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# Duration of Work Disability After Low Back Injury: A Comparison of Administrative and Self-Reported Outcomes

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**Background** *Workers' compensation wage replacement data have recently been used to estimate time to return to work (RTW) and the number of work days lost after occupational injury. The degree to which indemnity-based measures reflect self-reported work disability has until now not been studied.*

**Method** *Kaplan-Meier curves of administrative and self-reported measures of duration of work disability were compared within a sample of 433 low back injury claimants followed up for 1 to 3.7 years.*

**Results** *Administrative measures consistently and significantly underestimated the duration of disability when compared to self-reported measures of RTW. The difference between the estimated mean number of work days lost for comparable administrative and self-reported measures ranged from 142 to 334 days.*

**Conclusions** *Number of work days lost after low back injury is substantially underestimated by measures based on the duration of wage replacement benefits. This calls into question the adequacy of indemnity benefits and underscores the need for disability prevention programs.*
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***KEY WORDS: low back pain; workers' compensation; work disability; return-to-work; survival analysis***

## INTRODUCTION

A recent trend in the study of work disability has been the use of indemnity (wage replacement) information from workers' compensation databases to estimate the number of missed work days due to occupational injuries [Cheadle et al., 1994; Hogg-Johnson et al., 1994; Krause et al., 1999; Oleinick et al., 1993, 1996]. Duration of disability has variously been defined as time to the end of disability benefits [Cheadle et al., 1994], time on indemnity benefits during the first temporary disability episode [Hogg-Johnson et al., 1994; Oleinick et al., 1996], and cumulative number of days on disability, based on the total of paid-to-date, lump-sum, and estimated future indemnity benefits [Oleinick et al., 1993]. In a study of work disability in a 3-year cohort of 850 California low back pain claimants, we presented eleven alternative ways of operationalizing duration of disability using workers' compensation data [Krause et al., 1999]. We concluded that a measure that takes into account all types of indemnity benefits and ''on'' and ''off'' disability periods is the ''best'' measure of duration of work disability that can be calculated from administrative workers' compensation data.

The question remains, however, as to the extent to which workers' compensation disability measures reflect

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''actual'' time-loss from work. Administrative measures of duration of work disability do not capture non-reported and/or non-compensated periods of injury-related work loss. Yet, workers' compensation administrative outcomes are commonly used as proxies for the number of work days lost [Oleinick et al., 1993, 1996] and/or time to ''return to work'' [Cheadle et al., 1994]. Indeed, the use of workers' compensation data for this purpose is attractive because benefit information is routinely collected and recorded for each claim by the workers' compensation insurer. Aside from the logistic difficulties encountered in extracting this information from some insurance systems [Franklin and Fulton-Kehoe, 1996; Krause et al., 1999; Oleinick et al., 1993], this information is relatively accessible, accurate, and complete. However, as already acknowledged by some, ''discontinuing receipt of benefits'' may not always be equivalent to ''return to work'' [Baldwin et al., 1996; Butler and Worrall, 1985; Frank et al., 1995]. In order to obtain a more complete picture of the impact of occupational injuries on lost work time, not to mention their impact on workers' social functioning and quality of life, it is necessary to supplement administrative data with information obtained from injured workers themselves [Franklin and Fulton-Kehoe, 1996].

The purpose of this paper is to compare measures of the duration of work disability obtained from administrative vs. self-reported data for workers with compensable low back injuries. Work disability due to low back pain continues to be a problem in industrialized nations, accounting for approximately one third of all workers' compensation costs in the United States [Andersson et al., 1991]. In a study of Ontario workers with permanent partial disabilities, Baldwin et al. [1995, 1996] found that workers with back strains were more likely to experience multiple absences from work than workers with any other kind of injury. These self-reported data on post-injury work histories also showed that work disability perseveres long after an initial return to work. However, the authors did not quantify these self-reported return to work outcomes in relation to administrative data on the same individuals. The degree to which work disability due to low back injuries extends beyond that measured by workers' compensation disability episodes has yet to be addressed.

In a companion article, we reported on the feasibility and adequacy of measures of duration of work disability based on workers' compensation insurance data alone, using a population of 850 California low back pain claimants with up to 3.5 years of administrative follow-up data [Krause et al., 1999]. In the present paper, we compare administrative and self-reported measures of ''return to work'' in a subsample of 433 low back pain claimants for whom we obtained additional return to work, medical, and quality of life outcomes data through a structured telephone interview conducted 1 to 3.7 years after the date of injury. To our knowledge, this is the first study to report on return to work outcomes based on administrative vs. self-reported data within the same sample.

## METHODS

### Subjects

A 3-year cohort of 850 workers' compensation low back injury claimants was identified from administrative claims data of a large California workers' compensation insurer. The cohort constitutes the complete population of low back pain cases with a date of injury between 1994 and 1996 in the electronic file system of three of the insurer's Northern California district offices. The sample was extracted in a multi-step process using electronic claims, benefits payment, and medical files at each of the offices. These files contain information on date of injury, nature of accident, nature of injury, claimant age and sex, workers' compensation benefit types and amounts of payments, medical diagnoses, and dates and types of medical services. Details of case selection, selection criteria, and the administrative databases are provided in our companion article [Krause et al., 1999]. In brief, the case inclusion criteria were: (1) date of injury between 1/1/94 and 12/31/96, (2) at least one day of temporary disability within 14 days after the date of injury, and (3) at least one ICD-9 code (International Classification of Diseases version 9) given by a medical doctor, osteopathic doctor, or chiropractic doctor indicating a non-traumatic injury to the lumbar or sacral region of the spine. Cases had at least one definite low back diagnosis, as defined by Cherkin and colleagues [Cherkin et al., 1992], within 90 days after the date of injury. Cases were excluded if an ICD-9 code indicated a vertebral fracture, neoplasm, infection, or inflammatory disease at any point in the life of the claim, or if a cause of accident or nature of injury code indicated burns, open wounds, or fractures.

### Interviews

The 850 claims were reduced to 721 cases that were followed up between July and December of 1997 by telephone interview. The follow-up included only those claimants whose primary treating physicians had been previously identified through abstraction of information from the insurer's hard copy administrative files. This was because the interviews were carried out in the context of a larger research project on doctors' attitudes, beliefs, and practices in returning workers' compensation back injury claimants to work. In order to investigate the relationship between doctor characteristics and actual return to work outcomes, doctor-patient pairs were required.

Selecting cases for which information on the treating physician was available reduced the sample from 850 to 824 cases. A further 94 cases (those with dates of injury in early

1994 or temporary disability payments within the 6 months before interviews started) were used during the pilot testing of the survey instrument and interviewer training phases of the project and were, therefore, not included in the final study sample. During physical file abstraction of physician information, nine other cases were excluded due to claimant death, change in residence outside the country, incorrect coding as a back injury, change in last date of temporary disability coverage, or duplicate listings of the same claimant for more than one back injury.

Of the 721 claimants remaining, 433 completed a return to work interview, a response rate of 60%. Of the 288 claimants not interviewed, 31 refused to participate, 14 did not participate due to a language difficulty, 11 could not complete the interview despite several contacts, 7 had died, 8 did not have a telephone, 3 denied having had a back injury, and 214 could not be located.

Telephone interviews were conducted in English or Spanish a minimum of 6 months after claimants' last date of temporary disability coverage using a survey instrument developed especially for this project. Respondents were informed that they would be asked about their medical care and their work experience before and after the back injury. Questions were organized into seven main topic areas: (1) physical and psychosocial characteristics of the worker's time-of-injury job, (2) health care received after the injury, (3) the first return to work experience (if ever returned to work), (4) work experience after temporary disability benefits ended, (5) work status at time of interview, (6) current health and disability, and (7) worker demographics.

## Outcomes

### *Administrative outcomes*

Information about claimants' indemnity benefits provided the basis for determining duration of disability from administrative workers' compensation claims data. Temporary disability (TD) benefits replace wages for work time that is missed while recuperating from an occupational illness or injury. TD benefits end when (1) the worker is no longer work disabled, or (2) the worker's condition reaches maximum medical improvement and the worker has residual effects of the injury, or ''permanent disability'' (PD), which results in a diminished capacity to work. A vocational rehabilitation (VR) allowance may also be paid during job re-training if the injury precludes return to the prior occupation.

From an administrative viewpoint, the termination of temporary disability benefits signifies a readiness to return to work, at least for those who do not receive PD or VR. While the end of TD is not equivalent to return to work, it is the closest proxy measure that can be identified from workers' compensation administrative data. Similarly, one can assume that workers receiving VR maintenance allowance are not working, to the extent that the worker is involved in a training program and is losing hours of work, although not necessarily due to an incapacity to work. In contrast, PD support does not translate as easily into lost work days. It compensates for a lost capacity to work, which may be expressed in fewer work hours or a lower wage rate. Since it is the only administrative measure to provide any information on the impact of the injury after TD and VR have ended, we use it in combination with TD and VR benefits to obtain the most comprehensive measure of work days lost.

We use four administrative measures of duration of disability for comparison with self-reported return-to-work outcomes. These are a subset of possible administratively-based outcome measures, which are described in more detail in our companion paper [Krause et al., 1999]. The first two are calendar time to event outcomes, which measure the number of elapsed calendar days between a worker's date of injury and the end of disability, defined in one of two ways:

1. FTD = Time from date of injury to the end date of the *first* episode of continuous TD. Twenty percent of the sample of 721 cases had more than one TD episode. These workers had gaps of a day or more in which TD was not paid, presumably because the worker made an attempt to return to work or the treating physician reported that the worker was capable of returning to work.
2. LTD = Time from date of injury to the end date of the *last* TD episode. In determining the last TD date we excluded TD ''outliers.'' These are isolated TD payments covering one to three days at the end of a case's TD payment history that are separated from earlier, longer TD episodes (and most likely represent time missed from work due to medical appointments or court appearances). Five percent of the sample had TD outliers.

The other two administrative outcome measures are cumulative time outcomes. They provide estimates of the number of work days lost by taking into account ''on'' and ''off'' disability periods that occurred during a given calendar period:

3. CUMTD = Cumulative TD, i.e., the total number of days for which TD was paid, calculated by summing over all TD episodes after having deleted TD outliers. This gives a proxy measure of the number of days the claimant was on temporary disability.
4. TCOMPDYS = Total compensated days, equal to the sum of all wage replacement benefit amounts (TD, PD, and VR) divided by the daily TD rate. This gives an estimate of the number of lost work days compensated

**TABLE I.** Summary of Administrative and Self-Reported Measures of Duration of Work Disability

| | | |
|---|---|---|
| Calendar time to event outcomes | | |
| Return to work after *first* TD episode | | |
| 1 | FTD | Time from date of injury to the end of the first temporary disability episode, defined as the first period of continuous TD |
| 2 | FRTW | Time from date of injury to date of self-reported first return to work |
| Return to work after *last* TD episode | | |
| 3 | LTD | Time from date of injury to the end of the last TD episode |
| 4 | RTWLTD | Time from date of injury to self-reported return to work after last TD episode |
| Cumulative time outcomes | | |
| 5 | CUMTD | Cumulative days of TD paid (after deleting TD outliers) |
| 6 | TCOMPDYS | Total compensated days, created by summing wage replacement benefits paid-to-date (TD + VR + PD) and dividing this sum by the daily TD rate |
| 7 | TLOSTDYS | Total lost work days (CUMTD + additional self-reported lost work days) |

during the entire life of a workers' compensation claim. The daily TD rate is used as the unit for measuring lost work days (as opposed to the daily permanent disability rate or vocational rehabilitation rate) because it reflects the implicit value the workers' compensation system attaches to a full lost work day. Applying this rate to PD and VR amounts produces an underestimate of days on PD and VR, since these benefits are generally paid at a lesser rate than TD. However, our aim was to produce a measure of duration of disability based on equivalent units, and the TD rate seemed to be the most reasonable and logistically feasible choice [given specific administrative file characteristics described in Krause et al., 1999].

### *Self-reported outcomes*

Return-to-work outcomes were constructed from survey respondents' recall of three pieces of information: (1) the date of first return to work after the back injury, (2) the date of return to work after the last temporary disability episode, and (3) the number of days of missed work (whether compensated or not) between the date recalled in (2) and the interview date. Since many respondents were being asked to recall events that happened as much as three and a half years earlier, background information was provided in order to orient the worker and anchor their responses to the time period in question. Respondents were reminded of their date of injury, their employer at the time, and the doctor(s) who treated them the most during the first 3 months following the injury. All interviewed workers were able to confirm this information. Questions were also asked in a sequence that for the most part mirrored their occurrence in real time.

Respondents were always given a frame of reference when asked to recall dates. For first return to work, they were reminded of the date of injury and asked to give the date of first return or an estimate of how long after the date of injury they returned to work. In the latter case, the interviewer calculated the return to work date and confirmed it with the worker. In asking workers to recall the date of return to work after the last temporary disability episode, the last date of TD coverage, excluding outliers, was provided. If a worker also received wage replacement benefits for vocational rehabilitation or permanent disability, the starting dates of these benefits and their timing with respect to temporary disability was given to aid recall if necessary.

We define three self-reported outcomes:

1. FRTW = Time from date of injury to self-reported first return to work;
2. RTWLTD = Time from date of injury to self-reported return to work after the last TD episode;
3. TLOSTDYS = Total number of lost work days due to the back injury between the date of injury and the date of interview. This was calculated by adding the number of days for which the worker received temporary disability (CUMTD, calculated from administrative data) and the number of self-reported work days lost between the date of last TD and the date of interview. This measure is, therefore, a composite of administrative and self-reported information.

The seven administrative and self-reported outcome measures are summarized in Table I.

## Analysis

### *Responders vs. non-responders*

To investigate possible selection bias, interviewed and non-interviewed cases were compared with respect to administrative information on socio-demographic, claim, and injury characteristics. The Student *t*-test was used to compare continuous variables and the chi-square or Fisher's

exact test was used to compare categorical data. In order to assess differences in injury severity, the 721 cases were categorized a priori into one of three injury severity groups based on the most severe ICD-9 back diagnosis received. Severity was ranked by the degree of clinically relevant morphological alteration, nerve root involvement, and the necessity for specific treatment. The most severe cases are those with an ICD-9 code indicating postlaminectomy syndrome, spinal stenosis, or herniated lumbar disc with myelopathy. Middle severity cases are those with sciatica, possible instability, or herniated lumbar disc without myelopathy. Least severe cases are those with probable degenerative changes or non-specific backache.

The difference between the four administrative outcomes of duration of disability for interviewed vs. non-interviewed cases was tested using survival analysis techniques. Specifically, we calculated the Kaplan-Meier (product-limit) estimate of the survival curve of each outcome measure for the two groups. In this context, ''survival'' refers to the proportion of injured workers who have not yet experienced the relevant administrative outcome (e.g., end of TD benefits), in other words, the proportion of workers ''still on disability.'' The Wilcoxon rank-sum test was used to test the equality of the Kaplan-Meier survival functions for each outcome across the two groups.

### *Administrative vs. self-reported outcomes*

Analyses focus on three main comparisons of administrative vs. self-reported outcomes, outlined by the three groupings in Table I. Within calendar time to event outcomes, measures of time to *first* ''return to work'' (FTD and FRTW) and time to ''return to work'' after the *last* temporary disability episode (LTD and RTWLTD) are compared across the two data sources. Within cumulative time outcomes, the number of work days lost is examined by comparing two administrative measures, one based on temporary disability alone (CUMTD), the other on all forms of indemnity payments (TCOMPDYS), to the sum of cumulative temporary disability days plus any additional self-reported missed work days (TLOSTDYS).

We examined differences between administrative and self-reported outcome measures in the group of 433 responders by calculating the Kaplan-Meier estimate of the survival curve for each outcome measure. Differences between survival curves for pairs of outcome measures were tested using a percentile bootstrap method for calculating the 95% confidence intervals of the estimated difference in the area under each curve, where the area represents the estimated mean value for each outcome [Shao and Tu, 1995]. If the confidence interval does not contain the value zero, then the curves are significantly different. This bootstrap method was devised for comparing alternative non-independent outcomes in a single group of subjects, in contrast to the more familiar methods for comparing two groups with respect to a single outcome.

Administrative and self-reported outcomes involved varying lengths of follow-up, and not all claimants had an observed outcome. For administrative outcomes, cases whose termination of disability benefits had not occurred at least 3 months before the date of electronic file writing (June, 1997) had a right-censored value for that outcome. Similarly, for self-reported outcomes, cases who reported lost work time due to the injury in the 3 months prior to the interview had a right-censored self-reported outcome. For the TD-based outcome measures (FTD, LTD, and CUMTD), no observations were censored, since all claimants were interviewed a minimum of 6 months after the end of their last temporary disability episode. Note that while the end of follow-up for the administrative data was in June 1997, all telephone interviews occurred a few weeks to 6 months after this date.

## RESULTS

### Responders Vs. Non-Responders

Table II provides information on socio-demographic and administrative claim variables, and Table III gives a breakdown of respondents and non-respondents by injury characteristics. Survey respondents were more often female, older, and had worked longer for their pre-injury employer than non-respondents. This mix of gender, age, and work experience is not atypical in telephone surveys; men and younger individuals are generally more difficult to recruit [Goyder, 1987]. Those with shorter durations of employment are also likely to be more mobile and therefore less easy to contact. Responders were also more often in professional or machine trades positions than non-responders. There were no significant differences in workers' county of residence, employer size, the percentage of cases receiving permanent disability or vocational rehabilitation, or in the percentage of litigated cases. Length of administrative follow-up is slightly longer for non-responders.

Table III indicates that non-responders were more likely to have multiple injuries, but there was no significant difference in nature of accident categories, severity of injury based on medical diagnosis, or the percentage for whom surgery was performed across the two groups.

A comparison of responders and non-responders with respect to the four administrative measures of duration of disability is presented in Table IV. Although the median days of disability is longer for non-responders than responders for each outcome measure, the survival curves themselves do not significantly differ from each other. To the extent that any self-reporting bias is the same across all workers, regardless of duration of ''administrative'' disability, any observed difference between administrative and

**TABLE II.** Socio-Demographic and Administrative Case Characteristics of Responders Vs. Non-Responders, 1994–1996 California Low Back Pain Claimant Cohort, N = 721

| | Responders (N = 433; percent or mean) | Non-responders (N = 288; percent or mean) | *P* value |
|---|---|---|---|
| Male gender | 70 | 81 | .00 |
| Age (years) | | | |
| Mean (SD) | 37.3 (10.5) | 34.5 (10.1) | .00 |
| <20 | 3 | 4 | .04 |
| 20–29 | 25 | 34 | |
| 30–39 | 35 | 34 | |
| 40–49 | 24 | 17 | |
| 50–59 | 10 | 8 | |
| ≥60 | 3 | 1 | |
| Unknown | 1 | 2 | |
| Occupation[a] | | | .00 |
| Professional, technical, managerial | 16.4 | 9.7 | |
| Clerical and sales | 11.1 | 9.4 | |
| Service | 16.9 | 16.0 | |
| Agricultural, fishery, forestry, etc. | 6.5 | 8.0 | |
| Machine trades | 6.0 | 3.1 | |
| Benchwork | 3.7 | 2.1 | |
| Structural work | 24.5 | 26.7 | |
| Miscellaneous | 15.0 | 24.0 | |
| Unknown | 0.0 | 1.0 | |
| County of residence | | | .79 |
| Northern California | 94.0 | 95.1 | |
| Southern California | 4.6 | 4.2 | |
| Out-of-state | 1.2 | 0.7 | |
| Unknown | 0.2 | 0.0 | |
| Employer size ($ payroll) | | | .42 |
| ≤$50,000 | 11.3 | 15.6 | |
| >$50,000 ≥ $500,000 | 36.7 | 36.8 | |
| >$500,000 ≤ $5,000,000 | 39.7 | 37.2 | |
| >$5,000,000 | 9.5 | 8.7 | |
| Unknown | 2.8 | 1.7 | |
| Length of pre-injury employment (years) | | | |
| Mean (SD) | 3.3 (4.7) | 1.7 (3.3) | .00 |
| Length of administrative follow-up (years) | | | |
| Mean (SD) | 2.4 (0.6) | 2.5 (0.6) | .01 |
| Received permanent disability | 30.0 | 29.9 | .96 |
| Received vocational rehabilitation[b] | 12.9 | 13.9 | .71 |
| Litigated case | 18.2 | 22.6 | .16 |

[a]Occupations were grouped into occupational divisions described in the *Dictionary of Occupational Titles,* revised 4th ed.
[b]Refers to vocational rehabilitation maintenance allowance, a wage replacement benefit.

**TABLE III.** Injury Characteristics of Responders Vs. Non-Responders, 1994–1996 California Low Back Pain Claimant Cohort, N = 721

| | Responders (N = 433; %) | Non-responders (N = 288; %) | *P* value |
|---|---|---|---|
| Nature of injury | | | |
| Strain or sprain | 94.7 | 89.9 | .05 |
| Multiple injuries | 4.8 | 9.4 | |
| Other | 0.5 | 0.7 | |
| Nature of accident | | | .62 |
| Lifting | 35.6 | 35.1 | |
| Unspecified movement | 23.1 | 24.0 | |
| Fall or slip | 18.2 | 16.0 | |
| Pushing or pulling | 6.5 | 7.3 | |
| Motor vehicle accident | 4.4 | 6.9 | |
| Holding or carrying | 4.4 | 2.1 | |
| Struck or injured by object | 2.8 | 2.8 | |
| Reaching | 1.4 | 1.7 | |
| Using tool or machine | 2.1 | 1.4 | |
| Other | 1.6 | 2.8 | |
| Severity of injury[a] | | | .74 |
| Most severe | 3.8 | 3.7 | |
| Middle severity | 14.9 | 17.1 | |
| Least severe | 81.2 | 79.2 | |
| Surgery performed | 1.2 | 1.4 | .75 |

[a]The most severe group consists of cases with an ICD-9 code indicating postlaminectomy syndrome, spinal stenosis, or herniated lumbar disc with myelopathy. The middle severity group contains cases with sciatica, possible instability, or herniated lumbar disc without myelopathy. Least severe cases have probable degenerative changes or non-specific backache.

self-reported measures of disability duration will not be biased as a function of duration of administrative disability. Therefore, it seems reasonable to assume that the comparisons featured in this report are valid.

## Administrative Vs. Self-Reported Outcomes

### *First return to work measures*

Figure 1 presents the Kaplan-Meier curves for the two outcome variables representing ''first return to work.'' The lower curve gives the estimated proportion of claimants who have not yet reached the administratively-based end of the first temporary disability episode (FTD). The upper curve gives the estimated proportion of claimants who have not yet had a self-reported first return to work (FRTW). As Figure 1 shows, the difference between the survival curves based on the administrative measure of ''first return'' and the self-reported measure of first return is substantial. Table V gives the value of each of the estimated percentages of claimants

**TABLE IV.** Median Duration of Disability and Test of Equality of Kaplan-Meier Survival Curves for Administrative Outcome Measures in Responders Vs. Non-Responders, 1994–1996 California Low Back Pain Claimant Cohort, N = 721

| Administrative outcome[a] | Median duration of disability (days) | | Test of equality of survival curves (*P* value)[b] |
|---|---|---|---|
| | Responders (n = 433) | Non-responders (n = 288) | |
| Calendar time to event | | | |
| Time to end of first TD episode (FTD) | 21 | 25 | 0.35 |
| Time to end of last TD episode (LTD) | 28 | 35 | 0.21 |
| Cumulative time | | | |
| Cumulative time on TD (CUMTD) | 24 | 30 | 0.13 |
| Total compensated days based on TD, VR, and PD (TCOMPDYS) | 30 | 34 | 0.31 |

[a]For full definitions of outcomes, see Table I; TD = temporary disability.
[b]Two-tailed Wilcoxon test for equality of Kaplan-Meier survival functions.

still work-disabled at various monthly intervals after the date of injury. At one month, 47.9% of survey participants reported they were still off work (FRTW), while 38.6% had not had an administrative ''first return to work'' by this time. At 6 months, 22% were still off work by self-report, while according to administrative reports, only 9% were still receiving benefits from their first TD episode, suggesting no return to work. The ratio of the percentage of people who have not yet returned to work by self- vs. administrative report increases from 1.2 at one month to 22 at 24 months. In summary, the administrative measure of time to the end of the first temporary disability episode shows the pattern of a better outcome than that seen for self-reported first return to work. These differential patterns further suggest that at least a portion of workers with multiple TD episodes do not return to work at all during ''off'' disability periods. Indeed, of the 100 workers with multiple TD episodes, 55% reported a first return to work after their last TD episode.

## Return to work after last TD episode

Figure 2 displays the estimated survival curves for time from date of injury to ''return to work'' after the end of the last temporary disability episode, measured administratively and by self-report. The lowest curve on the graph gives the estimated proportion of claimants still receiving temporary disability benefits (LTD). The middle curve presents the estimated proportion of claimants who have not yet had a self-reported first return to work (FRTW), as already shown in Figure 1.

The uppermost curve shows the estimated proportion of claimants still off work after their last TD payment, measured by self-report (RTWLTD). The curve for administratively-measured time from date of injury to the end of the last TD episode (LTD) shows an overall shorter duration of disability when compared to both self-reported measures.

The percentage of workers who have not yet reached the end of their disability is presented in Table VI for the three outcome measures at selected months after the date of injury. At one month, the percentage of workers who have not yet experienced a self-reported first return to work (FRTW) or the end of their last temporary disability episode (LTD) is nearly the same, at about 48%. However, by 12 months, these percentages have diverged substantially (17.5 vs. 6.3%). The percentage of people still reporting work disability after their last TD episode at 12 months following the date of injury is even greater (21.7%). With longer durations of disability, the ratio of the percentage of claimants still disabled by self-report after their last TD episode (RTWLTD) to the percentage of claimants still receiving TD benefits (LTD) increases (from 1.2 at one month to 56.5 at 30 months).

## Cumulative workdays lost

The final comparison of administrative and self-reported outcomes of duration of work disability concerns cumulative time outcomes. Figure 3 displays the survival curves for three measures of cumulative work days lost. Note that in contrast to Figures 1 and 2, the x-axis represents cumulative rather than calendar time. The uppermost curve gives the proportion of claimants still experiencing lost work days, as measured by the combination of administratively measured cumulative days on temporary disability and self-reported number of work days lost after TD benefits ended (TLOSTDYS). The remaining two curves are calculated solely from administrative data. The middle curve shows the proportion of claimants still accumulating compensated disability days of any type, i.e., days for which the worker received TD, VR, and PD benefits combined (TCOMPDYS). The lower curve depicts the proportion of claimants still accruing days of temporary disability only (CUMTD).

As the graphs show, the proportion of claimants still disabled by administrative measures of cumulative days on disability consistently underestimates the proportion still disabled by the measure of self-reported workdays lost. Table VII depicts the percentage of workers who have not yet experienced the end of work disability at different months of cumulative days of disability for each outcome measure. While the ratio of total lost work days (TLOSTDYS) to both total compensated days (TCOMPDYS) and

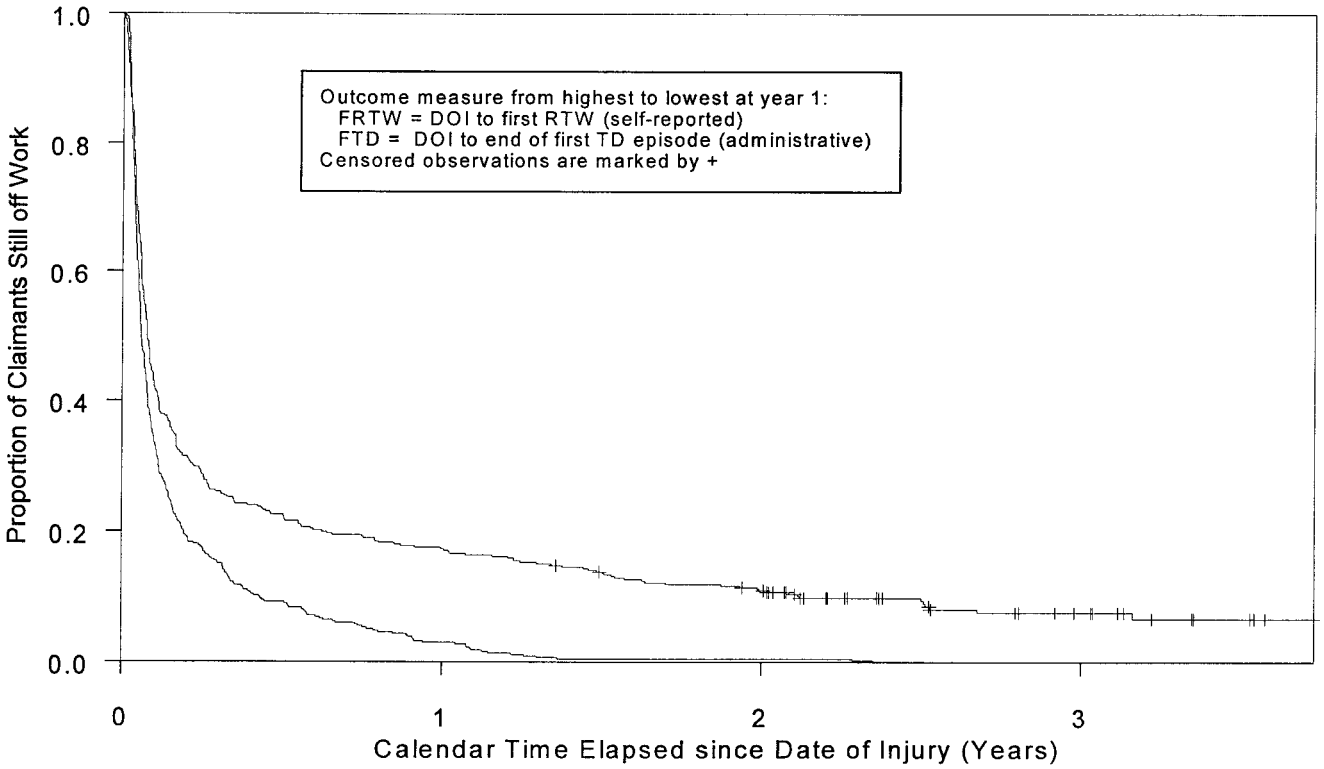


**FIGURE 1.** Proportion of claimants still off work by calendar time elapsed since date of injury. Kaplan-Meier estimates of administrative and self-reported measures of first return to work. 1994–1996 California Low Back Pain Claimant Cohort, N-430.

**TABLE V.** Percent of Claimants Still Off Work at Selected Calendar Times (Months After Injury)*

| | Number of calendar months | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Outcome measure** | **1** | **3** | **6** | **9** | **12** | **18** | **24** | **30** | **36** |
| Time from date of injury to | | | | | | | | | |
| Self-reported first RTW (FRTW) | 47.9 | 28.6 | 22.3 | 19.3 | 17.4 | 13.7 | 11.0 | 9.5 | 7.7 |
| End of first TD episode (FTD) | 38.6 | 17.4 | 9.3 | 5.4 | 3.0 | 0.5 | 0.5 | 0.0 | 0.0 |
| Ratio | | | | | | | | | |
| FRTW/FTD | 1.2 | 1.6 | 2.4 | 3.6 | 5.8 | 27.4 | 22.0 | — | — |

*Kaplan-Meier estimates and ratios for administrative and self-reported measures of first return to work (RTW), 1994–1996 California Low Back Pain Claimant Cohort, N = 430. For full definitions of outcomes, see Table I; TD = temporary disability.

cumulative TD (CUMTD) is 1.3 at one month, it increases to 2.6 and 52.8, respectively, at 24 months. About four years after the date of injury, more than 20% of workers are still experiencing lost work days, as measured by self-report. We would expect these workers to report more lost work days should they be followed up longer. From an indemnity point of view, however, nearly all workers are off disability by four years of cumulative disability (see Fig. 3).

### *Mean and total number of work days lost*

We summarize the overall results in Table VIII by presenting the estimated mean number of work days lost during follow-up, the estimated differences between the means, and the 95% bootstrap confidence intervals for the differences between the means for selected pairs of administrative and self-reported outcome measures. For all comparisons— between measures of first ''return to work'' (FTD vs. FRTW), ''return to work'' after the last TD episode (LTD vs. RTWLTD), and cumulative measures of time on disability (TCOMPDYS vs. TLOSTDYS; CUMTD vs. TLOSTDYS)— self-reported outcome measures are significantly larger than their corresponding administrative measures. Mean estimates of the number of work days lost range from 60 (FTD) to 409 (TLOSTDYS) days per claimant. Multiplying the mean by the sample size (N = 433) results in estimates of 25,980 total work days lost (FTD) to 177,097 total work days lost (TLOSTDYS), a difference of nearly 7-fold between administrative and self-reported outcomes. These differences are illustrated in Figure 4.

## DISCUSSION

This paper reports on a comparison of return-to-work outcomes assessed from information in administrative databases on workers' compensation low back injury claims and

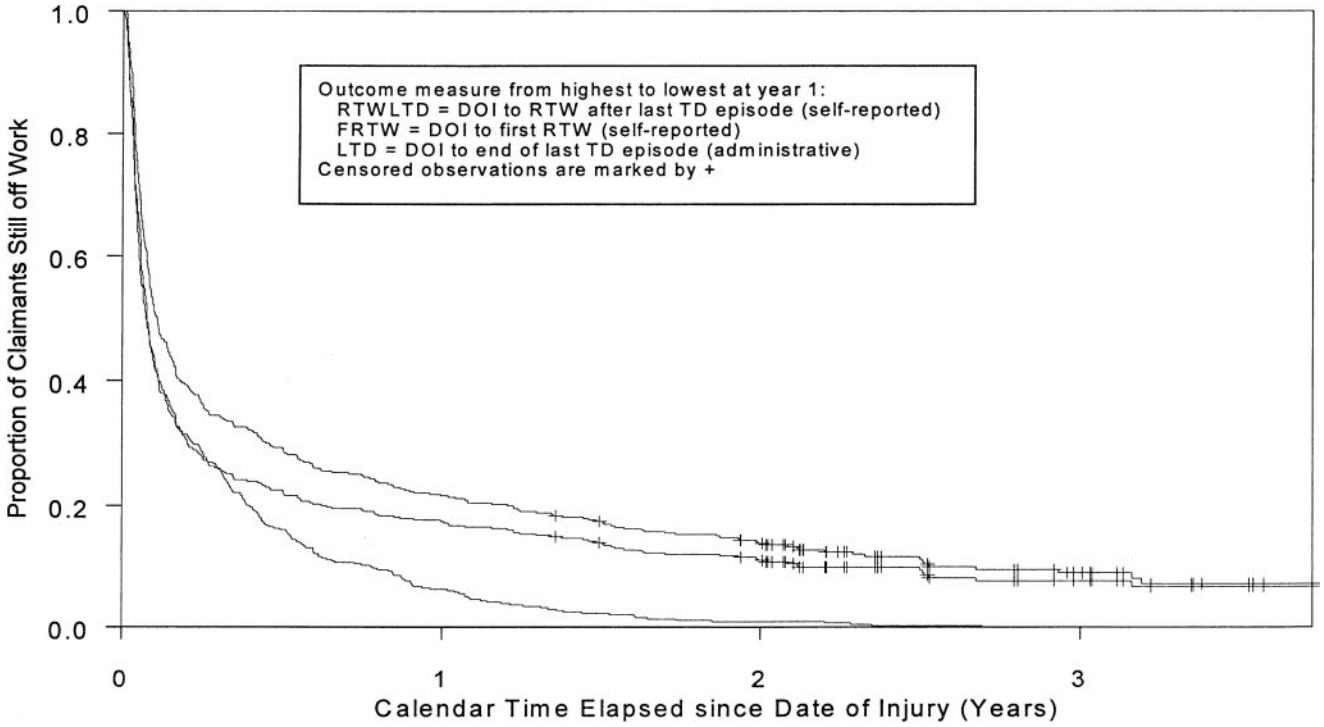


**FIGURE 2.** Proportion of claimants still off work by calendar time elapsed since date of injury. Kaplan-Meier estimates of self-reported first return to work and administrative and self-reported measures of return to work after last TD episode. 1994–1996 California Low Back Pain Claimant Cohort, N-429.

**TABLE VI.** Percent of Claimants Still Off Work at Selected Calendar Times (Months After Injury)*

| | Number of calendar months | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Outcome measure** | **1** | **3** | **6** | **9** | **12** | **18** | **24** | **30** | **36** |
| Time from date of injury to | | | | | | | | | |
| Self-reported RTW after last TD episode (RTWLTD) | 57.1 | 36.4 | 29.1 | 24.9 | 21.7 | 17.2 | 13.9 | 11.3 | 9.0 |
| Self-reported first RTW (FRTW) | 48.0 | 28.7 | 22.4 | 19.4 | 17.5 | 13.7 | 11.1 | 9.5 | 7.7 |
| End of last TD episode (LTD) | 47.3 | 27.5 | 16.1 | 10.3 | 6.3 | 2.3 | 0.9 | 0.2 | 0.0 |
| Ratios | | | | | | | | | |
| RTWLTD/LTD | 1.2 | 1.3 | 1.8 | 2.4 | 3.4 | 7.5 | 15.4 | 56.5 | — |
| FRTW/LTD | 1.0 | 1.0 | 1.4 | 1.9 | 2.8 | 6.0 | 12.3 | 47.5 | — |

*Kaplan-Meier estimates and ratios for administrative and self-reported measures of first return to work and return to work (RTW) after last temporary disability (TD) episode, 1994–1996 California Low Back Pain Claimant Cohort, N = 429. For full definitions of outcomes, see Table I.

from injured workers' self-report of their return to work experience. The main question addressed was whether the cessation of indemnity benefits and self-reported return to work are contemporaneous. In a series of comparisons of administrative and self-reported return to work outcomes, we showed that measures of duration of disability in low back pain claimants which are based on workers' compensation data consistently and significantly underestimate the duration of work disability as reported by injured workers. Using the duration of the first temporary disability episode as a proxy for first return to work, the percentage of workers still off work at one year differs by a factor of 5.8 when compared to self-reported measures of first return to work (3.0 vs. 17.4%). Duration of work disability defined as the time from date of injury to the cessation of all temporary disability benefits is only slightly more congruent with the comparable self-reported measure, date of injury to return to work after the last temporary disability episode; the ratio of the percentages of claimants still disabled at one year is 3.4 (6.3 vs. 21.7%). If cumulative days of temporary disability are compared to total lost work days (TLOSTDYS), which includes all days of compensated temporary disability plus any additional self-reported lost work days, the administrative measure of the percentage of workers still disabled at one year is off by over 7 times (4.7 vs. 33.4%). Although the end of temporary disability is not contingent upon actual return to work, these discrepancies are remarkable, given that the purpose of temporary disability is to compensate the worker for lost wages due to an inability to work.

As we concluded in our companion article [Krause et al. 1999], the best administrative measure of the burden of

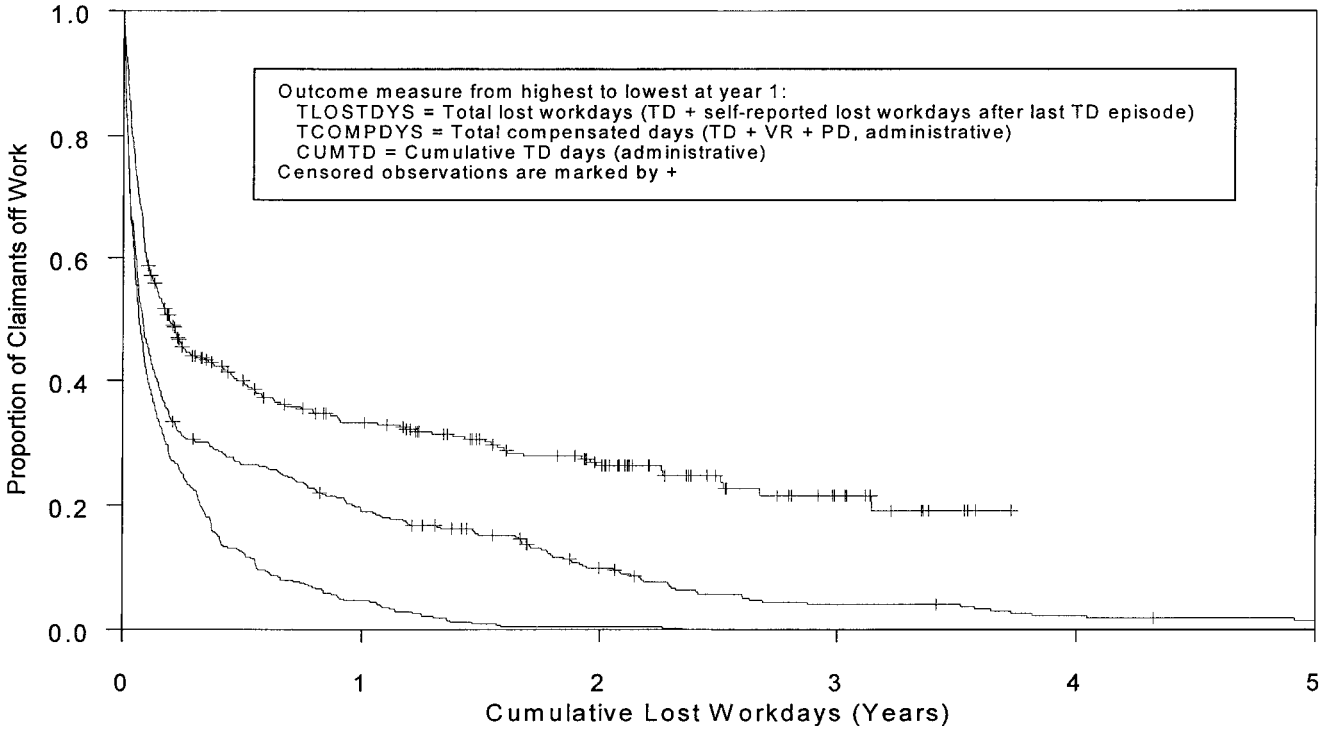


**FIGURE 3.** Proportion of claimants off work by cumulative work time lost. Kaplan-Meier estimates of administrative and self-reported cumulative time measures of work days lost. 1994–1996 California Low Back Pain Claimant Cohort, N-430.

**TABLE VII.** Percent of Claimants Off Work by Cumulative Months of Work Days Lost*

| | Number of cumulative months | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Outcome measure** | **1** | **3** | **6** | **9** | **12** | **18** | **24** | **30** | **36** |
| Time from date of injury to | | | | | | | | | |
| Total lost work days (TLOST-DYS) | 63.3 | 45.1 | 40.0 | 35.5 | 33.4 | 30.6 | 26.4 | 24.8 | 21.6 |
| Total compensated days (TCOMP-DYS) | 48.9 | 31.0 | 26.4 | 23.8 | 19.1 | 15.2 | 10.0 | 0 | 0 |
| Cumulative TD (CUMTD) | 44.5 | 24.9 | 12.5 | 7.5 | 4.7 | 0.9 | 0.5 | 0 | 0 |
| Ratios | | | | | | | | | |
| TLOSTDYS/ TCOMPDYS | 1.3 | 1.4 | 1.5 | 1.5 | 1.7 | 2.0 | 2.6 | 4.4 | 5.4 |
| TLOSTDYS/CUMTD | 1.3 | 1.8 | 3.2 | 4.7 | 7.1 | 34.0 | 52.8 | — | — |

*Kaplan-Meier estimates and ratios for administrative and self-reported measures of cumulative lost work days, 1994–1996 California Low Back Pain Claimant Cohort, N = 425. For full definitions of outcomes, see Table I.

**TABLE VIII.** Estimated Mean Number of Work Days Lost for Selected Comparisons of Administrative Vs. Self-Reported Return-to-Work Outcome Measures, 1994–1996 California Low Back Pain Claimant Cohort, N = 433

| **Outcome measure[a]** | **Administrative outcome (estimated mean, days)** | **Self-reported outcome (estimated mean, days)** | **Estimated difference between means (days)** | **95% CI (days)[b]** |
|---|---|---|---|---|
| First return to work measures (FTD vs. FRTW) | 60 | 203 | 142 | 101–177 |
| Return to work after last TD episode (LTD vs. RTWLTD) | 92 | 249 | 157 | 115–193 |
| Cumulative work days lost (CUMTD vs. TLOSTDYS) | 75 | 409 | 334 | 280–391 |
| Total cumulative work days lost (TCOMP-DYS vs. TLOSTDYS) | 200 | 408 | 209 | 139–273 |

[a]For full definitions of outcomes, see Table I.
[b]95% bootstrap confidence interval.

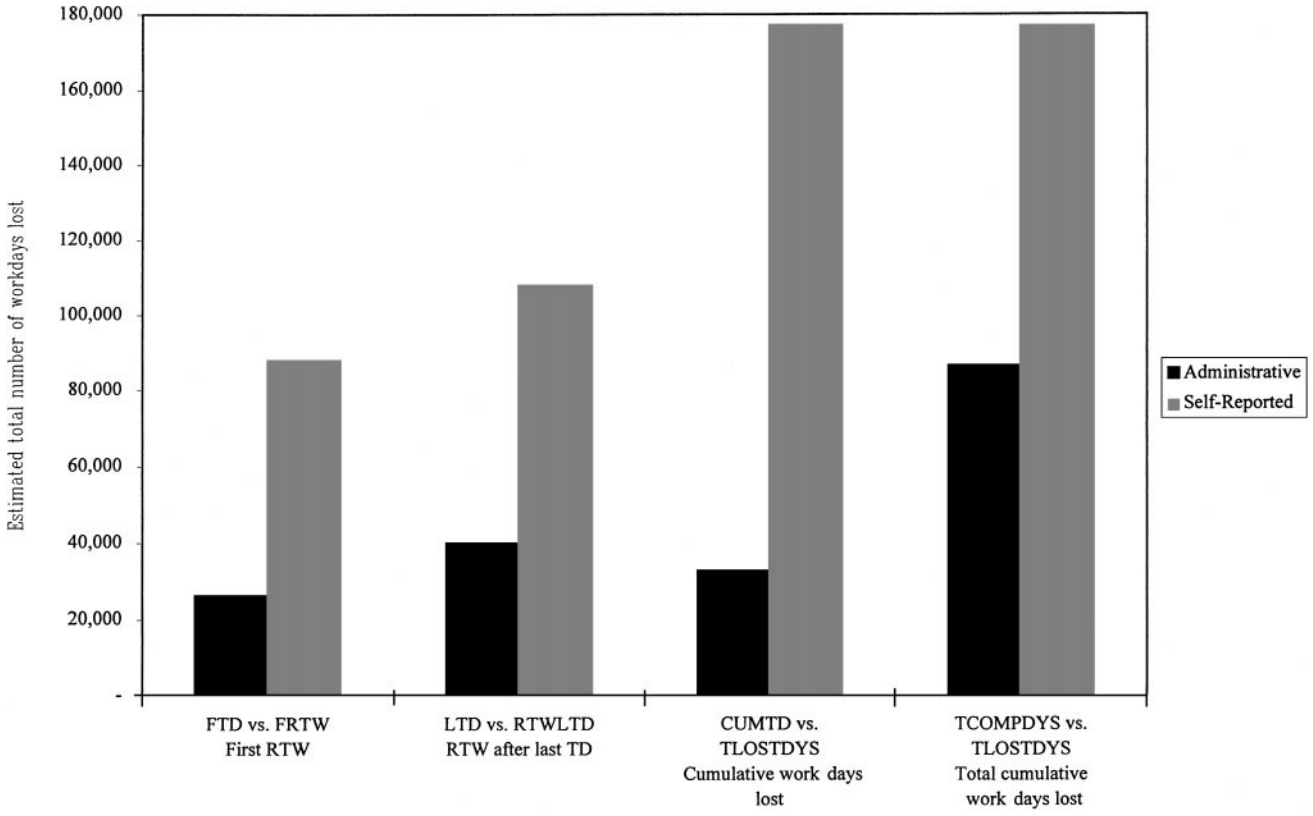


**FIGURE 4.** Estimated total number of work days lost for selected comparisons of administrative vs. self-reported return-to-work outcomes. 1994–1996 California Low Back Pain Claimant Cohort, N-433. For definitions of outcomes, see Table I.

disability is one that takes into account all forms of wage replacement benefits, i.e., vocational rehabilitation and temporary and permanent disability. However, in comparison to total lost work days (TLOSTDYS), which is based on both administrative and self-reported information, the percentage of people still disabled by the administrative measure total compensated days (TCOMPDYS) is still off by a factor of 1.7 at one year and 2.6 at two years after the date of injury. With longer durations of disability, we expect this difference to be even greater. We considered that total compensated days might in fact overestimate the impact of low back injuries on lost work time, since workers may return to full-time employment while on permanent disability, albeit possibly at a lower wage rate, and may collect permanent disability and vocational rehabilitation simultaneously. However, in light of the comparison between self-reported and administrative outcomes, this does not appear to be the case. Further, the results of a recent wage loss study of California workers are also suggestive of continuing work loss for workers receiving permanent disability [Peterson et al., 1997]. This study combined administrative workers' compensation data on benefits paid and quarterly earnings data from the California Employment Development Department (EDD) over a 5-year period, showing that permanently disabled workers received a total income that was less than 40% of their full earnings in comparison to wage- and employer-matched uninjured controls. This difference in earnings appeared to be driven by both periods of unemployment and reduced wages after the injury.

We did not collect any third-party information verifying actual return-to-work dates and thus have no ''gold standard'' against which to compare either administratively-derived or worker-reported outcomes. Self-reported recall of dates may not always be accurate. On the other hand, we believe our administrative data on workers' compensation benefits paid to be highly accurate. One could argue that within the oftentimes contentious and highly emotional realm of workers' compensation, injured workers may tend to overestimate their level and duration of disability. However, we guarded against this possibility by conducting the interview in as unbiased a manner as possible. For example, when initially asking workers to recall the date of their first return to work, we did not prompt with any information on the timing of their disability benefits. Rather, the date of injury was used as a point of reference. Our impression was that workers were reasonably sure of when they returned to work. In fact, 13% adamantly reported that they first returned to work before their temporary disability benefits

had ended and continued to work while collecting temporary disability. In these instances, the portion of temporary disability for which the worker claimed to have worked was subtracted from cumulative TD in calculating total lost work days (TLOSTDYS). While we have no way of assessing the congruence of self-reported and actual return-to-work outcomes without a third measure, such as employer records, the difference between administrative and self-reported measures of duration of disability is substantial enough to deserve further attention. In order to obtain estimates of work disability least affected by recall error, the use of prospective longitudinal studies that repeatedly survey injured workers and/or their employers, or the use of longitudinal quarterly earnings data, as in the study by Peterson et al. [1997], may be desirable in future studies.

Economists have hypothesized that disability benefits may ''induce recipients to extend their work absences beyond the time when they are able to return'' [Baldwin et al., 1996]. Based on this hypothesis, one would expect the cessation of benefits to closely coincide with self-reported return to work. This was not the pattern we observed in our cohort of low back pain claimants. On the contrary, nearly 30% had not returned to work a month after their last temporary disability payment, 14% had not returned a year after this date, and 9% still had not returned three years later. This discrepancy is not totally driven by workers who go on to collect another form of wage replacement benefits, i.e., vocational rehabilitation maintenance allowance or permanent disability. Workers who only collected temporary disability ($n = 302$) also experienced delays in return to work after the end of their last temporary disability episode; 14% had not returned to work a month after their temporary disability ended, 9% had not returned 3 months later, and 7% were still not back to work at 6 months. At 3 years after the end of temporary disability payments, 4% had still not returned to work. Moreover, 60% of all survey responders reported time loss due to their back injury after they first returned to work, and 55% of the workers with multiple temporary disability episodes did not report returning to work between disability episodes when they received no benefits. As others have reported, the experience of further injury-related time loss after an initial return to work is not unusual for low back pain claimants [Baldwin et al., 1996; Butler et al., 1995; Rossignol et al., 1992].

Whether a delay in return to work after the end of wage replacement benefits is due to the back injury and/or some other reason(s) remains to be studied. We did, however, ask claimants who never returned to work the reasons for this. We also asked workers who returned to work after their injury, but were not employed at the time of their interview, why they were not currently employed. For both groups of workers, the reasons for not working were multidimensional. Among the 38 claimants who never returned to work, 92% said the back injury played a role. Of these, 40% also had a secondary health problem that prevented them from returning. A large percentage of these workers also reported employer-related factors as reasons for not returning, ranging from problems with their supervisor (21%), being fired or laid off (32%), to lack of modified work (42%) and no job to return to (42%). In contrast, the 66 workers who had worked after their injury but were not employed at the time of interview were less likely to attribute their work status to their injury (65%) or another health problem (29%), but more often reported problems with their boss (32%) or being fired or laid off (39%). It therefore appears that later periods of unemployment after an initial return to work following a back injury are less directly attributable to the original injury.

Return to work is a key outcome in the management of low back pain cases. However, other outcomes such as medical recovery, residual functional disability, and quality of life after a back injury are equally important outcomes if the full magnitude of the effect of occupational low back injuries on the injured worker and society is to be understood. The return-to-work survey was also designed to collect information on these additional outcomes. While this report focused on the duration of work disability, future reports will look at this broader set of self-reported outcomes and their relation to the duration of work disability measures reported on here.

## Conclusions

This is the first study to compare return to work outcomes based on administrative and self-reported data within the same sample. The study shows that the amount of lost work time after a low back injury, as reported by injured workers, is significantly underestimated by administrative measures based on the duration of wage replacement benefits. Even the most inclusive administratively-derived measure of duration of work disability, the total number of compensated work days, including all weekly and lump-sum wage replacement benefits during vocational rehabilitation and temporary and permanent disability, underestimates the mean duration of disability by a factor of 2; the estimated mean number of total compensated days is 200 while the estimated mean number of total lost days is 408. The study shows that in order to determine the total amount of work disability associated with back injuries, follow-up surveys of injured workers and/or their employers are necessary.

The large discrepancy between administrative and self-reported return to work has potential implications for the adequacy of indemnity benefits. This is especially true for workers who never fully recover from their injury and receive permanent disability benefits. Since the California workers' compensation system places a statutory limit on permanent disability benefit amounts, the discrepancy between time on wage replacement and total work loss is likely to be the greatest for the most chronic cases. However, even

workers only temporarily disabled experienced gaps between the ending of benefits and return to work. These discrepancies suggest a reevaluation of the medical, legal, and administrative processes by which the workers' compensation system determines and compensates lost work time. This study also underscores the need for increased efforts to understand and prevent causes for chronic work disability after low back injuries.

## ACKNOWLEDGMENTS

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