California Workers' Compensation Institute

Research Note

Trends in The Use of Opioids in California's Workers' Compensation System

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Executive Summary

There is a widespread consensus that overuse of prescription pain medications in the United States has reached epidemic levels.[1] The most commonly abused prescription painkillers are opioids, which have experienced a significant increase in use over the past two decades.

Despite a growing awareness of the problems and long-term repercussions associated with opioid use, utilization of these drugs in California's workers' compensation system has expanded to the point where they now comprise the single largest category of medications prescribed to injured workers. A number of CWCI studies have tracked this growth, the most recent being an analysis published in May 2014 that measured utilization and payment trends for Schedule II opioids such as oxycodone, morphine, and fentanyl, as well as less potent, but still potentially addictive Schedule III opioids (primarily hydrocodone combination drugs such as Vicodin, Norco and Lortab).[2] The results of that analysis showed that except for a brief dip following the enactment of SB 899 in 2004, use of Schedule II opioids had risen steadily, increasing nearly sixfold from 1.3 percent of all workers' compensation prescriptions in 2002 to a record 7.3 percent in the first half of 2013. Furthermore, the study noted that although the growth rate for Schedule II opioids plateaued after 2010, use of these drugs remained at an all-time high and payments for these painkillers had increased from about 4 percent of all California workers' compensation prescription dollars in 2005 to nearly 20 percent in the first half of 2013. Use of less powerful Schedule III drugs fell to a post reform low in 2005 and remained fairly level thereafter. From 2005 through the first half of 2013, these drugs consistently accounted for about 20 percent of the prescriptions dispensed to injured workers and around 10 percent of the prescription dollars.

This report updates and expands upon those earlier findings using data from more than 10.8 million workers' compensation prescriptions that were dispensed to injured workers in California between January 2005 and December 2014. Aggregate payments for these prescriptions totaled $1.1 billion.

The report is divided into three parts. Part I identifies growth trends for opioids compared with other drugs used to treat injured workers. Part II analyzes utilization and payment patterns for brand vs. generic opioids

1. The Centers for Disease Control and Prevention first referred to the growing number of overdoses from prescription pain medications as an epidemic in November 2011. www.cdc.gov/media/releases/2011/p1101_flu_pain_killer_overdose.html
2. Ireland, J., Young, B., Swedlow, A. Part 1: Schedule II & Schedule III Opioids: Prescription and Payment Trends in California Workers' Compensation. CWCI Research Update, May 2014.

as well as for opioid medications of varying potencies. Part III examines opioid utilization at various stages in the life of a claim, measuring the percentage of claims that involved opioids, the average number of opioid prescriptions, and the average number of morphine equivalents per prescription and per opioid user, each at 3, 12, 24, and 36 months post injury. Key findings include:

- Opioids comprised 29.8 percent of the 10.8 million 2005 to 2014 prescriptions in the study sample and accounted for 27.3 percent of the prescription dollars paid.
- Opioids increased from 27.0 percent of all prescription drugs dispensed to California injured workers in 2005 to a peak of 31.8 percent in 2008 and then declined to 27.2 percent in 2014. Even with the recent decline, however, opioids have remained the number one prescription drug category in both use and payments since 2006.
- Opioids grew from 19.3 percent of all California workers' compensation prescription drug payments in 2005 to 24.4 percent in 2014. Much of that growth was associated with the increased use of brand name opioids between 2005 and 2009. In 2005, 15.9 percent of every dollar paid for an opioid was for a brand name drug; by 2009, the percentage had more than tripled to 49.4 percent. However, between 2009 and 2014, the proportion of brand name opioids declined to 41.0 percent as the use of the lower cost generic opioids increased relative to brand name opioids.
- Between 2005 and 2014, the average payment per opioid prescription increased by 85 percent (from $61 to $113), while the average payment for all other prescriptions increased by 39 percent (from $94 to $131).
- The proportion of injured workers receiving opioids within the first 24 months post injury increased from 22.4 percent in accident year (AY) 2005 to 27.9 percent in AY 2012.
- Among opioid users, several measures of opioid utilization (also at 24-months post injury) that increased in the first several years of the study period have showed decline in recent years.
  - The number of opioid prescriptions per user increased from 3.38 in AY 2005 to a peak of 4.43 in AY 2009 and then declined to 4.10 in AY 2012.
  - The average number of morphine equivalents per opioid prescription increased from 473 in AY 2005 to a peak of 550 in AY 2007 and then declined to 422 in AY 2012.
  - Morphine equivalents per opioid user increased from 1,599 in AY 2005 to a peak of 2,355 in AY 2008 then decreased to 1,728 in AY 2012.

These recent trends are positive, so it will be important to monitor them and to explore what may be driving them as this information may be useful to those charged with shaping policies to govern the use of opioids in workers' compensation.

Overview

According to the Centers for Disease Control and Prevention (CDC), there is a serious and worsening epidemic of overuse of prescription pain medications in the United States. The most commonly abused medications are opioids. While opioids can be of benefit to patients experiencing acute pain, the reality is that they are extremely addictive and extended use often causes serious health problems, including digestive and respiratory issues and mental health conditions. As a result, additional medications are often prescribed to address the side effects of opioid use. Furthermore, overprescribing and the lack of effective management of patients who are prescribed opioids are associated with increased risk of death from overdose. As stated in a recent CDC publication: "*The United States is experiencing an epidemic of drug overdose (poisoning) deaths. Since 2000, the rate of deaths from drug overdoses has increased 137%, including a 200% increase in the rate of overdose deaths involving opioids (opioid pain relievers and heroin).*"[3]

These problems have also arisen in workers' compensation as the use of opioids to treat injured workers has grown. Opioids are now the number one category of medication prescribed to injured workers in the U.S. California is no exception. The adverse side effects, and growing overdose and mortality rates associated with opioid use, are drawing increased attention and increased calls for intervention. In March 2016, the CDC released guidelines to promote safe and effective use of opioids and alternative treatments,[4] and last fall California's Division of Workers' Compensation (DWC) issued proposed Opioid Treatment Guidelines for inclusion in the state's workers' compensation Medical Treatment Utilization Schedule,[5] and began to develop a prescription drug formulary that will address opioid use.[6]

To help quantify the magnitude and dimensions of the problem, this report highlights the utilization and payment trends for the top 20 therapeutic groups of drugs used in the California workers' compensation system from January 2005 through December 2014. These 20 drug groups include more than 93 percent of all drugs prescribed in the system.

In each of the 10 years studied, opioids ranked first among all drug groups in terms of utilization. Furthermore, the percentage of injured workers receiving opioids steadily increased over the study period, and notably, other drugs within the top 20 therapeutic groups either treat side effects of opioid use (such as constipation, nausea, and depression) or are frequently used as substitutes for opioids (e.g., anti-inflammatories and dermatological analgesics).

3. Increases in Drug and Opioid Overdose Deaths — United States, 2000–2014, Morbidity and Mortality Weekly Report (MMWR), Centers for Disease Control and Prevention (CDC), January 1, 2016 / 64(50); 1378-82.
4. Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. MMWR Recomm Rep 2016;65:1–49.
5. Medical Treatment Utilization Schedule (MTUS), Chronic Pain Medical Treatment Guidelines, and Opioids Treatment Guidelines, State of California Department of Industrial Relations, Division of Workers' Compensation. https://www.dir.ca.gov/dwc/DWCPropRegs/MTUS-Opioids-ChronicPain/MTUS-Opioids-ChronicPain.htm
6. AB 1124 requires the California Department of Industrial Relations, Division of Workers' Compensation, to establish a drug formulary on or before July 1, 2017. http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB1124

Objective of this Analysis

To identify utilization and payment trends for opioids between 2005 and 2014, this study measures changes in the:

- Volume and payment distributions for the top 20 workers' compensation drug categories;
- Volume and payment distributions for brand and generic opioids;
- Percent of injured workers who receive opioids; and,
- Levels of opioid medication injured workers received including opioid prescriptions per user, morphine equivalents per prescription, and total morphine equivalents per opioid user.

Data and Methods

As noted earlier, this study updates CWCI's 2014 analysis that examined utilization and payment trends related to Schedule II and Schedule III opioids. That study found that Schedule II opioids, which at the time were limited to the most powerful narcotics, represented the fastest growing category of opioids. However, in August 2014, the U.S. Drug Enforcement Agency (DEA) reclassified hydrocodone combination products from Schedule III to the more restrictive Schedule II category of controlled substances. These drugs are by far the most widely prescribed opioids in the U.S. and in California's workers' compensation.

Because of this reclassification, this study, unlike the earlier analysis, does not differentiate between opioids of high and average potency based on DEA classification. Instead, it categorizes all opioids by their active drug ingredient names, which are listed below in rank order, from high to low, based on how often they were prescribed during the 10-year study period.

- Hydrocodone
- Tramadol
- Oxycodone
- Propoxyphene
- Codeine
- Morphine
- Fentanyl
- Other Opioids

Although these drugs include different active ingredients, strengths, and formulations, for this study they have been converted into standard Morphine Milligram Equivalents (MMEs) to facilitate comparison of their potency across populations and over time. [7]

The data used in this study was extracted from CWCI's Industry Research Information System (IRIS) database[8] and encompassed more than 10.8 million California workers' compensation prescriptions filled

7. Another important measure that is not included here is the Morphine Equivalent Daily Dose (MEDD), which represents the number of morphine equivalents consumed within a 24-hour period. This measure is generally used when establishing safety standards and/or treatment guidelines.
8. IRIS is CWCI's proprietary database containing data on employee and employer characteristics, medical service data, benefits and administrative costs on approximately 5 million California workers' compensation claims.

between January 2005 and December 2014. Each medication was identified by its National Drug Code (NDC), and the dataset was enhanced with descriptive detail from a Medi-Span[9] database of all pharmaceutical drugs. The descriptive information included the drug's therapeutic group and class description, active ingredient, strength, route of administration, availability as brand name or generic, manufacturer name, and other characteristics of the drugs. Aggregate payments for these prescriptions totaled close to $1.1 billion. More than 3.2 million (29.8 percent) of those 10.8 million prescriptions were classified as opioid analgesics (opioids), with payments for those prescriptions totaling nearly $300 million (27.3 percent of the prescription dollars paid).

9. Master Drug Data Base (MDDB®) Version 2.5 Documentation Manual, Wolters Kluwer Health, Medi-Span.

Part I: Growth of Opioids vs. Other Drugs in California Workers' Comp

To determine how the distribution and types of drugs used to treat injured workers have changed over time, the prescriptions were sorted by fill date and therapeutic group. There are 99 Medi-Span therapeutic drug groups, but workers' compensation prescriptions are concentrated in a relatively small number of groups. Exhibit 1 shows the proportion of each year's prescriptions that were in the top 20 therapeutic groups (based on 2014 volume), and how much each therapeutic group's share of California workers' compensation prescriptions changed over the 10-year span of the study.

Exhibit 1: Top 20 Therapeutic Groups by Year of Service – Percentage of Total Prescriptions Sorted by 2014 Volume

Therapeutic Group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14 Net Change	'05-'14 % Change
Opioid Analgesics	27.0%	28.2%	29.8%	31.5%	31.8%	31.5%	31.2%	30.0%	28.8%	27.2%	0.2%	1%
Anti-Inflammatory Analgesics	26.8%	25.0%	22.8%	18.7%	17.7%	17.2%	16.8%	16.2%	16.2%	18.7%	-8.1%	-30%
Musculoskeletal Therapy Agents	14.1%	13.6%	12.4%	11.3%	11.1%	10.0%	9.3%	9.3%	9.1%	9.3%	-4.8%	-34%
Ulcer Drugs	7.7%	7.6%	7.2%	6.1%	6.7%	6.6%	5.9%	6.3%	6.5%	6.7%	-0.9%	-12%
Anticonvulsants	2.1%	2.5%	3.7%	4.9%	5.3%	5.7%	5.6%	5.8%	6.0%	6.7%	4.7%	228%
Antidepressants	3.8%	3.9%	4.8%	5.6%	5.7%	6.0%	6.4%	6.7%	6.9%	6.2%	2.4%	63%
Dermatologicals	4.0%	3.5%	2.6%	3.5%	4.3%	4.6%	4.7%	4.8%	5.0%	4.9%	1.0%	25%
Hypnotics/Sedatives/Sleep Agents	2.2%	2.5%	3.0%	3.8%	3.4%	3.2%	3.1%	3.2%	3.1%	2.4%	0.2%	8%
Antianxiety Agents	1.7%	2.0%	2.0%	2.3%	2.3%	2.1%	2.1%	2.3%	2.5%	2.0%	0.3%	21%
Antihypertensives	0.3%	0.3%	0.4%	0.5%	0.6%	0.8%	1.2%	1.3%	1.3%	1.5%	1.2%	390%
Antihyperlipidemics	0.1%	0.1%	0.2%	0.3%	0.3%	0.6%	0.9%	0.9%	1.0%	1.1%	1.0%	916%
Chemicals	0.2%	0.3%	1.0%	1.5%	1.0%	0.7%	0.6%	0.9%	1.1%	1.1%	0.9%	475%
Laxatives	0.3%	0.4%	0.4%	0.5%	0.6%	0.7%	1.0%	1.2%	1.2%	1.1%	0.8%	257%
Corticosteroids	1.3%	1.4%	1.3%	1.2%	1.4%	1.7%	1.4%	1.4%	1.4%	0.9%	-0.4%	-30%
Beta Blockers	0.2%	0.2%	0.2%	0.3%	0.3%	0.5%	0.8%	0.8%	0.8%	0.9%	0.7%	394%
Cephalosporins	2.2%	2.0%	1.7%	1.3%	1.0%	0.9%	0.8%	0.7%	0.7%	0.7%	-1.5%	-69%
Antipsychotics/Antimanic Agents	0.3%	0.3%	0.4%	0.5%	0.6%	0.7%	0.7%	0.7%	0.6%	0.6%	0.3%	122%
Analgesics – Nonnarcotic	1.6%	1.3%	1.1%	0.7%	0.6%	0.5%	0.5%	0.5%	0.6%	0.6%	-1.0%	-64%
Ophthalmic Agents	0.6%	0.6%	0.6%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.5%	-0.2%	-26%
Antidiabetics	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.4%	0.4%	0.4%	0.5%	0.3%	207%
Subtotal	**96.5%**	**96.0%**	**95.8%**	**95.3%**	**95.3%**	**94.5%**	**93.8%**	**93.6%**	**93.7%**	**93.5%**	**-3.0%**	**-3%**

In all 10 years studied, the 20 highest volume drug groups accounted for more than 93 percent of all prescriptions. Opioids topped the list each year; their share of prescriptions ranged from a low of 27.0 percent in 2005 to a high of 31.8 percent in 2009. In 2014, opioids accounted for 27.2 percent of all prescription drugs dispensed to injured workers. Between 2005 and 2014, the second and third largest

therapeutic groups, anti-inflammatories and musculoskeletal therapy agents, declined from 26.8 to 18.7 percent and from 14.1 to 9.3 percent, respectively. The therapeutic groups with the largest net increase were anticonvulsants and antidepressants. Anticonvulsants grew from 2.1 percent to 6.7 percent of all prescriptions, and antidepressants grew from 3.8 percent to 6.2 percent of prescriptions.

Exhibit 2 summarizes the trends in overall drug payments between January 2005 and December 2014.

Exhibit 2: Top 20 Therapeutic Groups by Year of Service – Percentage of Total Payments Sorted by 2014 Volume

Therapeutic Group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14 Net Change	'05-'14 % Change
Opioid Analgesics	19.3%	20.1%	26.3%	30.3%	31.9%	31.8%	31.5%	28.5%	25.1%	24.4%	5.1%	26%
Anti-Inflammatory Analgesics	19.9%	18.6%	16.6%	12.2%	12.1%	11.8%	11.0%	10.9%	11.9%	13.6%	-6.3%	-32%
Dermatologicals	2.6%	2.8%	4.1%	7.0%	8.5%	9.3%	9.4%	10.6%	11.2%	10.1%	7.5%	292%
Ulcer Drugs	16.0%	15.7%	12.1%	9.1%	10.2%	10.3%	8.9%	8.8%	8.3%	8.0%	-8.0%	-50%
Anticonvulsants	3.1%	3.8%	5.8%	7.5%	5.9%	5.6%	5.4%	5.2%	5.5%	6.3%	3.2%	104%
Bulk Chemicals	0.6%	0.8%	2.6%	3.9%	3.3%	2.5%	2.5%	3.8%	4.9%	6.1%	5.5%	971%
Antidepressants	3.9%	4.3%	5.5%	6.1%	5.7%	6.0%	6.4%	6.9%	7.3%	5.8%	1.9%	49%
Musculoskeletal Therapy Agents	23.7%	22.3%	12.7%	8.1%	7.7%	6.2%	5.4%	5.4%	6.1%	5.0%	-18.7%	-79%
Antipsychotics/Antimanic Agents	0.6%	0.7%	1.0%	1.4%	1.7%	2.0%	2.4%	2.3%	2.3%	2.1%	1.6%	283%
Hypnotics/Sedatives/Sleep Agents	2.0%	2.3%	3.6%	4.1%	2.5%	2.4%	2.2%	2.1%	2.0%	1.6%	-0.4%	-22%
Antihyperlipidemics	0.1%	0.2%	0.3%	0.3%	0.4%	0.7%	1.1%	1.1%	1.3%	1.4%	1.2%	893%
Cardiovascular Agents - Misc.	0.1%	0.2%	0.3%	0.5%	0.5%	0.7%	0.7%	0.7%	0.9%	1.1%	1.0%	703%
Antivirals	0.1%	0.1%	0.3%	0.2%	0.3%	0.3%	0.5%	0.4%	0.4%	1.1%	1.0%	804%
Antihypertensives	0.2%	0.3%	0.3%	0.4%	0.5%	0.6%	0.8%	0.8%	0.8%	0.9%	0.7%	314%
Antiemetics	0.2%	0.1%	0.2%	0.5%	0.6%	0.6%	0.8%	0.8%	0.8%	0.9%	0.6%	283%
Migraine Products	0.3%	0.2%	0.5%	0.7%	0.7%	0.7%	0.9%	0.9%	0.9%	0.9%	0.6%	198%
ADHD/Anti-Narcolepsy/Anti-Obesity/Anorexiants	0.3%	0.3%	0.6%	0.8%	0.8%	0.9%	1.0%	1.0%	0.8%	0.8%	0.5%	164%
Antidiabetics	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%	0.4%	0.5%	0.6%	0.8%	0.6%	476%
Antiasthmatic and Bronchodilator Agents	0.2%	0.2%	0.3%	0.4%	0.5%	0.5%	0.6%	0.7%	0.7%	0.7%	0.4%	199%
Anticoagulants	0.2%	0.2%	0.4%	0.4%	0.4%	0.4%	0.5%	0.4%	0.5%	0.6%	0.4%	234%
Subtotal	**93.5%**	**93.6%**	**93.8%**	**94.1%**	**94.1%**	**93.6%**	**92.3%**	**91.6%**	**92.2%**	**91.9%**	**-1.6%**	**-2%**

In all 10 study years, the top 20 therapeutic groups based on total payments accounted for more than 91 percent of the overall drug spend in the California workers' compensation system. Initially, musculoskeletal therapy agents and anti-inflammatories accounted for the highest share of the payments (23.7 percent and 19.9 percent respectively vs. 19.3 percent for opioids), but by 2014, musculoskeletal therapy agents were down to 5 percent of the prescription drug spend and anti-inflammatories had dropped to 13.6 percent, while opioids' share had increased by more than 5 percentage points to 24.4 percent.

The therapeutic group with the third largest portion of payments in 2014 was dermatologicals. This group's share of workers' compensation prescription payments nearly quadrupled from 2.6 percent in 2005 to 10.1 percent in 2014, which was the largest percentage point increase among all therapeutic groups over the 10-year study period. Bulk chemicals, which are the active ingredients used to create compound drugs, also experienced dramatic growth between 2005 and 2014. Bulk drug payments as a share of total prescription drug reimbursements increased more than 10-fold from 0.6 to 6.1 percent -- the largest relative increase among the top 20 therapeutic drug groups, and by 2014 bulk chemicals ranked sixth among the therapeutic drug groups in terms of total drug spend. The therapeutic group with the greatest proportional decrease in payments was musculoskeletal therapy agents, which fell by 18.7 percentage points from 23.7 percent of the workers' compensation prescription dollars in 2005 to 5.0 percent in 2014 – a relative decline of 79 percent. Ulcer drugs registered the second biggest decline; their share of the overall drug spend dropped by half over the 10-year span, falling from 16 percent in 2005 to 8 percent in 2014.

Part II: Opioid Utilization and Payment Patterns

To better understand the impact of the opioid epidemic on California workers' compensation, the exhibits in Part II and Part III focus on changes in opioid treatment and payment patterns over time.

Exhibit 3 shows the workers' compensation opioid prescription and payment distributions for brand vs. generic versions of these drugs from 2005 through 2014. It also displays the proportional change in the volume and amount paid for these drugs, and the change in the average amounts paid, over this period.

Exhibit 3: Analgesic Opioid Trends by Brand / Generic Status and Year of Service

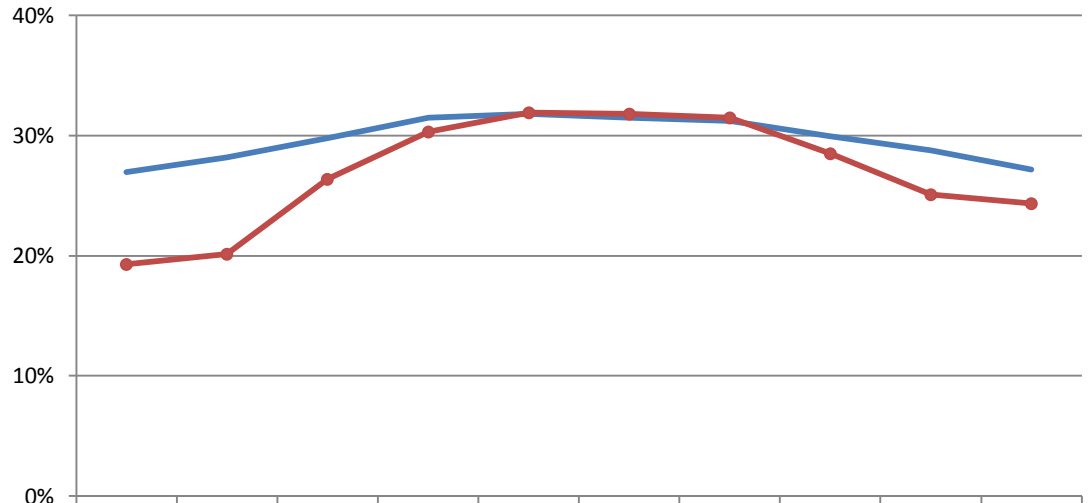
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	'05-'14 Net Change
Prescriptions											
Brand	6.5%	4.7%	9.3%	10.8%	11.7%	11.1%	11.4%	10.3%	8.6%	9.5%	3.0%
Generic	93.5%	95.3%	90.7%	89.2%	88.3%	88.9%	88.6%	89.7%	91.4%	90.5%	-3.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	N/A
Payments											
Brand	15.9%	12.2%	36.3%	45.6%	49.4%	48.5%	49.0%	46.5%	39.2%	41.0%	25.1%
Generic	84.1%	87.8%	63.7%	54.4%	50.6%	51.5%	51.0%	53.5%	60.8%	59.0%	-25.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	N/A
Average Payment											
Brand	$149	$170	$290	$383	$416	$433	$456	$482	$478	$486	$337
Generic	$55	$60	$52	$56	$56	$57	$61	$64	$69	$74	$19
Total	$61	$66	$74	$91	$98	$99	$106	$107	$104	$113	$52

Between 2005 and 2009, brand name drugs represented a growing share of the opioids prescribed in California workers' compensation, with brand versions increasing from 6.5 percent to 11.7 percent of the opioids dispensed to injured workers. But after 2009 that percentage began to trend down, and by 2014 it was down 2.2 percentage points from the 2009 high-water mark to 9.5 percent. The changing distribution between brand and generic opioids is also evident in the payment data. Between 2005 and 2009, brand name drugs' share of opioid prescription payments more than tripled from 15.9 percent to 49.4 percent. This proportion declined with the increased use of generics after 2009, falling to 41 percent by 2014.

Over the 10-year timeframe of the study, the average amount paid for a brand name opioid prescription more than tripled from $149 to $486, while the average amount paid for a generic opioid increased only 34 percent, from $55 to $74. The greatest one-year increase in the average amount paid for brand drugs was between 2006 and 2007, when the average payment increased 70 percent, from $170 to $290. This was followed by a 32 percent increase between 2007 and 2008, and then generally by single-digit annual increases through 2014.

Exhibit 4 displays the trends in the portions of prescriptions and payments for opioids by year of service. As shown, opioid prescriptions increased slightly from 27.0 percent of all workers' compensation prescriptions in 2005 to 27.2 percent in 2014, while payments for these prescriptions rose from 19.3 percent to 24.4 percent of the total prescription drug spend.

Exhibit 4: Analgesic Opioids by Year of Service – Percentage of Total Prescriptions and Payments



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Scripts	27.0%	28.2%	29.8%	31.5%	31.8%	31.5%	31.2%	30.0%	28.8%	27.2%
Payments	19.3%	20.1%	26.3%	30.3%	31.9%	31.8%	31.5%	28.5%	25.1%	24.4%

The most dramatic growth in utilization of, and reimbursements for, opioids during the 10-year span occurred between 2005 and 2009. This was a period during which the average payment per opioid prescription increased by 61 percent (from $61 to $98), while the average payment for all other (non-opioid) prescriptions increased by only 3 percent (from $94 to $98). The increase in average payments for opioids during this 5-year period was primarily driven by the rising cost of brand name drugs; the average amount paid for a generic opioid rose less than 2 percent (from $55 to $56) while the average paid for brand name versions of these drugs nearly tripled from $149 to $416. However, after 2009 the growth in the average amount paid for brand name opioids leveled off, increasing 16.8 percent from $416 in 2009 to $486 in 2014, while the average paid for generic versions of these drugs rose 32 percent from $56 to $74. Over the same 6-year period, opioids as a percentage of California workers' compensation prescriptions declined from 31.8 percent to 27.2 percent, and payments for these drugs declined from 31.9 percent to 24.4 percent of workers' compensation prescription dollars. This was driven by a 33.7 percent increase in the average amount paid for non-opioid drugs. In contrast, the average amount paid for opioid prescriptions increased by 15.3 percent.

Differences Among the Most Widely Prescribed Opioids

All opioids work by blocking the transmission of pain signals to the brain, but their active chemical ingredients differ in their potency per milligram, the number of milligrams of the active ingredient, the route of administration (e.g., oral or intravenous), and dosage form (e.g., immediate- or controlled-release tablet, patch). These factors work together to determine potency and duration of the analgesic effect as well as the risk of overdose, addiction, and diversion for misuse/abuse. Some of the more salient features of the most widely prescribed opioids used in California workers' compensation are noted in the sidebar below. These are presented in order (from high to low) based on how often they were prescribed during the study period.

The Most Widely Prescribed Opioids in California Workers' Comp

Hydrocodone is available as a combination product, usually with acetaminophen. When taken orally, its potency is equivalent to that of morphine. Almost all of the hydrocodone prescriptions in the study sample were for 5-10 mg immediate-release tablets. Immediate-release formulations are generally used to treat acute pain, unlike extended-release forms which are intended for chronic, around-the-clock, pain. Only 3 percent were for brand name versions of the drug (e.g., Norco, Vicodin). The most powerful drug in this category is Zohydro, a 10-50 milligram extended-release capsule that was approved by the FDA in October 2013. Utilization of Zohydro to date has been minimal.

Tramadol is available as a single-drug or in combination with acetaminophen. When taken orally, its potency is only one tenth (per milligram) that of morphine. In recent years, there has been a shift in the types of tramadol prescribed to injured workers. In 2007, 19 percent of the workers' compensation prescriptions for tramadol were brand versions of the drug (e.g. Ultram, Ultracet); but this proportion declined to 2 percent by 2014. Among 2014 prescriptions for tramadol in the study sample, 80 percent were tablets, indicating acute pain, and 20 percent were extended-release products, indicating chronic pain. In June 2014, drugs containing tramadol, which was originally deemed a "safe opioid" and classified as a non-scheduled medication, were classified as Schedule IV controlled substances. This classification is used for drugs with recognized medical use and relatively low potential for abuse and dependence. The reclassification meant tramadol prescriptions could only be filled within six months from the date written instead of 12 months, and patients were limited to six fills. Prior to this change, physicians often prescribed tramadol in order to avoid scheduled drug restrictions. But with the tighter restrictions, prescribing patterns could change. For example, there could be a shift away from tramadol toward other opioids, or toward non-steroidal anti-inflammatory drugs by doctors who want to avoid using scheduled drugs to treat pain.

(continued on page 11)

The Most Widely Prescribed Opioids in California Workers' Comp (continued)

Oxycodone is available as both a single and combination product. When taken orally, its potency is 50 percent greater than morphine. Within workers' compensation, brand utilization decreased modestly over the study period, from 40 percent in 2005 to 31 percent in 2014. Well-known brand names are Percocet and OxyContin, an extended-release tablet. Extended-release products became popular with drug abusers because they contain 20 to 40 milligrams of the active ingredient, compared to conventional tablets which contain 5 to 10 milligrams. When first approved in 1995, OxyContin was supposed to result in less abuse as it would be absorbed slowly and would not produce an immediate "high." However, despite warnings on the packaging, drug abusers circumvented these precautions by crushing extended-release tablets and intravenously injecting the drug. This led to widespread abuse. In late 2009, a higher priced, abuse-deterrent, version of OxyContin was released, effectively replacing all extended-release oxycodone products, both brand name and generic. Unfortunately, drug abusers have learned how to circumvent this abuse-deterrent formulation.

Propoxyphene was the second most prescribed opioid in California's workers' compensation system in 2005, although it was widely known to be extremely dangerous. It was banned in the U.K. in 2005 because of its risk for causing users to commit suicide, removed from the market in Europe in 2009 over concerns about fatal overdoses, and finally banned in the U.S. in 2010 when it was shown to have minimal pain relieving benefits and to cause serious damage to the heart, even at recommended doses.

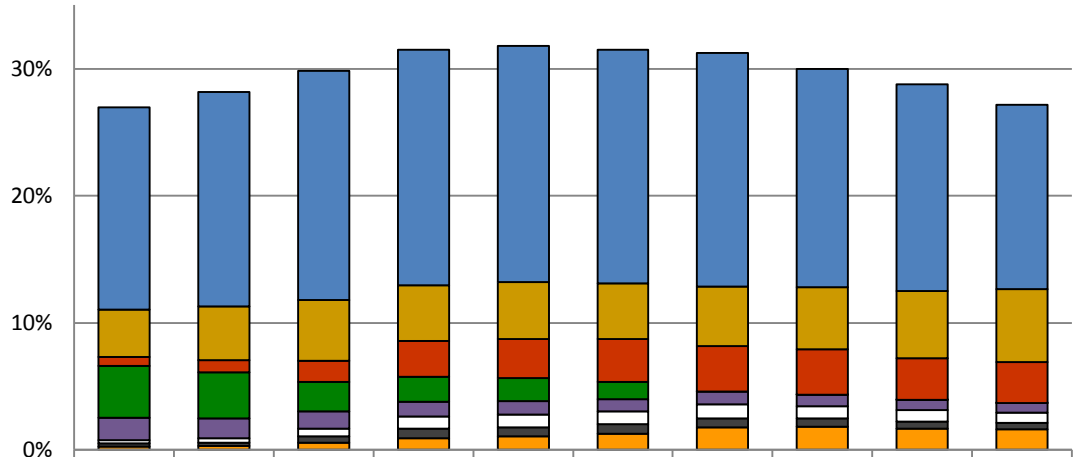
Codeine is the weakest opioid. Its relative per milligram potency is 0.15 (i.e., one seventh) that of morphine and it is most often prescribed in 30 milligram tablets. This is slightly weaker than 50 milligrams of tramadol or 5 milligrams of hydrocodone. In California's workers' compensation it is almost always prescribed as a generic 30 milligram tablet in combination with acetaminophen. At an average of $20 per prescription, it is the least expensive opioid.

Morphine is available as a single-ingredient drug (morphine sulfate). In California's workers' compensation the most common formulations are extended-release tablets and capsules, which constituted 85 percent of the morphine prescriptions in 2014.This suggests that morphine is being used to treat chronic pain. Utilization of brand name drugs (e.g., Kadian, MS Contin) has declined from 57 percent of morphine drugs in 2005 to 9 percent in 2014.

Fentanyl was approved by the FDA for treatment of cancer patients who have severe pain. It is 15 - 100 times more potent than morphine, and is prescribed to patients who are considered "opioid tolerant" (i.e., already addicted). It is available in a wide variety of formulations, including: transdermal patch, tablet, lozenge, injectable solution, sublingual spray, and compounding powder. The majority of fentanyl prescribed in workers' compensation (94 percent in 2014) has been for 72-hour patches, followed by solution (2 percent) and lozenges (2 percent). Brand utilization of patches was 41 percent of the total in 2005 and declined to 10 percent in 2014. The most common brands of fentanyl were Duragesic (transdermal patch), Subys (liquid spray), Fentora (tablet), and Actiq (lozenge).

Exhibit 5 illustrates the changes in opioid prescribing patterns over time. It shows the seven most widely prescribed opioids, as well as all other opioids, as a percentage of all California workers' compensation prescriptions from 2005 through 2014.

Exhibit 5: Top Opioid Drugs by Year of Service – Percentage of California Workers' Comp Prescriptions



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Hydrocodone	15.9%	16.9%	18.0%	18.6%	18.6%	18.4%	18.4%	17.1%	16.3%	14.5%
Tramadol	3.7%	4.2%	4.8%	4.4%	4.5%	4.4%	4.7%	4.9%	5.3%	5.7%
Oxycodone	0.7%	0.9%	1.6%	2.8%	3.1%	3.3%	3.6%	3.5%	3.3%	3.2%
Propoxyphene	4.1%	3.7%	2.3%	2.0%	1.8%	1.4%	0.0%	0.0%	0.0%	0.0%
Codeine	1.7%	1.5%	1.4%	1.1%	1.1%	0.9%	1.0%	0.9%	0.8%	0.8%
Morphine	0.3%	0.3%	0.6%	1.0%	1.0%	1.0%	1.1%	1.0%	0.9%	0.8%
Fentanyl	0.2%	0.3%	0.5%	0.8%	0.7%	0.7%	0.7%	0.6%	0.6%	0.5%
Other Opioids	0.3%	0.3%	0.5%	0.9%	1.0%	1.3%	1.8%	1.8%	1.7%	1.6%

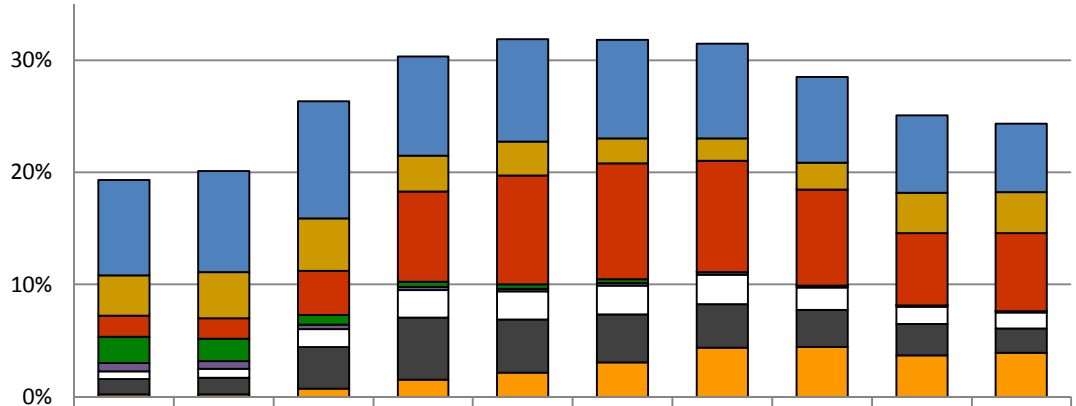
Exhibit 5 reveals a number of key findings:

- **Hydrocodone** (e.g., Norco, Vicodin) was by far the most frequently prescribed opioid during the study period. The portion represented by hydrocodone peaked at 18.6 percent of all prescriptions (59.0 percent of opioids) in 2008 and 2009, then declined to 14.5 percent (53.5 percent of opioids) in 2014.
- **Tramadol** (e.g., Ultram, Ultracet), the second most frequently prescribed opioid, increased from 3.7 percent of all prescriptions in 2005 to 5.7 percent of prescriptions in 2014. As a portion of all opioids, tramadol grew from 13.7 percent to 21.1 percent, making it the second fastest growing opioid drug.
- **Oxycodone** (e.g., OxyContin, Percocet), the third most frequently prescribed opioid, increased from 0.7 percent of all prescriptions in 2005 to 3.2 percent in 2014. As a portion of all opioids, oxycodone grew from 2.6 percent to 11.8 percent, a net change of 9.2 percentage points, making it the fastest growing opioid.

- **Propoxyphene** (e.g., Darvon, Darvocet) represented 4.1 percent of all prescriptions in 2005 (15.2 percent of opioids), however, its share declined to 0.0 percent in 2011. Although this drug was the subject of safety concerns for decades, it was not until 2009 that the FDA issued a safety warning about the risk of overdose, and not until 2010 that the FDA finally banned it altogether.
- **Codeine** represented 1.7 percent of all prescriptions in 2005 (6.4 percent of opioids), but it declined to 0.8 percent of all prescriptions (2.8 percent of opioids) in 2014.
- **Morphine**, which represented 0.3 percent of all prescriptions in 2005 (1.0 percent of opioids) increased to 0.8 percent (3.0 percent of opioids) in 2014.
- **Fentanyl** represented 0.2 percent of all prescriptions in 2005 (0.9 percent of opioids) and it increased to 0.5 percent (1.8 percent of opioids) in 2014.
- **All other opioids** combined represented 0.3 percent of all prescriptions in 2005 (1.0 percent of opioids), and increased to 1.6 percent (6.0 percent of opioids) in 2014. Among the drugs in this category were buprenorphine, including the Butrans transdermal patch (21 percent), oxymorphone (19 percent), and methadone (14 percent).

Exhibit 6 tracks opioid payment patterns over time by showing the amounts paid for the most widely prescribed opioids as a percent of all workers' compensation prescription payments from 2005 to 2014.

Exhibit 6: Top Opioid Drugs by Year of Service – Percentage of Total Payments



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Hydrocodone	8.5%	9.0%	10.5%	8.8%	9.1%	8.8%	8.5%	7.7%	6.9%	6.1%
Tramadol	3.6%	4.1%	4.6%	3.2%	3.0%	2.2%	2.0%	2.4%	3.6%	3.7%
Oxycodone	1.9%	1.8%	4.0%	8.0%	9.7%	10.4%	9.9%	8.6%	6.4%	6.9%
Propoxyphene	2.3%	2.0%	0.8%	0.5%	0.4%	0.3%	0.0%	0.0%	0.0%	0.0%
Codeine	0.7%	0.7%	0.4%	0.3%	0.3%	0.2%	0.2%	0.2%	0.1%	0.1%
Morphine	0.7%	0.8%	1.6%	2.5%	2.5%	2.6%	2.6%	2.0%	1.5%	1.4%
Fentanyl	1.4%	1.5%	3.7%	5.5%	4.7%	4.3%	3.9%	3.3%	2.8%	2.2%
Other Opioids	0.2%	0.2%	0.7%	1.5%	2.2%	3.1%	4.4%	4.4%	3.7%	3.9%

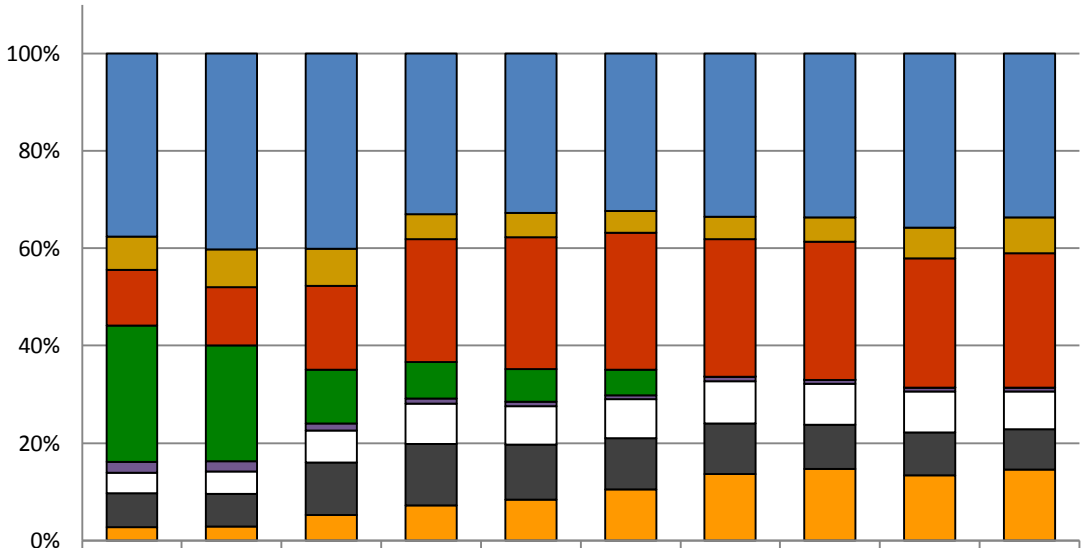
Key findings revealed in Exhibit 6 are:

- **Hydrocodone** represented 6.1 percent of all payments in 2014. This is below its 14.5 percent share of 2014 prescriptions, reflecting its relatively low average payment per prescription ($53).
- **Oxycodone** represented 1.9 percent of all payments in 2005 and increased to 6.9 in 2014; this is much higher than its 2014 share of prescriptions (3.2 percent). The higher portion of payments reflects its relatively high average payment per prescription ($271).
- **Codeine** was the least costly opioid ($20) in 2014. Its share of payments declined from 0.7 percent in 2005 to 0.1 percent in 2014.
- **Fentanyl** accounted for 2.2 percent of the 2014 payments, but only 0.5 percent of the prescriptions. This reflects a relatively high average payment per prescription ($574).
- **Other opioids** represented only 0.2 percent of payments in 2005, but increased to 3.9 percent in 2014. This was due to the emergence of several relatively high cost brand name drugs:
  - Buprenophine (e.g., Butans) weekly patch
  - Tapentadol (e.g., Nucynta) tablet
  - Oxymorphone (e.g., Opana) 12-hour abuse-deterrent tablet
  - Hydromorphone (e.g., Exalgo) 24-hour abuse-deterrent tablet

Distribution of Morphine Equivalents in Workers' Comp by Type of Opioid

A Morphine Milligram Equivalent (MME) represents the potency of one milligram of morphine. This measure can be used to compare opioid use across different drugs and over time (the method for calculating MME is described in Appendix 3). Exhibit 7 shows the proportion of the total MMEs represented by the most widely prescribed opioid drugs in each year of the study.

Exhibit 7: Top Opioid Drugs by Year of Service – Percentage of Morphine Equivalents



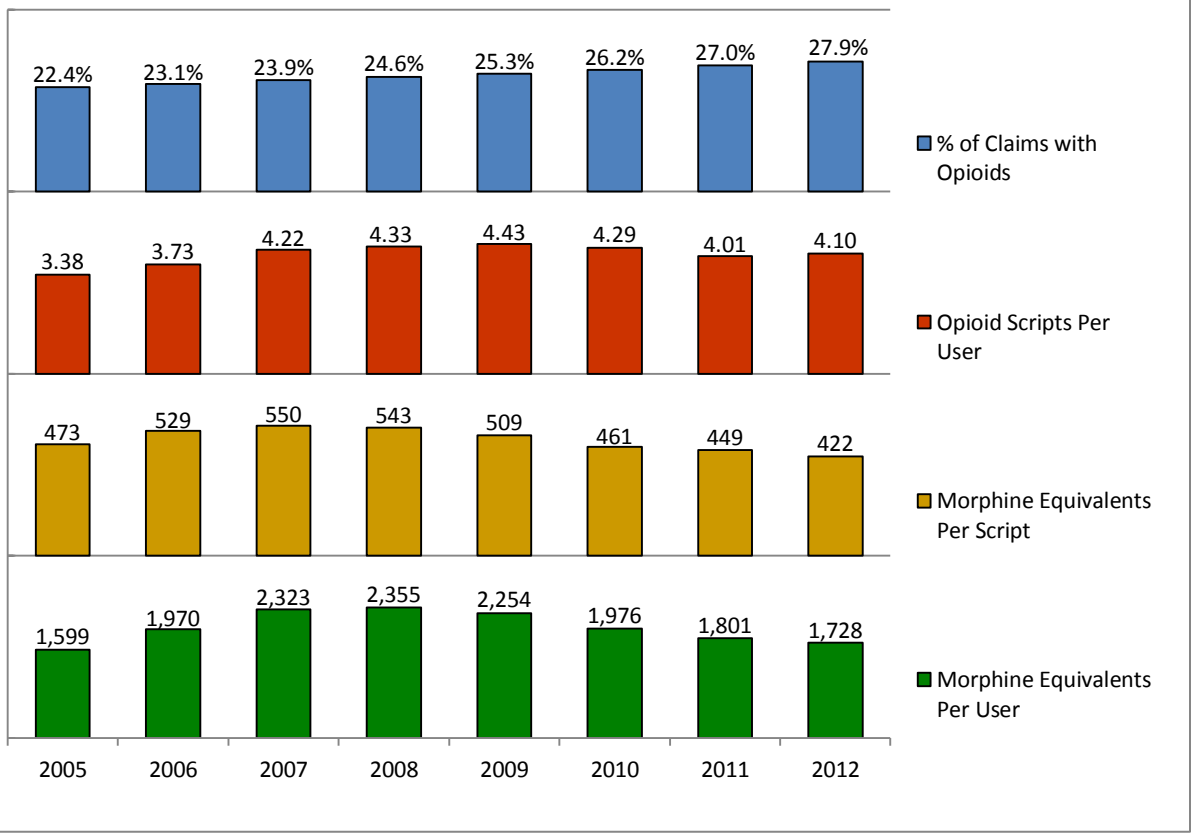
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Hydrocodone	37.5%	40.2%	40.1%	32.9%	32.7%	32.4%	33.5%	33.6%	35.7%	33.7%
Tramadol	6.9%	7.8%	7.6%	5.2%	5.0%	4.4%	4.6%	5.1%	6.3%	7.3%
Oxycodone	11.5%	12.0%	17.1%	25.3%	27.1%	28.2%	28.3%	28.3%	26.6%	27.6%
Propoxyphene	28.0%	23.8%	11.1%	7.5%	6.7%	5.2%	0.0%	0.0%	0.0%	0.0%
Codeine	2.2%	2.1%	1.4%	1.0%	1.0%	0.8%	0.9%	0.8%	0.8%	0.8%
Morphine	4.3%	4.5%	6.6%	8.2%	7.9%	8.0%	8.6%	8.4%	8.3%	7.7%
Fentanyl	6.9%	6.7%	10.8%	12.7%	11.3%	10.6%	10.4%	9.1%	8.9%	8.3%
Other Opioids	2.8%	2.9%	5.2%	7.2%	8.4%	10.4%	13.6%	14.7%	13.4%	14.6%

- **Oxycodone** had the fastest growing percentage of total morphine equivalents during the study period. Its portion of the total morphine equivalents in California workers' compensation more than doubled from 11.5 percent in 2005 to 27.6 percent in 2014.
- **Other opioids** had the second fastest growing portion of total MMEs between 2005 and 2014, reflecting the emergence of the high cost/high potency, brand name drugs noted under Exhibit 6. As a result, opioids other than the seven drugs noted above saw their share of total MMEs increase fivefold from 2.8 percent in 2005 to 14.6 percent in 2014.
- **Morphine** increased from 4.3 percent of the MMEs in 2005 to 7.7 percent in 2014.
- **Propoxyphene** decreased from 28.0 percent of the morphine equivalents in 2005 to 0.0 percent in 2011, after it was banned by the FDA.

Part III: Opioid Utilization at Various Levels of Claim Development

Exhibit 8 displays several population-based trends in the use of opioids and Morphine Milligram Equivalents (MMEs). Unlike the previous exhibits which are based on service year, these figures were derived from accident year (AY) 2005 to 2012 claims and show four different measures of opioid utilization at 24 months post injury across these eight accident years.

Exhibit 8: Opioid Utilization by Accident Year at 24-Months of Claim Development



As shown above, at 24-months of claim development:

- **The percentage of claims in which opioids were dispensed in the first two years post injury** increased steadily from 22.4 percent in AY 2005 to 27.9 percent in AY 2012, though as noted below, this steady growth in the proportion of claims involving opioids does not hold for all claim development periods.
- **The average number of opioid prescriptions per opioid user** at the 2-year benchmark increased from 3.38 in AY 2005 to 4.10 in AY 2012, an increase of 21 percent. The highest level (4.43) was reached in AY 2009, followed by a 7 percent decline between 2009 and 2012.
- **The average number of MMEs per opioid prescription** increased from 473 in AY 2005 to a peak of 550 in AY 2007, but then began a steady downtrend, falling 23 percent over the next five years to 422 in AY 2012.

- **The average number of MMEs per opioid user** increased 47 percent from 1,599 in AY 2005 to a record 2,355 in AY 2008, but then declined steadily over the next four years, falling 27 percent to an average of 1,728 MMEs per user in AY 2012. The result of these fluctuations was a net increase of 8.8 percent in the average MMEs per opioid user between AY 2005 and AY 2012.

Exhibit 8 shows that, while the percentage of claims that involved opioids at 24 months post injury increased in every accident year from AY 2005 to AY 2012, several other measures of opioid use—opioid prescriptions per claim, MMEs per opioid prescription, and MMEs per opioid user—peaked between 2007 and 2009 and have since declined. These are positive trends so it will be important to monitor them and to identify what may be driving them.

Opioid Utilization on AY 2005-2012 Claims at Various Levels of Claim Development

While Exhibit 8 shows four measures of opioid utilization for AY 2005-AY 2012 claims at 24-months post injury, different trends emerge when opioid utilization is gauged at earlier or later stages of claim development. Appendices 4a and 4b provide a more detailed look at the timing of opioid utilization for each accident year by comparing the percentage of claims that involved opioids at 3, 12, 24, and 36 months post injury, as well as the average number of opioid prescriptions per user, the average number of MMEs per opioid prescription, and the average number of MMEs per opioid user at these four levels of development. The results for the shorter development periods, such as 3-months post injury, show the level of opioid use for the most recent claims in the study (with injury dates as recent as September 30, 2014). This provides an indication of trends that may be emerging and offers a window into opioid utilization during the critical first few months of treatment. The results measured later in the life of the claim, such as at 36 months post injury, offer a more complete picture, as they cover a much larger proportion of the life of a claim. However, this longer-term experience is only available for older claims (e.g., in this study sample, the most recent claims for which 36-month data were available were from AY 2011).

The earlier results found that the percentage of claims in which opioids were dispensed within 24 months of the injury increased in every accident year of the study. However, analysis of shorter development periods indicates a different opioid utilization pattern may be developing in the initial stages of the newest claims. For example, Appendix 4a shows that the percentage of claims in which opioids were dispensed within 3 months of the injury increased steadily from 18.0 percent in AY 2005 to 22.0 percent in AY 2012. However, the results for AY 2013 claims and AY 2014 (through September) claims indicate that opioid utilization at the 3-month benchmark fell to 19.5 percent. Similarly, the percentage of claims with opioid prescriptions within 12 months of injury increased across seven consecutive accident years (from 21.2 percent in AY 2005 to 26.5 percent in AY 2012) before declining to 24.2 percent in AY 2013.

These findings, which are based on the shortest levels of development measured in the study, suggest that the proportion of injured workers receiving opioids may have begun to decline in recent years. This, and the finding that opioid users have been receiving fewer prescriptions and MMEs over the past several years, could portend new, positive trends. This potential development should be closely monitored as these claims continue to develop.

Discussion

Public awareness of the opioid epidemic and its repercussions has reached critical mass, putting increased pressure on state and federal policymakers to address the issue. In March 2016, the U.S. Centers for Disease Control took an important step by issuing a guideline with recommendations for primary care clinicians who prescribe opioids for chronic pain outside of active cancer treatment, palliative care, and end-of-life care. The guideline addresses when to initiate or continue opioids for chronic pain; opioid selection, dosage, duration, follow up, and discontinuation; and addresses potential risks associated with opioid use.[10]

At the state level, Kentucky enacted legislation in 2012 requiring physicians to check the state's prescription drug monitoring program (PDMP) database before prescribing opioids to prevent patients from doctor shopping and receiving multiple opioid prescriptions from different providers; while Massachusetts just enacted new legislation placing restrictions on how opioids can be prescribed, with similar measures now under consideration in Vermont and Maine.[11] In California workers' compensation, legislation (AB 1124) was enacted last year calling for the development and phased-in adoption of a drug formulary beginning in July 2017 which, depending on how it is structured, may provide an opportunity to improve control and management of opioids prescribed to injured workers.

As for opioid utilization in California workers' compensation, this study has uncovered some recent positive trends. Opioids as a percentage of all drugs dispensed to injured workers peaked at 31.9 percent of all prescriptions filled in 2009, then declined in each of the five subsequent years, falling to a 9-year low of 27.2 percent in 2014. Meanwhile, data from AY 2005 through AY 2012 claims also reveal reductions in the average number of prescriptions per opioid user. Furthermore, the potency of those prescriptions as measured by the average number of morphine equivalents per user, and the average number of morphine equivalents per opioid prescription at 3, 12, 24 and 36 months post injury, also fell.

Despite these positive trends, opioid use is still excessive, as these drugs continue to be prescribed in situations where their use is not supported in the scientific literature.[12] In addition, prior Institute studies of utilization review (UR) and independent medical review (IMR) have shown that medical management resources in California workers' compensation have become disproportionately dedicated to the review of requests for opioids and pain management drugs. For example, a January 2014 study found that 43 percent of all utilization reviews involved prescription drug requests,[13] while a February 2016 analysis found that almost half of all IMR determinations issued in 2015 were for prescription drugs, and of those requests, opioids and pain management compounds topped the list of disputed drug requests even though about 90 percent of such requests were ultimately deemed medically unnecessary by the IMR physician.[14]

10. Dowell D, Haegerich TM, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. MMWR Recomm Rep 2016;65:1–49. DOI: http://dx.doi.org/10.15585/mmwr.rr6501e1.
11. Meier, B. Tavernise, S. States Move to Control How Painkillers Are Prescribed. New York Times, March 11, 2016.
12. Swedlow, A., Gardner, L., Ireland, J., Genovese, E. Pain Management and the Use of Opioids in the Treatment of Back Conditions in the California Workers' Compensation System. CWCI Report to the Industry, June 2008.
13. David, R., Ramirez, B., Swedlow, A. Medical Dispute Resolution: Utilization Review and Independent Medical Review In the California Workers' Compensation System. CWCI Research Note, January 2014.
14. David, R., Independent Medical Review Decisions – January Through December 2015. CWCI Spotlight Report, February 2016.

Clearly, more needs to be done to protect injured workers. Recently, Von Korff and Frankin[15] suggested several steps to respond to the crisis of opioid abuse and the associated adverse outcomes:

- Avoid ill-advised and unplanned initiation of chronic opioid therapy;
- Change policies and regulations that do not adhere to scientific evidence of proper use;
- Enhance population surveillance of opioid prescribing and safety, including full implementation and use of prescription drug monitoring programs;[16]
- Step up clinical monitoring by physicians (e.g., checking the PDMP and conducting urine drug tests); and
- Consistently offer reduced levels of opioids as an option for continued pain management treatment.

State regulators and various stakeholders are currently focused on developing supplemental pharmaceutical controls within the California workers' compensation system. These include:

- The creation and phased-in implementation of the state-wide formulary beginning in July 2017;
- Revisions to the chronic pain treatment guidelines within the California Workers' Compensation Medical Treatment Utilization Schedule, which are currently under final review; and
- Ongoing efforts to allow third party payors access to the state's prescription drug monitoring database (CURES) so that they can better monitor physician prescribing patterns and opioid utilization.

Future studies will focus on the degree to which these controls will further curb inappropriate opioid utilization; reduce the negative effects of long-term opioid use on the health, functionality and wellbeing of injured workers; and help contain costs.

It will also be important to consider all related trends. For example, is the reduction in prescription opioid use related to more effective and safer approaches to managing pain and/or to new forms of drug abuse (e.g., the increased use of illegal drugs)? CWCI will continue to monitor these trends and provide regular updates to support discussion and decision-making related to the development of California's workers' compensation formulary and to specifically address pain experienced by injured workers.

15. Von Korff, M., Franklin, G. Responding to America's Iatrogenic Epidemic of Prescription Opioid Addiction and Overdose. Medical Care Volume 54, Number 5, May 2016.
16. The PDMP system in California, CURES 2.0 (Controlled Substance Utilization Review and Evaluation System) is a database of Schedule II, III and IV controlled substance prescriptions dispensed in California serving the public health, regulatory oversight agencies, and law enforcement.

APPENDICES

Appendix 1: Distribution of Opioid Prescriptions by Year of Service, Top 25 Opioids Sorted by 2005-2014 Volume											
Drug Name and Strength	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**'05 - '14 Net Change**
Hydrocodone-Acetaminophen Tab 10-325 MG	10.7%	12.6%	20.8%	25.0%	27.6%	30.0%	30.8%	32.0%	33.4%	32.5%	21.7%
Hydrocodone-Acetaminophen Tab 5-325 MG	0.4%	0.6%	1.6%	2.3%	3.3%	3.5%	4.1%	5.4%	7.8%	13.1%	12.7%
Tramadol Tab 50 MG	12.0%	13.5%	11.0%	9.6%	9.7%	9.1%	10.0%	10.4%	10.9%	12.6%	0.5%
Tramadol-Acetaminophen Tab 37.5-325 MG	1.7%	1.2%	2.4%	2.0%	2.3%	3.3%	3.8%	4.1%	3.8%	4.2%	2.5%
Oxycodone w/ Acetaminophen Tab 10-325 MG	0.3%	0.4%	0.9%	1.8%	2.3%	2.9%	3.5%	3.8%	3.9%	3.9%	3.6%
Hydrocodone-Acetaminophen Tab 7.5-325 MG	0.7%	0.9%	1.4%	1.7%	1.7%	1.7%	2.0%	2.1%	2.6%	3.5%	2.8%
Tramadol Cap SR 24HR Biphasic Release 150 MG	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	2.5%	2.9%	2.9%
Acetaminophen w/ Codeine Tab 300-30 MG	5.3%	4.6%	4.0%	2.9%	2.7%	2.3%	2.7%	2.5%	2.3%	2.4%	-2.8%
Oxycodone w/ Acetaminophen Tab 5-325 MG	0.6%	1.1%	1.4%	1.7%	1.8%	1.7%	1.9%	1.8%	1.8%	1.9%	1.2%
Oxycodone Tab 30 MG	0.0%	0.1%	0.1%	0.3%	0.3%	0.4%	0.6%	0.9%	1.0%	0.8%	0.8%
Morphine Tab CR 30 MG	0.1%	0.2%	0.3%	0.4%	0.4%	0.5%	0.7%	0.7%	0.7%	0.7%	0.6%
Oxycodone Tab 15 MG	0.1%	0.1%	0.2%	0.4%	0.4%	0.6%	0.6%	0.8%	0.8%	0.7%	0.6%
Methadone Tab 10 MG	0.3%	0.4%	0.6%	0.9%	0.8%	0.9%	0.9%	0.8%	0.8%	0.7%	0.4%
Hydrocodone-Acetaminophen Tab 5-500 MG	31.8%	31.0%	23.1%	19.1%	16.7%	14.8%	14.8%	11.7%	7.5%	0.5%	-31.2%
Fentanyl TD Patch 72HR 25 MCG/HR	0.2%	0.2%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.4%	0.2%
Fentanyl TD Patch 72HR 50 MCG/HR	0.2%	0.3%	0.4%	0.6%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.2%
Hydrocodone-Ibuprofen Tab 7.5-200 MG	0.3%	0.3%	0.6%	0.6%	0.5%	0.6%	0.5%	0.5%	0.4%	0.4%	0.1%
Acetaminophen w/ Codeine Tab 300-60 MG	0.7%	0.7%	0.6%	0.6%	0.7%	0.6%	0.5%	0.5%	0.4%	0.4%	-0.4%
Hydrocodone-Acetaminophen Tab 7.5-750 MG	10.0%	9.7%	7.4%	6.4%	5.6%	4.8%	4.0%	3.2%	2.0%	0.1%	-9.9%
Hydrocodone-Acetaminophen Tab 7.5-500 MG	1.4%	1.2%	0.9%	0.8%	0.8%	0.8%	0.7%	0.7%	0.5%	0.1%	-1.3%
Hydrocodone-Acetaminophen Tab 10-500 MG	0.7%	0.7%	0.9%	1.0%	0.7%	0.7%	0.7%	0.6%	0.4%	0.0%	-0.7%
Hydrocodone-Acetaminophen Tab 10-650 MG	2.8%	2.7%	1.4%	0.8%	0.6%	0.5%	0.5%	0.3%	0.2%	0.0%	-2.8%
Propoxyphene-N w/ Acetaminophen Tab 100-650 MG	15.0%	12.8%	7.6%	6.1%	5.4%	4.2%	0.0%	0.0%	0.0%	0.0%	-15.0%
Oxycodone Tab SR 12HR 40 MG	0.3%	0.4%	0.6%	1.2%	1.1%	0.8%	0.1%	0.0%	0.0%	0.0%	-0.3%
Oxycodone Tab SR 12HR 20 MG	0.4%	0.4%	0.8%	1.1%	1.0%	0.8%	0.0%	0.0%	0.0%	0.0%	-0.4%
Total (Percent of Opioids)	**96.1%**	**96.1%**	**89.4%**	**87.7%**	**87.4%**	**86.7%**	**84.5%**	**84.5%**	**84.7%**	**82.2%**	**-14.0%**

Appendix 2: Distribution of Opioid Payments by Year of Service, Top 25 Opioids Sorted by 2005-2014 Volume											
Drug Name and Strength	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**'05-'14 Net Change**
Hydrocodone-Acetaminophen Tab 10-325 MG	13.0%	15.5%	17.8%	17.3%	17.7%	19.2%	18.9%	19.5%	19.9%	16.8%	3.8%
Tramadol Cap SR 24HR Biphasic Release 150 MG	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	8.8%	9.0%	9.0%
Oxycodone w/ Acetaminophen Tab 10-325 MG	0.8%	1.0%	2.1%	3.5%	4.2%	5.2%	6.1%	6.3%	6.4%	8.2%	7.4%
Oxycodone Tab ER 12HR Deter 80 MG	0.0%	0.0%	0.0%	0.0%	0.0%	3.3%	9.7%	8.8%	6.8%	6.9%	6.9%
Oxycodone Tab ER 12HR Deter 40 MG	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	4.8%	4.4%	3.4%	3.8%	3.8%
Hydrocodone-Acetaminophen Tab 5-325 MG	0.2%	0.3%	0.7%	0.8%	1.0%	1.0%	1.1%	1.5%	2.1%	3.1%	2.9%
Oxycodone Tab ER 12HR Deter 60 MG	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	2.6%	2.8%	2.2%	2.4%	2.4%
Fentanyl TD Patch 72HR 100 MCG/HR	1.9%	1.9%	3.2%	4.1%	3.8%	4.0%	3.6%	3.1%	2.6%	2.0%	0.1%
Oxycodone Tab ER 12HR Deter 20 MG	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	2.7%	2.4%	1.7%	1.8%	1.8%
Tramadol-Acetaminophen Tab 37.5-325 MG	1.9%	1.3%	1.6%	1.2%	1.2%	1.9%	2.0%	2.1%	1.7%	1.7%	-0.2%
Tramadol Tab 50 MG	16.7%	18.5%	6.7%	3.6%	2.7%	1.7%	1.7%	1.6%	1.6%	1.7%	-15.0%
Fentanyl TD Patch 72HR 75 MCG/HR	1.2%	0.9%	1.9%	2.3%	2.4%	2.2%	1.9%	1.7%	1.7%	1.4%	0.2%
Fentanyl TD Patch 72HR 50 MCG/HR	1.1%	1.2%	1.7%	1.8%	1.4%	1.5%	1.5%	1.3%	1.3%	1.2%	0.1%
Oxycodone Tab 30 MG	0.1%	0.1%	0.3%	0.5%	0.6%	0.9%	1.2%	1.5%	1.5%	1.2%	1.1%
Hydrocodone-Acetaminophen Tab 7.5-325 MG	0.5%	0.6%	0.8%	0.8%	0.7%	0.7%	0.8%	0.8%	1.0%	1.2%	0.7%
Fentanyl Citrate Buccal Tab 600 MCG (Base Equiv)	0.0%	0.0%	0.4%	0.6%	1.0%	0.9%	1.3%	1.7%	1.5%	0.6%	0.6%
Oxymorphone Tab SR 12HR 40 MG	0.0%	0.0%	0.3%	0.8%	1.2%	1.8%	2.9%	1.0%	0.3%	0.5%	0.5%
Hydrocodone-Acetaminophen Tab 5-500 MG	16.0%	15.0%	5.6%	3.1%	3.7%	3.4%	3.4%	2.4%	1.4%	0.1%	-15.9%
Tramadol Tab 50 MG & Dietary Management Cap Pack	0.0%	0.0%	7.4%	3.1%	2.5%	0.3%	0.2%	0.1%	0.1%	0.0%	0.0%
Hydrocodone-Acetaminophen Tab 7.5-750 MG	7.2%	6.7%	2.7%	1.5%	1.3%	1.1%	0.9%	0.7%	0.4%	0.0%	-7.2%
Propoxyphene-N w/ Acetaminophen Tab 100-650 MG	11.9%	9.8%	3.0%	1.4%	1.1%	0.9%	0.0%	0.0%	0.0%	0.0%	-11.9%
Hydrocodone-APAP Tab 10-650 MG & Dietary Manage Cap Pack	0.0%	0.0%	8.4%	2.9%	2.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Oxycodone Tab SR 12HR 80 MG	3.2%	2.9%	5.4%	10.5%	12.0%	8.3%	0.1%	0.0%	0.0%	0.0%	-3.2%
Oxycodone Tab SR 12HR 40 MG	2.6%	2.3%	3.3%	5.8%	5.7%	4.4%	0.3%	0.0%	0.0%	0.0%	-2.6%
Oxycodone Tab SR 12HR 20 MG	1.7%	1.5%	2.2%	3.1%	3.1%	2.3%	0.1%	0.0%	0.0%	0.0%	-1.7%
Total Opioids	**79.9%**	**79.6%**	**75.3%**	**68.5%**	**69.5%**	**68.1%**	**67.8%**	**66.5%**	**66.4%**	**63.7%**	**-16.3%**

Appendix 3: Relative Potency of Common Opioid Medications				
Opioid Ingredient	**Morphine Milligram Equivalent (MME) Conversion Factor[1]**	**Common Product Name**	**Common Individual Doses**	**Morphine Equivalent Dose (MED)[2]**
Hydrocodone	1.00	Generic Vicodin/Norco	5-10 mg tablet 5-10 mg tablet	5-10 5-10
Tramadol	0.10	Generic Generic Ultracet Ultram Ultram ER	37.5-50 mg tablet 100-300 mg 24-hr release capsule 37.5 mg tablet 50 mg tablet 100-300 mg extended release tablet	3.75-5 10-30 3.75 5 10-30
Oxycodone	1.50	Percocet/Endocet OxyContin	5-10 mg tablet 10-80 mg extended release tablet	7.5-15 15-120
Propoxyphene	0.23	Generic Darvon/Darvocet Propoxacet	100 mg tablet 100 mg tablet 100 mg tablet	23 23 23
Codeine	0.15	Tylenol/Codine	15-60 mg tablet	2.25-9
Morphine	1.00	Generic Generic MS Contin Kadian	15-30 mg tablet 15-200 mg extended release tablet 15-200 mg extended release tablet 10-200 mg 24-hr release tablet	15-30 15-200 15-200 10-200
Fentanyl Patch[3]	7.20	Generic Duragesic	12-100 mcg/hr 72-hr patch 12-100 mcg/hr 72-hr patch	86-720 86-720
Fentanyl Lozenge/ Sublingual Tablet[3]	0.13	Generic Actiq Fentora	200-1600 microgram lozenge 200-1600 microgram lozenge 100-800 microgram tablet	26-208 26-208 13-104

1. Morphine Milligram Equivalent (MME) Conversion Factors were obtained from the Centers for Disease Control.
2. Morphine Equivalent Dose (MED) represents a single dose, not a cumulative daily dose.
3. The conversion factors for Fentanyl are multiplied by micrograms (mcg), rather than milligrams (mg).

Appendix 3 compares the relative potency across the most common opioids in California workers' compensation. The measures include both the Morphine Milligram Equivalent (MME) conversion factors and Morphine Equivalents Dose (MED) for a single dose.

- The MME conversion factor represents the relative potency of *one* milligram of the opioid chemical ingredient, given the formulation of the drug and how it was intended to be used (e.g., swallowed, applied as a patch, or injected).
- The MED is based on the MME multiplied by the drug strength in milligrams or micrograms (fentanyl).

Another important measure, although not included above, is the Morphine Equivalent Daily Dose (MEDD). This measure represents the number of morphine equivalents consumed within a 24-hour period. This measure would generally be used when establishing safety standards and/or treatment guidelines.

Appendix 4a: Opioid Utilization at 3-Months and 12-Months of Claim Development

Opioid Utilization at 3-Months of Claim Development										
Measure	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
% of Claims with Opioids										
Mean	18.0%	18.4%	18.7%	19.8%	20.2%	20.7%	21.2%	22.0%	19.5%	19.5%
Prescriptions Per Opioid User										
Mean	1.80	1.83	1.93	2.01	2.04	1.99	1.89	1.91	1.91	1.76
25th Percentile	1	1	1	1	1	1	1	1	1	1
50th Percentile	1	1	1	1	1	1	1	1	1	1
75th Percentile	2	2	2	2	2	2	2	2	2	2
90th Percentile	4	4	4	4	4	4	4	4	4	3
95th Percentile	5	5	5	6	6	6	5	5	5	5
Morphine Equivalents Per Opioid Prescription										
Mean	267	273	275	280	267	258	230	238	237	249
25th Percentile	100	100	100	100	100	100	100	100	100	100
50th Percentile	150	150	150	150	150	150	150	150	150	150
75th Percentile	305	300	300	300	298	300	233	240	250	300
90th Percentile	495	540	500	500	460	460	375	400	446	450
95th Percentile	690	690	690	690	690	621	518	550	558	600
Morphine Equivalents Per Opioid User										
Mean	480	497	531	563	545	515	434	456	453	439
25th Percentile	100	100	100	113	113	113	113	113	113	113
50th Percentile	200	218	200	225	225	225	200	200	225	225
75th Percentile	500	550	550	600	600	540	450	450	450	450
90th Percentile	1,070	1,200	1,200	1,350	1,295	1,200	920	1,035	1,000	975
95th Percentile	1,725	1,800	1,880	2,070	2,010	1,850	1,500	1,600	1,650	1,500

Opioid Utilization at 12-Months of Claim Development									
Measure	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
% of Claims with Opioids									
Mean	21.2%	21.7%	22.5%	23.4%	23.9%	24.5%	25.4%	26.5%	24.2%
Prescriptions Per Opioid User									
Mean	2.63	2.71	3.04	3.19	3.22	3.15	2.94	3.11	2.93
25th Percentile	1	1	1	1	1	1	1	1	1
50th Percentile	1	1	1	1	2	2	1	2	2
75th Percentile	3	3	3	3	3	3	3	3	3
90th Percentile	6	6	7	7	8	7	7	7	7
95th Percentile	9	9	11	12	11	11	10	11	10
Morphine Equivalents Per Opioid Prescription									
Mean	375	392	423	425	397	367	345	353	332
25th Percentile	100	100	100	100	113	113	113	113	100
50th Percentile	150	169	167	171	167	175	150	167	188
75th Percentile	355	375	363	360	350	323	300	300	309
90th Percentile	660	690	675	630	600	571	496	500	500
95th Percentile	900	900	920	900	840	706	600	647	600
Morphine Equivalents Per Opioid User									
Mean	984	1,064	1,287	1,357	1,279	1,156	1,015	1,097	973
25th Percentile	125	135	150	150	150	150	150	135	150
50th Percentile	300	300	300	300	300	300	300	300	300
75th Percentile	800	900	950	1,020	1,050	975	850	900	900
90th Percentile	2,318	2,450	2,819	3,050	3,005	2,700	2,306	2,650	2,250
95th Percentile	4,140	4,440	5,275	5,723	5,400	4,825	4,000	4,779	3,775

Appendix 4b: Opioid Utilization at 24-Months and 36-Months of Claim Development

Opioid Utilization at 24-Months of Claim Development								
Measure	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
% of Claims with Opioids								
Mean	22.4%	23.1%	23.9%	24.6%	25.3%	26.2%	27.0%	27.9%
Prescriptions Per Opioid User								
Mean	3.38	3.73	4.22	4.33	4.43	4.29	4.01	4.10
25th Percentile	1	1	1	1	1	1	1	1
50th Percentile	1	1	2	2	2	2	2	2
75th Percentile	3	4	4	4	4	4	4	4
90th Percentile	8	9	10	11	11	11	10	10
95th Percentile	13	15	17	18	18	17	16	16
Morphine Equivalents Per Opioid Prescription								
Mean	473	529	550	543	509	461	449	422
25th Percentile	100	100	100	113	113	113	113	113
50th Percentile	190	200	200	200	200	200	188	200
75th Percentile	418	450	420	414	400	375	319	338
90th Percentile	690	690	690	690	650	600	550	540
95th Percentile	1,004	1,030	1,035	990	900	788	707	690
Morphine Equivalents Per Opioid User								
Mean	1,599	1,970	2,323	2,355	2,254	1,976	1,801	1,728
25th Percentile	135	150	150	150	150	150	150	150
50th Percentile	345	345	350	353	378	375	300	300
75th Percentile	1,050	1,210	1,360	1,380	1,380	1,350	1,200	1,200
90th Percentile	3,510	4,250	4,830	5,100	4,950	4,400	3,775	4,000
95th Percentile	7,020	8,400	10,160	10,110	9,700	8,440	7,650	7,460

Opioid Utilization at 36-Months of Claim Development							
Measure	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
% of Claims with Opioids							
Mean	23.0%	23.7%	24.3%	25.2%	25.9%	26.8%	27.5%
Prescriptions Per Opioid User							
Mean	4.10	4.63	5.13	5.20	5.29	5.09	4.68
25th Percentile	1	1	1	1	1	1	1
50th Percentile	1	2	2	2	2	2	2
75th Percentile	4	4	4	4	5	5	4
90th Percentile	10	11	13	13	14	13	12
95th Percentile	17	20	23	23	23	22	20
Morphine Equivalents Per Opioid Prescription							
Mean	583	637	643	620	576	527	509
25th Percentile	100	108	100	113	113	113	113
50th Percentile	200	203	200	201	203	215	200
75th Percentile	450	455	450	445	416	389	338
90th Percentile	700	720	733	695	675	600	572
95th Percentile	1,103	1,104	1,100	1,018	915	840	725
Morphine Equivalents Per Opioid User							
Mean	2,390	2,949	3,299	3,222	3,051	2,683	2,385
25th Percentile	150	150	150	150	150	150	150
50th Percentile	345	390	400	400	405	400	300
75th Percentile	1,255	1,380	1,500	1,575	1,650	1,560	1,290
90th Percentile	4,773	5,730	6,480	6,600	6,135	5,650	4,613
95th Percentile	9,900	12,450	14,145	13,763	12,735	11,420	9,683

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