers who either do not return to work or who return at a substantially lower wage. Workers receiving earnings capacity benefits will almost always have higher losses. Washington's relative inability to target benefits to the more serious cases may be driven by the limitations of the impairment-based system used to set benefits. It is possible that information on the type of injury alone does not capture as much variation in the postinjury outcomes as economic factors such as the ability to return to work (the payment of earnings capacity benefits in Wisconsin) or the personal characteristics of the injured (the occupational and age adjustments to disability ratings used in California).

Several recent papers have noted that, particularly in permanent disability cases, absence from work following the initial return to work is common among workers with occupational injuries (Biddle 1998; Butler, Johnson, and Baldwin 1995; Galizzi and Boden 1996; Reville 1999). For this reason, we depart from the approach often adopted in the workers' compensation literature of examining duration to first return to work, and instead we examine differences over the years after the injury between the fraction of injured workers and controls without reported earnings. This allows both the injured workers and the con-

**Table 5 The Relationship of Losses and Total Income Benefits, by PPD Benefit Percentile**

| Sample | | Permanent disability benefit percentile | | | | |
|---|---|---|---|---|---|---|
| | | 0–20 | 21–40 | 41–60 | 61–80 | 81–100 |
| California 1993 injuries | Losses at 3.5 yr. ($) | 14,654 | 17,818 | 26,319 | 37,043 | 69,937 |
| | Losses projected 10 yr ($) | 24,120 | 29,948 | 43,107 | 55,754 | 114,226 |
| | Income benefits received[a] ($) | 1,695 | 5,689 | 12,391 | 24,158 | 61,621 |
| | 10-yr. replacement rate (%) | 7 | 18.9 | 28.7 | 44.1 | 53.9 |
| Washington 1993–94 injuries | Losses at 3.5 yr. ($) | 13,493 | 13,499 | 16,199 | 5,915 | 17,679 |
| | Losses projected 10 yr. ($) | 30,512 | 28,834 | 34,555 | 32,485 | 35,775 |
| | Income benefits received[a] ($) | 4,395 | 8,859 | 14,095 | 18,086 | 29,433 |
| | 10-yr. replacement rate (%) | 14.4 | 30.8 | 40 8 | 55.7 | 82.3 |
| Wisconsin 1989–90 injuries | Losses at 3.5 yr. ($) | 6,078 | 9,209 | 14,616 | 18,976 | 37,595 |
| | Losses projected 10 yr. ($) | 8,255 | 13,816 | 20,957 | 32,036 | 65,713 |
| | Income benefits received[a] ($) | 3,299 | 6,259 | 9,912 | 14,703 | 38,425 |
| | 10-yr. replacement rate (%) | 40.0 | 45.3 | 47.3 | 45.9 | 58.5 |

[a] Temporary plus permanent disability benefits.

trols to move in and out of the labor force, but if the fraction of injured workers out of the labor force exceeds the fraction of controls, then we assume this is injury-related.[24] This estimate of injury-related non-employment is reported in Table 6 for 3, 5, 10, and (where available) 20 quarters after injury.

Table 6 shows that in all three states, injury-related non-employment continues to be significant even 10 quarters following injury. It is clear that California's considerably higher earnings losses are associated with much higher rates of injury-related non-employment. Both the 1992 and 1993 injured workers have injury-related non-employment exceeding 15 percent for the first 2 1/2 years, though similar rates are never observed in Washington or Wisconsin, not even during the first quarter after injury. As shown in Reville and Schoeni (1999), injury-related non-employment is higher in recessions, and the difference between the states may be in part driven by the severity of the recession experienced in California in the early 1990s. There may be other reasons for the difference, including differences in litigation rates among the states and differences in the characteristics of jobs, workers, and industries. We plan to explore these differences in future studies.

Table 7 shows non-employment for Washington and Wisconsin by age group. In both Washington and Wisconsin, compared with nondisabled workers, workers over 55 with permanently disabling injuries are increasingly likely to be out of work as time from the injury increases. This suggests that a disabling workplace injury (as with the onset of other health conditions) may lead older workers to choose to retire earlier than they would have otherwise.

**Table 6 Injury-Related Non-Employment Rate by Quarters from Injury (%)**

| | Quarters | | | |
|---|---|---|---|---|
| Sample | 3 | 5 | 10 | 20 |
| California 1993 injuries | 25 | 23 | 17 | 9 |
| Washington 1993–94 injuries | 12 | 11 | 9 | ND[a] |
| Wisconsin 1989–90 injuries | 12 | 12 | 12 | ND |

[a] ND = no data available

**Table 7 Injury-Related Non-Employment Rates by Quarters from Injury and by Age Group, PPD Cases in Wisconsin and Washington (%)**

| Sample | Quarters | | |
|---|---|---|---|
| | 3 | 5 | 10 |
| Wisconsin | | | |
| Age <35 | 11 | 10 | 9 |
| Age 35–54 | 8 | 11 | 12 |
| Age 55+ | 12 | 17 | 27 |
| Washington | | | |
| Age <35 | 13 | 11 | 7 |
| Age 35–54 | 12 | 12 | 10 |
| Age 55+ | 13 | 15 | 18 |

## CONCLUSION

This paper examines the losses experienced by workers with permanent disabilities in California, Washington and Wisconsin and compares the adequacy of compensation received from those states' workers' compensation systems. We find evidence of substantial losses from permanently disabling injuries in the three states. The state programs differ substantially in the proportion of workers' compensation cases receiving permanent disability benefits and in the average losses sustained by these injured workers, reflecting both differences in the laws and practices in those states. In general, California stands out: a higher proportion of injured workers received permanent disability benefits in California, experiencing higher average losses and receiving higher average benefits (but replacing a lower fraction of lost earnings). Wisconsin's system appears to lead to better targeting of benefits to losses, while Washington's impairment-based PPD schedule leads to losses unrelated to benefits paid.

It is possible that some of the differences among the states are driven by differences in industry mix, demographics, and economic conditions. At this point, we also cannot rule out the possibility that the differences are driven, at least in part, by differences in methods

used. However, our preliminary research (which is still in progress) on disabling injuries in Florida, a state with industry mix and demographics that are similar to those of California, has found losses that are at least as close to those in California as to Wisconsin's or Washington's. This research has used the same methods we have used in Wisconsin, which suggests that the methods do not drive the observed differences. In our ongoing research, we are estimating losses with similar control groups and will examine how measured interstate differences (such as industry mix) affect the disparities in the losses we have measured.

Besides differences in earnings losses, California also pays PPD benefits to more than twice the proportion of workers with lost-time injuries than do the other two states (see Table 2). This does not necessarily imply that more workers in California suffer long-term losses; as noted earlier, California has a relatively more permissive definition of permanent disability than the other states, with greater reliance on subjective complaints (such as pain) and on work restrictions. However, Biddle (1998) and Boden and Galizzi (1999) both found that individuals with long-term temporary disability benefits (more than four weeks) but lacking permanent disability benefits have losses that are, on average, almost as large as those in PPD cases and that these losses continued at least to the end of the period they observed.[25] The long-term TTD group is larger in these states than the group receiving permanent disability benefits. Since they do not receive PPD benefits but have similar losses, these workers also had the lowest replacement rates. Within this group, there are certain to be a significant number of people who would have qualified for PPD benefits had they been injured in California. Accounting for this might reduce the differences in replacement rates among states, even if it does not reduce the differences in earnings losses.

Our data indicate that workplace injuries and illnesses are important sources of disability throughout the working life, but that they are particularly so for older workers. When older workers are injured, they appear to suffer more permanently disabling injuries, and those with permanent disabilities experience more injury-related non-employment. Current evidence on the relationship of age and losses is ambiguous. Still, older workers in the states we have studied appear to recover a smaller proportion of their losses from workers' compensation than do other injured workers, at least over the first few years after

injury. This raises concerns about the extent to which the uncompensated burden of work-related disabilities of older workers falls on the workers and their families or is absorbed by other public and private insurance systems.

The mechanisms behind the age-related differences in employment and losses are unclear. We do not know the extent to which they are simply caused by age-related physiological effects like delayed and incomplete recovery, nor do we yet understand the interaction between retirement decisions and the onset of work-related disabilities. Health and disability has been shown to be a primary reason for retirement (Anderson and Burkhauser 1985; Blau, Gilleskie, and Slusher 1997; Bound 1991; Sherman 1985; Stern 1988), but the extent to which health and disability is driven by occupational factors is unknown. Finally, we have questions about how the nature of employer accommodations may differentially affect older and younger workers. Studies have shown that when the employers provide accommodations for disabled workers and rehire injured workers, time lost from work is reduced substantially and the employment trajectory is improved (Burkhauser, Butler, and Kim 1995; Galizzi and Boden 1996).

The analysis of disability from workplace injuries is likely to prove useful not only in its own right, but also in helping us to understand more about the labor-market impacts of nonworkplace health shocks on older workers. In particular, occupational injuries provide unusually good availability of administrative data and potential access to more detailed data about the behavior of both the supply and demand sides of the labor market for disabled workers.

## Notes

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1. A considerable literature in economics exists on the incentive effects of temporary disability benefits. See, for instance, Moore and Viscusi (1990), Krueger (1990), and Meyer, Viscusi, and Durbin (1995)
2. For a discussion of some theoretical issues in the interpretation of earnings losses as a measure of welfare of injured workers, see Reville, Bhattacharya, and Sager (1999)

3. Earnings losses have also been estimated using similar methods in the literature on the impact of downsizing. See, for instance, Jacobson, LaLonde, and Sullivan (1993) and Schoeni and Dardia (1996).
4. Workers were categorized into severity groups based on number of days missed and whether PPD benefits were received, and workers in different groups were allowed to have separate preinjury trends of earnings. The specification allowed the earnings of workers in the comparison group to follow a linear trend in the postinjury period as well, while for each of the injured worker groups, dummy variables for the quarter of injury and the five subsequent quarters allowed earnings to follow a flexible, nonmonotonic path following the injury. After this six-quarter period, a separate linear earnings trend was specified for each injured worker group. Variables were also included to control for the impact of any subsequent injuries on earnings. The Washington estimates were based on a fixed-effects specification, while the Wisconsin estimates used a first-differences approach. The results showed little sensitivity to the specification used.
5. Boden and Galizzi (1999) used a 3 percent rate, but the estimates presented below use a 2.3 percent rate.
6. The use of a fixed-effect regression technique controls for any persistent preinjury differences in the level of earnings between injured workers and the workers in the comparison group. Even before controlling, however, these differences amount to less than 5 percent of quarterly earnings.
7. In each of the three states, workers' compensation claims data are linked to longitudinal quarterly earnings data collected by the state for administration of the unemployment insurance (UI) program. The earnings data are obtained for both the injured workers and the comparison workers. The UI data reports all within-state, before-tax earnings at UI-covered employers (approximately 95 percent of employment in each of the states). If no earnings data are reported for a particular quarter for either injured workers or controls, we assume that zero earnings are received. Earnings data for the self-insured and for workers who move out of state will be missing. This will not bias estimates unless disabled workers are systematically more or less likely to receive these types of earnings.
8. See also Peterson, Reville, Stern, and Barth (1997).
9. For a general discussion of matching in econometrics, see Heckman, Ichimura, and Todd (1997).
10. This test is not directly comparable to the test in Washington and Wisconsin. The $28 difference in California is in levels, while the $17 and $8 differences for the other states reported above were in changes (or growth).
11. Two-thirds of employees in California work at insured firms (firms that purchase insurance). The remaining one-third are employed at self-insured firms.
12. States vary in the statutory justification for permanent disability benefits. Many states, such as California, justify it as compensation for loss of future earnings capacity. Construction of an ordinal scale to rank injuries and set compensation is equally complex with the justifications used in other states, such as compensation for "impairment."

13. The most commonly used rating system is the American Medical Association's *Guides to the Evaluation of Permanent Impairment* (1993)
14. Table 2 reports the fraction with PPD by age using a new sample of self-insured claims recently collected by RAND. Data on age for workers with temporary disability benefits are not available for the insured firms examined in this paper.
15. In addition, workers' legal and medical-legal expenses have not been subtracted from the indemnity paid to the worker, even though they are usually directly paid to attorneys or evaluating doctors.
16. In Reville (1999), estimates of the replacement rate use simulated benefits paid out over time according to the schedule using the information from the WCIRB data on actual disability ratings and various benefits paid. This was intended to insure that the time window for losses and benefits coincide and to eliminate the impact of the settlement of medical costs in the replacement rate. This led to lower total income benefit payments (reflecting the fact that five years of losses were reported and therefore the benefits represented five years of benefits) and therefore lower replacement rates. This approach is not adopted here for consistency with the data available from other states.
17. Berkowitz and Burton (1987), using data from claims in 1968, also found that replacement rates were considerably higher in Wisconsin than in California.
18. According to U.S. Department of Labor (1998), nonwage benefits account for approximately 38 percent of wage and salary income.
19. We interpret the replacement rates as the fraction of losses replaced by workers' compensation benefits Another interesting estimate would be the fraction of losses replaced by all government benefits. While most of the injured workers are not disabled enough to receive Social Security disability benefits, we suspect that they are more likely to receive them than their controls, and therefore replacement rates counting all benefits would be higher. However, we do not have data on Social Security disability benefits for these workers.
20. This, too, may be somewhat exaggerated by the projection method for losses, which does not account for the decline in losses associated with retirement.
21. The regression specification includes a fourth-order polynomial in age, and therefore we expect that we have accounted for age during the observed period flexibly enough to correctly estimate losses even given the decline in labor force participation after age 65.
22. Benefits for PPD in state workers' compensation systems differentially reflect the two opposing effects of age on lost earnings. As noted earlier, in California, higher benefits are paid to older workers to compensate them for their diminished ability to recover from injury. In contrast, in Colorado, lower benefits are paid to older workers (Barth and Niss 1999), presumably because they are closer to retirement and will not experience lost earnings over as many years.
23. In all states, the replacement rate results for the highest quintile may be exaggerated relative to the lower quintiles by the use of a 10-year projection period. This group is likely to have large and long-term losses.

24. As with earnings, in all three states we found no evidence of significant differences in labor force participation of injured workers and controls prior to injury.
25. Some people who have not received PPD benefits may nevertheless have permanent impairments that cause long-term earnings losses. This may reflect a limitation in the disability rating mechanism used by the state. Alternatively, long-term losses may occur because of labor-market effects that persist after recovery from injury. For example, workers who stay off work several months may lose their preinjury jobs and their investments in skill and seniority at those jobs. Earnings and employment after return could be affected, even if they fully recover from the effects of the injury. Finally, some of the long-term losses may be attributable to employers' unwillingness to hire people with the stigma of past workers' compensation injuries and illnesses. Employers may believe that long spells of work absence mark someone as unreliable or otherwise unacceptable for employment, thus limiting employment opportunities and reducing future earnings for this group.

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