California Workers' Compensation Institute

Research Note

Cumulative Trauma in California Workers' Compensation

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Executive Summary

Cumulative traumas (CT) are injuries that arise over time from repetitive stress, motion, or exposures rather than from a specific event or accident, and that result in disability or the need for medical treatment. Earlier this year, the California Workers' Compensation Insurance Rating Bureau (WCIRB) reported that CT cases as a percentage of work-related lost-time claims had more than doubled over the past decade, increasing from about 8 percent of all 2005-2007 indemnity claims to about 18 percent of all 2015 indemnity claims.[1] Because CT claims have become a significant cost driver in California workers' compensation, the Institute undertook this analysis to gain a better understanding of where they come from, how much they cost, and how they differ from specific injury (non-CT) claims. Among the key findings:

- Thresholds for CT compensability in California workers' compensation differ from those in other jurisdictions, which is reflected in higher CT claim frequency and higher overall claim frequency.
- Injured workers from the Los Angeles Basin accounted for more than 56 percent of all CT claims in the study sample versus 37 percent of the non-CT claims. The breakdown across each of the 9 years studied, however, shows the percentage of CT claims filed by residents of the Los Angeles Basin grew from 51 percent in 2005 to 67 percent in 2013, while the percentage of non-CT claims filed by L.A. Basin residents held steady at around 37 percent across all study years.
- On average, workers claiming CT injuries are five years older than workers who file non-CT injury claims.
- The lag time from the date of injury to the claims administrator notification was 9.5 times greater for CT claims than for non-CT claims.
- About a quarter of all CT claims involved multiple body parts/systems, which was more than three times the proportion for non-CT claims, while 5.7 percent of the CT claims involved mental disorders, which was more than 7 times the proportion found in the non-CT claims.
- 57 percent of all CT claims have indemnity payments compared to 32 percent for non-CT claims.
- More than 90 percent of lost-time claims for CT injuries involved attorneys -- nearly twice the proportion noted for non-CT injuries.

1. WCIRB, "Analysis of Changes in Indemnity Claim Frequency," January 2016.

- In nearly 30 percent of the CT claims the worker claimed one or more additional injuries, while less than 3 percent of injured workers who filed non-CT claims claimed additional injuries.
- Average claim costs for CT claims were 53 percent higher compared to non-CT claims with similar injuries, demographics, and employer characteristics. This difference is primarily associated with the greater level of attorney involvement in CT claims and the high proportion of CT claims in the Los Angeles Basin.
- The findings of this study suggest that the rising incidence of CT claims is due more to the experience within the Los Angeles, Inland Empire and Orange County regions, and the involvement of attorneys in those claims, than to the emergence of a new form of injury or changes in the work force.

Background

There are two basic types of compensable workplace injuries in the California workers' compensation system: specific injuries and cumulative injuries. Specific injuries result from a singular event such as fracture or a laceration. Cumulative injuries, also referred to as cumulative trauma (CT) injuries, are defined under California Labor Code §3208.1(b) as injuries "…occurring as repetitive mentally or physically traumatic activities extending over a period of time, the combined effect of which causes any disability or need for medical treatment." In recent years, California employers have reported increasing numbers of work-related CT injuries. According to a report published by the Workers' Compensation Insurance Rating Bureau of California (WCIRB), cumulative trauma injury claims have increased from 7.8 percent of all lost-time claims in accident year 2005 to 17.9 percent in accident year 2014.[2] This rise in CT injury claims contributed to an overall increase in indemnity claim frequency in California between 2009 and 2015, which contrasts with a decline in frequency seen in other jurisdictions.[3]

Although CT claims are not unique to California workers' compensation, other jurisdictions differ considerably in their requirements and limitations regarding these claims. Some states prohibit CT claims altogether; others impose a higher causation standard or require a higher standard of proof that the cumulative injury occurred at work. For example, Alabama requires a causation standard of more than 50 percent; Arkansas limits CT claims to repetitive motion injuries for back/neck, or hearing loss; Louisiana accepts only CT claims related to occupational disease; Tennessee limits CT to carpal tunnel injuries; and Virginia allows only hearing loss and carpal tunnel, but imposes a "clear and convincing evidence" standard of proof. In contrast, California has a relatively low burden of proof for CT claims, requiring only a 1 percent causation threshold and using a simple preponderance of evidence standard of proof.

For reporting purposes, CT claims are differentiated from specific injuries by the different timeframes within which an employee may claim the injury. Because of the cumulative nature of a CT injury there is no specific date of injury. Instead, the date of injury assigned to a CT claim has been defined under California Labor Code §5412 as "…that date upon which the employee first suffered disability therefrom and either knew, or in the exercise of reasonable diligence should have known, that such disability was caused by his present or prior employment." The vague nature of the date of injury often results in significant delay in reporting an injury to the employer (or past employer) and claims administrator. A worker claiming a CT injury must file a claim for benefits within one year from the date of knowledge, or the date that he or she should have known, that the disability was caused by work activities (L.C. §5405).

With limited exceptions, LC §3600(a)(10) precludes post-termination claims by prohibiting claims from being filed after an employment termination or layoff date. One exception, however, is when the "date of injury, as specified in Section 5412, is subsequent to the date of the notice of termination or layoff."[4] This exception, coupled with the "disability" and "employee knowledge" components required for a cumulative trauma injury, and the one-year statute of limitation for filing a claim under L.C. §5405, creates a legal conundrum in which claims for CT injuries often provide a pathway to post-termination claims.[5]

2. WCIRB. *State of the System: WCIRB Report on the State of the California Workers' Compensation Insurance System.* 2016. Retrieved from http://www.wcirb.com/sites/default/files/documents/wcirb_state_of_the_wc_system_report_2016.pdf
3. *Ibid*.
4. LC §3600(a)(10)(D).
5. In a 2015 WCIRB survey of 340 cumulative trauma indemnity claims, approximately 40% were identified as post-termination claims. http://www.wcirb.com/sites/default/files/documents/january_2016_claim_frequency_report-complete.pdf

Prior to the SB 899 legislative reforms of 2004, apportionment calculations excluded causation factors; but beginning April 19, 2004, Labor Code §4663(a) introduced causation as the basis for apportionment of permanent disability. While SB 899 did not specifically change the definitions or timeframes for cumulative trauma claims, the causation language was layered on top of existing statutory limitations (L.C. §5303).[6] As a result, since the 2004 reforms, a specific injury and a subsequent or concurrent cumulative trauma injury to the same body part may be considered as separate causes contributing to the disability and the need for additional medical treatment.

In this analysis, the authors examine whether the growth in cumulative trauma claim frequency is the result of an emergence of new forms of workplace injury. The study focuses on two central questions:

- What are the characteristics and factors contributing to the reported increase in CT claims?
- How do medical and indemnity benefits and expenses for CT and non-CT claims compare?

Study Data and Methods

For this study, the authors used a sample of 41,000 CT claims and 608,000 corresponding non-CT claims receiving benefits from January 2005 to December 2013, compiled from CWCI's Industry Research Information System (IRIS) for the subset of insurance carriers selected for the study. CT claims with Asbestos and Black Lung disease were excluded due to the special rules that apply to those populations. The study includes comparisons of claim characteristics (age, gender, tenure, etc.); injury and nature of injury characteristics; and medical, indemnity benefit, and expense payment transaction data. In addition, the authors compiled and compared additional key variables specific to the study. These include:

- **Cumulative Trauma Flag:** Insurers report the CT status of claims as part of their Unit Statistical reporting to the Workers' Compensation Insurance Rating Bureau (WCIRB) of California.[7] With permission from the study participants, the WCIRB provided this information to CWCI, and it is the basis for defining CT and non-CT claims for the study.
- **Medical Condition:** Parts of the study focus on the top five medical conditions for CT claims (low back, mental disorder, multiple body parts/systems, shoulder, and wrist or hand) which were identified from the reported body part and nature of injury data and additional diagnosis data.
- **Related Claim Identifier:** Injured workers can have more than one injury over the course of their employment. It is not unusual for a cumulative injury to follow a specific injury, or vice-versa. Study participants provided supplemental data to identify claims filed by the same individual and considered related under their business practices. Since rules varied by participant, the authors applied standardized criteria to the claims to derive final related claim flags and identifiers. This process only identifies relationships within the same carrier and employer. It does not identify claims that have overlapping responsibility across carriers.

6. L.C. §5303 states in part that "there is but one cause of action for each injury coming within the provisions of this division" and … "no injury, whether specific or cumulative, shall, for any purpose whatsoever, merge into or form a part of another injury; nor shall any award based on a cumulative injury include disability caused by any specific injury or by any other cumulative injury causing or contributing to the existing disability, need for medical treatment or death."
7. Insurers are required to submit data, including losses and payroll by classification, resulting from every workers' compensation insurance policy written in California to the WCIRB in a Unit Statistical Report (USR). These reports are the source of the data used by the WCIRB to administer the Experience Rating System and to publish experience modifications.

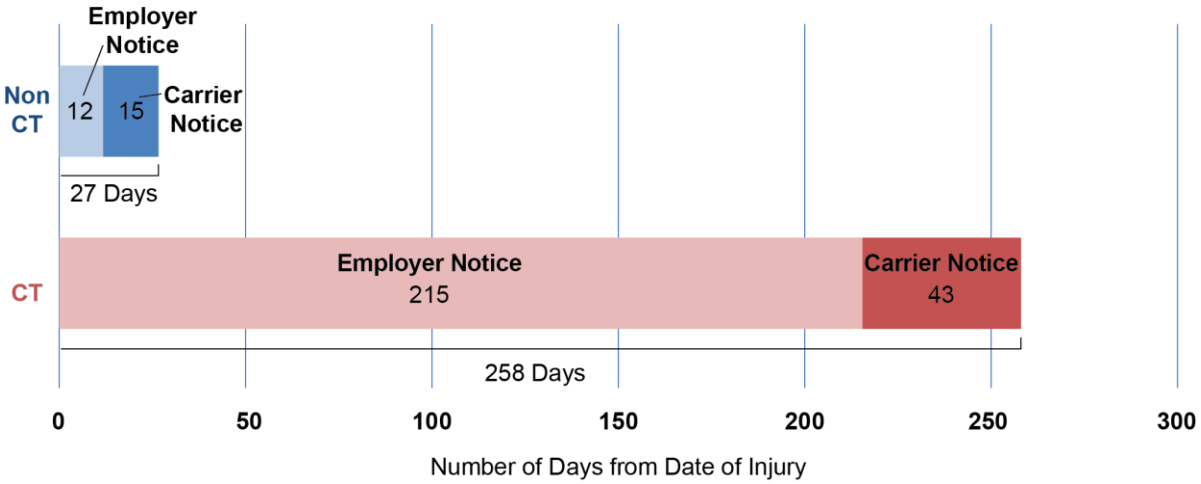
Results

Claim Characteristics

As previously noted, the date of injury assigned to CT claims can be inconsistent, representing any of the following dates: date of first medical treatment; the date of disability; the date of employer notification; or the last date of policy coverage.

Coupled with the one-year statute of limitations for filing a CT claim, the notification date often lags the reported date of injury.

Exhibit 1: Average Number of Days Between Date of Injury, Employer Notice and Carrier Notice

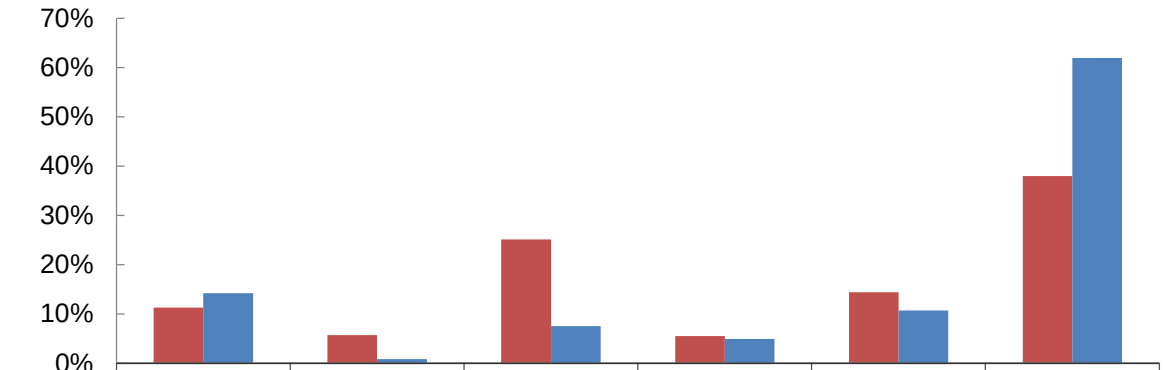


As shown in Exhibit 1, the average lag time from the date of injury to employer notification and then to carrier notification is 27 days for non-CT claims. In comparison, the average lag time from the recorded date of injury to employer notice and then to carrier notice for CT claims is 258 days, almost 9.5 times greater.[8] Because of these significant differences in the timing of claim notification, the authors used the carrier notification year rather than the year of injury as the basis for grouping CT and non-CT claims into study periods.

8. The data showed significant differences in the notification ranges for CT claims compared to non-CT claims. CT claims ranged from 2 days at the 10th percentile to 270 days at the 75th percentile. Non-CT claims ranged from 1 day at the 10th percentile to 15 days at the 75th percentile.

Over the nine-year study period, most CT claims were heavily concentrated within just a few injury categories, with five medical conditions reported for CT claims accounting for more than 62 percent of all CT claims, and with none of the other conditions/body parts that comprised the balance accounting for more than 5 percent of the CT claims (in most cases, they accounted for less than one percent). Exhibit 2 shows the percent of CT claims and non-CT claims represented by each of the five defined conditions and the aggregated "All Other" category. (Detail on the other conditions can be found in Appendix I.) About a quarter of the CT claims involved multiple body parts/systems, which was more than three times the proportion noted for non-CT claims, while 5.7 percent of the CT claims involved mental disorders, which was more than 7 times the proportion found in the non-CT claims.

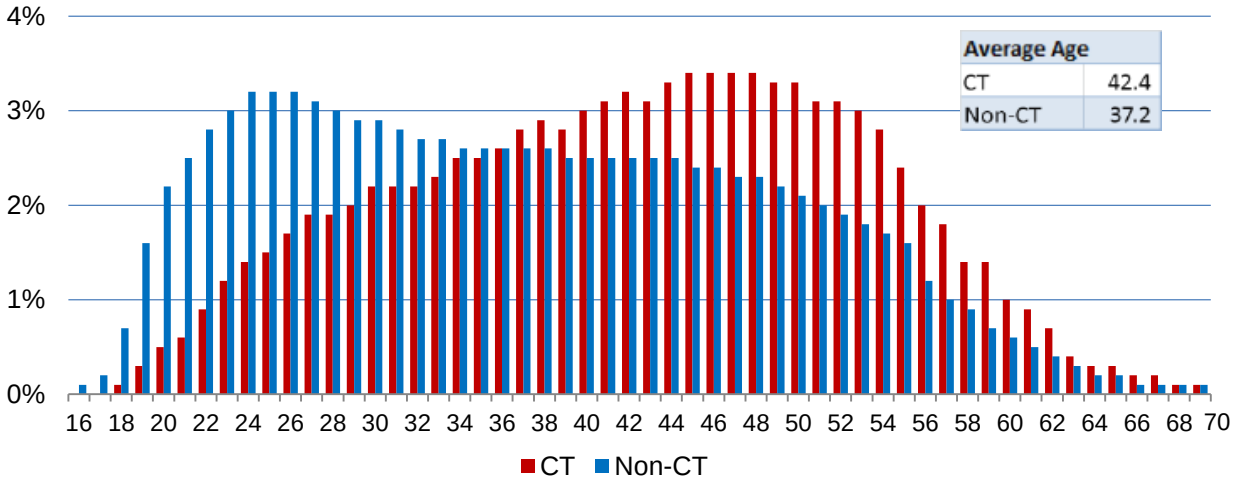
Exhibit 2: Percent of Claims by Condition - Carrier Notice Years 2005-2013



	Low Back	Mental Disorder	Multiple Body Parts/Systems	Shoulder	Wrist or Hand	All Other
CT	11.3%	5.7%	25.1%	5.5%	14.4%	38.0%
Non-CT	14.2%	0.8%	7.5%	4.9%	10.7%	61.9%

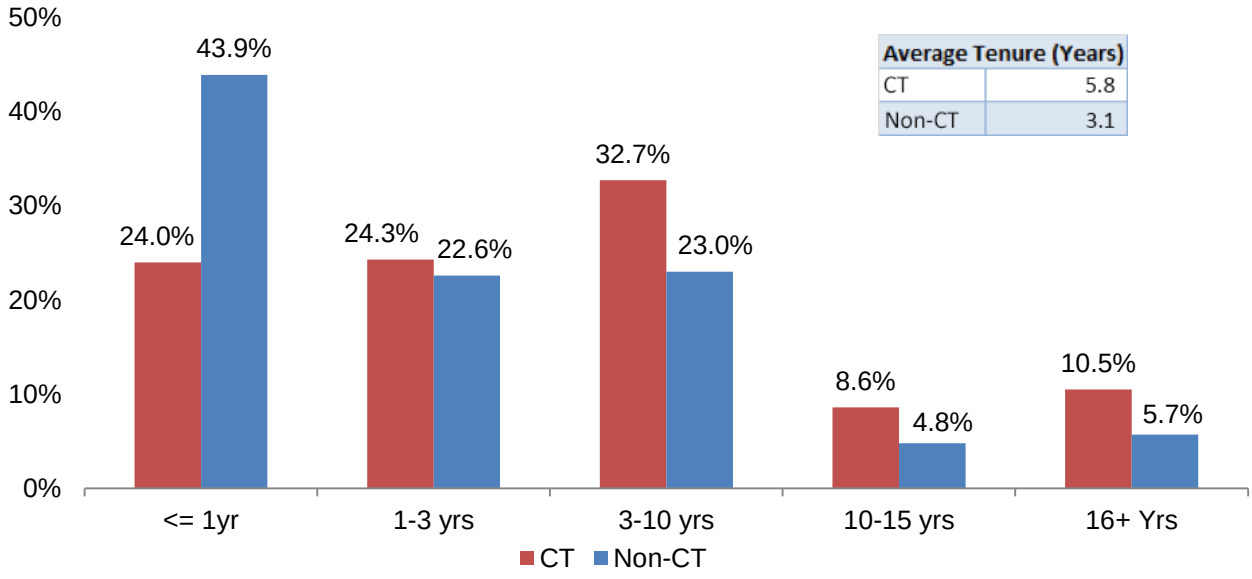
Using this study population, the authors analyzed various claim characteristics comparing CT claims and non-CT claims. The first characteristic was the age of the injured worker at the time of the recorded date of injury, shown in Exhibit 3. The overall age distribution patterns for CT versus non-CT claims differed somewhat, with younger workers accounting for a higher percentage of the non-CT claims and older workers representing a higher percentage of the CT claims. Overall, the average age of an injured worker with a CT claim was 42.4 compared to an average age of 37.2 for an injured worker with a non-CT claim.

Exhibit 3: Age Distribution, CT vs. Non-CT Claims



In addition to the age of the injured worker, the authors also analyzed tenure, *i.e.*, the length of time an injured worker had been working for the employer at the time they were injured. Exhibit 4 shows the percentage of claims with tenures in five different time categories (less than one year, 1-3 years, 3-10 years, 10-15 years, and more than 16 years). Injured workers employed less than one year by the employer of record represented 44 percent of the non-CT claims, but just 24 percent of the CT claims. Overall, the average tenure associated with non-CT claims was 3.1 years compared to 5.8 years for CT claims.

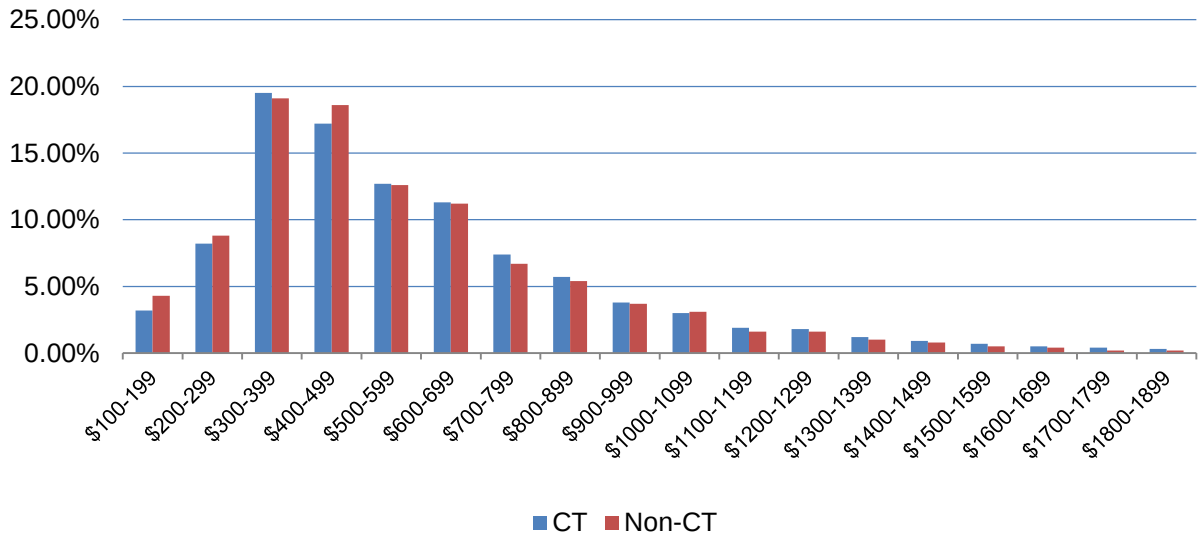
Exhibit 4: Employment Tenure at the Date of Injury, CT vs. Non-CT Claims



Average Tenure (Years)	
CT	5.8
Non-CT	3.1

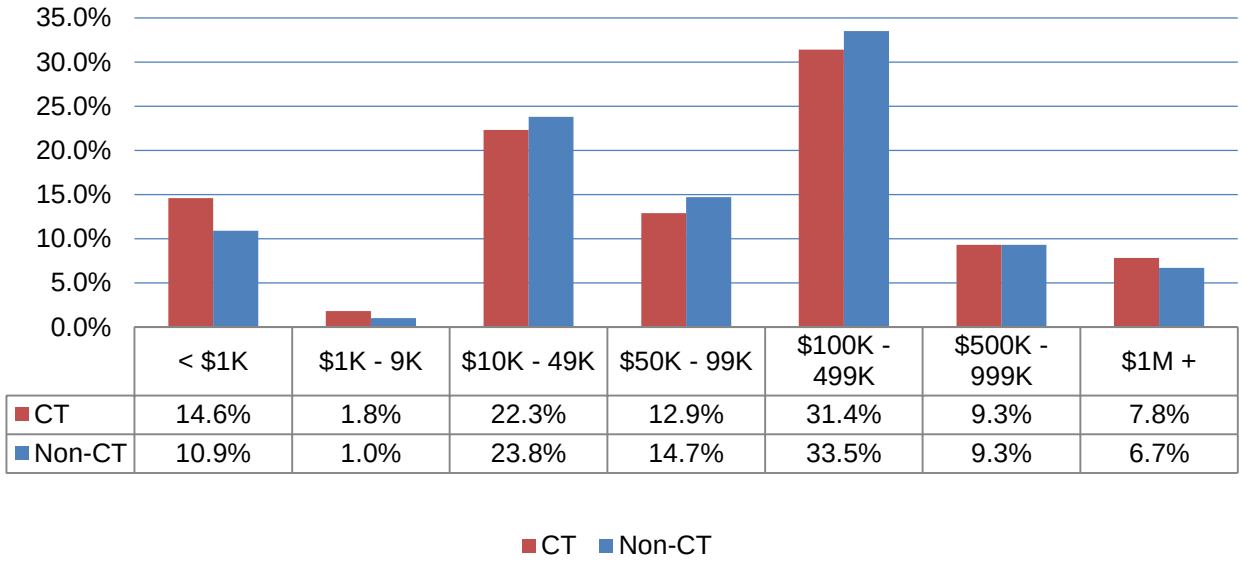
The average weekly wage data showed very little variation between CT and non-CT claims for each of the wage groups (Exhibit 5). The difference between CT and non-CT claims did not vary by more than one percentage point for any of the wage groups.

Exhibit 5: Average Weekly Wage for CT and Non-CT Claims



The data show only minor variations between CT and non-CT claims based on employer size, measured by workers' compensation insurance premium (Exhibit 6).

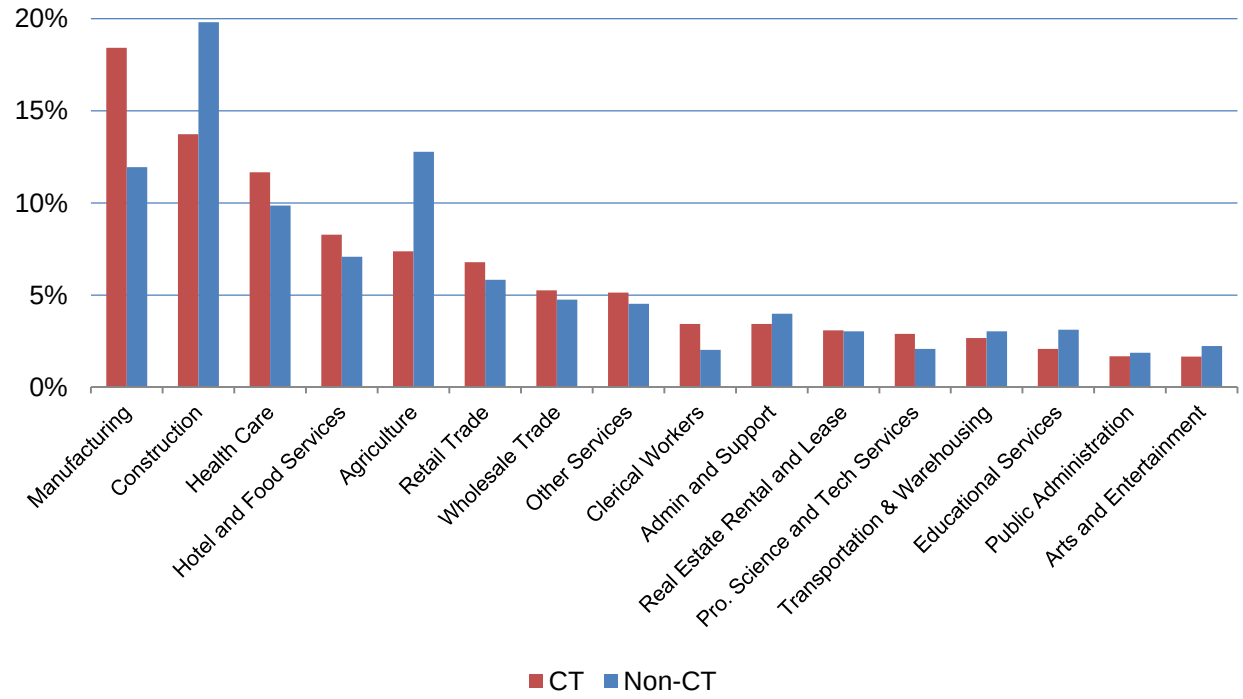
Exhibit 6: Distribution of CT and Non-CT Claims by Employer Premium Size



	< $1K	$1K - 9K	$10K - 49K	$50K - 99K	$100K - 499K	$500K - 999K	$1M +
CT	14.6%	1.8%	22.3%	12.9%	31.4%	9.3%	7.8%
Non-CT	10.9%	1.0%	23.8%	14.7%	33.5%	9.3%	6.7%

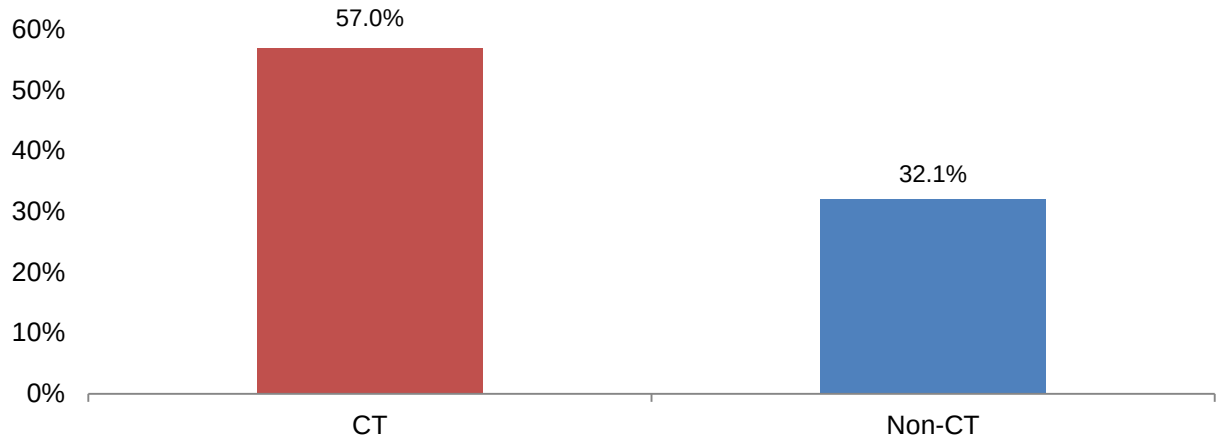
Exhibit 7 shows the distribution of CT and non-CT claims by industry classification. More than 18 percent of the CT claims in the study sample were filed by workers employed in the manufacturing sector (vs. 11.9 percent of the non-CT claims) while non-CT claims were more heavily concentrated in the construction sector (19.8 percent vs. 13.7 percent of the CT claims) and in the agriculture sector (12.8 percent vs. 7.4 percent of the CT claims).

Exhibit 7: Distribution of CT and Non-CT Claims by Industry



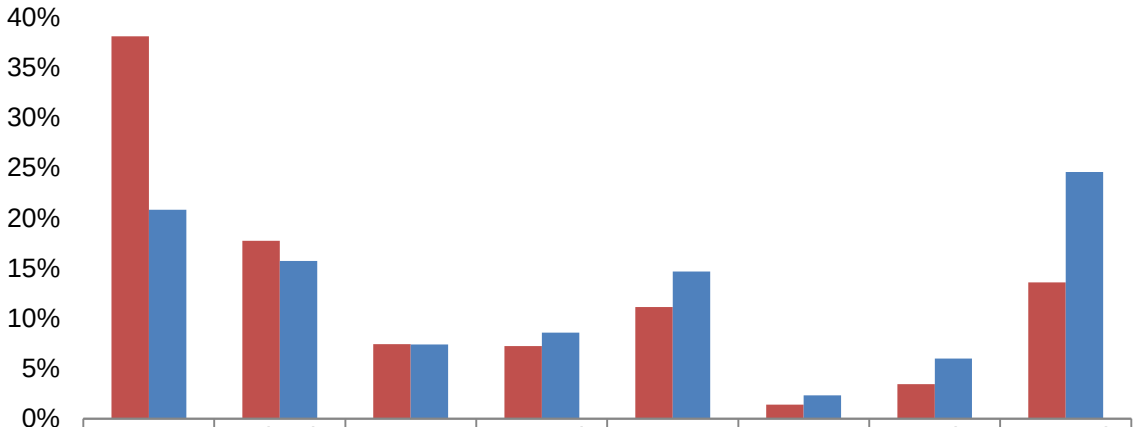
CT claims are more likely than non-CT claims to have indemnity payments, indicating a greater degree of lost time from work as shown in Exhibit 8. Well over half (57.0 percent) of the CT claims in the 9-year study period had indemnity benefits, compared to less than a third (32.1 percent) of the non-CT claims.

Exhibit 8: Percent of CT and Non-CT Claims with an Indemnity Payment



The ZIP code from the injured worker's address was used to identify regional distributions for CT and non-CT claims (Exhibit 9). Los Angeles County residents accounted for more than 38 percent of all CT claims in the study, nearly twice the proportion of non-CT claims filed by residents of the region (20.8 percent). Furthermore, residents of Los Angeles County, the Inland Empire (Riverside and San Bernardino), and Orange Counties filed 55.8 percent of the CT claims in the sample versus only 36.5 percent of non-CT claims. Conversely, CT claims were far less prevalent among workers from the Central Valley (the farm belt stretching from Kern County in the south to Glenn and Butte Counties in the north), who accounted for 13.6 percent of the CT claims in the study vs. 24.6 percent of the non-CT claims. Over the 9-year span, the proportion of non-CT claims from the L.A. Basin held steady at about 37 percent, while the proportion of CT claims coming from the region grew from 51 percent in 2005 to 67 percent in 2013 (see Appendix II).

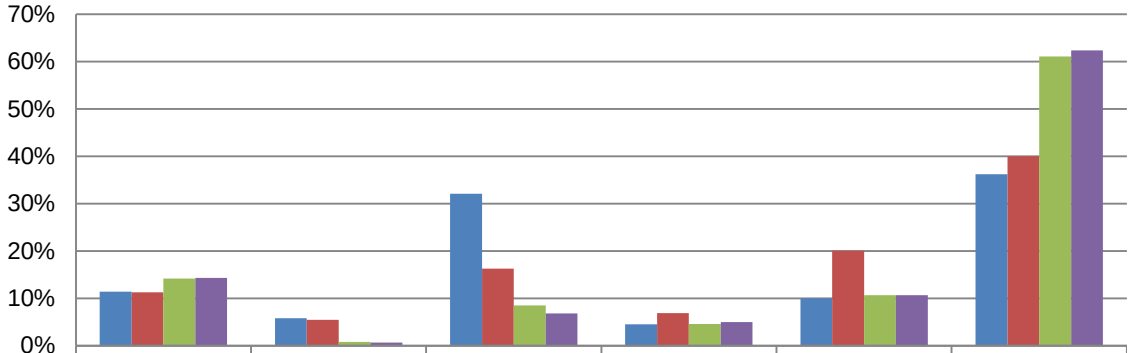
Exhibit 9: Distribution of CT and Non-CT Claims by Region



	Los Angeles	Inland Emp/OC	San Diego	Central Coast	Bay Area	Sierras	North Counties	Central Valley
CT	38.1%	17.7%	7.4%	7.2%	11.1%	1.4%	3.4%	13.6%
Non-CT	20.8%	15.7%	7.4%	8.6%	14.7%	2.3%	6.0%	24.6%

Exhibit 10 shows the mix of CT and non-CT claims by medical condition. As noted earlier, claims for injuries to multiple body parts/systems represented over a quarter of the CT claims in the study, and the regional distribution shows a disproportionate share of them came from the L.A. Basin, where almost a third of the CT claims involved injuries to multiple body parts/systems — nearly twice the proportion noted in the rest of the state. In contrast, only 1 in 10 CT claims in the L.A. Basin involved hand or wrist injuries — half the proportion noted for CT claims from other regions. Among non-CT claims, however, the percentage of claims involving hand or wrist injuries was identical in the L.A. Basin to other regions, as these injuries comprised 10.7 percent of non-CT claims inside and outside the L.A. Basin.

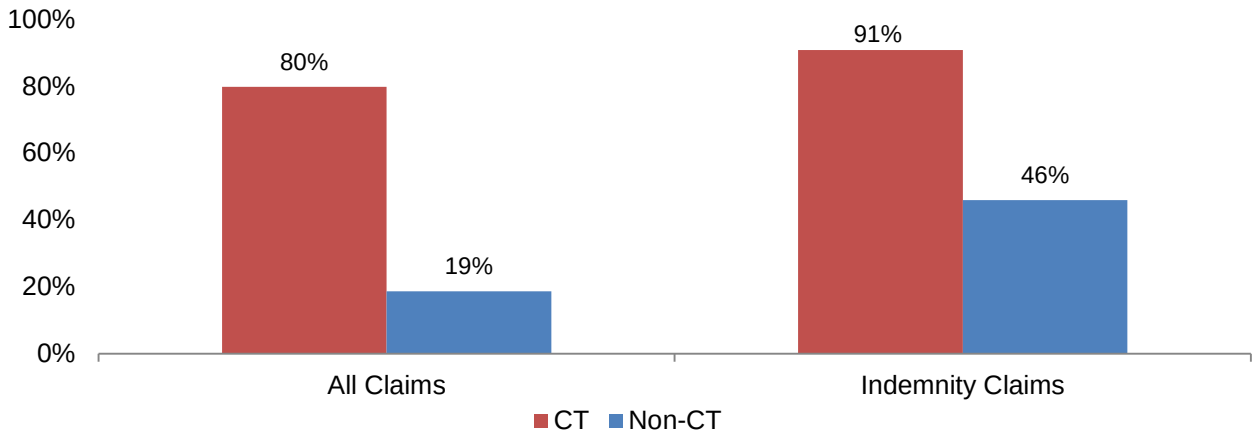
Exhibit 10: Distribution of CT and Non-CT Claims by Condition and Region



	Low Back	Mental Disorder	Multiple Body Parts/Systems	Shoulder	Wrist or Hand	All Other
CT-LA Basin	11.4%	5.8%	32.1%	4.5%	10.0%	36.2%
CT-Rest of State	11.3%	5.5%	16.3%	6.9%	20.1%	40.0%
Non-CT-LA Basin	14.2%	0.8%	8.5%	4.6%	10.7%	61.1%
Non-CT-Rest of State	14.3%	0.7%	6.8%	5.0%	10.7%	62.4%

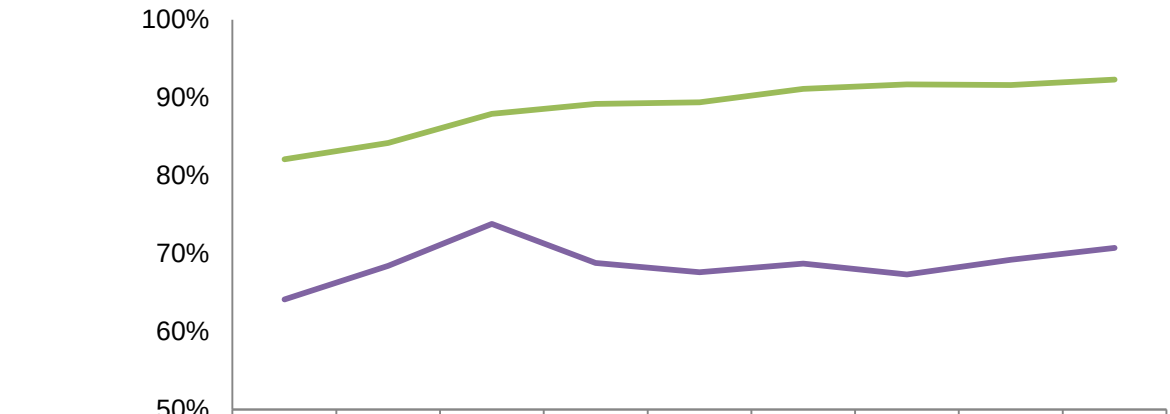
The authors found a significant difference between the proportions of CT claims with and without attorney involvement (Exhibit 11). Overall, 8 out of 10 CT claims involved attorneys – more than four times the proportion noted for non-CT claims. Limiting the comparison to indemnity claims (those in which temporary disability and/or permanent disability was paid) shows attorney involvement was also far more prevalent among the CT claims, as attorneys were utilized in 91 percent of the CT cases with indemnity payments, nearly twice the proportion noted for non-CT claims in which indemnity was paid.

Exhibit 11: Percent of CT and Non-CT Claims with Attorney Involvement



The regional data show the L.A. Basin CT claims experienced a higher attorney involvement rate than the rest of the state in each of the nine years of the study (Exhibit 12). Attorney involvement for CT claims filed by workers from the L.A. Basin ranged from a low of 82.1 percent in carrier notice year 2005 to a high of 92.3 percent in 2013. For CT claims filed by workers from other regions, the attorney involvement rate ranged from 64.1 to 73.8 percent, and was at least 21 percentage points less than in the L.A. Basin in each of the six most recent years.

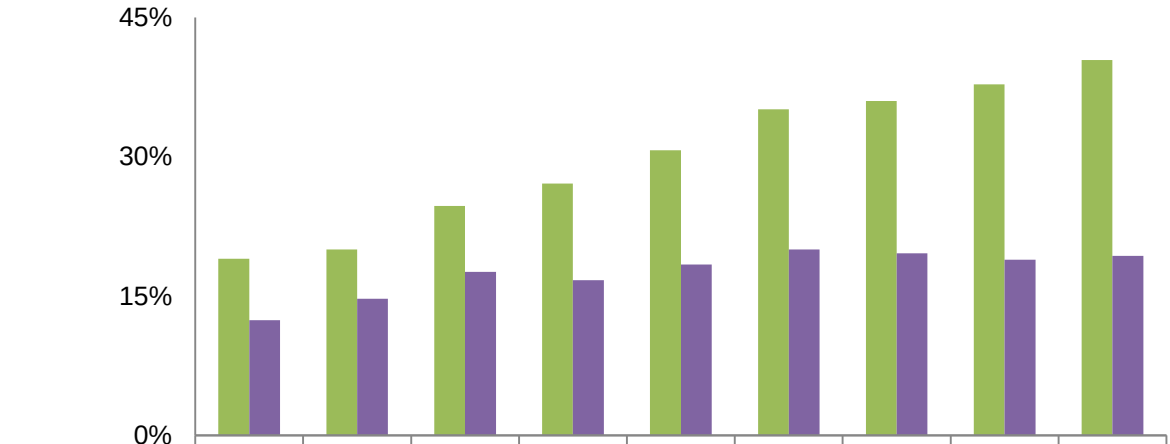
Exhibit 12: Percent of CT Claims with Attorney Involvement by Carrier Notice Year L.A. Basin vs. All Other Regions



	2005	2006	2007	2008	2009	2010	2011	2012	2013
LA Basin	82.1%	84.2%	87.9%	89.2%	89.4%	91.1%	91.7%	91.6%	92.3%
Rest of State	64.1%	68.4%	73.8%	68.8%	67.6%	68.7%	67.3%	69.2%	70.7%

Exhibit 13 shows the percentage of attorney involvement for the L.A. Basin and the rest of the state. In the L.A. Basin, CT claims as a proportion of attorney involvement claims rose steadily across the 9-year span of the study, while elsewhere, CT claims' share of attorney involvement claims increased from 2005 to 2007, during the initial implementation of SB 899, but after that remained relatively flat, fluctuating less than 2.5 percentage points from 2008 to 2013.

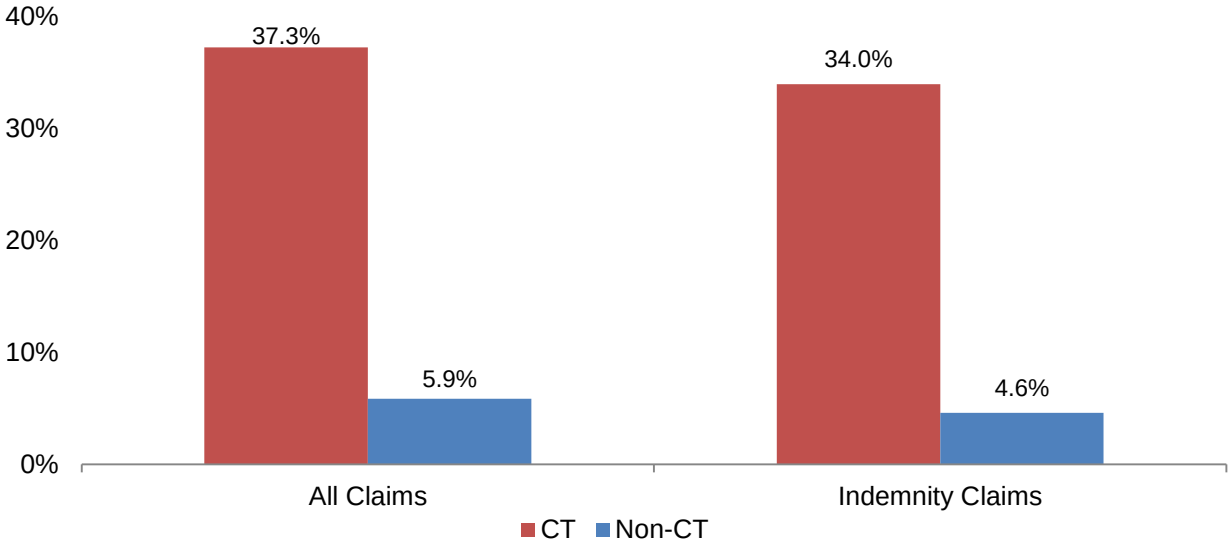
Exhibit 13: CT Claims as a Percent of Attorney Involvement Claims, L.A. vs. Other Areas



	2005	2006	2007	2008	2009	2010	2011	2012	2013
LA Basin	19.0%	20.0%	24.7%	27.1%	30.7%	35.1%	36.0%	37.8%	40.4%
Rest of State	12.4%	14.7%	17.6%	16.7%	18.4%	20.0%	19.6%	18.9%	19.3%

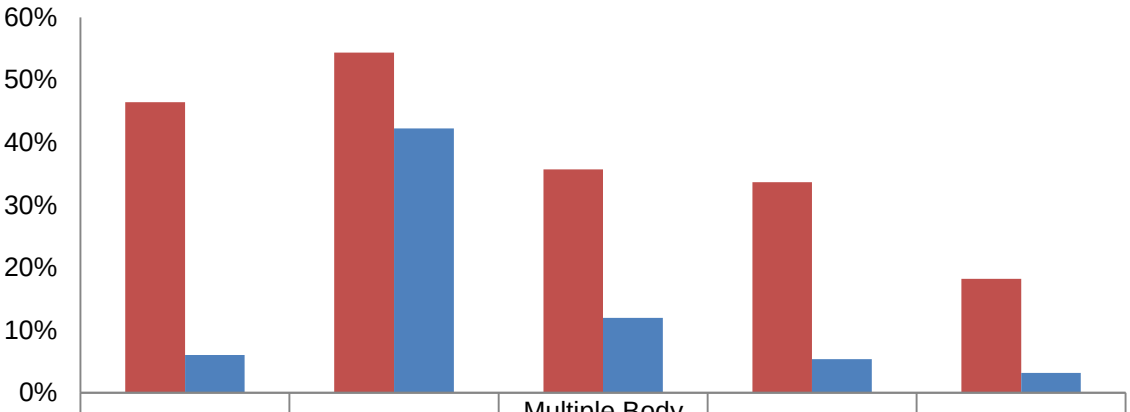
Exhibit 14 shows the percent of CT and non-CT claims with coverage disputes. Although the authors could not isolate specific types of disputes within the sample claims, it is clear that CT claims have a much higher dispute rate than non-CT claims. More than 37 percent of all CT claims were identified as disputed claims, more than 6 times the proportion noted for non-CT claims. Among the CT claims with indemnity payments the dispute rate was 34 percent, more than 7 times the dispute rate for non-CT claims.

Exhibit 14: Percent of CT and Non-CT Claims Disputed



To better understand where these disputes occur, dispute rates were broken out based on the five primary medical conditions identified earlier in the study. Exhibit 15 shows that dispute rates differed significantly between CT and non-CT claims in all categories, with the smallest difference noted in claims for mental disorders, where the spread between CT and non-CT claims was about 12 percentage points. In contrast, disputes were about 3 times more prevalent in CT vs. non-CT claims for multiple body part/system claims; 6 times more prevalent among CT vs. non-CT cases involving shoulder or wrist or hand injuries; and nearly 8 times more prevalent among CT vs. non-CT claims for low back injuries.

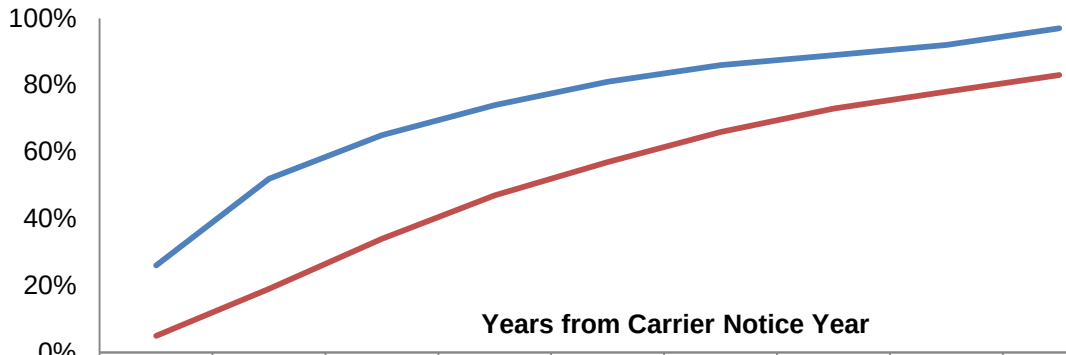
Exhibit 15: Dispute Rates by Condition



	Low Back	Mental Disorder	Multiple Body Parts/Systems	Shoulder	Wrist or Hand
CT	46.5%	54.3%	35.7%	33.7%	18.2%
Non-CT	6.0%	42.2%	12.0%	5.4%	3.2%

Exhibit 16 examines claim closure rates. The data show that just over half of all non-CT indemnity claims (52 percent) closed within two years of the carrier notice compared to only 19 percent of CT indemnity claims. Furthermore, over half of all CT claims with indemnity payments remained open more than four years after the carrier was notified of the claim, compared to just over a quarter of the non-CT claims.

Exhibit 16: Percent of CT and Non-CT Indemnity Claims Closed at Years 1 - 9

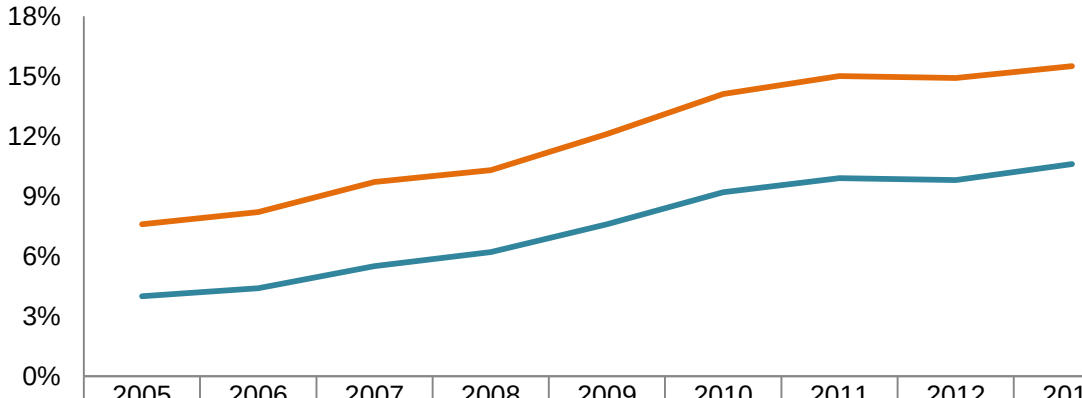


	1	2	3	4	5	6	7	8	9
CT	5%	19%	34%	47%	57%	66%	73%	78%	83%
Non-CT	26%	52%	65%	74%	81%	86%	89%	92%	97%

Claim Frequency

An evaluation of claim frequency for the study sample confirms similar results to the claim frequency reported by WCIRB. Exhibit 17 shows that CT claims as a proportion of all claims increased from 4.0 percent to 10.6 percent over the 9-year study period, while CT claims as a proportion of indemnity claims increased from 7.6 percent to 15.5 percent over the same period.

Exhibit 17: CT Claims as Percent of Total Claims and Indemnity Claims

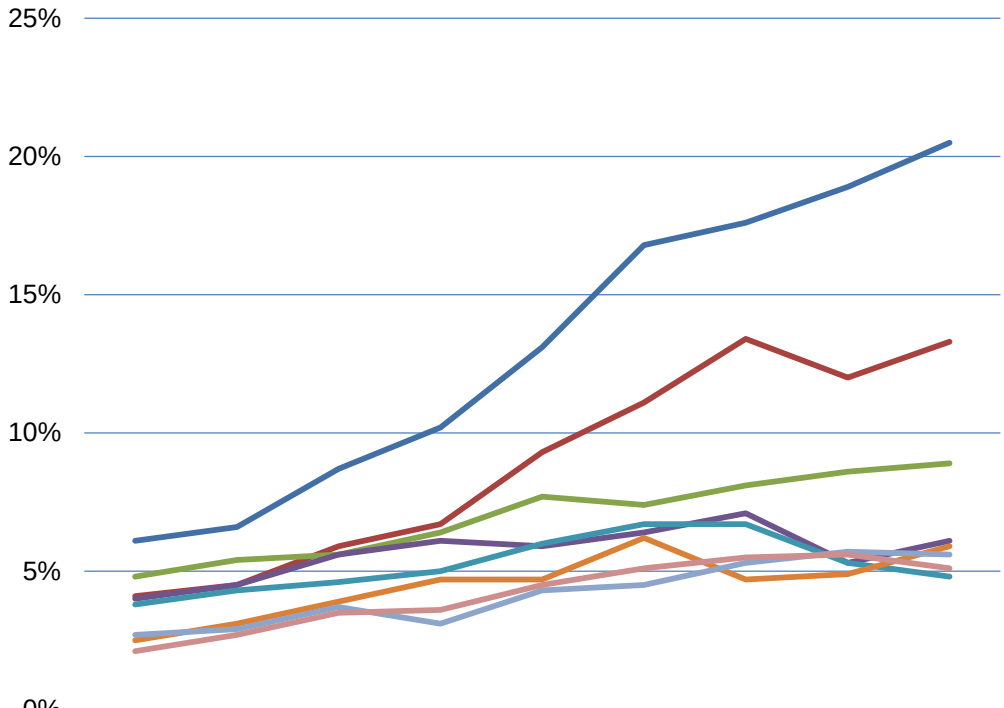


	2005	2006	2007	2008	2009	2010	2011	2012	2013
Indemnity	7.6%	8.2%	9.7%	10.3%	12.1%	14.1%	15.0%	14.9%	15.5%
All Claims	4.0%	4.4%	5.5%	6.2%	7.6%	9.2%	9.9%	9.8%	10.6%

The prevalence of cumulative trauma injury claims in California varies dramatically by region, with CT claims accounting for a much higher share of workers' compensation claims in Southern California than in other parts of the state. The regional differences in CT claim filing rates are shown in Exhibit 18. The most recent data show that more than 1 in 5 claims reported in Los Angeles County in 2013 were for cumulative trauma injuries – the highest proportion in the state, and that percentage has been growing. At the same time, CT claims accounted for 13.3 percent of all Inland Empire/Orange County claims, the second highest level in the state, followed by San Diego County, where 8.9 percent of all claims were for CT injuries. In contrast, in all other regions of the state, CT claims represented about 5 to 6 percent of the workers' compensation claims reported in 2013.

Back in 2005, the earliest year in the study, the regional data show CT claims ranged between 2.1 percent and 6.1 percent of all claims, though greater regional differences began to appear in 2007, at which time CT claims in Los Angeles County and in the Inland Empire/Orange County began to increase at a faster rate than in the rest of the state.

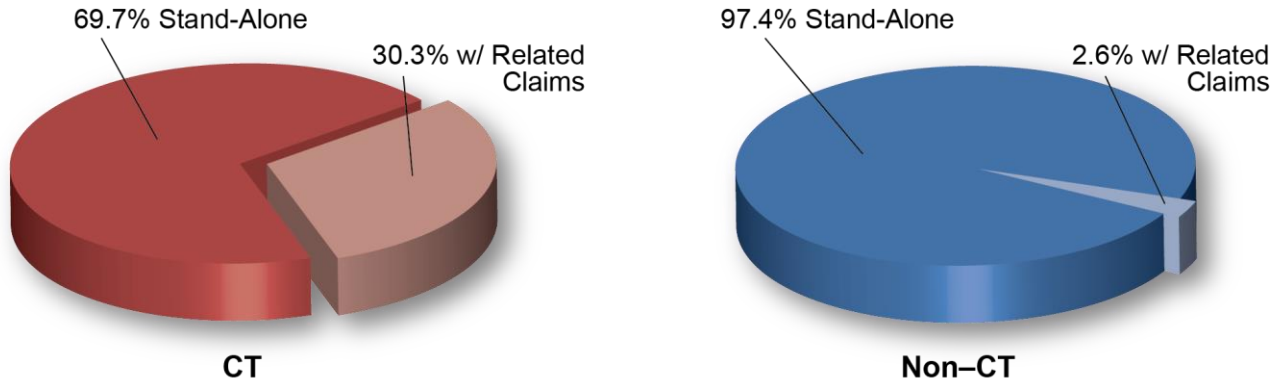
Exhibit 18: CT Claims as a Percent of Total Claims by Region and Carrier Notice Year



	2005	2006	2007	2008	2009	2010	2011	2012	2013
Los Angeles	6.1%	6.6%	8.7%	10.2%	13.1%	16.8%	17.6%	18.9%	20.5%
Inland Empire/OC	4.1%	4.5%	5.9%	6.7%	9.3%	11.1%	13.4%	12.0%	13.3%
San Diego	4.8%	5.4%	5.6%	6.4%	7.7%	7.4%	8.1%	8.6%	8.9%
Central Coast	4.0%	4.5%	5.6%	6.1%	5.9%	6.4%	7.1%	5.3%	6.1%
Bay Area	3.8%	4.3%	4.6%	5.0%	6.0%	6.7%	6.7%	5.3%	4.8%
Sierras	2.5%	3.1%	3.9%	4.7%	4.7%	6.2%	4.7%	4.9%	5.9%
North Counties	2.7%	2.9%	3.7%	3.1%	4.3%	4.5%	5.3%	5.7%	5.6%
Central Valley	2.1%	2.7%	3.5%	3.6%	4.5%	5.1%	5.5%	5.6%	5.1%

In many instances the authors found that an injured worker had more than one claimed injury with an employer. Exhibit 19 shows the proportion of injured workers with a CT claim where the claimant had a single CT claim (stand-alone) and where the claimant had a CT claim and at least one other claim with the same employer. In nearly 7 out of 10 CT claims in the study sample, the injured worker had a stand-alone CT, while in roughly 3 out of 10 cases the worker claimed one or more additional injuries. In contrast, among the non-CT claims, more than 97 percent of the cases involved stand-alone injuries, while less than 3 percent of the claims involved more than a single injury.

Exhibit 19 - Percent of Injured Workers with One or More Related Claims



Overall, the related claims associated with CT claims represented 2 percent of the total claim volume for the study population.

Cost Analysis

To identify factors associated with the differences in indemnity claim costs for CT and non-CT injuries, the authors compared costs for CT claims with those of two different samples of non-CT indemnity claims. The cost analysis did not distinguish between CT claims with and without related claims (see Appendix III). To minimize the effect of covariates, case-control matching was used to select the samples. These covariates are characteristics of the study groups that were found to be associated with higher or lower claim costs. These characteristics include medical condition, several demographic variables (age, gender, industry, job tenure, and salary), geographic region, and attorney involvement. To control for these differences, it was necessary to identify non-CT claims that were similar to the CT claims across each of these variables. This was accomplished by using a technique called propensity score matching.[9]

The first scenario used medical condition and the demographic variables, *i.e.*, attorney involvement and geographic region, were excluded from the matching criteria. This created a control group of non-CT claims with a similar demographic profile and medical condition as the CT claims. The second scenario included all of the variables.

9. Parsons, Lori. "Performing a 1:N Case-Control Match on Propensity Score." SUGI 29: SAS Institute.

Exhibit 20 compares the estimated benefits and expenses for CT and non-CT claims matched on all variables except attorney involvement and region. On average, the CT claims had 43 percent higher medical payments, 58 percent higher indemnity payments, 119 percent higher expenses, and 53 percent higher total costs compared to non-CT claims.

Exhibit 20: Estimated Benefits and Expenses for Matched CT & Non-CT Indemnity Claims Excluding Attorney Involvement and Region

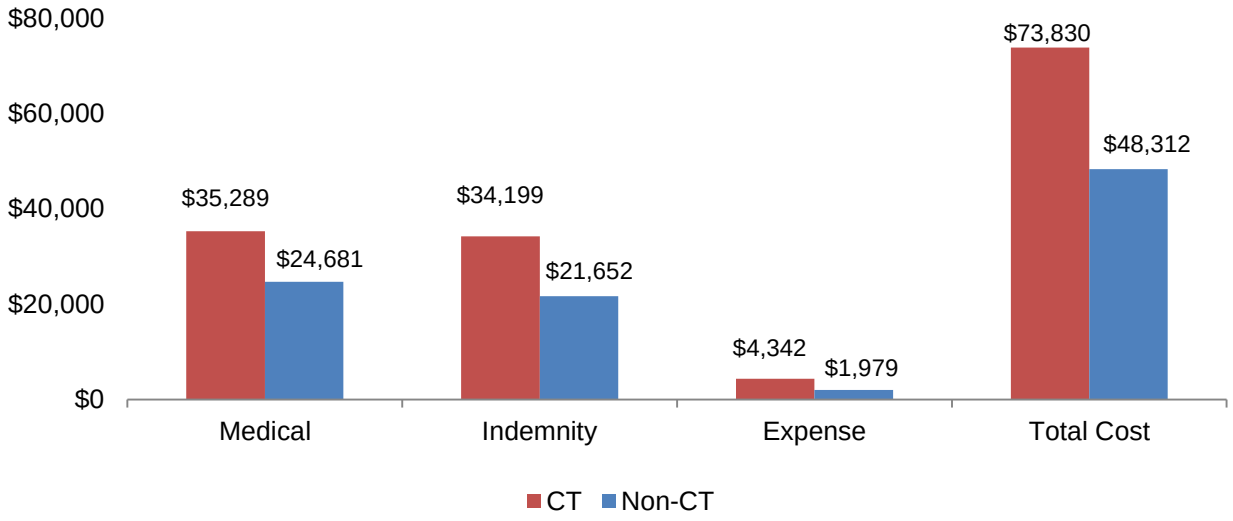
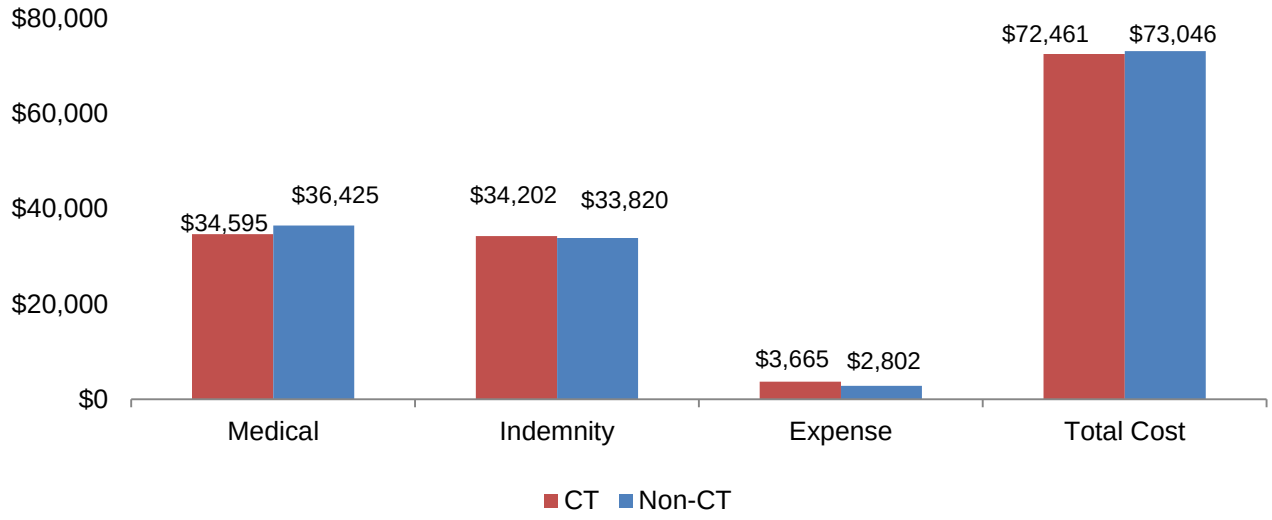


Exhibit 21 compares estimated benefits and expenses for CT and non-CT claims that were matched on all claim characteristics (including attorney involvement and region). In this scenario the average medical and indemnity benefits are within 5 percent and the total claim costs for CT claims were within 1 percent to those for non-CT claims. The only significant difference was for expenses, where the average paid was 31 percent higher for CT claims than for non-CT claims.

Exhibit 21: Estimated Benefits and Expenses for Matched Indemnity Claims (Matching Includes Attorney Involvement and Region)



Total medical and indemnity benefit payments for injured workers with similar medical conditions and demographics were analyzed over time comparing CT and non-CT claims. Exhibit 22 shows the estimated benefit payments for CT and matched non-CT indemnity claims by carrier notice year. In this scenario, the matching excluded attorney involvement and region. The estimated payments were consistently higher for CT claims, averaging about $16,000 to $29,000 more than the estimated amounts paid for non-CT claims over the 9-year study period.

Exhibit 22: Estimated Total Benefit Payments for Matched Indemnity Claims (Matching Excludes Attorney Involvement and Region)

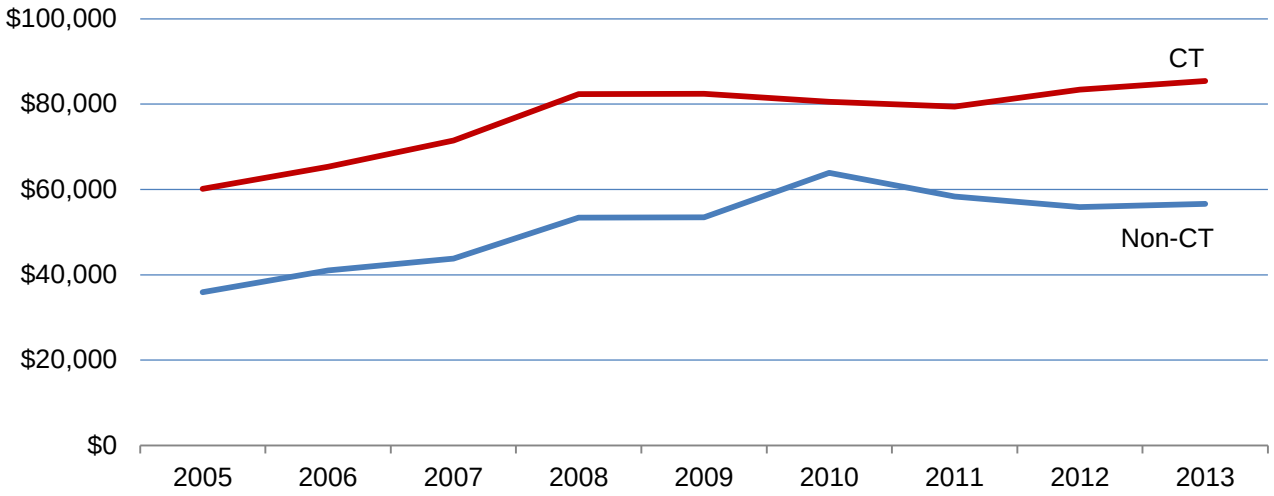
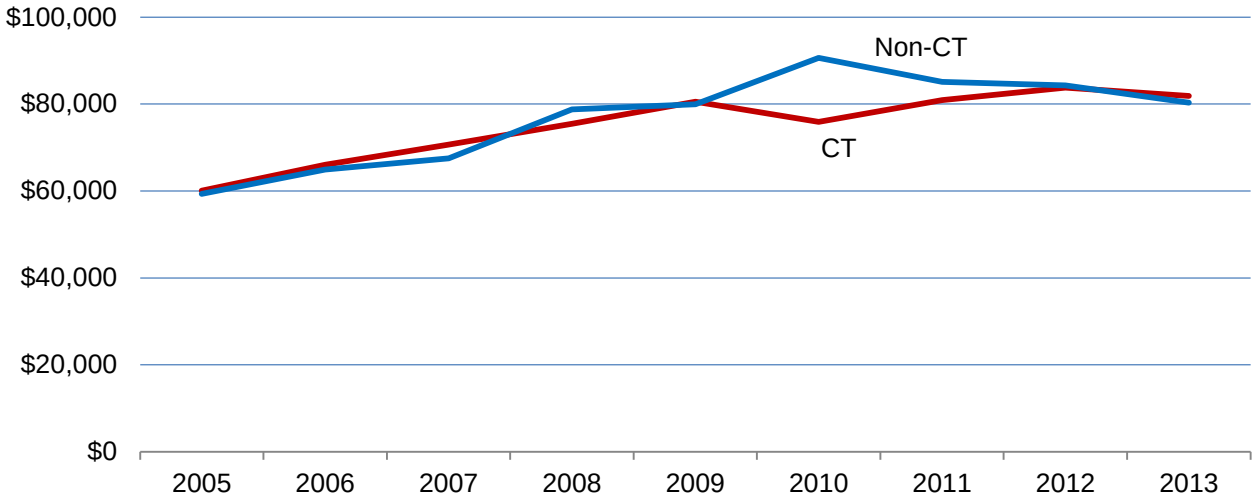


Exhibit 23 shows the estimated total payments per claim for CT and non-CT claims over time with the inclusion of geographic region and attorney involvement in the matching criteria. Comparing Exhibits 22 and 23, it is clear that differences between total costs for CT and non-CT claims can be explained by geographic region and attorney involvement. When these two characteristics are controlled there is minimal difference between the total payments per claim.

Exhibit 23: Estimated Total Benefit Payments for Matched Indemnity Claims (Matching Includes Attorney Involvement and Region)



Discussion

This study offers insights into the expanding role of cumulative trauma claims in the California workers' compensation system. In particular, the information on the changing nature of the frequency and notification of CT claims, as well as the pivotal roles of region and attorney involvement point to new areas for public policy discussion.

The study confirms findings from prior research showing the increasing proportion of CT claims. Cumulative trauma claims as a proportion of all claims reported to study participants more than doubled from 7.6 percent in 2005 to 15.5 percent in 2013. The analysis of injured worker demographics and injury mix reveals some variation between CT and non-CT claimants, including an average age differential of five years between CT claimants and specific injury claimants, with CT claimants being older on average and having longer workplace tenure. However, claimant demographics and medical condition and industry mixes do not explain the increases in frequency of CT claims or in the costs associated with these claims when compared to non-CT claims.

While this study has isolated many of the distinguishing characteristics between CT and non-CT injuries, statutory differences between California and other jurisdictions also impact the incidence of cumulative trauma claims in the California workers' compensation system. Key among these differences is California's relatively low burden of proof for a cumulative trauma claim, which requires only a 1 percent causation threshold.

The findings of this study suggest the rising incidence of CT claims is not so much due to the emergence of a new form of injury or changes to the work force, but more to the regional experience within the Los Angeles/Inland Empire/Orange County areas and the associated presence of attorney involvement in those claims. Research has shown that Los Angeles has been a focal point of other cost driving components of the California workers' compensation system. Prior research from 2014[10] found that claims from Los Angeles County residents averaged 50 percent more independent medical reviews than their claim volume would otherwise predict, as well as a disproportionately high rate of medical liens.[11] In addition, compared to employers in other parts of the state, Los Angeles employers wait three times as long to be alerted to workers' compensation claims, and when claims are filed, they take 28 percent longer to resolve, have 31 percent more litigation, 29 percent more permanent disability, and cost 21 percent more than the average for other regions.[12]

This study found that nearly 56 percent of all CT claims in the study population were filed in the Los Angeles County/Inland Empire/Orange County area compared to 36.5 percent of all non-CT claims, and the CT claims had a much higher likelihood of attorney involvement, with 91 percent of indemnity CT claims involving attorneys. In addition, more than 30 percent of all CT claims in the study had an associated dispute compared to only about 5 percent of the non-CT claims. The noted higher level of disputes likely drives the disparity in expenses between CT claims with attorney involvement in the Los Angeles Basin, shown in Exhibit 20. Additionally, while CT claims appear to have higher medical costs than non-CT claims upon initial observation, the gap disappears when attorney involvement and region are factored into the equation as shown in Exhibits 22 and 23.

10. "Independent Medical Review Outcomes in California Workers' Compensation," California Workers' Compensation Institute, April 2015.
11. Department of Industrial Relations Issue Brief: Issues and Impact of Lien Filing in California Workers' Compensation System, August 19, 2016.
12. IRIS Regional Score Card, Los Angeles County. California Workers' Compensation Institute, August 2016.

The authors found that 30 percent of injured employees with a CT claim also have another claim with the employer compared to only 3 percent of injured employees with non-CT claims. The high rate of injured workers with cumulative trauma and related claims may have implications on measures of claim frequency, especially over the last five to 10 years as the proportion of CT claims began to increase rapidly. The data also show that compared to non-CT claims, average medical and indemnity benefit costs on CT claims are 43 and 58 percent higher, respectively, while expenses average more than twice as much when compared to claims with similar conditions and claim characteristics. Characteristics of the medical treatment associated with overlapping CT and non-CT claims for the same body part is an area for future analysis, including a deeper exploration of network utilization, opioid and other prescription drug use, and temporary disability duration.

Appendix I.

Top Body Parts for All Other Conditions for CT Claims

Body Part	% of CT Claims
Knee	3.60%
Multiple Upper Extremities (no hands/wrists)	3.11%
Soft Tissue	2.39%
Lungs	2.16%
Elbow	1.51%
Lower Arm	1.51%
Upper Arm	1.39%
Upper Back (Thoracic)	1.36%
Abdomen	1.26%
Multiple Trunk	1.06%
Disc (Trunk)	1.05%
Insufficient Info to Properly Identify	6.56%
Other Condition Categories With Less Than 1% of CT Volume	11.1%
Total – All Other Conditions	**38.0%**

Top Body Parts for All Other Conditions for Non-CT Claims

Body Part	% of Non-CT Claims
Finger(s)	10.71%
Knee	6.11%
Eye(s)	5.59%
Ankle	3.80%
Thumb	3.09%
Foot	3.04%
Other Facial Soft Tissue	2.54%
Lower Arm	2.48%
Abdomen	2.22%
Lower Leg	2.12%
Chest (include Ribs, Sternum and Soft Tissue)	1.86%
Insufficient Info to Properly Identify	3.34%
Other Condition Categories With Less Than 1.8% of Non-CT Volume	15.1%
Total – All Other Conditions	**61.9%**

Appendix II.

Proportion of CT and Non-CT Claims from the L.A. Basin by Carrier Notice Year

	2005	2006	2007	2008	2009	2010	2011	2012	2013
CT	51%	47%	51%	53%	56%	60%	60%	64%	67%
Non-CT	38%	37%	36%	36%	35%	35%	35%	36%	37%

Appendix III.

Estimated Total Cost for CT Indemnity Claims – Top 5 Conditions (mix adjusted)

Benefit	Stand-Alone	Related	Difference
Medical	$33,789	$39,212	-14%
Indemnity	$34,861	$39,010	-11%
Expense	$5,823	$4,800	21%
Total Cost	**$74,473**	**$83,021**	**-10%**

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