

## Uncompensated Wage Loss for Injured Workers with Permanent Disabilities

The regulations establishing the 2005 Permanent Disability Rating Schedule (PDRS) require the Division of Workers' Compensation (DWC) to compile data for 18 months (Jan. 1, 2005–Jun. 30, 2006) and analyze the data to determine the effects of the new PDRS. Specifically, the DWC is required to evaluate available data and, based on these data, determine the aggregate effect of the diminished future earning capacity adjustment on permanent partial disability ratings under the 2005 PDRS and revise, if necessary, the diminished future earning capacity adjustment to reflect consideration of an employee's diminished future earning capacity due to injuries.

To fully and properly evaluate the cumulative effects of the 2005 PDRS on wage loss, it is necessary to conduct a comprehensive wage loss study using three years of post-injury wage data. A comprehensive study of workers injured in 2005 can be conducted in early 2009, once the wage data from the fourth quarter of 2008 is reported to the Employment Development Department (EDD).

In order to perform an analysis of the effects of the new PDRS in a more timely manner, DWC developed a comprehensive research plan to analyze the PDRS and other factors that impact wage loss. This plan is graphically displayed below and includes: (1) disabled workers' return-to-work rates for periods before and after January 2005; (2) wage loss and uncompensated wage loss experienced by disabled workers in recent years; and (3) permanent disability rating information, by part of body, under the 1997 and 2005 permanent disability rating schedules.

This report lays out two distinct paths the DWC traveled in the course of examining the PDRS: First, the process and results of DWC's return to work study and wage loss analysis and second, how that analysis may be used to make adjustments to the PDRS.

Phase I: Analysis of Return-to-Work Rates: <i>released January 2007</i>	
Phase II: Wage Loss Analysis	Step 1: Three-year wage loss for workers injured Oct. 1, 2000 to Jun. 30, 2003: <i>released March 2007</i>
	Step 2: Correlate return-to-work rates and indemnity payments to determine uncompensated wage loss under the 1997 PDRS: <i>included in this May 2007 report</i>
	Step 3: Compare ratings in the 2005 PDRS: <i>included in this May 2007 report</i>
Phase III: Routine Quarterly Updates of Return-to-Work Rates and Wage Loss Analysis: <i>pending</i>	

## Previous DWC Research Studies<sup>1</sup> and Results

### Phase I: Return-to-work

The DWC's return-to-work study, released in January, represented the first phase of the research plan. Return-to-work rates are important because RAND concluded, among other observations about return-to-work, that injured workers who continue at the at-injury employer may actually receive benefits that exceed their earning losses after taxes are considered.<sup>2</sup> The 2004 reforms contained incentives for employers to bring injured workers back to work.

The key findings of the DWC return-to-work study were:

- The overall 12-month return-to-work rate for permanently disabled workers increased by about five percentage points—from 64.6 percent to 70 percent—between 2003 and 2005.
- Return-to-work rates at 12 months varied significantly by part of body and ranged from 53 percent for psychiatric injuries to 78 percent for upper extremity injuries.
- Return-to-work rates rose with age, up to age 60. Even workers over age 60 had higher return-to-work rates than any age category under age 40.

### Phase II, Step 1: Three-year wage loss for workers injured Oct. 1, 2000 to Jun. 30, 2003

Following the first step of the second phase of its research, DWC reported in March on a retrospective wage loss analysis that duplicated research methodology used by the RAND Corporation in its initial analysis of wage loss for permanently disabled workers injured between 1991 and 1996.<sup>3</sup> The RAND study matched injured workers with uninjured workers with similar (pre-injury) earnings at their same employer. Wage loss was estimated as the difference in earnings streams (post-injury) of uninjured and injured worker groups. DWC updated RAND's study from the 1990s in order to produce a more current wage loss estimate using the RAND methodology and more recent data. As a starting point for DWC's Phase II wage loss analysis using an alternative methodology, this served as a check of the data and also helped to ensure consistency in estimating wage loss.

The key findings of the first step of the wage loss analysis using the RAND methodology updated with 2000-2003 data were:

- The three-year proportional wage loss calculated for 2000 through 2003 (14.93 percent) was marginally changed from the 1991 through 1996 time period (14.25 percent) calculated by RAND in its 2003 report, meaning that wage loss was essentially the same between the two time periods.
- The average disability rating in DWC's study group was up slightly, from 15.58 in the RAND study to 17.38 in the DWC study, both numbers being based on the 1997 PDRS. This means that compensation increased slightly between the two time periods.
- The ratio of permanent disability (PD) ratings over wage loss was very similar between the two time periods: 1.09 in the RAND study and 1.16 in the DWC study.

---

<sup>1</sup> The two previous studies can be accessed on DWC's home page at <http://www.dir.ca.gov/dwc>

<sup>2</sup> Reville, Robert T., et al. "An Evaluation of California's Permanent Disability Ratings System." RAND Institute for Civil Justice, 2005, p. xxiv

<sup>3</sup> Seabury, Seth A., et al. "Data for Adjusting Disability Ratings to Reflect Diminished Future Earnings and Capacity in Compliance with SB 899." RAND Institute for Civil Justice Working Paper WR-214-ICJ (December 2004).

## **Phase II, Step 2: Estimate wage loss using the propensity scoring method. Correlate return-to-work rates and indemnity payments to determine uncompensated wage loss under the 1997 PDRS**

In Step 2 of Phase II, wage loss is estimated using a propensity score methodology rather than the simpler matching methodology used by RAND and replicated by DWC in the March 2007 report. The propensity score method estimates total wage loss in two stages: The first stage estimates the probability of injury using all available characteristics of the data assembled from the EDD base wage file, including size of firm, tenure of workers and industry. The second stage subtracts the earnings of the injured workers from those who are uninjured. After total wage loss is calculated, benefits paid to the injured worker are deducted to determine two additional measures: total uncompensated wage loss and uncompensated wage loss after temporary disability (TD) payments are included.

### Wage Loss Estimation Model

Estimation of wage loss involves tracking the wages of injured workers before and after the date of injury. This tracking permits measurement of wage growth of the injured worker population subsequent to injury. In order to estimate wage loss resulting from occupational injury, it is necessary to compare this trend in earnings to an employee, or group of employees, selected because their wage growth pattern is similar to what the injured employee's wage growth would have been had s/he not been injured. In statistical terms, this comparison employee or group of employees is known as a "counterfactual."

The fundamental requirement of the estimation procedure is that the selected pool of workers be similar to the injured worker, had s/he not been injured. There are many ways to select such a comparison group. Differences among methods involve the amount of data utilized for the number of employees considered and how many characteristics of those employees are considered, as well as the way the employee information is weighted. The DWC Research Unit used a propensity score estimation procedure because it is the best available method. See the Technical Appendix for a full explanation of the methodology.

Determining the pure effect of this methodology on the total group requires an extensive amount of computer processing time because the data sets are so large. Therefore, recalculation of wage loss using the propensity score and accounting for wage replacement is initially being calculated for workers injured in calendar year 2002, and rated under the 1997 PDRS. Wage loss will subsequently be calculated for workers injured between Jan. 1, 2003 and Jun. 30, 2003, for ratings under both the 1997 PDRS and the 2005 PDRS. Information from these studies, combined with information on return-to-work rates and indemnity payment data, will provide more information on uncompensated wage loss.

In summary, Phase II, Step 2 of DWC wage loss research reported here provides estimates of wage loss for workers injured in calendar year 2002 who were rated under the 1997 PDRS, using the propensity score methodology—that is, using all available relevant information to match injured workers to uninjured workers by probability of injury. This research also calculates benefits paid during the three-year period to determine the uncompensated wage loss, or wage loss not replaced by workers' compensation indemnity payments received. The findings are shown in detail in **Table 1**, by part of body. Sample sizes were very small for a number of the parts of body. These smaller groups have been combined into the "OTHER" category and include hip, toes, hearing, soft tissue/internal, heart, eyes, respiratory and post-traumatic brain syndrome. Valid calculations for uncompensated wage loss for the smaller part-of-body groups will be made as more refined estimates are completed.

The key findings of the second step of the wage loss analysis are:

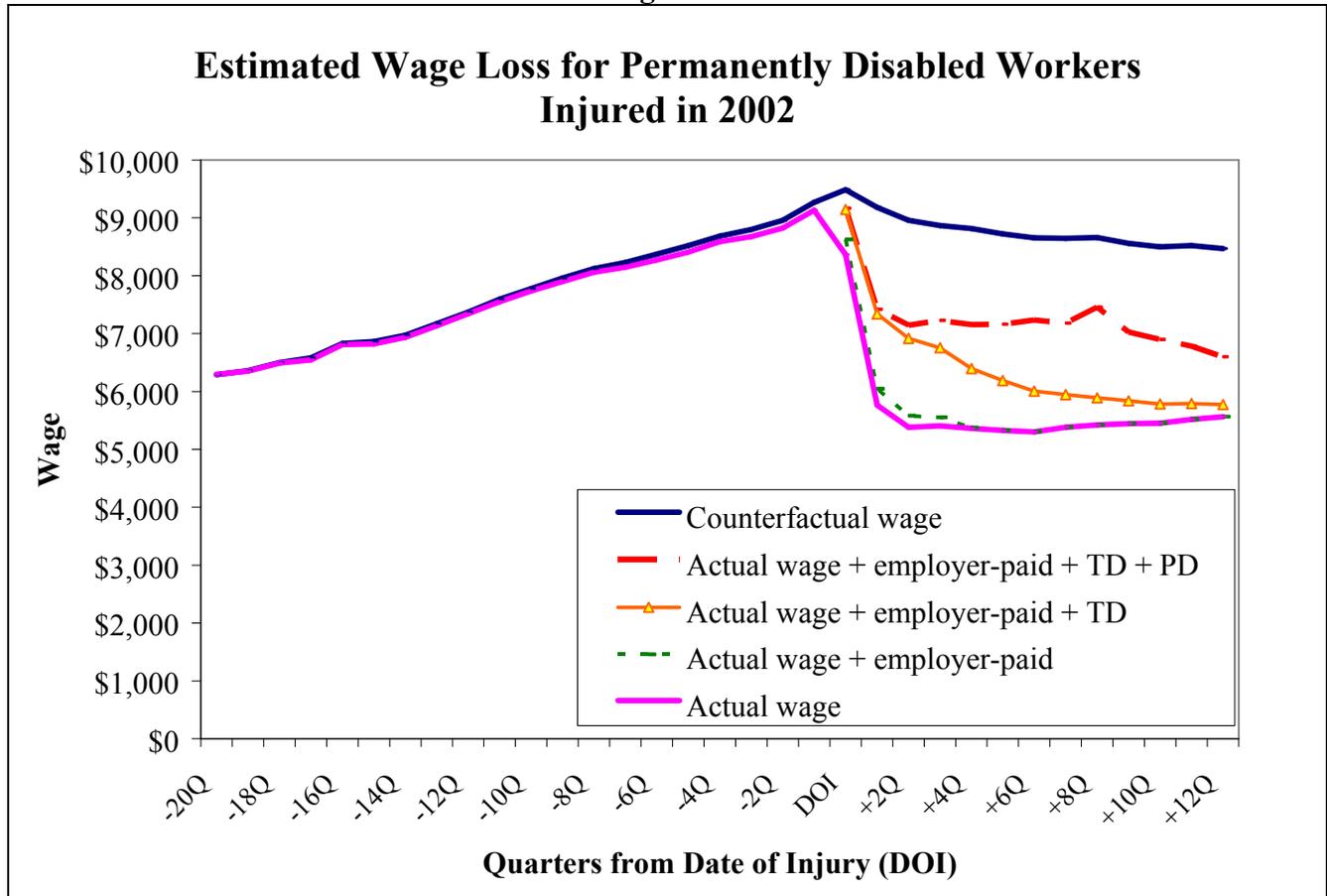
- The average three-year proportionate uncompensated wage loss for workers injured in 2002 is 16.5 percent, which is equivalent to a \$17,900 reduction in total earnings during the first three years after the injury.
- On average, 2002 injured workers' tax-free indemnity benefits replaced \$19,800 during the three-year period, which is slightly over half (52.5 percent) of the taxable wages lost over the three-year period. Of this amount, PD payments represent about \$9,000.
- This estimate of the sum of benefits paid over the three-year period (\$19,800) doesn't include all indemnity payments ultimately received by the injured worker, especially in PD, as some PD payments occur after the three-year period in the study.
- Uncompensated wage loss differs significantly by part of body. Three-year proportionate uncompensated wage loss ranges from knee injuries reporting a net gain of 3.1 percent in earnings to psychiatric injuries reporting uncompensated wage loss of 37 percent.

**Table 1**

<b>Wage Loss Estimates for Workers Injured in 2002 and Benefits Paid, (Thousands of Dollars*)</b>											
	<u>Three-year Earnings</u>			PD + TD		Total Wage Loss (\$ 000s)	Three-year Uncompen- sated Wage Loss (\$ 000s)	Uncompen- sated Wage Loss as a % of Counter- factual Earnings	% of Total Wage Loss Replaced by PD+TD Benefits	% of Total Wage Loss Replaced by TD Benefits	
	Number of 2002 Claims	Counter- factual Earnings (\$ 000s)	Actual Earnings (Injured Workers (\$ 000s)	PD Benefits (\$ 000s)	TD Benefits (\$ 000s)						Wage Replace- ment) (\$ 000s)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SPINE	7,699	\$107.9	\$67.6	\$10.4	\$10.7	\$21.1	\$40.3	\$19.2	17.8%	52.4%	26.6%
KNEE	2,442	\$109.4	\$93.6	\$9.1	\$10.2	\$19.3	\$15.8	-\$3.5	-3.1%	122.2%	64.6%
UPPER EXT	2,072	\$109.4	\$72.8	\$7.8	\$10.0	\$17.8	\$36.6	\$18.8	17.2%	48.6%	27.3%
SHOULDER	1,839	\$109.7	\$85.3	\$5.8	\$10.1	\$15.9	\$24.4	\$8.5	7.7%	65.2%	41.4%
GRIP	1,696	\$108.2	\$87.9	\$5.6	\$7.0	\$12.6	\$20.3	\$7.7	7.1%	62.1%	34.5%
WRIST	1,161	\$106.9	\$82.2	\$7.6	\$8.6	\$16.2	\$24.7	\$8.5	8.0%	65.6%	34.8%
HAND	1,016	\$107.3	\$84.7	\$5.5	\$6.2	\$11.7	\$22.6	\$10.9	10.2%	51.8%	27.4%
ANKLE	811	\$107.9	\$86.4	\$8.0	\$8.6	\$16.6	\$21.5	\$4.9	4.4%	77.2%	40.0%
ELBOW	470	\$108.1	\$91.0	\$5.2	\$8.4	\$13.6	\$17.1	\$3.5	3.1%	79.5%	49.1%
LOWER EXT	463	\$110.8	\$72.6	\$9.3	\$12.0	\$21.3	\$38.2	\$16.9	15.2%	55.8%	31.4%
PSYCH	247	\$107.2	\$44.6	\$7.9	\$14.9	\$22.8	\$62.6	\$39.8	37.0%	36.4%	23.8%
OTHER	752	\$108.2	\$83.0	\$7.3	\$6.4	\$13.7	\$25.2	\$11.5	10.6%	54.4%	25.4%
TOTAL, exclude Multiple	20,668	\$108.4	\$77.8	\$8.4	\$9.7	\$18.1	\$30.6	\$12.6	11.6%	59.0%	31.5%
MULTIPLE	7,788	\$108.0	\$51.4	\$11.1	\$13.5	\$24.6	\$56.6	\$32.0	29.6%	43.5%	23.9%
TOTAL	28,456	\$108.3	\$70.6	\$9.1	\$10.7	\$19.8	\$37.7	\$17.9	16.5%	52.5%	28.4%
Columns (2) to (5) are estimates; Columns (6) to (11) are formulas: (6) = (4) + (5); (7) = (2) - (3); (8) = (7) - (6); (9) = (8) / (2); (10) = (6) / (7); (11) = (5) / (7)											
* All dollar values are discounted at a 3 percent annual rate relative to the quarter of injury and are presented in 2007 dollars. All averages are weighted.											

**Figure 1** graphically displays how the average permanently disabled injured workers' earnings and benefits differ from the earnings of the counterfactuals. Because not all indemnity benefits are paid during the three-year period following an injury, a wage loss estimate carried out to five years from the date of injury would produce different results.

**Figure 1**



**Comparison of the Propensity Score Method to the RAND Methodology**

The three-year uncompensated wage loss estimate reported here, which uses a propensity score method, differs from the three-year wage loss reported in March, which used the RAND methodology. The RAND methodology used only quarters of earnings where the reported earnings of the injured worker were greater than zero. When DWC calculated wage loss for workers injured in 2002 who meet the same criteria (i.e. injured worker earnings greater than zero), the average wage loss using the propensity score method was nine percent. Using the RAND methodology, DWC obtained a wage loss of 14.93 percent for workers injured from October 2000 through June 2003.

Several factors account for this difference. The RAND methodology discarded 30 percent of injured workers because there was no matching worker at the at-injury employer. RAND also considered only summary-rated injuries. The methodology used by DWC provides counterfactual matching for all permanently disabled injured workers, not just those that were summary-rated. DWC researchers also noted that matching to workers from the same employer resulted in higher average earnings for the comparison workers, which increased the gap between the wages of the injured and uninjured workers.

### **Phase II, Step 3: Compare Ratings in the 1997 and the 2005 PDRS**

In order to compare similar groups of injured workers rated under the 1997 PDRS to those rated under the 2005 PDRS, it is necessary to control the time horizon from date of injury to date of rating. The average ratings shown in the three-year uncompensated wage loss calculation in **Table 2** are based on workers injured in 2002 who received a rating under the 1997 PDRS within 42 months of the date of injury. There were 28,456 workers in this group.

DWC developed a comparison group of injured workers who were rated under the 2005 PDRS. The comparison group is comprised of workers who were injured prior to Oct. 1, 2003 and were rated within 42 months of the date of injury using the 2005 PDRS. There were only 3,311 workers in this group.

**Table 2** compares ratings for workers rated within 42 months of the date of injury between the 1997 PDRS and the 2005 PDRS. **Table 2** also shows the three-year uncompensated wage loss for the 2002 dates of injury and the future earning capacity (FEC) modifier in the 2005 PDRS for each part of the body.

The key findings of the third step of the wage loss analysis are:

- The average PD rating decreased from 28.1 (1997 PDRS) to 19.9 (2005 PDRS) for workers in these samples who were rated by the DWC Disability Evaluation Unit (DEU) within 42 months of the date of injury. This amounted to a decrease of 29.2 percent.
- For parts of the body that had reduced ratings between the 1997 PDRS and the 2005 PDRS, the range was from a 1.3 percent reduction in PD ratings for eye injuries to a 56.3 percent reduction for ankle injuries.
- Hearing, respiratory and psychiatric injuries experienced increases in average ratings between the 1997 PDRS and the 2005 PDRS.
- The implementation of the 2005 schedule and FEC categories was somewhat effective in reducing the disparity in compensation between parts of body: Relatively over-compensated knee, ankle and elbow (FEC = 2) experienced above-average decreases in PD ratings; relatively under-compensated psychiatric injuries (FEC = 8) experienced an overall gain in rating.

Table 2

<b>Comparison of Three-Year Uncompensated Wage Loss as a Percentage of Counterfactual Earnings, Average Final DEU Ratings under the 1997 and 2005 PDRS (for injuries rated within 42 months of date of injury), and the Future Earnings Capacity (FEC) Modifier</b>					
<b>Part of Body</b>	<b>Uncompensated Wage Loss as a % of Counterfactual Earnings</b>	<b>Average Final Rating under 1997 PDRS</b>	<b>Average Final Rating under 2005 PDRS</b>	<b>Percentage Change between 1997 and 2005 PDRS</b>	<b>Current FEC in 2005 PDRS</b>
SPINE	17.8%	30.1	19.5	-35.2%	5
KNEE	-3.1%	21.9	12.8	-41.6%	2
UPPER EXTREMITY	17.2%	25.2	14.0	-44.4%	5
SHOULDER	7.7%	14.7	11.5	-21.8%	7
GRIP STRENGTH	7.1%	15.2	14.4	-5.3%	4
WRIST	8.0%	20.8	11.1	-46.6%	4
HAND	10.2%	13.0	8.7	-33.1%	1
ANKLE	4.4%	21.5	9.4	-56.3%	2
ELBOW	3.1%	14.2	8.6	-39.4%	2
LOWER EXTREMITY	15.2%	27.7	15.0	-45.8%	5
PSYCHIATRIC	37.0%	34.2	37.8	10.5%	8
OTHER:	10.6%	21.1	22.2	5.2%	
Hearing	---	12.1	12.3	1.7%	8
Eyes	---	16.0	15.8	-1.3%	1
Hip	---	28.0	19.9	-28.9%	5
Heart	---	41.4	35.9	-13.3%	5
Toe(s)	---	14.3	---	---	5
Respiratory	---	21.3	39.0	83.1%	7
PT Head	---	26.1	---	---	6
Soft Tissue	---	27.6	21.9	-20.7%	6
Other	---	21.4	20.5	-4.2%	2
TOTAL, excluding multiple	11.6%	23.7	16.7	-29.5%	
Multiple	29.6%	39.8	28.4	-28.6%	
TOTAL	16.5%	28.1	19.9	-29.2%	
Number of observations	28,456	28,456	3,311	<i>Weighted average</i>	

Twelve-month return-to-work outcomes provide a different method of studying PD ratings and the FEC categories. Injuries rated within a 42-month time horizon were used for the wage loss calculations and an 18-month time horizon was used to estimate return-to-work rates. This means that the return-to-work rates considered less severe, more recent injuries. For ratings done within 18 months of injury, **Table 3** details the differences between PD ratings for workers injured in 2002, rated under the 1997 schedule, and for workers injured in 2005, rated under the 2005 PDRS.

Of those injured in 2002, 34,737 workers received PD ratings within 18 months of their date of injury. The number of workers injured in 2005 who were rated within this time horizon dropped by more than two-thirds, to 9,495 workers. The fact that fewer injuries have been rated at 18 months under the 2005 schedule merits further study to determine whether there may be a selection bias in the 2005 sample. Using the 18-month time horizon, the average PD rating decreased from 24.0 (1997 PDRS) to 12.4 (2005 PDRS). This amounted to a decrease of 48.3 percent. Looking at shorter time horizons overstates the overall decrease from the 1997 to the 2005 PDRS.

**Table 3**

<b>Average DEU Rating by Part of Body for Dates of Injury (DOI) in 2002 and 2005                      (for injuries rated within 18 months of the date of injury),                      12-Month Return to Work (RTW) Rates,                      and the Future Earnings Capacity (FEC) Modifier</b>							
<b>Part of Body</b>	<b>Number of Ratings with 2002 DOI</b>	<b>Average Rating under 1997 PDRS</b>	<b>Number of Ratings with 2005 DOI</b>	<b>Average Rating under 2005 PDRS</b>	<b>Percentage Change in Average Rating</b>	<b>12-month RTW Rate (2000-2005)</b>	<b>FEC in 2005 PDRS</b>
SPINE	10,040	27.3	3,053	13.8	-49.5%	60.1%	5
KNEE	3,426	18.4	1,292	7.0	-62.0%	75.6%	2
UPPER EXT	2,530	23.3	369	9.4	-59.7%	66.8%	5
SHOULDER	2,300	12.3	954	8.3	-32.5%	73.4%	7
GRIP	2,902	13.6	115	12.5	-8.1%	78.3%	4
WRIST	1,746	18.5	259	7.2	-61.1%	72.9%	4
HAND	1,725	11.8	1,050	5.3	-55.1%	77.6%	1
ANKLE	1,182	18.3	258	7.9	-56.8%	73.2%	2
ELBOW	830	12.6	138	4.8	-61.9%	78.4%	2
LOWER EXT	585	25.3	132	13.1	-48.2%	67.9%	5
PSYCHIATRIC	363	32.6	205	25.3	-22.4%	52.5%	8
OTHER:							
Hearing	382	11.1	100	11.9	7.2%	72.6%	8
Eyes	121	12.6	19	16.2	28.6%	65.5%	1
Hip	113	26.1	41	12.3	-52.9%	69.6%	5
Heart	109	39.1	135	34.1	-12.8%	69.3%	5
Toe(s)	91	12.1	39	4.5	-62.8%	76.4%	5
Respiratory	68	18.9	21	24.4	29.1%	65.1%	7
PT Head	25	27.4	14	7.8	-71.5%	57.1%	6
Soft Tissue	9	16.4	29	18.1	10.4%	65.4%	6
Other	528	20.0	114	14.3	-28.5%	65.7%	2
Total, excluding Multiple	29,075	20.7	8,337	10.9	-47.3%	68.3%	
Multiple	5,662	40.8	1,158	23.3	-42.9%	53.5%	
<b>TOTAL</b>	<b>34,737</b>	<b>24.0</b>	<b>9,495</b>	<b>12.4</b>	<b>-48.3%</b>	<b>63.3%</b>	

## Other Factors Impacting Uncompensated Wage Loss

The above charts and narrative illustrate wage loss incurred by workers injured in 2002 by part of body, compared to the FEC modifier and changes in average ratings under the 2005 PDRS. To adjust the PDRS, the DWC must also consider other factors that impact how much uncompensated wage loss is incurred by injured workers. One example is how age is used to adjust ratings. Changes to the workers' compensation system that impact workers injured on or after Jan. 1, 2005 must also be taken into account. In addition to the decrease in average PD ratings, the major changes that occurred include an increase in return-to-work rates as a result of return-to-work incentives and an increase in temporary disability benefits.

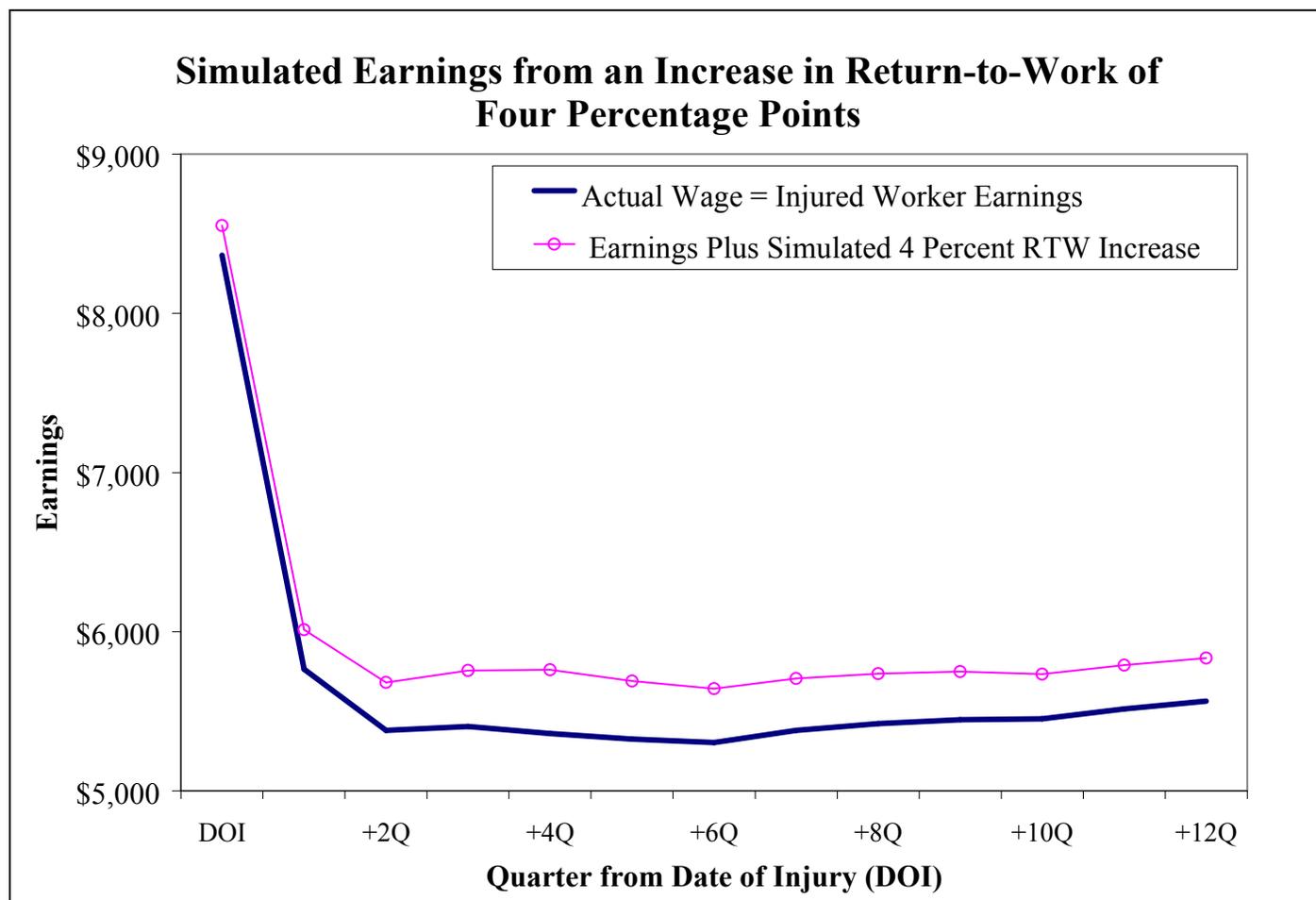
Simulations over a three-year time horizon show that total wage loss is mitigated, on average, by \$3,600 for an increase of four percentage points in the return-to-work rate, and \$300 for an increase in the maximum TD benefit, from \$490 to \$840. This highlights the importance of early return to work for injured workers.

### Return-to-Work Rates

Past research by RAND and others has shown a direct relationship between return-to-work rates and wage loss. The return-to-work rates under the 2005 PDRS show that more employees who have sustained a measurable permanent disability are going back to work since the implementation of return-to-work incentives.

**Figure 2** presents the results of a simulated four percentage point increase in return-to-work rates for the sample of workers injured in 2002. This simulation was done by overweighting the injured workers who were working four quarters after their quarter of injury and underweighting the injured workers who were not working four quarters after their injury, such that the four quarter return-to-work rate increased from 56 percent to 60 percent. This implies an increase in earnings of approximately \$300 per quarter. At three years, the present value of the simulated three-year earnings is \$74,300 compared to the actual three-year earnings of \$70,700, an increase of \$3,600. This simulated sample has substantially higher earnings at the last quarter considered in the three-year simulation, implying that benefits from increased return-to-work persist well beyond the three years immediately following injury.

Figure 2



### The Age Factor

In the study released in January 2007, DWC calculated return-to-work rates by age. One surprising finding was that return-to-work rates steadily increased as workers aged, up to age 60, and even workers over age 60 had better return-to-work rates than workers under age 40.

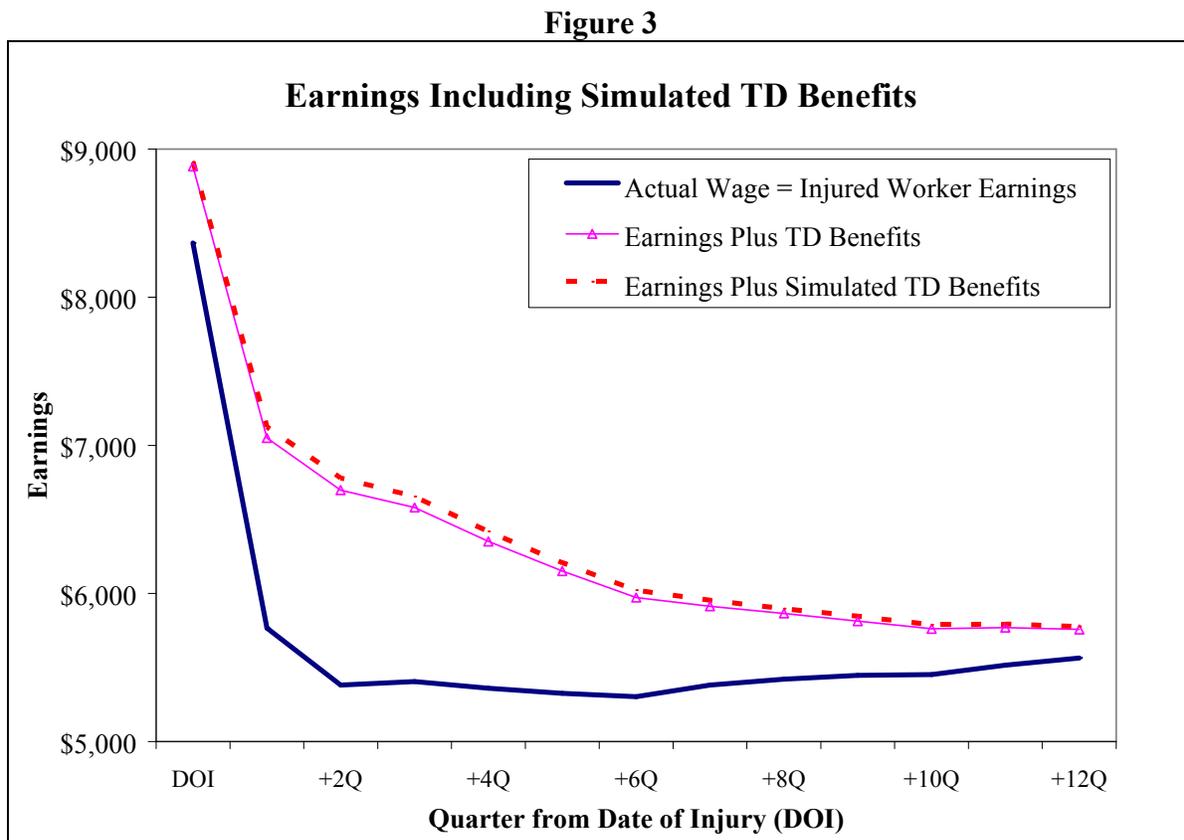
Labor Code § 4660 requires the administrative director of DWC, in determining the percentages of permanent disability, to take into account the nature of the physical injury, the occupation of the injured employee, his or her age at the time of injury, and diminished future earning capacity. Under both the 1997 PDRS and the 2005 PDRS, workers under age 39 receive a downward adjustment in their permanent disability rating, while workers above age 39 receive an upward adjustment. This is based on the philosophy behind the 1997 schedule, which was to compensate injured workers for their decreased ability to compete in the open labor market.

The 2005 PDRS is designed to compensate injured workers for diminished future earning capacity, as defined by wage loss. Since wage loss is directly related to return-to-work rates, it is probable that the existing age adjustment is no longer correct and should be modified. DWC is conducting subsequent analyses of wage loss rates by age to determine what adjustments, if any, should be made.

## Temporary disability (TD) rates

In 2002, the Legislature passed AB 749, which increased TD rates over three years, starting in 2003, and mandated that minimum and maximum TD payments thereafter be tied to increases in the state average weekly wage (SAWW). For work injuries occurring before 2003, the maximum weekly TD payment had been \$490, with a minimum of either \$126 per week or actual wages if less than \$126. Beginning with claims for 2003 injuries, the minimum TD payment was set at \$126 per week, while the weekly maximum increased to \$602. The maximum then increased to \$728 for injuries occurring in 2004, and \$840 for injuries occurring in 2005. Labor Code § 4659(c) requires that, for workers injured on or after Jan. 1, 2003, permanent total disability (PTD) and life pension payments be increased on Jan. 1, 2004 and every January 1 thereafter based on changes in the California SAWW.

**Figure 3** presents the results of a simulated increase in TD benefits for the sample of workers injured in 2002. The simulation replaces the TD benefits of those at the maximum of \$490 per week with TD benefits the worker would have received had the maximum benefit been what it was in 2005--\$840 per week. The increase in benefits is small--at most \$80 per quarter--and the increase declines to nothing by the end of the three years. Overall, the increase in TD benefits is \$300, off of a baseline of \$8,875, for a 3.4 percent increase in overall TD benefits for these workers.<sup>4</sup> The simulation does not consider the rise in the number of workers who qualify for weekly benefits of above \$490 in the time period, nor does it adjust for the workers who received their TD benefits through a compromise and release settlement. It further excludes any possible effect of the increase on employer-paid indemnity benefits, making the \$300 increase an underestimate of the effect of the increase in TD benefits on more recent PD injuries.



<sup>4</sup> The baseline of \$8,875 does not include employer-paid TD benefits.

## **In Conclusion**

DWC is charged with creating a permanent disability rating schedule that provides objective, uniform and consistent ratings, removing subjectivity from the system. DWC is further charged with ensuring that injured workers get prompt, sound medical care so they can return to work quickly. The 1997 schedule was revised because it resulted in inflated ratings for lower level disabilities and a protracted process, which caused increased litigation and claim costs, and led to poor outcomes for injured workers. Under the 2005 PDRS, uncertainty and contention over ratings are eliminated because using the AMA guides requires that ratings be based on objective medical evidence of disability.

Potential administrative adjustments to the PDRS will be made based on facts and data, using the best methodology possible in light of technical developments.

This study of uncompensated wage loss data and the comparison of average ratings reported in this paper, combined with changes in return-to-work rates and increases in temporary disability benefits, provide the structure within which DWC can consider appropriate changes to the PDRS. DWC will meet with interested parties in two open forums, which will be held in Los Angeles and San Francisco, to collaborate on the development of recommendations to adjust the PDRS.

## Technical Appendix: Propensity Score Estimation of Wage Loss

### Data Sample

#### *Injured Workers*

The data sample used for this analysis began with all injuries with dates of injury in 2002 that received disability ratings from the DWC Disability Evaluation Unit (DEU). The selection criteria include that the disability rating be greater than zero, and that the time period from date of injury to date of disability rating not exceed 3.5 years. Summary and consultative ratings are included in the sample. This resulted in a potential pool of 60,202 injured workers to draw from for DWC's wage loss study.

The DEU-rated permanent disability (PD) claims were then matched to claims in the DWC's Workers' Compensation Information System (WCIS) database in order to obtain indemnity payment information on the disabled workers. The selection criteria employed were that PD claimants rated by the DEU were matched to claimants contained in the WCIS database with claims administrators who generally provide credible indemnity data. The credibility criteria were that each of the trading partners/claims administrators must have handled at least 50 PD claims in 2002, and submitted indemnity data to the WCIS for at least 80 percent of the indemnity claims handled by the claims administrator. Data from 45 claims administrators, accounting for over half of the total matched DEU-WCIS sample of 60,202 permanently disabled workers, are represented in the sample used for this study.

More than 90 percent of the matched DEU-WCIS PD claimants were subsequently matched to wage data in the California Employment Development Department (EDD) base wage file.

#### *Uninjured (Counterfactual) Workers*

The group of uninjured comparative workers was drawn from the EDD wage file based on employer clients served by the 45 good WCIS reporters. California employers—and, thus, their employees—were included if (1) the claims administrators had received at least one first report of injury (FROI) from the employer during 2002 and submitted it to the WCIS, and (2) the injured worker claims submitted were linkable to the EDD database. The resulting sample of injured workers' employers represented approximately 1.1 million California employers, or about one-fourth of the total in the state. Together, they employed more than half of the California work force in 2002. Workers were excluded from the counterfactual if they were recorded as having received temporary disability payments in the WCIS, or if they had ever applied for a rating from the DEU.

### Data Sources

The data on permanent disability ratings come from the DEU. The DEU PD data contain specific information about the type of impairment, the severity of the impairment, and demographic data about the injured worker, such as gender, age and occupation. Data from the DEU were matched to information from WCIS. The WCIS contains indemnity payment data, such as temporary disability compensation, which injured workers receive as income support due to time lost at work, and permanent disability compensation for the injury.

The earnings data used in the study are from the base wage file maintained by the EDD. Every quarter, employers covered by unemployment insurance in California are required to report the quarterly earnings of every employee to EDD, and these reports are stored in the base wage file.

Estimation of wage loss involves tracking the wages of injured workers before and after the date of injury. This tracking permits measurement of wage growth of injured workers after injury. In order to estimate wage loss resulting from occupational injury, it is necessary to compare this trend in earnings to wage trends for comparable workers.

As noted in the body of this report, the propensity score estimation (PSE) of wage loss is performed in two steps. In the first step, the method uses all available characteristics of the data in order to estimate the probability of injury. In the second step, the method subtracts the earnings of the injured workers from those who are uninjured. The important feature of the propensity score technique is that the estimate is made from only comparing wages of workers with similar probabilities of injury.

The PSE procedure requires the use of the full sample of the wage records collected by the EDD, along with other data collected. This includes 20 quarters of wage history, including who the employer was prior to the date of injury. From the Department of Industrial Relations (DIR), it is necessary to know who has filed for permanent disabilities, as well as who has ever experienced a temporary disability claim. Worker gender and worker ethnicity (identified by linking information from the first and last names of workers to estimate their gender and ethnicity) were used to help improve the match between disabled and uninjured workers.

Technically, estimates for the probability of injury are calculated using the statistical model known as the “logit” model,<sup>5</sup> which is a multiple regression methodology that associates each worker or employer characteristic--such as worker gender or job tenure, or employer industry or firm size--with the probability of the worker being injured. The PSE procedure matches these probabilities to individuals’ characteristics, and applies a logit-specific aggregation method to generate what is called the “propensity score” associated with workplace injury. This is the estimated probability of injury for each worker based on all observable characteristics.<sup>6</sup> The propensity score ranges from 0 to 1, with higher values of the propensity score indicating a higher probability of injury for a specific worker.

The logit model that DWC uses for estimating the propensity score includes EDD unemployment insurance records for all employees in the state. The DWC uses the following characteristics from EDD: 20 quarters of earnings history, 20 quarters of tenure history, four-digit industry classification codes, gender and ethnicity. A large number of polynomials and interaction terms are used.

The previous wage loss studies done by RAND on injuries during the 1990s, and the March DWC study of more recent injuries, employed a matching algorithm that matched on the firm of employment and wage at the time of injury. Specifically, a counterfactual worker was chosen for each injured worker if s/he worked at the same firm and, over the four previous quarters, had an average log wage that was within 10 percent of the standard deviation of the similar average log wage in the economy in the quarter in which the worker was injured. In contrast, the logit model can estimate the correlation between injury and wages in multiple periods, and also trends in wage growth. Consequently, if a gradual increase in wages is associated with the probability of injury, then the propensity score will be higher for an individual with falling wages, all things equal.

In applying the PSE method in the current study, DWC compared injured to non-injured workers according to their propensity scores as follows: the total pool of injured workers was ordered on the basis of the relative

---

<sup>5</sup> The logit model is estimated using the SAS logistic procedure.

<sup>6</sup> For a review of primary assessments of the propensity score matching technique, see Imbens, Guido. “Nonparametric Estimation of Average Treatment Effects Under Exogeneity: A Review,” *Review of Economics and Statistics*. 86:1 (2004), 4-29.

size of their propensity scores, and then divided into 200 equal-size groups, commonly referred to as “cells.” Each of these cells has a lower bound and upper bound on the propensity score. Using the same boundaries for the 200 cells, all of the uninjured workers were clustered into the 200 cells on the basis of the upper and lower bounds calculated for the injured workers.<sup>7</sup> Subsequently, the average post-injury wage for the injured workers in each cell was subtracted from average wage for the 200 analogous groups of uninjured workers.

---

<sup>7</sup> The 200 cells have the same number of injured workers by construction, but the 200 corresponding cells for the propensity score-matched counterfactual do not have the same number of uninjured workers in them.