Post-Injury Wage Loss: A Quasi-Experimental Design

Prepared for The NIOSH Mountain and Plains Education and Research Center (MAP ERC)

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Abstract

The following paper details the Workers' Compensation pilot study undertaken by Research & Planning on behalf of the National Institute for Occupational Safety and Health. The objective of the pilot study was to provide a better understanding of the demographics of claimants in addition to developing a methodology for control group analysis. Pilot study results indicated a consistent pattern in earnings loss for claimants, particularly in the construction and mining industries. The earnings of medical claimants compared to non-claimants were statistically different. The same result occurred when comparing the post-injury earnings of medical only claimants to more severely injured workers. The results further indicate increased risk of claims-filing for workers in those two industries relative to the general worker population. The focus of future research will be on the costs to workers and to the economy of claimed injuries and those occupations at greatest risk for the most costly injuries.

Post-Injury Wage Loss:

A Quasi-Experimental Design

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Chapter 1: Introduction

by: Tony Glover, Senior Research Analyst

The Occupational Safety and Health Administration (OSHA, 2009) estimates that each year 5,200 deaths occur as a direct result of workplace injuries, 50,000 employees die from long-term illnesses related to workplace exposure, and nearly 4.3 million people suffer non-fatal injuries. Leigh, Markowitz, Fahs, and Landrigan (2000) estimated the total direct and indirect cost related to workplace injury and illness was between $128 billion and $155 billion.

A recent meta-analysis (an analysis combining results from several studies related to a similar topic) on occupational injury and illness (Schulte, 2005) reviewed forty independent studies and concluded "The magnitude of occupational disease and injury burden is significant but underestimated. There is need for an integrated approach to address these underestimates." Shulte's meta-analysis revealed that current approaches to measuring costs due to occupational injuries or death are indirect and incomplete. In 2001 Reville, Bhattacharya, & Weinstein speculated that technological advances and linked employee-employer databases should lead to rapid advances in understanding the economic consequences of workplace injuries. To our knowledge, Wyoming's Research & Planning is the only agency in this country with complete access to the four databases used in this study. We believe this study a good first step towards using administrative databases as Reville proposed in 2001.

In March of 2008 the Wyoming Department of Employment, Research & Planning (R&P) submitted a proposal to the National Institute for Occupational Safety and Health (NIOSH) to study the impact of occupational injuries on employees short- and long-term earnings. In contrast to the studies described above which were based on surveys and human capitol statistical models, R&P's method combines several comprehensive longitudinal administrative databases. R&P's research focus is on workplace-specific injuries both in number and relative severity from the non-severe requiring minor medical attention to the most severe resulting in death. By combining administrative databases and analyzing long-term wage loss, R&P suggests consideration be given to the idea that prevention efforts be focused on workplace settings with the greatest number of injuries and injuries that lead to the most economic harm on the workers, the workers' families, and Wyoming's medical services.

The first advantage of administrative databases is the volume of information they contain. For example, when collecting survey data, it is typical to collect information on subsequent earnings from a small representative sample of the group studied. In contrast, R&P uses Unemployment Insurance (UI) Wage Records, which include the wages by quarter for 90.0% of persons employed in Wyoming from 1992 to present. Additionally, survey data is collected from the individual and subject to reporting errors due to recall bias, incentives to misrepresent, and other factors. Wage records are collected from employers for unemployment insurance tax purposes, are frequently audited, and have penalties associated with misrepresentation. Lastly, administrative databases are easily combined with other administrative databases and are less costly to collect, maintain, and analyze. A brief list and descriptions of the databases used in the first phase this study are below.

- R&P's Wyoming Administrative data
- Worker's Compensation data (WC) – Workers' compensation claims in 2004.

- Wage Records – Wages by social security number for all persons employed in UI covered employment from 1992 to present.

- Driver's License Data (DL) – Wyoming driver's license activity from 1988 to present including dates of issuance and renewal and change of address. License data is used to construct theoretically relevant comparison (control) groups.

- Quarterly Census of Employment and Wages (QCEW) – A quarterly count of employment and wages by employer from 1990 to present. QCEW assigns a North American Industrial Classification System code to the industries in which employees work.

A disadvantage of administrative databases includes an absence of depth. For example, we may observe using wage records that an individual's total wages from one year to the next declined but the database does not offer details as to why this occurred. The reasons could include an economic downturn or recession (which is largely outside the individual's control), or taking time off to care for a family member (a very personal reason). However, the methodological design of this study counters this disadvantage in the following ways.

First, Chapter 2 discusses the economic context (economic expansion) in which our analysis takes place. By knowing what is going on in the environment in which injured individuals are operating we gain a better understanding of the factors shaping employment opportunities and wages. For example, Tables 2a & 2b of Chapter 2 (see pages 13 and 15, respectively) show employment from 2001 to 2008 grew from 239,763 to 287,779 or 20.0%. At the same time, the average weekly wage per job increased from $527 to $780 or 48.0%. In light of this information we would expect to see the injured individual's wages increase at a similar rate if the injury had no impact on earnings.

Second, Chapter 3 shows the methods used to select matched control groups for this study. A matched control group is a statistically selected portion of Wyoming's workforce that is similar to the Workers' Compensation claimants on a number of theoretically relevant characteristics. In the current study, these characteristics include sex and age (characteristics of the individual), earnings, quarters worked, primary industry, and tenure with employer (characteristics of the individual's relationship to Wyoming's labor market). By matching the injured to a randomly matched control group we effectively eliminate the impact of a wage change due to nonwork-related (e.g. personal) reasons as we are just as likely to select a comparable individual that takes time off to care for a family member for the control group.

A true experimental design would have us take the entire workforce of Wyoming and randomly assign individuals to the injured (treatment group) and the non-injured (control group). Our next step would be to injure everyone in the treatment group and then assess the difference in earnings between the two groups at a future point in time. True experimental design, while unethical to conduct for a number of reasons, is the only design that allows you to say that the injury caused an earnings decrease. Due to the ethical problem associated with gathering a random group of people and inflicting a physical injury on them this study uses a quasi-experimental design.

Quasi- or almost-experimental design allows us to determine the impact of an injury on future earnings to a degree of certainty via statistical methods. The most important keys to a quasi-experimental design are an understanding of the

environment with which the participants interact and the control group selection. Both of these, mentioned previously, are documented in more detail in the following chapters. For a more in depth discussion of control groups and research design see "Compared to What? Purpose and Method of Control Group Selection" (Glover, 2002).

The results of this study clearly demonstrate that an injury has a significant impact on the Workers' Compensation claimants' subsequent earnings and quarters worked over the three and a half years following injury in 2004. The difference in earnings and quarters worked correspondingly increase with the severity of the injury. The results also show that the earnings loss relative to the severity of the injury is further differentiated by the industry in which the individual worked. Lastly, this study demonstrates the effectiveness of using comprehensive longitudinal databases to address current labor market issues.

The 2004 WC file was coded to the Standard Occupational Classification system by R&P employees responsible for occupational coding in the BLS's Occupational Employment Statistics (OES), Survey of Occupational Injury and Illness (SOII), and Census of Fatal Occupational and Injuries (CFOI) programs based on the information contained on the Wyoming Report of Injury Form (see Appendix A, page 42). Future avenues of research will incorporate the occupation along with the other factors discussed in this study: gender, age, quarters worked, industry, wages, tenure and additional data available from the worker's compensation system (e.g. date of injury) to build predictive models. These models will describe the factors leading to injury or death and give policy makers the tools necessary to help prevent or lessen the impact of those outcomes.

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Chapter 2: Wyoming's Labor Market in Context

by: Sara Saulcy, Senior Economist

Wyoming, like many western states, has strong historical economic and cultural ties to natural resources. Jobs in mining and construction, both of which are growing industries in the state, are physically demanding and present more risk of injury than many jobs. This research uses injury data for 2004 from the Wyoming Workers' Compensation (WC) claims file in conjunction with other data to identify earnings losses of injured workers when compared to similarly employed workers. Because of their importance to Wyoming, we focus on the natural resources & mining (mining in particular) and construction industries. These industries experienced incidence rates of nonfatal injuries in 2004 that were higher than the national average (U.S. Department of Labor, Bureau of Labor Statistics, n.d.). For methodological reasons, we also focus on a sector of the health care industry. Despite the inherent risks of working in mining and construction, the seriousness of injuries can, to a large extent, be controlled through preventative efforts (Chelius, 1991). By focusing on workers at greatest risk for high-cost injuries, surveillance and preventative measures may be instituted to reduce the probability of injury.

In this section we discuss how the dynamics of the state's economy influenced the factors available for analysis, shown in Table 1 (see page 10). These variables are conditions of the circumstances associated with injury rather than proximate factors associated with the event. Because our reference period is a single year, 2004, other unmeasured yet relevant factors (e.g., weather conditions unique to Wyoming) may change, limiting our ability to generalize the results and necessitating study replication. These other factors may interact with age, gender, and other factors.

The Labor Force in General

Figures 1 and 2 show the changing state of Wyoming's labor force from 2000-2008. Figure 1 illustrates labor force estimates, while Figure 2 (see pages 10 and 11, respectively) shows the unemployment rate. Wyoming's economy in 2004 was in the midst of an economic expansion. Growth in the labor force from 2000 to 2004 was more moderate than from 2005 to 2008. Research suggests a link between employee tenure and the likelihood of injury. Tenure itself may be affected by economic growth (see for example Smith, de Hoop, Marx, & Pine, 1999; Rinefort & Van Fleet, 1998). An influx of inexperienced workers in a relatively short time could result in higher-than-average injury rates.

Figure 1 shows that Wyoming added 7,938 people to the labor force (the sum of employed and unemployed) from 2000 to 2004 (270,274 to 278,212). Labor force growth accelerated following 2004, with the labor force growing by 18,600 to 296,812 in 2008.

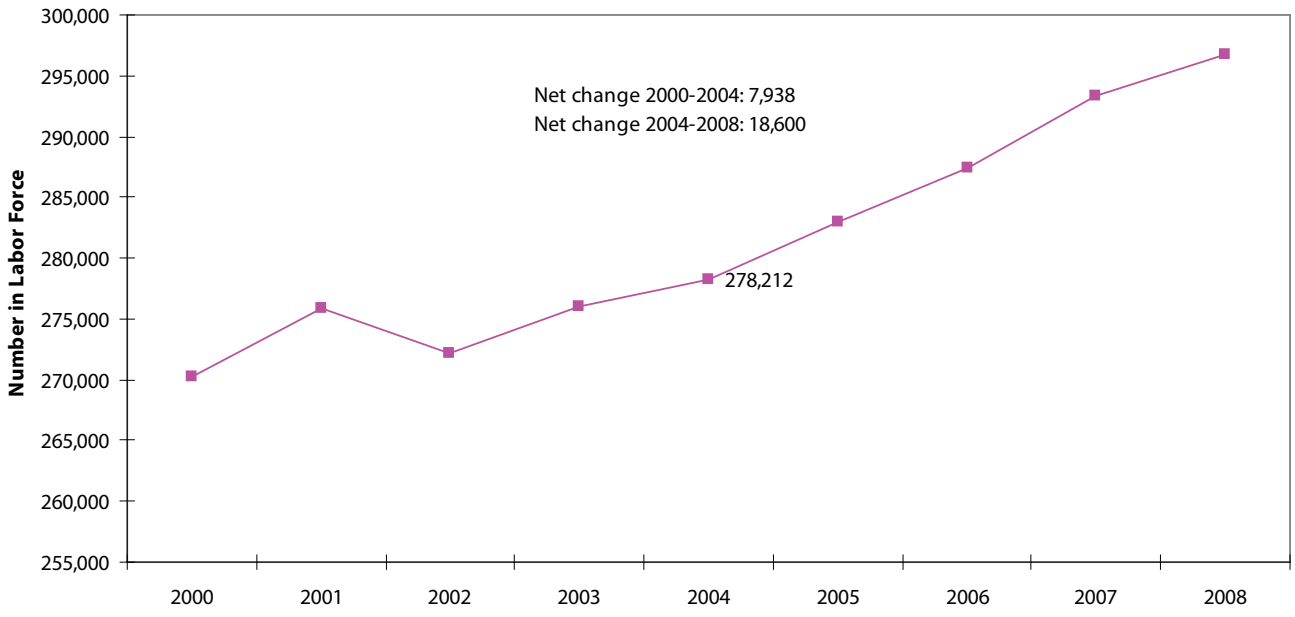
The unemployment rate for Wyoming ranged from a high of 4.0% in 2003 to a low of 2.6% in 2006 (see Figure 2). From 2003 to 2004, the unemployment rate fell by 0.7 percentage points to 3.3%. While the labor force was growing, unemployment declined. This was especially true from 2005 to 2006, when the labor force grew by 1.6% and the unemployment rate stood at 2.6%.

Wyoming is one of five states (the four others are Ohio, North Dakota, Washington, and West Virginia) in which the state is the

(Text continued on page 10)

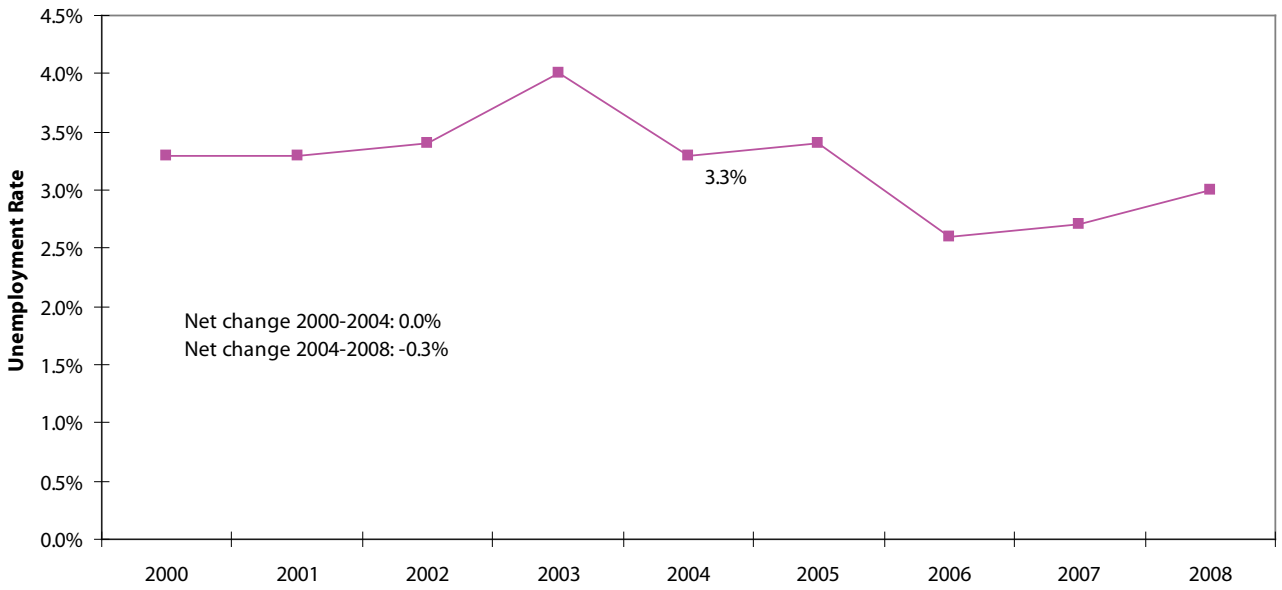
Table 1: **Wyoming Post-Injury Wage Loss Analysis Factors, 2004**

Factor	Definition
Age	Employee's age
Gender	Gender of employee
Tenure	Number of quarters with primary employer from 2001-2004
Primary employer	The employer who paid the employee the highest wages
Quarters worked prior to 2004	Number of quarters worked from 2001-2003
Wyoming resident status	Established by the six quarters surrounding a calendar year; see S. Jones. (2004, August). Worker residency determination - Wyoming stepwise procedure. Wyoming Labor Force Trends. Retrieved March 2, 2009, from http://doe.state.wy.us/lmi/0804/a1supp.htm
Workers' Compensation coverage status	Whether or not the employee is covered by Workers' Compensation by the primary employer
Average wages	An employee's average wages earned from 2001-2004
Total wages	An employee's total wages earned from 2001-2004
2004 wages	The employee's wages in 2004



Source: U.S. Department of Labor, Bureau of Labor Statistics. (n.d.). *State and Metro Area Employment, Hours, & Earnings.* Retrieved February 10, 2009, from http://www.bls.gov/sae/home.htm. Estimates are from survey data rather than the employer universe.

Figure 1: **Wyoming Labor Force, 2000-2008**



Source: U.S. Department of Labor, Bureau of Labor Statistics. (n.d.). *State and Metro Area Employment, Hours, & Earnings.* Retrieved February 10, 2009, from http://www.bls.gov/sae/home.htm. Estimates are from survey data rather than the employer universe.

Figure 2: Wyoming Unemployment Rate, 2000-2008

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exclusive workers' compensation insurance provider (National Academy of Social Insurance, 2008). There are some exceptions to the state monopoly, not all of which are long term. For example, in 2006, the National Academy of Social Insurance (NASI; 2008) estimated that 783 private carriers provided workers' compensation insurance in Wyoming. Yet in 2005, there were no private providers (for further discussion, see Workers' Compensation: Benefits, Coverage, and Costs, 2006 at http://www.nasi.org/publications2763/publications_show.htm?doc_id=702308&name=Disability).

Despite the near-monopoly on workers' compensation insurance, not all employees in the state are covered by workers' compensation. Exceptions include but are not limited to employees of private households, most employees of agriculture operations, and student employees of schools and colleges. In some instances, however, employers may elect to acquire Wyoming Workers' Compensation coverage for their employees (Wyoming Workers' Compensation Act, 1986). As a result, our study is not an exhaustive evaluation of workplace injuries and costs in the state, although the vast majority of Wyoming employees are covered.

Natural Gas Prices

After 2004, Wyoming experienced the most pronounced period of economic growth since the 1970s. The growth resulted in large part from higher energy prices, and natural gas prices in particular. Figure 3 (see page 12) shows monthly U.S. natural gas wellhead prices and Wyoming marketed production from January 2000 to October 2008. The lowest price was $2.19 per thousand cubic feet (mcf) in February 2002. Prices rose steadily, and by July 2004 had increased to $5.62 per mcf, more

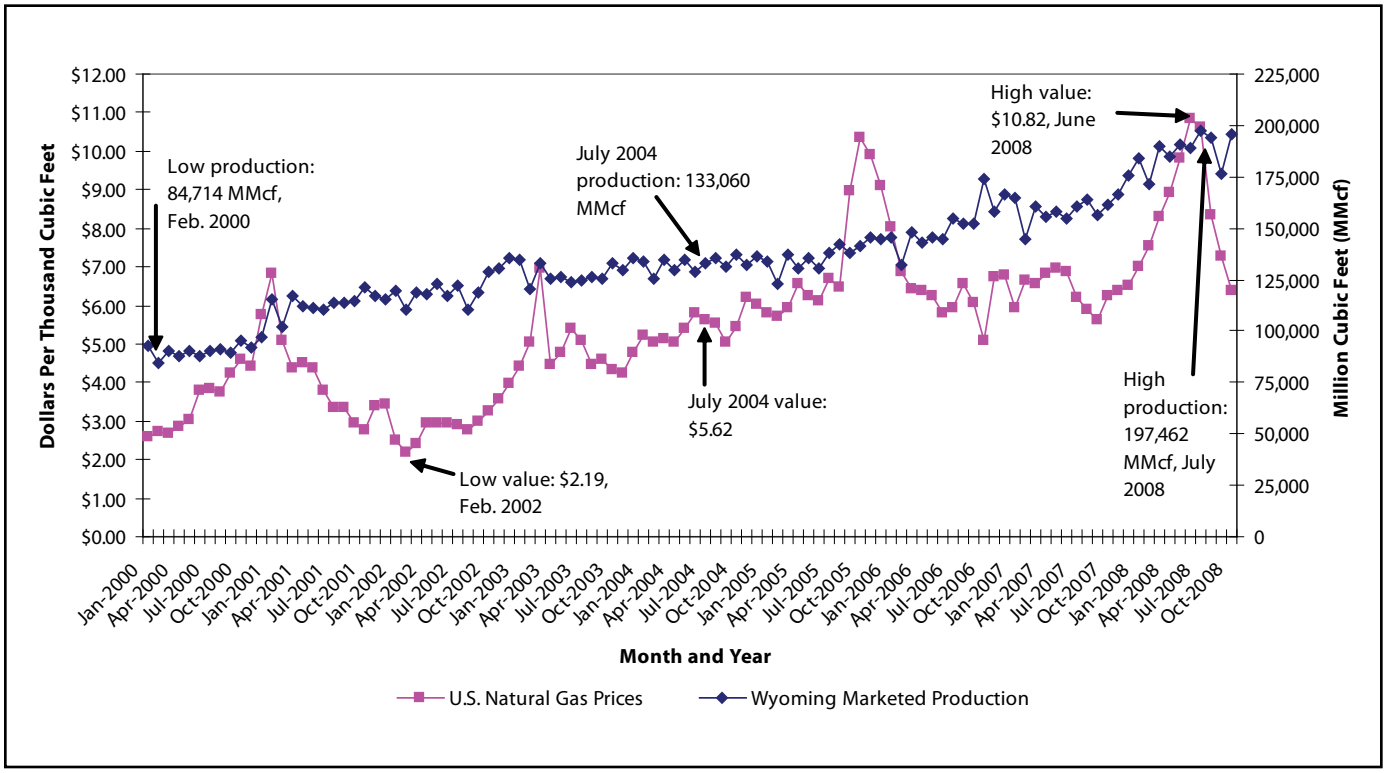

Figure 3: **U.S. Natural Gas Prices and Wyoming Marketed Production, January 2000-October 2008**

than double the February 2002 price. Prices nearly doubled yet again by June 2008 to $10.82 per mcf. Correspondingly, production in Wyoming steadily rose over the eight-year period. Production at its highest level in July 2008 (197,462 million cubic feet; MMcf) was more than twice what it had been in February 2000 (84,714 MMcf).

Industry Employment and Wages

Wyoming's goods- and services-producing industries grew at 3.2% and 5.0%, respectively, from 2001 to 2004 (see Table 2a, page 13). From 2004 to 2008, however, goods-producing industries had a marked advantage in employment growth over most other industries. Jobs worked in natural resources & mining rose from 20,413 in 2001 to 22,239 in 2004, the bulk of which was in the mining subsector. Employment growth was even more pronounced from 2004 to 2008 in natural resources & mining, with jobs rising by 8,930 (45.4%) to 28,619.

Growth in the construction industry was substantially lower from 2001 to 2004 compared to 2004 to 2008 (see Table 2a). From 2001 to 2004 employment grew by 412 (2.1%). Conversely the construction industry outpaced the natural resources & mining industry from 2004 to 2008 with growth of 41.3% (8,253 jobs).

Part of the growth in construction was tied to mining through the construction and expansion of natural gas pipelines (Bleizeffer 2006). Figure 4 (see page 14) shows the distribution of jobs worked in construction subsectors. The share of jobs worked in heavy construction grew from 24.1% in 2001 to 33.1% in 2008. Firms in this subsector are primarily engaged in infrastructure construction and include, among other types of firms, those engaged in oil and gas pipeline and related

Table 2a: **Wyoming Employment by Industry, 2001, 2004, and 2008**

	2001Q2		2004Q2		2008Q2		Change, 2001-2004		Change, 2004-2008	
Industry	N	% of Total	N	% of Total	N	% of Total	Net	%	Net	%
Goods-Producing	49,948	20.8%	51,559	20.6%	69,108	24.0%	1,611	3.2%	17,549	34.0%
Natural Resources & Mining	20,413	8.5%	22,239	8.9%	31,023	10.8%	1,826	8.9%	8,784	39.5%
Mining	17,897	7.5%	19,689	7.9%	28,619	9.9%	1,792	10.0%	8,930	45.4%
Construction	19,565	8.2%	19,977	8.0%	28,230	9.8%	412	2.1%	8,253	41.3%
Manufacturing	9,970	4.2%	9,343	3.7%	9,855	3.4%	-627	-6.3%	512	5.5%
Service-Providing	189,815	79.2%	199,227	79.4%	218,671	76.0%	9,412	5.0%	19,444	9.8%
Trade, Transportation, & Utilities	46,011	19.2%	46,944	18.7%	53,015	18.4%	933	2.0%	6,071	12.9%
Information	3,971	1.7%	4,251	1.7%	4,004	1.4%	280	7.1%	-247	-5.8%
Financial Activities	9,626	4.0%	10,490	4.2%	11,624	4.0%	864	9.0%	1,134	10.8%
Professional & Business Services	15,971	6.7%	15,665	6.2%	18,956	6.6%	-306	-1.9%	3,291	21.0%
Education & Health Services	18,385	7.7%	20,497	8.2%	23,376	8.1%	2,112	11.5%	2,879	14.0%
Educational Services	1,054	0.4%	1,204	0.5%	1,452	0.5%	150	14.3%	248	20.6%
Health Care & Social Assistance	17,331	7.2%	19,293	7.7%	21,924	7.6%	1,962	11.3%	2,631	13.6%
Leisure & Hospitality	30,268	12.6%	31,962	12.7%	34,856	12.1%	1,694	5.6%	2,894	9.1%
Other Services	7,651	3.2%	7,539	3.0%	8,380	2.9%	-112	-1.5%	841	11.2%
Government	57,932	24.2%	61,879	24.7%	64,460	22.4%	3,947	6.8%	2,581	4.2%
Total	**239,763**	**100.0%**	**250,786**	**100.0%**	**287,779**	**100.0%**	**11,023**	**4.6%**	**36,993**	**14.8%**

Source: Wyoming Department of Employment, Research & Planning. (n.d.). Wyoming Quarterly Census of Employment and Wages (QCEW). Retrieved April 10, 2009, from http://doe.state.wy.us/lmi/toc_202.htm

construction. This construction directly supports oil and gas firms by providing them with the capacity to export their products.

In response to the tighter labor market, wages grew significantly from 2001 to 2008. Figure 5 (see page 14) shows average weekly wages for 2001, 2004, and 2008 for all industries, and for construction and mining separately. Wage growth statewide was more moderate from 2001-2004 than from 2004-2008. In 2001, average weekly wages were $527. By 2004 wages had risen to $586, a gain of $59. By 2008 average weekly wages went up to $780, an increase of $194 from 2004.

With natural gas extraction the primary driver, wages rose even more in the mining industry than average wages for all industries. Average weekly wages in natural resources & mining rose by $66, from $1,023 in 2001 to $1,089 in 2004. By 2008, the average weekly wage increased to $1,440, which was $471 higher than the average weekly wage in 2001.

Wage increases were less pronounced in construction than in mining for both the 2001-2004 and 2004-2008 periods. The rise in the average weekly wage from 2001-2004 for mining was slightly more than double that of construction ($66 compared to $32). Although net wage gains in mining were

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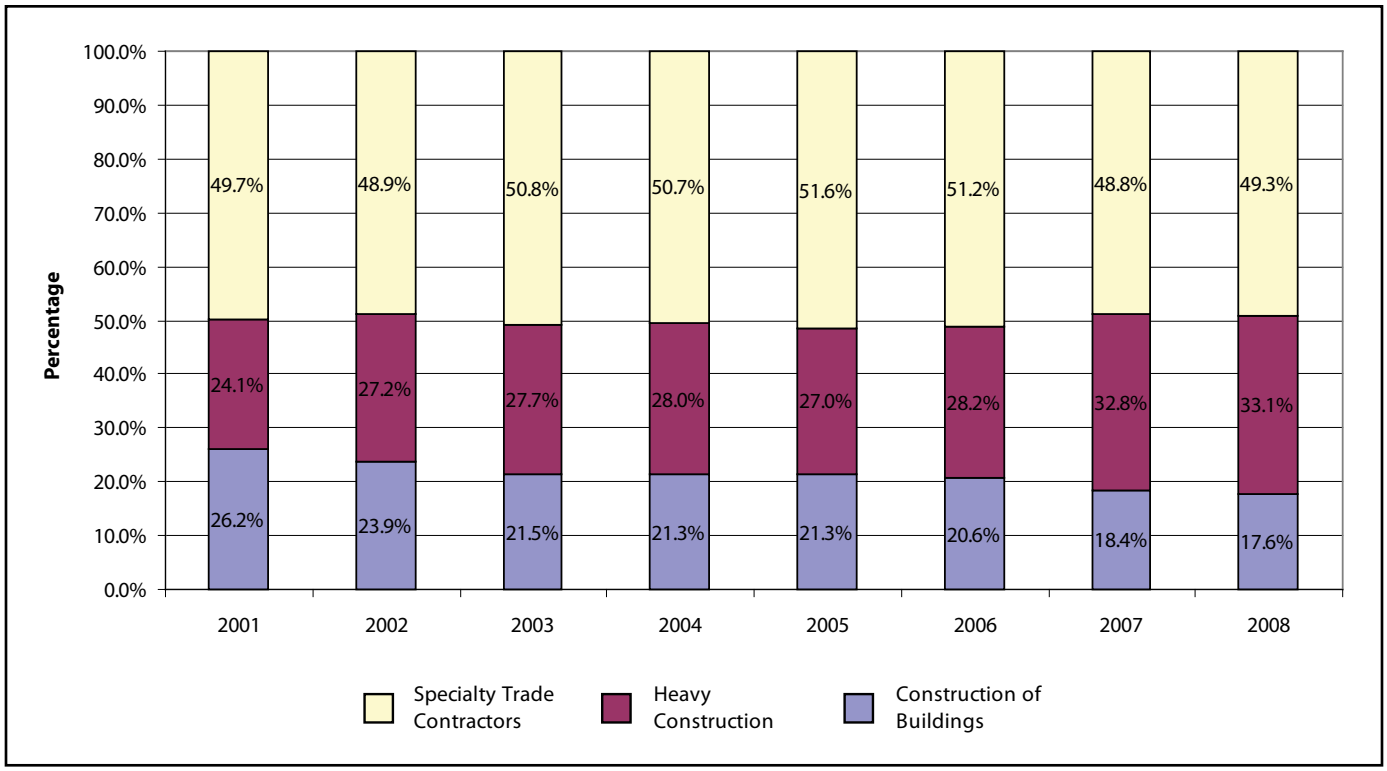

Figure 4: **Wyoming Distribution of Construction Employment by Subsector, 2001-2008 (Reference Month: July)**

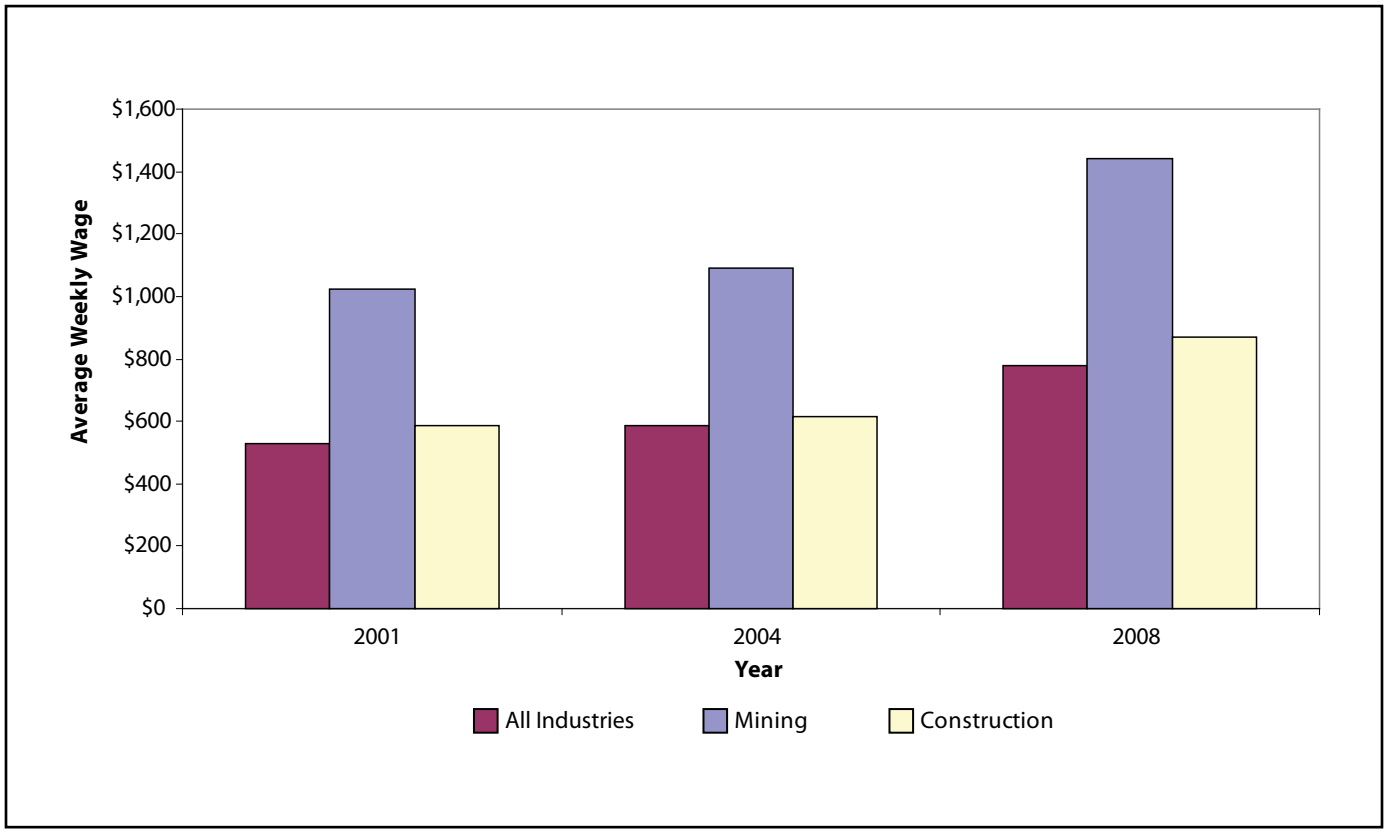

Figure 5: **Wyoming Average Weekly Wage Per Job in Mining and Construction, 2001, 2004, and 2008**

Table 2b: **Wyoming Average Weekly Wage by Industry, 2001, 2004, and 2008**

	2001Q2		2004Q2		2008Q2		Change 2001-2004		Change 2004-2008	
Industry	Avg. Weekly Wage	% of Average Weekly Wage	Average Weekly Wage	% of Average Weekly Wage	Average Weekly Wage	% of Average Weekly Wage	Net	%	Net	%
Goods-Producing	$615	116.6%	$675	115.3%	$968	124.2%	$60	9.8%	$293	43.5%
Natural Resources & Mining	$943	178.9%	$1,011	172.6%	$1,365	175.0%	$68	7.2%	$354	35.0%
Mining	$1,023	194.2%	$1,089	186.0%	$1,440	184.6%	$66	6.5%	$351	32.2%
Construction	$585	111.1%	$617	105.3%	$870	111.6%	$31	5.4%	$254	41.2%
Manufacturing	$694	131.8%	$721	123.2%	$910	116.7%	$27	3.9%	$189	26.1%
Service-Providing	$504	95.6%	$678	115.7%	$710	91.0%	$174	34.5%	$32	4.7%
Trade, Transportation, & Utilities	$460	87.4%	$528	90.2%	$669	85.8%	$68	14.7%	$141	26.8%
Information	$547	103.9%	$582	99.3%	$680	87.2%	$34	6.3%	$98	16.9%
Financial Activities	$571	108.4%	$614	104.9%	$801	102.7%	$43	7.6%	$187	30.4%
Professional & Business Services	$496	94.1%	$587	100.3%	$801	102.7%	$91	18.4%	$214	36.5%
Education & Health Services	$507	96.2%	$573	97.8%	$694	89.0%	$66	13.0%	$121	21.1%
Educational Services	$369	70.1%	$427	73.0%	$485	62.2%	$58	15.7%	$58	13.5%
Health Care & Social Assistance	$515	97.8%	$582	99.4%	$708	90.7%	$67	12.9%	$126	21.6%
Leisure & Hospitality	$203	38.5%	$230	39.3%	$289	37.0%	$27	13.2%	$59	25.6%
Other Services	$384	72.9%	$412	70.4%	$588	75.4%	$28	7.3%	$176	42.7%
Government	$579	109.9%	$650	111.0%	$848	108.7%	$71	12.3%	$198	30.4%
Total	$527	100.0%	$586	100.0%	$780	100.0%	$59	11.1%	$194	33.2%

Source: Wyoming Department of Employment, Research & Planning. (n.d.). Wyoming Quarterly Census of Employment and Wages (QCEW). Retrieved April 10, 2009, from http://doe.state.wy.us/lmi/toc_202.htm

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also higher than construction from 2004-2008, the percent change for construction was greater during this period. The average weekly wage in mining rose by $351 from 2004 to 2008 compared to $254 for construction. On a percentage basis, mining wages rose by 32.2% while the change in the construction wage was 41.2%.

Turnover

High turnover rates have been linked to increased rates of worker injury (Smith, de Hoop, Marx, & Pine, 1999; Rinefort & Van

Fleet, 1998). Figure 6 (see page 17) shows the percentage of Wyoming workers who exited employment with an employer for first quarter 2003 (2003Q1) to 2005Q4 (for a discussion of turnover definitions, see Leonard, 2006). During this period, the percentage of Wyoming workers who left their employer ranged from approximately 25% to 40%. Mining had a lower-than-average percentage of exits while construction was significantly higher than average. The percentage of exiting workers in construction ranged from a low of 39.0% in 2005Q1 to a high of 84.8% in 2003Q4. Much of the exiting pattern in construction can be attributed to the seasonality of the industry (Lukasiewicz and Tschetter, 1983). Mining, which had the lowest percentage of exits in 2003Q1 and 2003Q2, was not immune from the increased turnover associated with the economic expansion. Over the 12 quarters, exits in mining went from 14.3% in 2003Q1 to 24.0% in 2005Q4.

Demographic Characteristics

Age

On average, younger workers in Wyoming were injured more often on the job than their older colleagues in 2004 (see discussion beginning on page 23). We anticipate the rate of employee injuries will decline as the average age of the workforce increases. However, declining injury rates may be less extensive in an economic expansion because of higher turnover rates.

Table 3 (see page 18) shows the distribution of employment by age group for all people employed at any time in Wyoming in 2000, 2004, and 2007. Between 2000 and 2007 the percentage of employees for whom demographic characteristics are not known increased. The percentage of these employees in Wyoming's work force has grown steadily since the mid-1990s (Jones, n.d.). For current research purposes, this trend has two consequences. First, the absence of demographic characteristics limits our ability to create control groups based on these characteristics. Second, it restricts our ability to generalize our findings to the overall population. These limitations are especially problematic for industries such as construction that rely heavily on workers with limited attachment to the state.

In addition, the percentage of workers age 35 and under fell relative to older workers and those without known demographics. The decline was especially pronounced for workers 35-44. In 2000, 21.6% of employment was in this age group. By 2004 it had fallen to 17.3%, and to 14.6% in 2007.

As with the age distribution overall, the share of employment without known demographics increased in the natural resources & mining industry (see Table 4, page 18). Unlike the overall distribution, the percentage of younger workers in natural resources & mining, in particular workers age 25-34, grew from 17.2% in 2000 to 19.0% in 2008.

The construction industry by far employed the most workers without known demographics (see Table 5, page 19). In 2004 approximately one-fourth of construction employees had no known demographics; by 2007 close to half (45.1%) of all workers in the construction industry were in this category. The lack of demographics for a substantial portion of the construction workforce exemplifies the issues associated with control groups and results generalization discussed earlier.

By age group, the biggest overall wage increase was for workers age 55-64 (see Table 6, page 19). From 2000 to 2004, the average annual wage rose by $6,608, from $27,307 per year to $33,915. Individuals in this age group saw even larger wage gains from 2004 to 2007, with the average annual wage rising by $8,002 to $41,917.

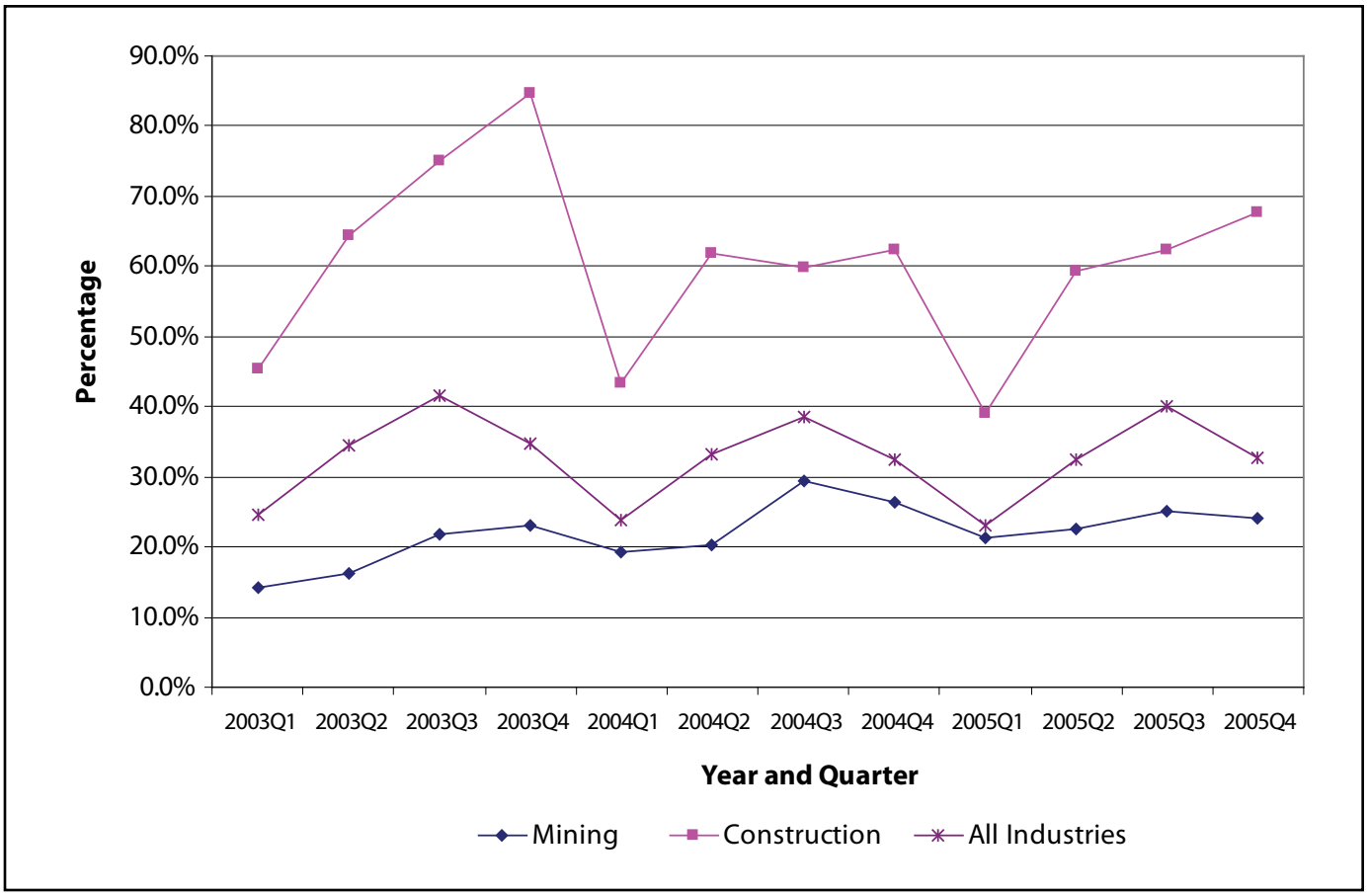


Figure 6: **Wyoming Percent Exits for All Industries, and Mining and Construction, First Quarter 2003 (2003Q1) to Fourth Quarter 2005 (2005Q4)**

Gender

The proportion of men employed in Wyoming increased gradually from 2000 to 2007 (see Figure 7, page 20). In 2000, men constituted 51.7% of employment; by 2008 they accounted for 53.6% of all workers. Despite gains by women in construction and natural resources & mining, men made up nearly 90% of employment in these two industries.

Workers' Compensation Claimants' Characteristics

Table 7 (see page 21) shows the demographic characteristics and wages of Wyoming Workers' Compensation claimants and non-claimants working at any time on the basis of their primary employers' workers' compensation coverage status. The discussion in this chapter is limited to employee claimants whose primary employer had coverage under the Wyoming Workers' Compensation system. The mining and construction industry subsets are detailed in Tables 7 and 8, respectively. These three tables describe the industry, demographics, and earnings characteristics from which control and treatment groups will be selected as described in the next chapter.

A total of 13,890 employees working for employers with workers' compensation coverage made claims in 2004. Men made twice as many workers' compensation claims as women did. A total of 8,693 men made claims for Workers' Compensation, while women made 4,370 claims. Although women accounted for 47.1% of total

Table 3: **Wyoming Distribution of Persons Employed at Any Time by Age Group, 2000, 2004, and 2007**

	2000		2004		2007	
Age Category	**N**	**% of Total**	**N**	**% of Total**	**N**	**% of Total**
< 20	27,493	8.9%	24,953	7.7%	24,354	6.5%
20 - 24	34,426	11.2%	33,752	10.4%	32,947	8.9%
25 - 34	55,981	18.2%	56,073	17.3%	59,550	16.0%
35 - 44	66,663	21.6%	56,092	17.3%	54,328	14.6%
45 - 54	57,207	18.6%	62,537	19.3%	64,730	17.4%
55 - 64	24,264	7.9%	32,476	10.0%	40,020	10.8%
> 65	7,200	2.3%	9,652	3.0%	11,556	3.1%
Unknown	35,062	11.4%	48,972	15.1%	84,437	22.7%
Total	**308,296**	**100.0%**	**324,507**	**100.0%**	**371,922**	**100.0%**

% Change, 2000-2004: 5.3%

% Change, 2004-2007: 14.6%

Source: S. Jones. (n.d.). Earnings by Age, Gender & Industry. Retrieved February 9, 2009, from http://doe.state.wy.us/lmi/wfdemog/toc3.htm The data source is the universe of employees in Wyoming Unemployment Insurance Wage Records.

employment in 2004 (see Figure 7, page 20), just under one-third of workers' compensation claimants were women.

Furthermore, the wages of men who were claimants were higher by about $10,000 than the wages of claimants who were women. For the highest wage claimant group, men age 45-54, annual wages were more than $13,000 higher than for

Table 4: **Wyoming Distribution of Persons Employed in Natural Resources & Mining at Any Time by Age Group, 2000, 2004, and 2007**

	2000		2004		2007	
Age Category	N	% of Total	N	% of Total	N	% of Total
< 20	883	3.6%	907	3.0%	835	2.1%
20 - 24	2,210	8.9%	2,848	9.4%	3,537	9.0%
25 - 34	4,250	17.2%	5,591	18.4%	7,483	19.0%
35 - 44	6,851	27.7%	5,818	19.1%	6,153	15.6%
45 - 54	5,845	23.6%	7,230	23.8%	7,879	20.0%
55 - 64	1,980	8.0%	2,800	9.2%	3,730	9.5%
> 65	403	1.6%	561	1.8%	679	1.7%
Unknown	2,301	9.3%	4,634	15.2%	9,070	23.0%
Total	24,723	100.0%	30,389	100.0%	39,366	100.0%

% Change, 2000-2004: 22.9%

% Change, 2004-2007: 29.5%

Source: S. Jones. (n.d.). Earnings by Age, Gender & Industry. Retrieved February 9, 2009, from http://doe.state.wy.us/lmi/wfdemog/toc3.htm The data source is the universe of employees in Wyoming Unemployment Insurance Wage Records.

Table 5: **Wyoming Distribution of Persons Employed in Construction at Any Time by Age Group, 2000, 2004, and 2007**

	2000		2004		2007	
Age Category	**N**	**% of Total**	**N**	**% of Total**	**N**	**% of Total**
< 20	1,678	5.3%	1,579	4.8%	1,758	3.5%
20 - 24	3,609	11.3%	3,393	10.4%	3,710	7.5%
25 - 34	6,405	20.1%	5,818	17.8%	6,489	13.1%
35 - 44	6,988	21.9%	5,407	16.5%	5,613	11.3%
45 - 54	4,441	13.9%	5,243	16.0%	6,002	12.1%
55 - 64	1,730	5.4%	2,167	6.6%	2,886	5.8%
> 65	473	1.5%	645	2.0%	821	1.7%
Unknown	6,593	20.7%	8,481	25.9%	22,431	45.1%
Total	**31,917**	**100.0%**	**32,733**	**100.0%**	**49,710**	**100.0%**

% Change, 2000-2004: 2.6%

% Change, 2004-2007: 51.9%

Source: S. Jones. (n.d.). Earnings by Age, Gender & Industry. Retrieved February 9, 2009, from http://doe.state.wy.us/lmi/wfdemog/toc3.htm The data source is the universe of employees in Wyoming Unemployment Insurance Wage Records.

women of the same age ($38,569 compared to $24,925). Male claimants earned an average of $30,563 annually compared to $20,278 for female claimants, a difference of $10,285. In comparison the difference between all employed men and women was $13,569 ($31,813 compared to $18,244; see Figure 8, page 23).

Of the 1,512 Workers' Compensation-covered claimants in the mining industry, 1,347 (89.1%) were men. This proportion is

Table 6: **Wyoming Average Annual Wages of Persons Employed at Any Time by Age Group, 2000, 2004, and 2007**

Age Category	2000	2004	2007	Net Change, 2000-2004	Net Change, 2004-2007
< 20	$3,529	$4,054	$5,184	$525	$1,130
20 - 24	$9,366	$11,997	$16,837	$2,632	$4,839
25 - 34	$18,029	$22,760	$30,259	$4,731	$7,499
35 - 44	$25,644	$30,356	$37,984	$4,712	$7,627
45 - 54	$31,312	$36,065	$43,408	$4,753	$7,343
55 - 64	$27,307	$33,915	$41,917	$6,608	$8,002
> 65	$14,443	$17,083	$22,549	$2,640	$5,467
Unknown	$4,022	$7,824	$14,172	$3,802	$6,348
Total	**$19,373**	**$22,773**	**$28,207**	**$3,399**	**$5,435**

Source: S. Jones. (n.d.). Earnings by Age, Gender & Industry. Retrieved February 9, 2009, from http://doe.state.wy.us/lmi/wfdemog/toc3.htm The data source is the universe of employees in Wyoming Unemployment Insurance Wage Records.

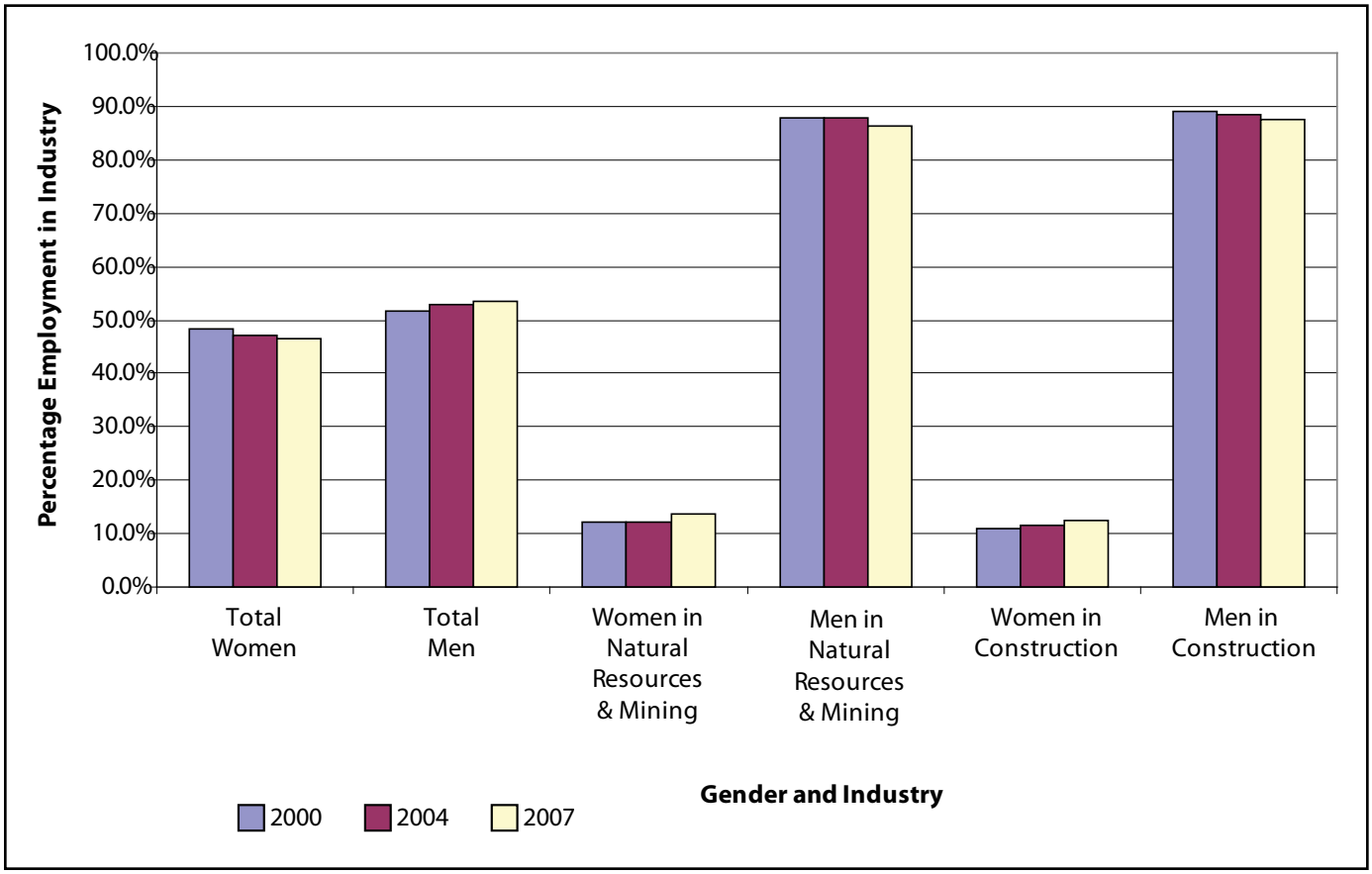


Figure 7: **Wyoming Distribution of Persons Working at Any Time by Gender and Industry, 2000, 2004, and 2007**

slightly higher than the proportion of men employed in natural resources & mining overall (87.7%; see Figure 9, page 24). Female claimants' average annual wages in mining differed less than male claimants' wages than the wages for male and female claimants overall (Figure 10, page 24). Women in mining earned about $4,300 less than men in the industry, compared to approximately $10,000 for all female claimants. Earnings differences between male and female claimants were also narrower than for all those employed in the industry. In 2004, females employed in natural resources & mining earned $18,417 less annually than males compared to a difference of $4,300 for claimants.

Approximately 300 more employees working for Workers' Compensation covered employers in construction filed claims than in the mining industry (see Figure 10). A total of 1,652 males made workers' compensation claims. The proportion of male claimants employed in construction was similar to the proportion employed in the industry overall (89.1% of claimants compared to 88.6% in the industry overall). Claims were filed by 448 men age 25-34, the largest number by gender and age group.

The average annual wage in 2004 for all construction employees was $19,851. Construction industry claimants' wages were about $3,000 less than for all employees in construction and nearly 50% lower than claimants in the mining industry (see Tables 8 and 9, pages 22 and 25, respectively). The wages of female claimants were $1,674 less than for construction

(Text continued on page 23)

Table 7: **Wages of Persons Working in Wyoming at Any Time by Employers' Workers' Compensation (WC) Coverage Status and Employee Claimant Status,[a] All Industries, 2004**

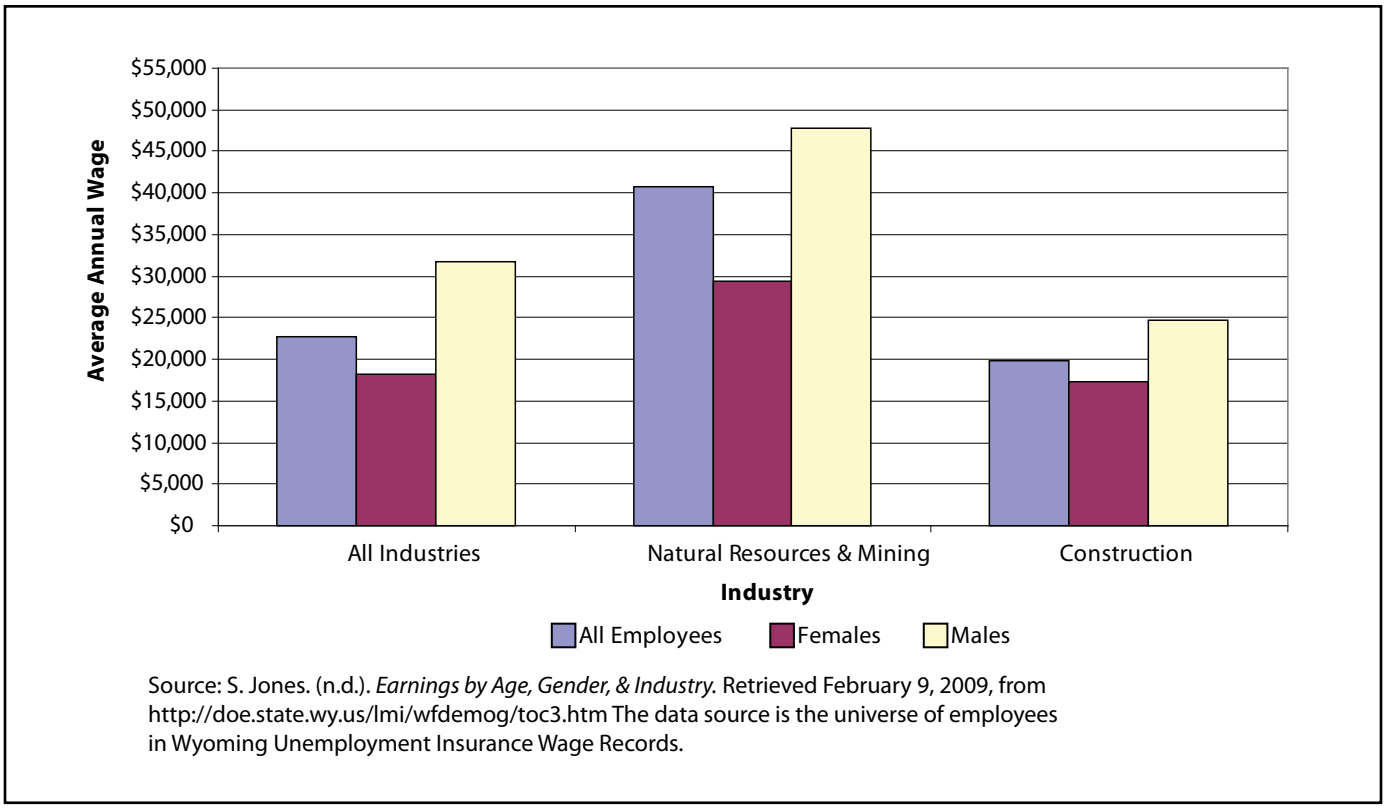
		Employees Whose Primary Employer Had WC Coverage								Employees Whose Primary Employer Did Not Have WC Coverage							
		Employee Claimants				Employee Non-Claimants				Employee Claimants				Employee Non-Claimants			
Gender	Age Group	N	%With WC-Covered Employer	Col. %	2004 Wages	N	%With WC-Covered Employer	Col. %	2004 Wages	N	% Without WC-Covered Employer	Col. %	2004 Wages	N	% Without WC-Covered Employer	Col. %	2004 Wages
Female	16 - 19	175	1.8%	4.0%	$6,141	9,723	98.2%	8.7%	$3,407	7	0.7%	8.0%	$5,876	1,024	99.3%	7.1%	$3,989
	20 - 24	517	3.6%	11.8%	$12,072	13,870	96.4%	12.4%	$8,530	15	0.8%	17.0%	$10,359	1,819	99.2%	12.6%	$9,374
	25 - 34	985	4.4%	22.5%	$18,574	21,614	95.6%	19.4%	$16,545	22	0.8%	25.0%	$17,420	2,655	99.2%	18.5%	$16,205
	35 - 44	991	4.2%	22.7%	$22,103	22,685	95.8%	20.3%	$21,726	18	0.6%	20.5%	$15,089	2,842	99.4%	19.8%	$21,502
	45 - 54	1087	4.0%	24.9%	$24,925	25,936	96.0%	23.2%	$25,817	17	0.5%	19.3%	$20,542	3,398	99.5%	23.6%	$23,364
	55-64	502	3.6%	11.5%	$24,404	13,263	96.4%	11.9%	$23,520	5	0.3%	5.7%	$21,191	1,931	99.7%	13.4%	$21,505
	65+	106	2.9%	2.4%	$16,442	3,511	97.1%	3.1%	$11,575	4	0.6%	4.5%	$7,345	648	99.4%	4.5%	$13,307
	Total	4,370	3.8%	100.0%	$20,278	111,568	96.2%	100.0%	$18,154	88	0.6%	100.0%	$15,181	14,389	99.4%	100.0%	$17,742
Male	16 - 19	298	2.9%	3.4%	$7,508	9,899	97.1%	7.7%	$4,098	10	1.4%	8.9%	$6,706	701	98.6%	7.5%	$4,172
	20 - 24	1160	6.9%	13.3%	$18,049	15,648	93.1%	12.2%	$13,541	23	2.0%	20.5%	$13,896	1,100	98.0%	11.8%	$11,204
	25 - 34	2,161	7.3%	24.9%	$27,702	27,265	92.7%	21.2%	$26,995	27	1.5%	24.1%	$18,245	1,802	98.5%	19.3%	$26,527
	35 - 44	2,039	7.4%	23.5%	$33,683	25,390	92.6%	19.8%	$38,118	25	1.4%	22.3%	$24,459	1,760	98.6%	18.8%	$38,029
	45 - 54	2,001	6.5%	23.0%	$38,569	28,641	93.5%	22.3%	$46,376	13	0.7%	11.6%	$28,959	1,978	99.3%	21.2%	$44,398
	55-64	888	5.4%	10.2%	$37,310	15,506	94.6%	12.1%	$44,107	12	0.9%	10.7%	$21,080	1,378	99.1%	14.7%	$48,462
	65+	136	2.8%	1.6%	$26,540	4,766	97.2%	3.7%	$20,883	2	0.4%	1.8%	$28,659	555	99.6%	5.9%	$34,756
	Total	8,693	6.3%	100.0%	$30,563	128,312	93.7%	100.0%	$31,720	112	1.2%	100.0%	$19,442	9,349	98.8%	100.0%	$32,517
Total	16 - 19	473	2.4%	3.41%	$7,002	19,623	97.6%	7.0%	$3,756	17	1.0%	8.2%	$6,364	1,725	99.0%	6.3%	$4,063
	20 - 24	1,677	5.4%	12.07%	$16,206	29,520	94.6%	10.5%	$11,186	38	1.3%	18.3%	$12,500	2,919	98.7%	10.6%	$10,064
	25 - 34	3,146	6.0%	22.65%	$24,844	48,881	94.0%	17.3%	$22,374	49	1.1%	23.6%	$17,874	4,457	98.9%	16.2%	$20,378
	35 - 44	3,030	5.9%	21.81%	$29,896	48,078	94.1%	17.1%	$30,383	43	0.9%	20.7%	$20,537	4,603	99.1%	16.8%	$27,826
	45 - 54	3,088	5.4%	22.23%	$33,766	54,581	94.6%	19.4%	$36,605	30	0.6%	14.4%	$24,190	5,376	99.4%	19.6%	$31,103
	55-64	1,390	4.6%	10.01%	$32,649	28,771	95.4%	10.2%	$34,614	17	0.5%	8.2%	$21,113	3,309	99.5%	12.0%	$32,731
	65+	242	2.8%	1.74%	$22,117	8,278	97.2%	2.9%	$16,935	6	0.5%	2.9%	$14,449	1,203	99.5%	4.4%	$23,203
	Unknown	844	1.9%	6.08%	$11,669	44,212	98.1%	15.7%	$7,242	8	0.2%	3.8%	$19,908	3,875	99.8%	14.1%	$8,035
	Total	13,890	4.7%	100.0%	$26,212	281,944	95.3%	100.0%	$22,744	208	0.8%	100.0%	$17,657	27,467	99.2%	100.0%	$21,475

[a]Data source is the universe of employers and employees in the Wyoming Workers' Compensation and Wage Records databases for 2004.

Table 8: **Wages of Persons Working in Mining in Wyoming at Any Time by Employers' Workers' Compensation (WC) Coverage Status and Employee Claimant Status,[a] All Industries, 2004**

Gender	Age Group	Employees Whose Primary Employer Had WC Coverage								Employees Whose Primary Employer Did Not Have WC Coverage								Grand Total		
		Employee Claimants				Employee Non-Claimants				Employee Claimants				Employee Non-Claimants						
		N	% With WC-Covered Employer	Col. %	2004 Wages	N	% With WC-Covered Employer	Col. %	2004 Wages	N	% Without WC-Covered Employer	Col. %	2004 Wages	N	% Without WC-Covered Employer	Col. %	2004 Wages	N	Col. %	2004 Wages
Female	16 - 19	2	2.5%	3.3%	$7,466	79	97.5%	3.4%	$6,159	0	0.0%	0.0%	$0	1	100.0%	6.3%	$530	82	3.4%	$6,122
	20 - 24	2	0.8%	3.3%	$6,774	255	99.2%	10.9%	$13,933	0	0.0%	0.0%	$0	0	100.0%	0.0%	$0	257	10.6%	$13,877
	25 - 34	15	3.6%	25.0%	$30,789	405	96.4%	17.3%	$31,529	0	0.0%	0.0%	$0	2	100.0%	12.5%	$32,065	422	17.5%	$31,505
	35 - 44	17	3.0%	28.3%	$35,310	551	97.0%	23.5%	$36,198	0	0.0%	0.0%	$0	2	100.0%	12.5%	$55,754	570	23.6%	$36,240
	45 - 54	19	2.5%	31.7%	$51,937	753	97.5%	32.2%	$46,287	0	0.0%	0.0%	$0	6	100.0%	37.5%	$26,211	778	32.2%	$46,270
	55-64	5	2.0%	8.3%	$54,445	246	98.0%	10.5%	$38,683	0	0.0%	0.0%	$0	5	100.0%	31.3%	$21,059	256	10.6%	$38,647
	65+	0	0.0%	0.0%	$0	46	100.0%	2.0%	$23,125	0	0.0%	0.0%	$0	0	100.0%	0.0%	$0	46	1.9%	$23,125
	Total	60	2.5%	100.0%	$39,160	2,342	97.5%	100.0%	$35,099	0	0.0%	0.0%	$0	16	100.0%	100.0%	$27,420	2,418	100.0%	$35,149
Male	16 - 19	24	6.2%	1.8%	$16,122	366	93.8%	1.9%	$9,450	0	0.0%	0.0%	$0	0	100.0%	0.0%	$0	390	1.9%	$9,860
	20 - 24	174	7.9%	12.9%	$29,697	2,031	92.1%	10.7%	$25,794	0	0.0%	0.0%	$0	5	100.0%	4.2%	$34,900	2,210	10.8%	$26,122
	25 - 34	353	7.5%	26.2%	$39,029	4,373	92.5%	23.0%	$42,993	0	0.0%	0.0%	$0	19	100.0%	15.8%	$37,163	4,745	23.1%	$42,674
	35 - 44	318	6.9%	23.6%	$44,304	4,279	93.1%	22.5%	$52,414	2	5.6%	66.7%	$45,726	34	94.4%	28.3%	$48,527	4,633	22.6%	$51,826
	45 - 54	327	5.6%	24.3%	$52,538	5,551	94.4%	29.1%	$64,538	1	2.6%	33.3%	$39,986	38	97.4%	31.7%	$63,949	5,917	28.8%	$63,867
	55-64	138	6.1%	10.2%	$54,343	2,111	93.9%	11.1%	$64,887	0	0.0%	0.0%	$0	21	100.0%	17.5%	$206,496	2,270	11.1%	$65,556
	65+	13	4.0%	1.0%	$42,127	315	96.0%	1.7%	$35,828	0	0.0%	0.0%	$0	3	100.0%	2.5%	$41,005	331	1.6%	$36,123
	Total	1,347	6.6%	100.0%	$43,539	19,052	93.4%	100.0%	$51,165	3	2.4%	100.0%	$43,813	120	97.6%	100.0%	$78,500	20,522	100.0%	$50,823
Total	16 - 19	26	5.5%	1.72%	$15,456	445	94.5%	1.8%	$8,866	0	0.0%	0.0%	$0	1	100.0%	0.6%	$530	472	1.8%	$9,211
	20 - 24	176	7.1%	11.64%	$29,436	2,286	92.9%	9.2%	$24,471	0	0.0%	0.0%	$0	5	100.0%	3.1%	$34,900	2,467	9.3%	$24,846
	25 - 34	368	7.1%	24.34%	$38,693	4,779	92.9%	19.1%	$42,016	0	0.0%	0.0%	$0	21	100.0%	12.9%	$36,677	5,168	19.4%	$41,758
	35 - 44	335	6.5%	22.16%	$43,848	4,831	93.5%	19.3%	$50,563	2	5.3%	66.7%	$45,726	36	94.7%	22.1%	$48,928	5,204	19.5%	$50,117
	45 - 54	346	5.2%	22.88%	$52,505	6,304	94.8%	25.2%	$62,358	1	2.2%	33.3%	$39,986	44	97.8%	27.0%	$58,803	6,695	25.1%	$61,822
	55-64	143	5.7%	9.46%	$54,347	2,357	94.3%	9.4%	$62,152	0	0.0%	0.0%	$0	26	100.0%	16.0%	$170,835	2,526	9.5%	$62,829
	65+	13	3.5%	0.86%	$42,127	361	96.5%	1.4%	$34,210	0	0.0%	0.0%	$0	3	100.0%	1.8%	$41,005	377	1.4%	$34,537
	Unknown	105	2.8%	6.94%	$19,751	3,609	97.2%	14.5%	$15,668	0	0.0%	0.0%	$0	27	100.0%	16.6%	$9,161	3,741	14.0%	$15,735
	Total	1,512	5.7%	100.0%	$41,713	24,972	94.3%	100.0%	$44,588	3	1.8%	100.0%	$43,813	163	98.2%	100.0%	$62,000	26,650	100.0%	$44,531

[a]Data source is the universe of employers and employees in the Wyoming Workers' Compensation and Wage Records databases for 2004.



Source: S. Jones. (n.d.). *Earnings by Age, Gender, & Industry.* Retrieved February 9, 2009, from http://doe.state.wy.us/lmi/wfdemog/toc3.htm The data source is the universe of employees in Wyoming Unemployment Insurance Wage Records.

Figure 8: **Average Annual Wages of All Persons Employed in Wyoming by Selected Industry and Gender, 2004**

(Text continued from page 20)

employees overall. Conversely, male claimants' wages were $4,938 greater than for the average annual wage in construction.

Discussion

Employee turnover is related to opportunities in the labor market. The more the economy is expanding the greater the likelihood that workers will engage in job changing (Mott, 2000; Economic Trends, 1998). Additionally, shorter tenure tends to be associated with workers who are younger or have less education or skills (Economic Trends, 1998). Lower skilled jobs are also usually more physical in nature and consequently present more risk of injury (Capell, 1995).

Lower employee tenure is also linked to increased frequency of accidents. A study of logging injuries in Louisiana (1999) found that most accidents happen to workers with less than three years of experience with their employer. A 1998 study of employees of an Indiana copper plant by Rinefort and Van Fleet found that workers were more frequently injured during the first three to five months of employment.

Tenure and employee age are strongly correlated. Nationally 49.6% of workers 20-24 years of age had worked for their current employer 12 months or less. For employees 45-54 years old the percentage with this level of tenure was only 11.0%. (U.S. Department of Labor, Bureau of Labor Statistics, 2004).

In addition, 2004 Wyoming Workers' Compensation claims data indicates that younger workers are more likely than their older colleagues to file a claim for workers' compensation. Wyoming's higher-than-average incidence of claims in the construction industry is most likely a

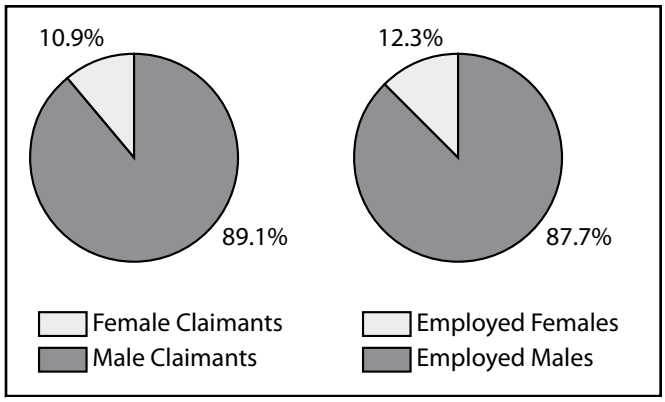


Figure 9: Wyoming Worker's Compensation Claimants and Overall Employment by Gender, 2004

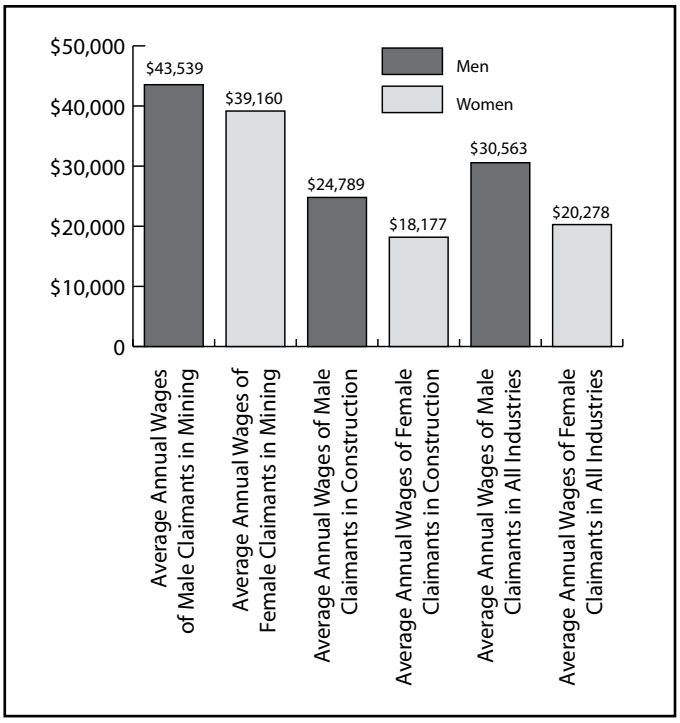


Figure 10: Average Annual Wages in Wyoming for Worker's Compensation Claimants in Mining, Construction, and All Industries, 2004

reflection of the fact that the industry has a high turnover rate and that workers are younger than the statewide average. Nationwide, construction and extraction occupations constituted 6.0% of employment but accounted for 11.4% of nonfatal occupational injuries and illnesses with days away from work (U.S. Department of Labor, Bureau of Labor Statistics, 2005). Wyoming increasingly relies on a nonresident labor force (Jones, 2006). As demonstrated by the relatively large number of workers without known demographic characteristics, the construction industry depends on workers who have limited attachment to the state.

Classical economic theory suggests that workers employed in hazardous jobs will tend to earn higher wages in exchange for risk (Smith, 1776/1937). While occupations in mining and construction typically pay higher than average wages, there is a risk for working in these industries. Additionally, younger workers face the prospect of greater lifetime earnings losses when injured on the job compared to older workers (Viscusi, 1993).

Research Extensions

This study represents an important step in understanding the characteristics of workers and their injuries in mining and construction in Wyoming and other western states. Since younger employees are more frequently injured on the job than older workers, one extension could be to examine whether the rate of work-related injury decreases as the overall age of the work force increases. It also may expose differences in the types of injuries that occur to older workers, thus revealing potential targets for prevention activities. Another expansion of this research might address how injury characteristics change in the face of rapid economic expansion. In 2004, Wyoming's economy was exiting a period of steady growth and entering a period of rapid economic expansion. Because low tenure has been linked to higher rates of injury, alternative prevention strategies may be necessary when employee tenure is relatively short. Additionally, Wyoming's economy has increasingly come to rely on workers without known demographic characteristics, suggesting that they are most likely nonresidents. Replication

(Text continued on page 26)

Table 9: **Wages of Persons Working in Construction in Wyoming at Any Time by Employers' Workers' Compensation (WC) Coverage Status and Employee Claimant Status,[a] All Industries, 2004**

		Employees Whose Primary Employer Had WC Coverage								Employees Whose Primary Employer Did Not Have WC Coverage								Grand Total		
		Employee Claimants				Employee Non-Claimants				Employee Claimants				Employee Non-Claimants						
Gender	Age Group	N	% With WC-Covered Employer	Col. %	2004 Wages	N	% With WC-Covered Employer	Col. %	2004 Wages	N	% Without WC-Covered Employer	Col. %	2004 Wages	N	% Without WC-Covered Employer	Col. %	2004 Wages	N	Col. %	2004 Wages
Female	16-19	4	2.6%	5.1%	$13,611	149	97.4%	5.5%	$4,115	0	0.0%	0.0%	$0	0	100.0%	0.0%	$0	**153**	**5.4%**	**$4,364**
	20-24	8	2.8%	10.1%	$12,941	276	97.2%	10.2%	$9,843	0	0.0%	0.0%	$0	1	100.0%	6.3%	$12,065	**285**	**10.1%**	**$9,938**
	25-34	18	3.3%	22.8%	$15,086	529	96.7%	19.5%	$14,039	0	0.0%	0.0%	$0	2	100.0%	12.5%	$2,859	**549**	**19.5%**	**$14,033**
	35-44	28	3.9%	35.4%	$17,090	694	96.1%	25.5%	$19,343	0	0.0%	0.0%	$0	6	100.0%	37.5%	$16,840	**728**	**25.9%**	**$19,236**
	45-54	18	2.5%	22.8%	$26,308	688	97.5%	25.3%	$21,982	0	0.0%	0.0%	$0	2	100.0%	12.5%	$13,550	**708**	**25.2%**	**$22,068**
	55-64	3	1.1%	3.8%	$18,130	282	98.9%	10.4%	$21,819	0	0.0%	0.0%	$0	1	100.0%	6.3%	$1,572	**286**	**10.2%**	**$21,710**
	65+	0	0.0%	0.0%	$0	79	100.0%	2.9%	$15,416	0	0.0%	0.0%	$0	4	100.0%	25.0%	$9,930	**83**	**3.0%**	**$15,151**
	Total	79	2.8%	100.0%	$18,177	2,717	97.2%	100.0%	$17,189	0	0.0%	0.0%	$0	16	100.0%	100.0%	$11,701	**2,812**	**100.0%**	**$17,186**
Male	16-19	63	5.4%	3.8%	$7,714	1,100	94.6%	5.5%	$5,169	0	0.0%	0.0%	$0	3	100.0%	1.6%	$6,730	**1,166**	**5.3%**	**$5,311**
	20-24	269	8.5%	16.3%	$17,817	2,889	91.5%	14.5%	$14,594	0	0.0%	0.0%	$0	12	100.0%	6.2%	$8,339	**3,170**	**14.5%**	**$14,843**
	25-34	448	8.3%	27.1%	$23,845	4,938	91.7%	24.7%	$23,150	1	2.2%	100.0%	$12,709	44	97.8%	22.8%	$9,324	**5,431**	**24.9%**	**$23,093**
	35-44	387	8.3%	23.4%	$27,574	4,299	91.7%	21.5%	$28,039	0	0.0%	0.0%	$0	56	100.0%	29.0%	$19,143	**4,742**	**21.7%**	**$27,896**
	45-54	339	7.3%	20.5%	$30,449	4,282	92.7%	21.4%	$32,508	0	0.0%	0.0%	$0	44	100.0%	22.8%	$25,294	**4,665**	**21.4%**	**$32,290**
	55-64	121	6.2%	7.3%	$27,961	1,819	93.8%	9.1%	$32,273	0	0.0%	0.0%	$0	18	100.0%	9.3%	$26,481	**1,958**	**9.0%**	**$31,953**
	65+	25	4.4%	1.5%	$24,546	540	95.6%	2.7%	$21,638	0	0.0%	0.0%	$0	16	100.0%	8.3%	$36,749	**581**	**2.7%**	**$22,179**
	Total	1,652	7.6%	100.0%	$24,789	19,978	92.4%	100.0%	$24,655	1	0.5%	100.0%	$12,709	193	99.5%	100.0%	$19,586	**21,824**	**100.0%**	**$24,619**
Total	16-19	67	5.1%	3.61%	$8,066	1,249	94.9%	4.1%	$5,044	0	0.0%	0.0%	$0	3	100.0%	0.5%	$6,730	**1,319**	**4.0%**	**$5,201**
	20-24	277	8.0%	14.93%	$17,676	3,166	92.0%	10.4%	$14,176	0	0.0%	0.0%	$0	13	100.0%	2.0%	$8,625	**3,456**	**10.5%**	**$14,436**
	25-34	466	7.9%	25.12%	$23,507	5,467	92.1%	18.0%	$22,268	1	2.1%	100.0%	$12,709	46	97.9%	7.0%	$9,043	**5,980**	**18.2%**	**$22,261**
	35-44	415	7.7%	22.37%	$26,866	4,995	92.3%	16.4%	$26,824	0	0.0%	0.0%	$0	62	100.0%	9.4%	$18,920	**5,472**	**16.6%**	**$26,737**
	45-54	357	6.7%	19.25%	$30,241	4,971	93.3%	16.3%	$31,050	0	0.0%	0.0%	$0	46	100.0%	7.0%	$24,783	**5,374**	**16.3%**	**$30,943**
	55-64	124	5.6%	6.68%	$27,723	2,101	94.4%	6.9%	$30,870	0	0.0%	0.0%	$0	19	100.0%	2.9%	$25,170	**2,244**	**6.8%**	**$30,648**
	65+	25	3.9%	1.35%	$24,546	619	96.1%	2.0%	$20,844	0	0.0%	0.0%	$0	20	100.0%	3.0%	$31,385	**664**	**2.0%**	**$21,301**
	Unknown	124	1.6%	6.68%	$14,845	7,852	98.4%	25.8%	$8,319	0	0.0%	0.0%	$0	449	100.0%	68.2%	$6,464	**8,425**	**25.6%**	**$8,316**
	Total	**1,855**	**5.7%**	**100.0%**	**$23,843**	**30,420**	**94.3%**	**100.0%**	**$19,866**	**1**	**0.2%**	**100.0%**	**$12,709**	**658**	**99.8%**	**100.0%**	**$10,440**	**32,934**	**100.0%**	**$19,902**

[a]Data source is the universe of employers and employees in the Wyoming Workers' Compensation and Wage Records databases for 2004.

(Text continued from page 24)

of the study on other years of Workers' Compensation data would help to determine to what degree, if any, these missing characteristics limit generalization of the results to other years. Last, a study of nonresidents who are injured may indicate characteristics unique to these employees and help target injury prevention actions.

Summary

The physical nature of many of Wyoming's jobs makes them inherently risky. However, prevention efforts by both employers and employees could mitigate the risks. A number of factors contribute to the risk level such as the employee's education, age, and tenure with an employer. Because 2004 was a year of transition from steady growth to rapid expansion, it is unclear whether the results found using the data from 2004 will be useful in generalizing to other years, particularly the years of rapid economic expansion, and for studying the increasing number of workers with limited attachment to the state.

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Chapter 3: Methodology and Results

by: Douglas W. Leonard, Senior Economist

The previous chapter described in detail the economic and social context of Wyoming's work environment from 2000 – 2008. This chapter further details the 2004 socioeconomic context first by analyzing the demographics of those who filed workers' compensation claims and those who did not. The second part of the analysis involves the development of matched treatment and control groups. In one case, the control group consists of workers who did not file a workers' compensation claim in 2004 while the treatment group consists of workers who did file a workers' compensation claim in 2004. In the second case, the control group consists of workers' compensation claimants who only filed medical claims while the treatment group consists of workers' compensation claimants with more severe injuries. This information then provides a basis for analyzing differences in earnings (lost wages).

Methodology

The analysis focuses on persons who worked at any time for businesses covered by Unemployment Insurance in Wyoming during 2004 based upon administrative records. The frame of analysis includes approximately 90% of all workers in the state. The universe does not include persons employed in federal government, self-employment, production agriculture, and most railroad workers (see Appendix B, page 45, for details). The project is further divided into workers' compensation claimants (claimants), and workers who did not file a workers' compensation claim in 2004 (non-claimants). If workers filed more than one claim during 2004, the more severe claim (according to Wyoming Workers' Compensation program rules) was used in the analysis. Wyoming Workers' Compensation (WC) staff provided the injury severity hierarchy upon request. The

Definitions

Control Group: Either non-claimants[1] or claimants who filed claims for medical benefits only

Indemnity Payments: Payments made to injured workers or their dependents when an injury resulting in a disability (or death) occurs.

Industry: The type(s) service the business provided or product(s) it produced in 2004[2]

Medical Billings: The total amount of medical expenses submitted to Workers' Compensation for payment

Medical Payments: The amount of medical expenses actually paid by Workers' Compensation

Nominal Dollars: The amount of money actually spent which ignores value changes due to inflation

Occupation: The type of job the claimant performed for the business where the Workers' Compensation claimed injury occurred in 2004[3]

Person Employed at Any Time: individuals who worked for a business covered by Workers' Compensation and Unemployment Insurance during 2004

Primary Employer Workers' Compensation Coverage: Whether

1 Uninjured workers

2 According to the employers' North American Industry Classification System (NAICS) codes

3 According to the injured workers' Standard Occupational Classification (SOC) codes. Codes were assigned by Research & Planning economists based on claimant self-reported job duties.

the worker's primary employer was covered by Workers' Compensation insurance. Most employers carry both Unemployment and Workers' Compensation Insurance

Primary Employer: The employer who paid the worker the most wages during 2004

Real Dollars: The amount of money spent relative to a certain time, e.g. a dollar today has less value than a dollar last year

Tenure with Primary Employer: The number of consecutive quarters since first quarter 1992 in which a person was paid wages by the primary employer allowing for breaks of three or fewer quarters

Treatment Group: Either the universe 2004 Workers' Compensation claimants or more severely injured claimants depending upon the level of analysis

Wage Replacement: The difference between wages earned by a non-claimant and the sum of wages earned by claimants plus their indemnity payments

order of severity shown in the results tables ranges from lowest (Did Not File a Workers' Compensation Claim), to the highest (Death). Demographic data for claimants were sourced from the Workers' Compensation episode file (collected from claim forms). Demographic data for non-claimants were sourced from the Wyoming Department of Transportation's driver's license database.

In order to equate wages and program costs for different years, all wages and costs were adjusted to constant 2008 dollars using the Consumer Price Index for All Urban Consumers (CPI-U, U.S. Department of Labor (n.d.)). Doing so allows the dollar amounts to be aggregated across several years and places them in the same temporal frame of reference.

Although an analysis of claimant and all non-claimant wages before and after 2004 provides insight into the effects of filing a WC claim on work histories, the demographic compositions of these two groups are not identical. Such a comparison would be invalid because of these differences. To control these differences, claimants were statistically matched to non-claimants on a case-by-case basis. Matching was accomplished in two steps. The first step involved controlling for demographics and earnings differences between claimants and non-claimants via a regression model. The model then generated an estimated probability that a worker was a claimant or non-claimant. These probabilities are called propensity scores. In the second step, claimants and non-claimants with the closest propensity scores were matched to produce control and treatment groups. For further details on the matching process see Appendix B. Following the development of the treatment (WC claimants) and control (non-claimants) groups, the next step involved analyzing claims patterns, and wage differentials regardless of injury severity. In a separate analysis, the same type of scoring and matching procedure was used to produce a second control group (medical claims only) and a second treatment group (more severely injured workers). The purpose of this analysis was to examine wage differentials between those two groups.

Results I: Demographics and Relative Risk

Table 1 (see page 31) summarizes the statewide demographic context of the

analysis (see Definitions, page 28, for a list of frequently used terms). The focus of the remainder of this section will be workers covered by their primary employer. The rate column indicates the rate at which claims were filed for a particular age group and gender, or in total.

Overall, males were 1.65 times more likely to be injured and file a WC claim than females (6.3% of males compared to 3.8% of females). The age distribution of claims indicates that the greatest probability of WC-reported injuries for females was in the 25-34 age group (4.4%). The same finding did not hold true for male workers as their peak reported injury rate occurred among 35-44 year olds (7.4%). Note that average 2004 wages were greater for female claimants ($20,278) than for non-claimants ($18,154).[1] This contrasts somewhat with males where non-claimants earned an average of $31,720 compared to $30,653 for non-claimants. This is an important distinction because of the traditional industries where men and women work. The male-skewed distributions of workers in relatively high-paying industries such as mining, construction, and manufacturing leads to the types of differences observed in claimant and non-claimant wages. This concept is detailed in a later section.

Figure 1 (see page 32) illustrates the distribution of female claimants and non-claimants by age. Claimants are proportionally less concentrated in workers younger than 25 years of age and among workers 55 years of age or older. However, claimants are proportionally more concentrated among workers between 25 and 54 years of age. Recall from Table 1 that workers in this age group are generally the greatest wage earners, implying that female worker injuries may be more damaging (greater loss of earnings and spending in the economy) to individuals and society than if they occurred to younger or older female workers.

The distribution of male workers by claimant status is somewhat different from female workers as shown in Figure 2 (see page 32). The distribution of both claimants and non-claimants is bi-modal. That is, it has one peak for males 25-34 and another for males 45-54. Greater proportions of claimants occurred in the 25-34, 55-64, and 65+ age groups. One major difference between Figures 1 and 2 is the proportion of claimants 16-19 years of age, which is approximately twice that of females.

While the distributional differences provide some information regarding male and female claimant populations, they become more striking when analyzing claim-filing rates. Figure 3 (see page 33) shows that for all workers except for those over 65, claims rates for males far exceed those of females. The difference is largest among workers 20-24 where males are 1.91 times more likely to file a claim than females (6.9% of males filed a claim compared to 3.6% of females). Another feature of the chart is that reported injury rates peak for females for 25-34 year olds, while the peak rate for males (7.4%) occurs for 35-44 year-olds.

Male and female claims rates also differ considerably among various industries. Figure 4 (see page 33) shows claims rates for three of Wyoming's traditionally male-dominated industries, mining, construction, and manufacturing. Although males were only slightly more likely to file a claim in mining than in the state as a whole (6.6% compared to 6.3%), they were 2.64 times as likely as a female working in mining. The difference is even larger in construction, where males were 2.71 times as likely to

1 All wage amounts referenced in this document are pre-tax gross wages per person.

(Text continued on page 32)

Table 1: **Demographics of the Wyoming Workforce by Age, Gender, and Workers' Compensation Claimant Status**

		WC Coverage Under Primary Employer Account?																Total		
		Yes								No										
		WC Claimant?								WC Claimant?										
		Yes				No				Yes				No						
Gender	and Age	N	Rate %	Col %	2004 Wages	N	Rate %	Col %	2004 Wages	N	Rate %	Col %	2004 Wages	N	Rate %	Col%	2004 Wages	N	Col%	2004 Wages
Female	16 - 19	175	1.8%	4.0%	$6,141	9,723	98.2%	8.7%	$3,407	7	0.7%	8.0%	$5,876	1,024	99.3%	7.1%	$3,989	10,929	8.4%	$3,507
	20 - 24	517	3.6%	11.8%	$12,072	13,870	96.4%	12.4%	$8,530	15	0.8%	17.0%	$10,359	1,819	99.2%	12.6%	$9,374	16,221	12.4%	$8,739
	25 - 34	985	4.4%	22.5%	$18,574	21,614	95.6%	19.4%	$16,545	22	0.8%	25.0%	$17,420	2,655	99.2%	18.5%	$16,205	25,276	19.4%	$16,589
	35 - 44	991	4.2%	22.7%	$22,103	22,685	95.8%	20.3%	$21,726	18	0.6%	20.5%	$15,089	2,842	99.4%	19.8%	$21,502	26,536	20.3%	$21,712
	45 - 54	1087	4.0%	24.9%	$24,925	25,936	96.0%	23.2%	$25,817	17	0.5%	19.3%	$20,542	3,398	99.5%	23.6%	$23,364	30,438	23.3%	$25,509
	55-64	502	3.6%	11.5%	$24,404	13,263	96.4%	11.9%	$23,520	5	0.3%	5.7%	$21,191	1,931	99.7%	13.4%	$21,505	15,701	12.0%	$23,299
	65+	106	2.9%	2.4%	$16,442	3,511	97.1%	3.1%	$11,575	4	0.6%	4.5%	$7,345	648	99.4%	4.5%	$13,307	4,269	3.3%	$11,955
	Total	4,370	3.8%	100.0%	$20,278	111,568	96.2%	100.0%	$18,154	88	0.6%	100.0%	$15,181	14,389	99.4%	100.0%	$17,742	130,415	100.0%	$18,177
Male	16 - 19	298	2.9%	3.4%	$7,508	9,899	97.1%	7.7%	$4,098	10	1.4%	8.9%	$6,706	701	98.6%	7.5%	$4,172	10,908	7.4%	$4,198
	20 - 24	1160	6.9%	13.3%	$18,049	15,648	93.1%	12.2%	$13,541	23	2.0%	20.5%	$13,896	1,100	98.0%	11.8%	$11,204	17,931	12.2%	$13,689
	25 - 34	2,161	7.3%	24.9%	$27,702	27,265	92.7%	21.2%	$26,995	27	1.5%	24.1%	$18,245	1,802	98.5%	19.3%	$26,527	31,255	21.3%	$27,010
	35 - 44	2,039	7.4%	23.5%	$33,683	25,390	92.6%	19.8%	$38,118	25	1.4%	22.3%	$24,459	1,760	98.6%	18.8%	$38,029	29,214	19.9%	$37,791
	45 - 54	2,001	6.5%	23.0%	$38,569	28,641	93.5%	22.3%	$46,376	13	0.7%	11.6%	$28,959	1,978	99.3%	21.2%	$44,398	32,633	22.3%	$45,770
	55-64	888	5.4%	10.2%	$37,310	15,506	94.6%	12.1%	$44,107	12	0.9%	10.7%	$21,080	1,378	99.1%	14.7%	$48,462	17,784	12.1%	$44,090
	65+	136	2.8%	1.6%	$26,540	4,766	97.2%	3.7%	$20,883	2	0.4%	1.8%	$28,659	555	99.6%	5.9%	$34,756	5,459	3.7%	$22,438
	Total	8,693	6.3%	100.0%	$30,563	128,312	93.7%	100.0%	$31,720	112	1.2%	100.0%	$19,442	9,349	98.8%	100.0%	$32,517	146,466	100.0%	$31,693
Total	16 - 19	473	2.4%	3.4%	$7,002	19,623	97.6%	7.0%	$3,756	17	1.0%	8.2%	$6,364	1,725	99.0%	6.3%	$4,063	21,838	6.8%	$3,852
	20 - 24	1,677	5.4%	12.1%	$16,206	29,520	94.6%	10.5%	$11,186	38	1.3%	18.3%	$12,500	2,919	98.7%	10.6%	$10,064	34,154	10.6%	$11,338
	25 - 34	3,146	6.0%	22.6%	$24,844	48,881	94.0%	17.3%	$22,374	49	1.1%	23.6%	$17,874	4,457	98.9%	16.2%	$20,378	56,533	17.5%	$22,350
	35 - 44	3,030	5.9%	21.8%	$29,896	48,078	94.1%	17.1%	$30,383	43	0.9%	20.7%	$20,537	4,603	99.1%	16.8%	$27,826	55,754	17.2%	$30,137
	45 - 54	3,088	5.4%	22.2%	$33,766	54,581	94.6%	19.4%	$36,605	30	0.6%	14.4%	$24,190	5,376	99.4%	19.6%	$31,103	63,075	19.5%	$35,991
	55-64	1,390	4.6%	10.0%	$32,649	28,771	95.4%	10.2%	$34,614	17	0.5%	8.2%	$21,113	3,309	99.5%	12.0%	$32,731	33,487	10.4%	$34,339
	65+	242	2.8%	1.7%	$22,117	8,278	97.2%	2.9%	$16,935	6	0.5%	2.9%	$14,449	1,203	99.5%	4.4%	$23,203	9,729	3.0%	$17,837
	Unknown	844	1.9%	6.1%	$11,669	44,212	98.1%	15.7%	$7,242	8	0.2%	3.8%	$19,908	3,875	99.8%	14.1%	$8,035	48,939	15.1%	$7,383
	Total	13,890	4.7%	100.0%	$26,212	281,944	95.3%	100.0%	$22,744	208	0.8%	100.0%	$17,657	27,467	99.2%	100.0%	$21,475	323,509	100.0%	$22,782

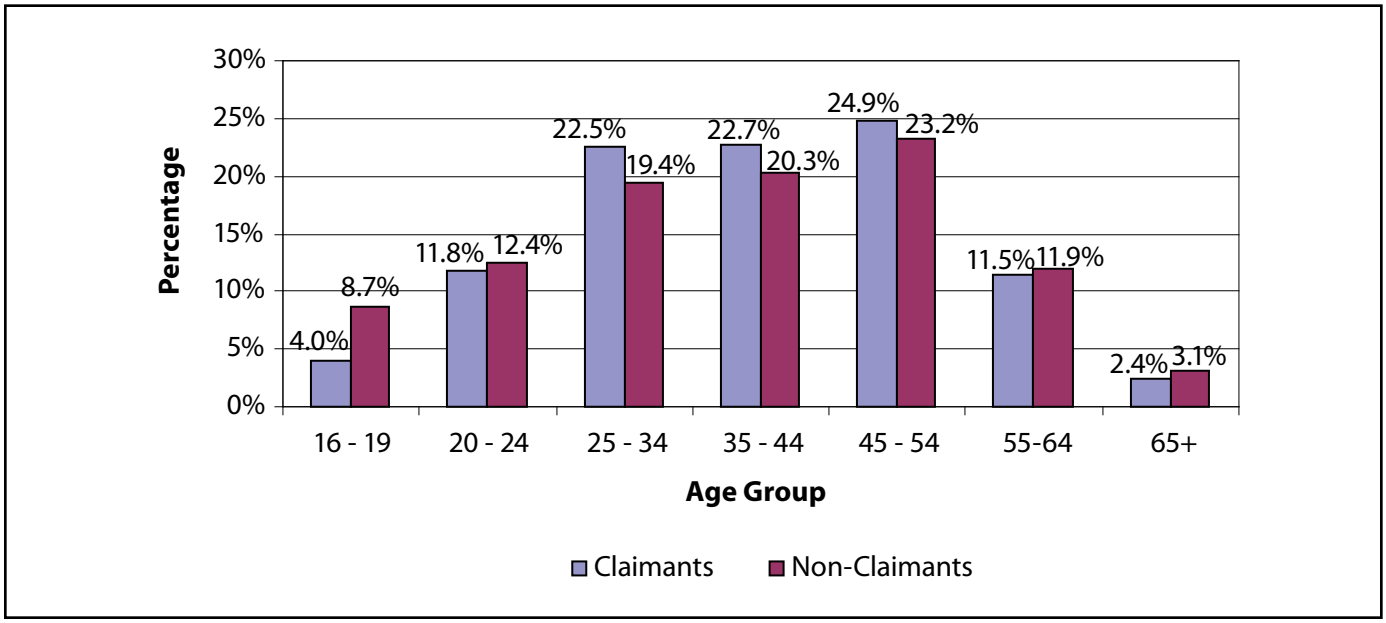

Figure 1: Statewide Distribution of Female Claimants and Non-Claimants Whose Primary Employer Carried Workers' Compensation Insurance, 2004

(Text continued from page 30)

file a claim as female workers. However, both male and female workers were more likely to be claimants in manufacturing than either mining or construction. The risk ratio between males and females in this industry was less (1.86 times) than mining and construction, but still greater than all industries combined.

Results II: Wage Analysis, All Workers

This section examines demographic

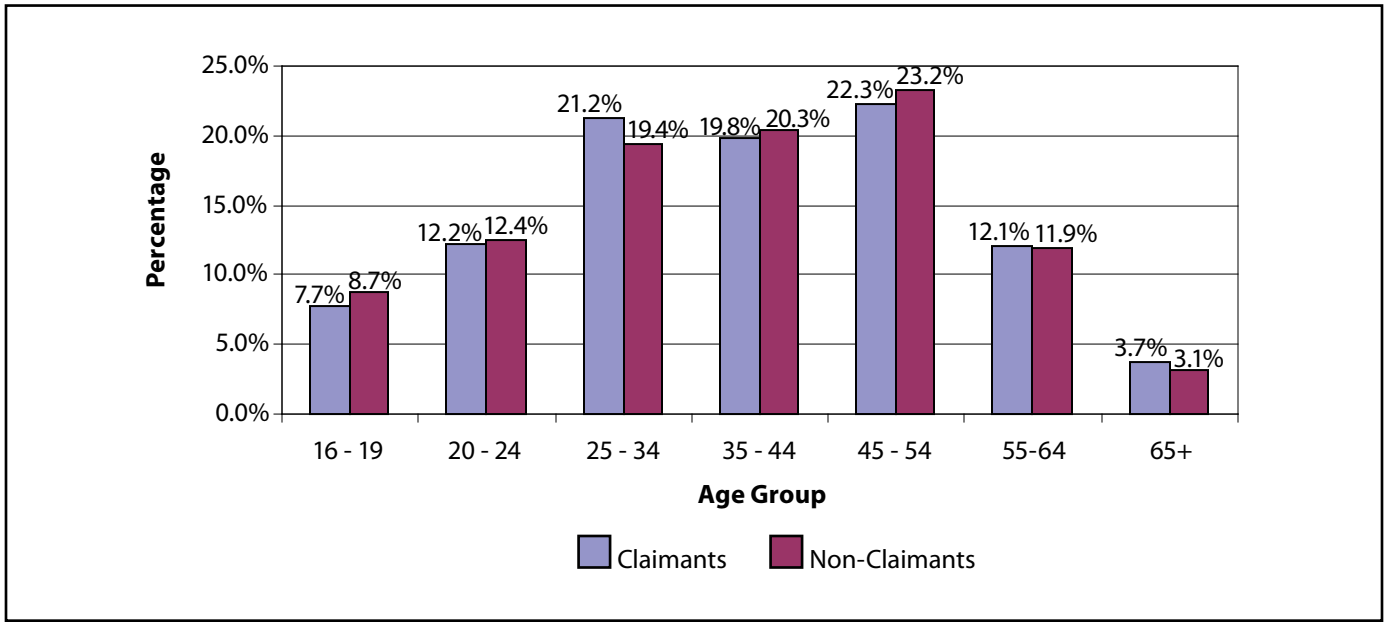

Figure 2: Statewide Distribution of Male Claimants and Non-Claimants Whose Primary Employer Carried Workers' Compensation Insurance, 2004

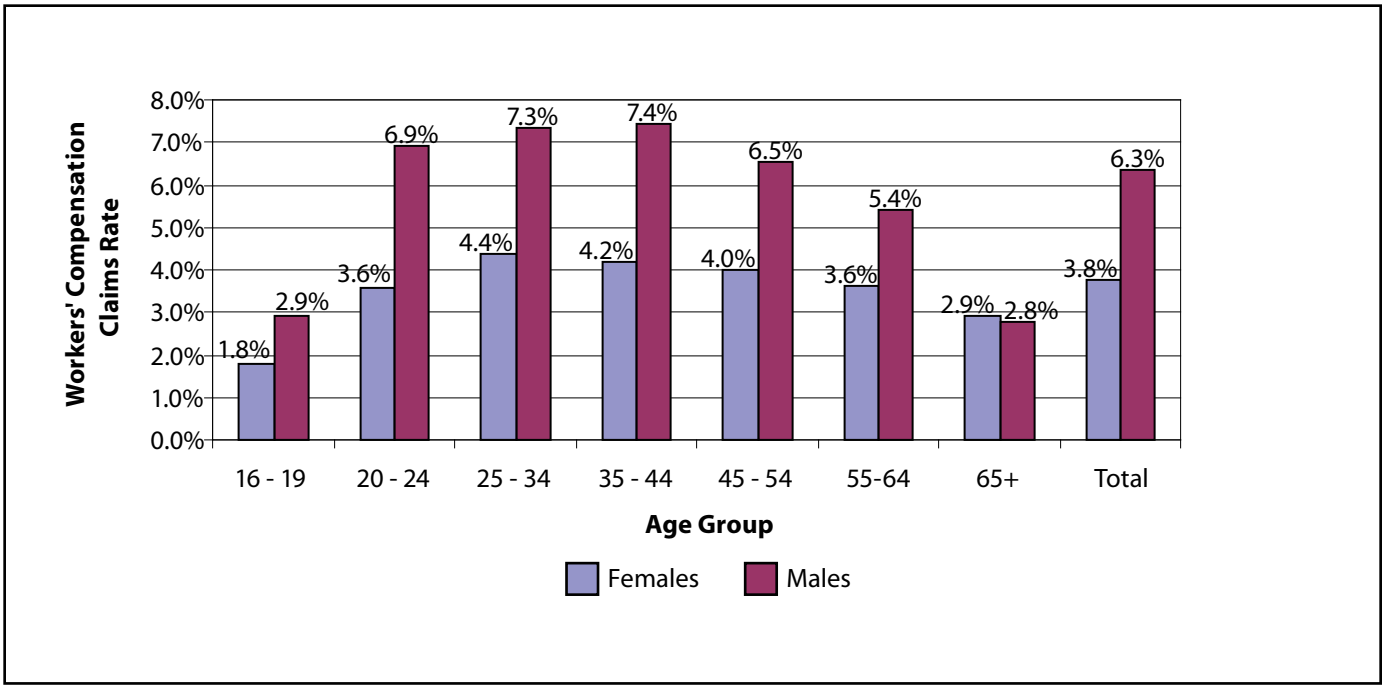

Figure 3: **Statewide Claims Rates of Workers Whose Primary Employer Carried Workers' Compensation Insurance, 2004**

differences using gross wages as a dependent variable. Figure 5 (see page 34) shows that, for female workers, claimants on average earned greater wages than non-claimants except for 45-54 year-olds ($24,925 and $25,817 respectively). In some cases, such as 16-19 year-olds, claimants earned an average of $1.80 for each $1.00 non-claimants earned. A similar scenario occurred for 20-24 year-olds ($1.41) and

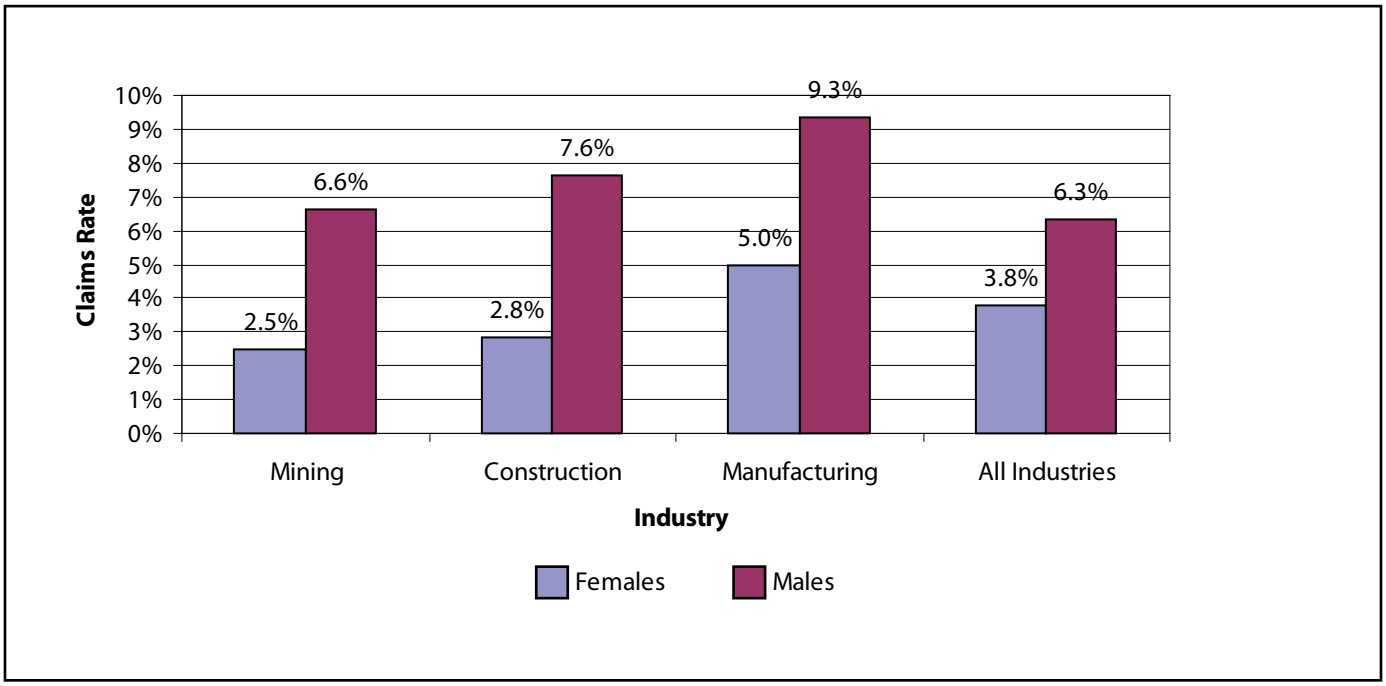

Figure 4: **Workers' Compensation Claims Rates for Workers Covered by Primary Employer Account for Selected Industries, 2004**

workers 65 and older ($1.42). The exception to this finding was for 45-54 year-olds where claimants on average earned $0.96 for each dollar non-claimants earned. The picture is somewhat different for males as shown in Figure 6 (see page 35). For male workers between 35 and 64 years of age, non-claimants earned between 13% (35-44) and 20% (45-54) more than claimants did. In addition, the average earnings for all male non-claimants ($31,720) exceeded that of male claimants ($30,563).

The industry summaries of average wages are shown in Figure 7 (see page 35). Claimant wages exceeded non-claimant wages in both construction ($23,843 compared to $19,866) and manufacturing ($31,558 compared to $30,898). Conversely, in mining non-claimant wages ($44,588) exceeded claimant wages ($41,713).

Results III: Control Group Analysis, All Claimants

Table 2 (see page 36) details the treatment and control group cases selected for the first analysis. The treatment group is the WC claimants and the control group is the non-claimants. Four unique control cases were matched to each treatment case. Thus, when the number of treatments analyzed (Row J) is multiplied by four, the result is the number of control cases shown in Row A. The number of treatment cases used is less than the total number of available cases because 393 (2.9%) could not be matched to control cases or an insufficient number of control cases were matched to them. Rows B through G of Table 2 show the distribution of treatment cases used in the first portion of the analysis. Note that 79.5% of treatment cases were medical claims only and did not involve any type of disability payments to injured workers. The remaining treatment cases (WC claimants) are arranged in ascending order of injury severity in rows C through G. The vast majority of more severely injured workers were classified as Temporary Total Disability or Permanent Partial Impairment. Of the more than 13,000 injury claims filed in 2004, only 14 resulted in worker deaths by 2008.

Note that for 2004, 14,098 WC claims were filed (see Table 1). However, the

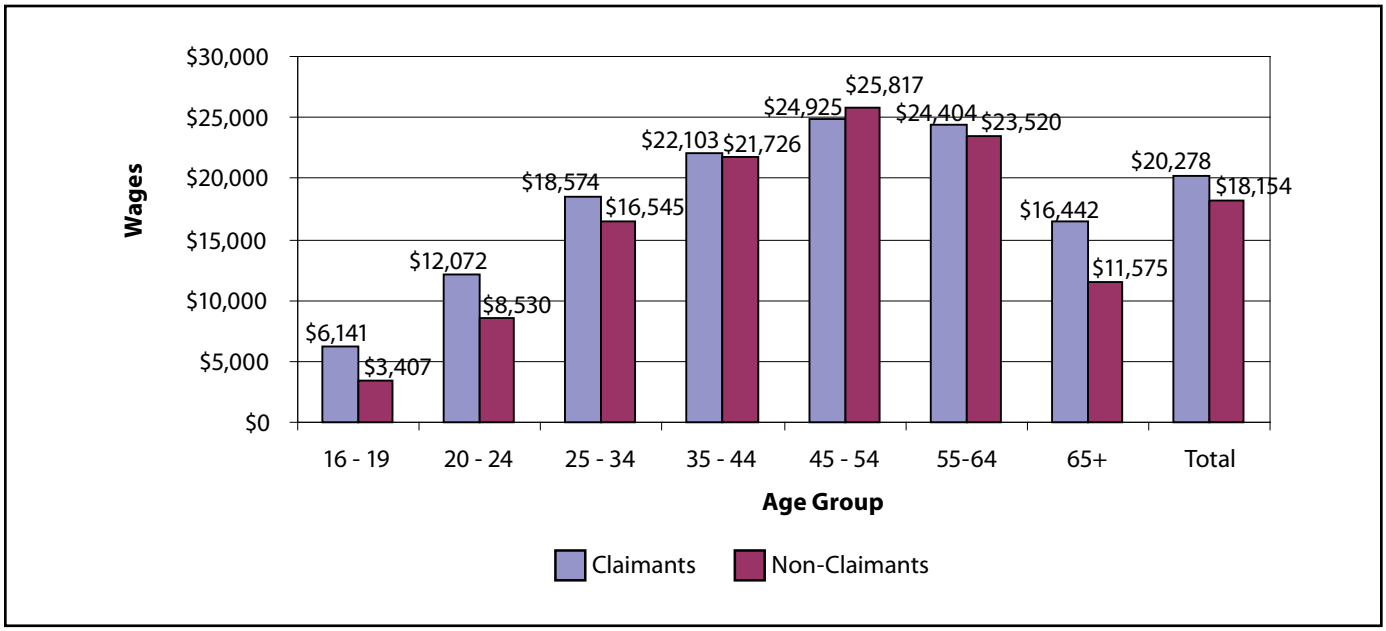

Figure 5: **Statewide Wages of Female Claimants and Non-Claimants Whose Primary Employer Carried Workers' Compensation Insurance, 2004**

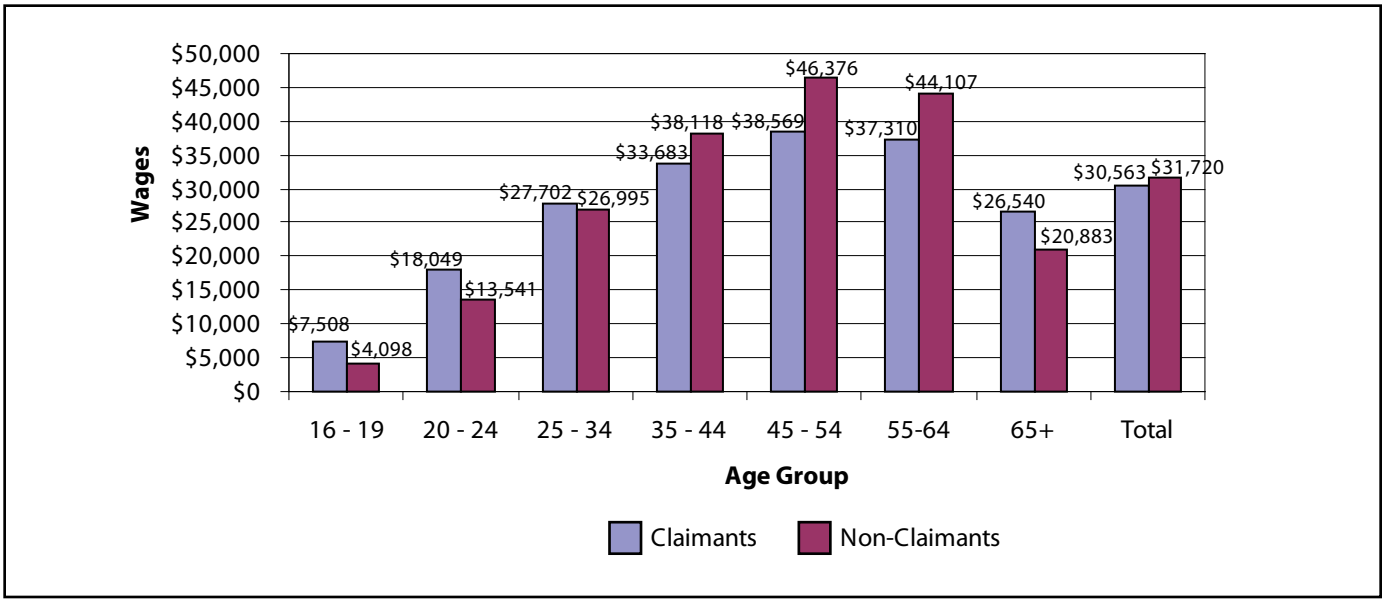

Figure 6: Statewide Wages of Male Claimants and Non-Claimants Whose Primary Employer Carried Workers' Compensation Insurance, 2004

analysis focuses only on the left half of the table (13,890 claims). Of the 13,890 WC claims shown in the left half of Table 1, only 13,781 were available for further analysis. The difference between the 13,781 shown in Table 2 and the 13,890 shown in Table 1 was primarily due to claim rejections.

Tables 3a and 3b (see pages 37) compare treatment and control group populations on age and gender dimensions. The goal of matching is to create a control group, which is identical to the treatment group on every control variable. The row and column percents of the two tables tell us how effective the process was. For example, Table 3a shows that for females age 20-24, the row percent is 33.3% and the column percent is 11.6%. The same cell in Table 3b (treatment group) has a row percent of 32.2% and

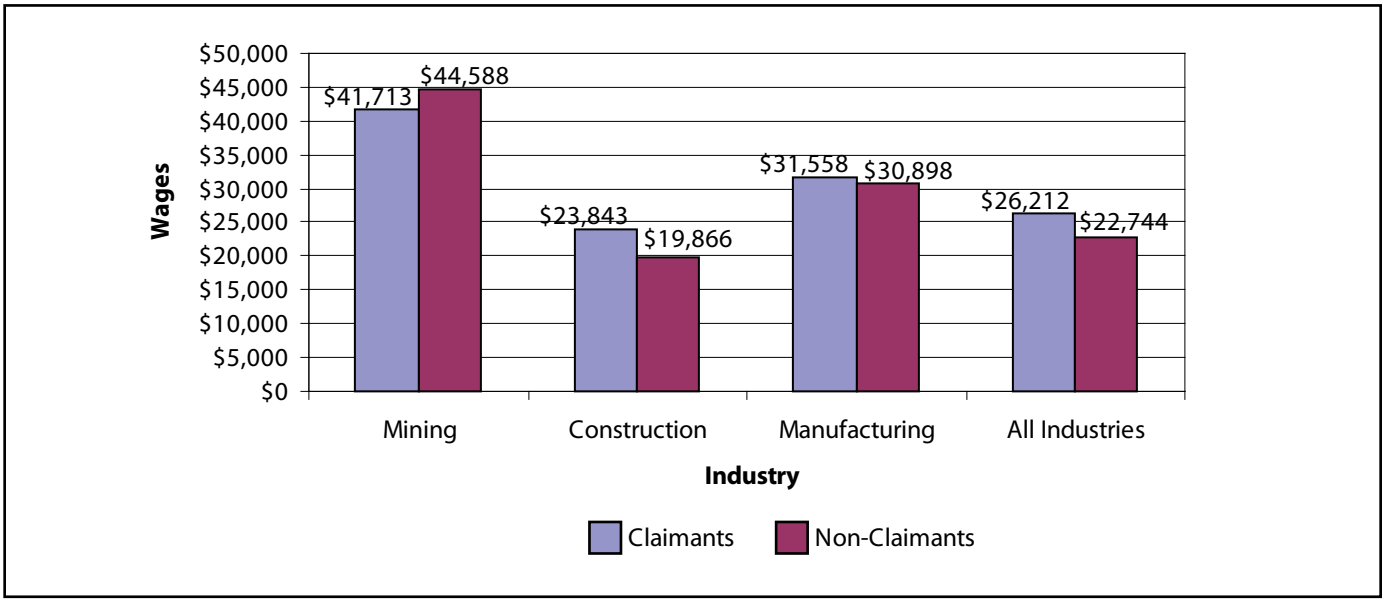

Figure 7: Statewide Wages of Claimants and Non-Claimants Covered by Primary Employer Accounts for Selected Industries, 2004

Table 2: **Distribution of Subjects Analyzed, Treatment and Control Group I**

Claimant Status	Severity	N	Total Cases Analyzed Col %	Distribution of Analyzed Claimants
Did Not File a Workers' Compensation Claim	No Inury Reported (A)	53,552	80.0%	n/a
Filed a Workers' Compensation Claim	Medical Only (B)	10,638	15.9%	79.5%
	Temporary Total Disability(C)	1,930	2.9%	14.4%
	Permanent Partial Impairment (D)	731	1.1%	5.5%
	Permanent Partial Disability/VR (E)	69	0.1%	0.5%
	Permanent Total Disability (F)	6	0.0%	0.0%
	Death (G)	14	0.0%	0.1%
	Total Matched Claimants (H) = (A) +(B) + (C) + (D) + (E) + (F) + (G)	13,388	20.0%	100.0%
	Unmatched Claimants (I)	393		
	Total Claimants (J) = (H) + (I)	13,781		
Total Cases Analyzed (A) + (J)		66,940		

a column percent of 11.8%. This result indicates a very close match. The remaining table cells show much the same results.

Table 4 (see page 38) displays the results when comparing wages for the treatment and control groups. The rows and columns of the table are labeled to facilitate ease of use. Results for mining and construction are shown as are the statewide totals. The analysis begins with the All Industries section (Rows 17 – 24), then proceeds to mining (Rows 3 – 9) and then construction (Rows 10 – 16).

Row 17 shows the all industries results for the control group, workers who did not file a claim. These 53,552 people worked an average of 10.7 quarters of the maximum 14 quarters between first quarter 2005 and second quarter 2008. Row 18 shows that the 10,638 claimants filing medical only claims also worked an average of 10.7 quarters. However, their real average total earnings were $107,662 or 92.6% of non-claimants.[2] If a worker incurred more debilitating injuries, wages declined rapidly as shown in cells E19 – E23. The greatest decline in wages occurred when injury severity increased from Permanent Partial Impairment (PPI) to Permanent Partial Disability (PPD).

How did PPI workers fare when it came to wage replacement (see Glossary for definition)? This can be estimated by subtracting the average PPI wages (E20) from the non-claimant average wages (E17) = $31,755/person. The estimated replacement from the indemnity payments (J17) averaged $19,860/person. The estimated replacement shortfall was $11,895. This amount does not include insurance deductibles or other out-of-pocket claimant costs. Similar calculations can be performed for other groups of claimants.

In the matched sample, 10.7% of WC claims occurred in mining (Rows 3 – 9). Although the average number of quarters worked (post-2004) was nearly the same as for all workers (11.0 and 10.7, respectively), the wage differences for mining workers in total and the three least severe injury categories (E4 – E6 compared to E17 – E20) were much

2 Student's t-test was significant at the p≤.001. See Appendix C for details.

Table 3a: **Control Group Demographics**

Age Group		Gender Female	Male	Unknown	Total
16 - 19	N	728	1,189	1	**1,918**
	Row%	37.9%	61.9%		**100.0%**
	Col%	4.0%	3.5%		**3.5%**
20 - 24	N	2,082	4,165	.	**6,247**
	Row%	33.3%	66.6%	.	**100.0%**
	Col%	11.6%	12.5%	.	**11.6%**
25 - 34	N	3,994	8,137	2	**12,133**
	Row%	32.9%	67.0%		**100.0%**
	Col%	22.3%	24.4%		**22.6%**
35 - 44	N	4,115	7,612	.	**11,727**
	Row%	35.0%	64.9%	.	**100.0%**
	Col%	23.0%	22.9%	.	**21.8%**
45 - 54	N	4,524	7,951	1	**12,476**
	Row%	36.2%	63.7%		**100.0%**
	Col%	25.3%	23.9%		**23.2%**
55-64	N	2,017	3,551	.	**5,568**
	Row%	36.2%	63.7%	.	**100.0%**
	Col%	11.2%	10.6%	.	**10.3%**
65+	N	362	567	.	**929**
	Row%	38.9%	61.0%	.	**100.0%**
	Col%	2.0%	1.7%	.	**1.7%**
Unknown	N	39	47	2,468	**2,554**
	Row%	1.5%	1.8%	96.6%	**100.0%**
	Col%	2.0%	1.0%	99.8%	**4.7%**
Total	**N**	**17,861**	**33,219**	**2,472**	**53,552**
	Row%	**33.4%**	**62.0%**	**4.6%**	**100.0%**
	Col%	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 3b: **Workers' Compensation Claimants (Treatment Group) Demographics**

Age Group		Gender Female	Male	Unknown	Total
16 - 19	N	182	302	.	**484**
	Row%	37.6%	62.3%	.	**100.0%**
	Col%	4.1%	3.6%	.	**3.6%**
20 - 24	N	522	1,095	.	**1,617**
	Row%	32.2%	67.7%	.	**100.0%**
	Col%	11.8%	13.0%	.	**12.0%**
25 - 34	N	995	2,069	.	**3,064**
	Row%	32.4%	67.5%	.	**100.0%**
	Col%	22.5%	24.6%	.	**22.8%**
35 - 44	N	996	1,960	.	**2,956**
	Row%	33.6%	66.3%	.	**100.0%**
	Col%	22.5%	23.3%	.	**22.0%**
45 - 54	N	1,099	1,936	.	**3,035**
	Row%	36.2%	63.7%	.	**100.0%**
	Col%	24.9%	23.0%	.	**22.6%**
55-64	N	501	877	.	**1,378**
	Row%	36.3%	63.6%	.	**100.0%**
	Col%	11.3%	10.4%	.	**10.2%**
65+	N	109	138	.	**247**
	Row%	44.1%	55.8%	.	**100.0%**
	Col%	2.4%	1.6%	.	**1.8%**
Unknown	N	7	10	590	**607**
	Row%	1.1%	1.6%	97.1%	**100.0%**
	Col%	1.0%	1.0%	100.0%	**4.5%**
Total	**N**	**4,411**	**8,387**	**590**	**13,388**
	Row%	**32.9%**	**62.6%**	**4.4%**	**100.0%**
	Col%	**100.0%**	**100.0%**	**100.0%**	**100.0%**

greater than in construction. Using the same replacement wage methodology described previously, the estimated replacement wage shortfall for PPI injuries in mining was estimated to be $41,560 per worker.

Rows 10 – 16 show the results for construction workers. Note that the average post-2004 wages in addition to the average quarters worked tended to be less for construction workers than for those in mining or for all industries combined. The seasonal nature of construction work is likely one contributor to this result.

One difference between PPI workers in construction and mining is that PPI worker average wages ($76,803) were greater than workers having a temporary total disability (TTD, $74,157).

Results IV: More Severely Injured Workers' Demographics

Table 5 (see page 39) displays the counts of treatment (more severely injured workers) and control cases (medical claims only). The treatment group for this

Table 4: **Detail Statistics of Mining and Construction Industries: All Claimants**

Industry	Severity	N	Average Quarters Worked Post 2004 (max= 14)	Post 2004 Wages	Earnings Percentage Compared to Nonclaimants	Avg. per Person Medical Billings	Avg. per Person Medical Payments	Avg. per Person Indemnity Payments	Avg. per Person Indemnity Billings
Mining	Did Not File A Claim	5,862	11.0	$198,041	100.0%	$0	$0	$0	$0
	Medical Only	1,086	11.4	$188,274	95.1%	$2,721	$1,544	$0	$0
	Temporary Total Disability	232	10.3	$141,134	71.3%	$18,131	$10,532	$5,622	$5,622
	Permanent Partial Impairment	93	9.6	$134,664	68.0%	$67,047	$39,518	$21,809	$21,809
	Permanent Partial Disability/VR	14	4.4	$29,727	15.0%	$109,176	$63,284	$94,650	$94,650
	Permanent Total Disability or Death	8	1.8	$14,063	7.1%	$327,585	$176,734	$136,190	$136,190
	Total Claimants	**1,433**	**11.0**	**$174,641**	**88.2%**	**$12,244**	**$7,045**	**$4,011**	**$4,011**
Construction	Did Not File A Claim	7,245	10.1	$110,062	100.0%	$0	$0	$0	$0
	Medical Only	1,287	10.2	$102,416	93.1%	$2,434	$1,050	$0	$0
	Temporary Total Disability	342	9.0	$74,157	67.4%	$12,815	$6,610	$3,644	$3,644
	Permanent Partial Impairment	133	8.5	$76,803	69.8%	$75,762	$44,461	$24,048	$24,048
	Permanent Partial Disability/VR	8	5.0	$36,425	33.1%	$138,117	$93,414	$76,963	$76,963
	Death	3	0.0	$0	0.0%	$4,552	$4,013	$131,600	$131,600
	Total Claimants	**1,773**	**9.8**	**$94,572**	**85.9%**	**$10,553**	**$5,801**	**$3,077**	**$3,077**
All Industries	Did Not File A Claim	53,552	10.7	$116,273	100.0%	$0	$0	$0	$0
	Medical Only	10,638	10.7	$107,662	92.6%	$2,097	$1,046	$0	$0
	Temporary Total Disability	1,930	10.2	$89,429	76.9%	$15,823	$8,548	$3,421	$3,421
	Permanent Partial Impairment	731	9.1	$84,518	72.7%	$78,080	$43,804	$19,860	$19,860
	Permanent Partial Disability/VR	69	5.1	$26,846	23.1%	$180,719	$96,956	$66,550	$66,550
	Permanent Total Disability	6	6.0	$35,859	30.8%	$444,519	$262,216	$161,384	$161,384
	Death	14	0.1	$2,578	2.2%	$70,133	$32,412	$119,710	$119,710
	Total Claimants	**13,388**	**10.5**	**$103,212**	**88.8%**	**$9,414**	**$5,106**	**$2,118**	**$2,118**

portion of the analysis is a subset of the injured workers shown in Table 2. In this example, two control cases were matched to each treatment case. The total number of matched treatment cases was 2,374 (Row L). The corresponding number of control cases was 4,748 (Row K). The number of unmatched treatment cases was 376 or 13.6% of the available cases.

Tables 6a and 6b illustrate the demographic distributions of the second treatment (more severely injured claimants) and control groups (medical only claims). Again, the cell for females age 20-24 is the example. The row and column percents for this cell in Table 6a (control group 2; see page 40) are 24.0% and 8.5%. They are somewhat different than the 27.4% (row) and 10.3% (column) shown for the treatment group (Table 6b; see page 40). The percentages do not match as closely as when using all available cases because there is a much smaller group of control cases available for matching. Therefore, a difference of a small number of cases more substantially influences the distribution percentages.

Results V: Matched Control Group Analysis, More Severe Injuries

Table 7 (see page 41) shows the results of when we further subset WC claimants

Table 5: **Sub-Control Group Study of Claimants Only, Treatment and Control Group II (Row Labels Continued from Table 2)**

Group	N	Dist %
Control Group (K)	4,748	66.7%
Treatment Group (L)	2,374	33.3%
Total Cases Analyzed (M) = (K) + (L)	7,122	100.0%
Unmatched Treatment Cases (N) = (M) - ((C) + (D) + (E) + (F) + (G))	376	

into more severe injuries (treatment group) and medical only injuries (control group). The total counts of the two groups shown in Rows 11 – 13 match those shown in Tables 6a and 6b. The earnings loss because of a more severe injury appears to be more acute for mining workers than construction workers. Column F shows that employees in mining with more severe injuries earned 83.7% of mining workers with a medical claim only. Similarly, construction employees with more severe injuries earned 86.6% of the construction worker wages with medical claims only. Not only do mining workers lose a greater proportion of potential earnings due to more severe injuries, they tend to work fewer quarters following injury occurrence. The average number of quarters worked post-injury was 1.1 less in mining[3] and 0.9 less in construction[4] compared to those with medical claims only. In addition, the earnings losses in construction and mining tended to be larger on a percentage basis than all injured workers when severity was greater than medical only claims.

Earnings replacement for more severely injured workers demonstrates a usual pattern (see Table 4). Overall, more severely injured workers made an average of $11,848 less than those with medical claims only (E11 – E12). The average amount replaced was $9,303 (E11 – E12 – I12). Dividing that quantity by the lost wages reveals that 78.5% of the wage difference between medical only claims and more severe injuries was replaced. Repeating the same calculations for mining and construction yields a differential replacement ratio of 84.9% (construction) and a differential replacement ratio of 45.4% in mining.

Conclusion

In this pilot study, matched control groups were used to analyze differences in wages earned when comparing claimants to non-claimants in addition to comparing different types of claimants to each other. The propensity scoring and matched control group strategy allows for direct comparisons because the influence of confounding variables is largely removed from the analysis. The pilot study demonstrates Research & Planning's unique ability to acquire and integrate multiple administrative data sets in both cross-sectional and longitudinal methods to enhance policymakers' understanding of workforce injuries and their effects on workers, their families, and the economy.

Future studies will include a more complete analysis of the cost components in the Workers' Compensation system. Furthermore, medical costs and lost wages by occupation will be explored in the development of models to help mitigate the most costly injuries. The quantification of the cost element illustrates in which industries and in some cases, which occupations are more likely to incur the greatest cost to society, not only in dollars lost, but in lost lives as well.

3 Student's t-test was statistically significant at p≤.001. See Appendix C for details.

4 Student's t-test was statistically significant at p≤.01. See Appendix C for details.

Table 6a: **Medical Claim Only (Control Group 2) Demographics**

Age Group		Sex: Female	Male	Unknown	Total
16 - 19	N	38	75	.	113
	Row%	33.6%	66.3%	.	100.0%
	Col%	2.7%	2.3%	.	2.3%
20 - 24	N	120	379	.	499
	Row%	24.0%	75.9%	.	100.0%
	Col%	8.5%	11.9%	.	10.5%
25 - 34	N	304	732	.	1,036
	Row%	29.3%	70.6%	.	100.0%
	Col%	21.6%	23.1%	.	21.8%
35 - 44	N	340	797	.	1,137
	Row%	29.9%	70.0%	.	100.0%
	Col%	24.2%	25.1%	.	23.9%
45 - 54	N	373	773	.	1,146
	Row%	32.5%	67.4%	.	100.0%
	Col%	26.6%	24.4%	.	24.1%
55-64	N	180	356	.	536
	Row%	33.5%	66.4%	.	100.0%
	Col%	12.8%	11.2%	.	11.2%
65+	N	43	49	.	92
	Row%	46.7%	53.2%	.	100.0%
	Col%	3.0%	1.5%	.	1.9%
Unknown	N	3	2	184	189
	Row%	1.5%	1.0%	97.3%	100.0%
	Col%	2.0%	0.1%	100.0%	3.9%
Total	N	1,401	3,163	184	4,748
	Row%	29.5%	66.6%	3.9%	100.0%
	Col%	100.0%	100.0%	100.0%	100.0%

Table 6b: **More Severe Injuries (Treatment Group 2) Demographics**

Age Group		Sex: Female	Male	Unknown	Total
16 - 19	N	19	43	.	62
	Row%	30.6%	69.3%	.	100.0%
	Col%	2.6%	2.7%	.	2.6%
20 - 24	N	74	196	.	270
	Row%	27.4%	72.5%	.	100.0%
	Col%	10.3%	12.5%	.	11.3%
25 - 34	N	139	394	.	533
	Row%	26.0%	73.9%	.	100.0%
	Col%	19.3%	25.1%	.	22.4%
35 - 44	N	185	376	.	561
	Row%	32.9%	67.0%	.	100.0%
	Col%	25.7%	23.9%	.	23.6%
45 - 54	N	184	369	.	553
	Row%	33.2%	66.7%	.	100.0%
	Col%	25.6%	23.5%	.	23.2%
55-64	N	91	165	.	256
	Row%	35.5%	64.4%	.	100.0%
	Col%	12.6%	10.5%	.	10.7%
65+	N	23	23	.	46
	Row%	50.0%	50.0%	.	100.0%
	Col%	3.2%	1.4%	.	1.9%
Unknown	N	3	1	89	93
	Row%	3.2%	1.0%	95.6%	100.0%
	Col%	4.0%	0.1%	100.0%	3.9%
Total	N	718	1,567	89	2,374
	Row%	30.2%	66.0%	3.7%	100.0%
	Col%	100.0%	100.0%	100.0%	100.0%

References

Allison, P. (1999). Logistic Regression Using SAS: Theory and Application. SAS Institute Inc., Cary, NC, USA.

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Table 7: **Control Group Matching, More Severe Injuries Subset**

Industry	Severity	N	Average Quarters Worked Post-2004	Post Injury Wages	Earnings as a Percentage of Medical Only	Medical Billings	Medical Payments	Indemnity Payments	Indemnity Billings
Mining	Medical Claim Only	576	11.5	$182,416	100.0%	$2,722	$1,493	$0	$0
	More Severe Injuries	277	10.4	$152,761	83.7%	$38,735	$22,038	$13,476	$13,476
	Total	853	11.2	$172,786	94.7%	$14,416	$8,165	$4,376	$4,376
Construction	Medical Claim Only	365	10.0	$92,813	100.0%	$2,114	$870	$0	$0
	More Severe Injuries	172	9.1	$80,359	86.6%	$29,186	$16,971	$10,576	$10,576
	Total	537	9.7	$88,673	95.5%	$11,114	$6,223	$3,516	$3,516
All Industries	Medical Claim Only	4,748	10.6	$102,978	100.0%	$2,285	$1,108	$0	$0
	More Severe Injuries	2,374	10.0	$91,130	88.5%	$36,533	$20,039	$9,303	$9,303
	Total	7,122	10.4	$99,029	96.2%	$13,701	$7,418	$3,101	$3,101

WYOMING REPORT OF INJURY

Workers' Safety & Compensation 307-777-7441 **CASE #:** _____

Please use ***BLACK*** ink. Do not cross zeros or sevens.

EMPLOYER INFORMATION

BUSINESS NAME | WORK COMP EMPLOYER #

ADDRESS

CITY | ST | ZIP | PHONE :

TYPE OF BUSINESS

EMPLOYEE INFORMATION

LAST NAME | FIRST NAME | MI

MAILING ADDRESS

CITY | ST | ZIP | PHONE #

PHYSICAL ADDRESS

CITY | ST | ZIP | DATE HIRED | STATE HIRED

US CITIZEN? Yes ☐ No ☐ | IF NO, INS# | SSN# | SEX: M ☐ F ☐

DATE OF BIRTH | MARITAL STATUS: SINGLE ☐ MARRIED ☐ DIVORCED ☐ WIDOWED ☐ | NUMBER OF DEPENDENTS

DRIVER LICENSE # | ST | EDUCATION: HIGHEST GRADE COMPLETED

WAGE INFORMATION

WAGE RATE | PER: HOUR ☐ DAY ☐ WEEK ☐ MONTH ☐ | HOURS WORKED PER DAY | # OF DAYS WORKED PER WEEK

OT HOURS PER WEEK | PAID IN FULL FOR THE DAY OF INJURY? Yes ☐ No ☐ | DO YOU HAVE MORE THAN ONE PAYING JOB? Yes ☐ No ☐

INJURY INFORMATION

DATE OF INJURY | TIME OF INJURY | AM ☐ PM ☐ | IF FATALITY, DATE OF DEATH

SHIFT BEGAN | AM ☐ PM ☐ | SHIFT ENDED | AM ☐ PM ☐ | DATE EMPLOYER NOTIFIED

PERSON CONTACTED | CONTACT PHONE #

INJURED WORKER JOB TITLE | STATUS: OWNER ☐ CORPORATE OFFICER ☐ PARTNER ☐ INDEPENDENT CONTRACTOR ☐

CHOOSE TYPE OF EMPLOYEE: R - REGULAR, V - VOLUNTEER, I - INMATE, O - OTHER | TIME LOST FROM WORK? Yes ☐ No ☐ | DATE LOST TIME BEGAN | DATE RETURN TO WORK

DESCRIBE THE ACCIDENT/ INJURY: (ATTACH SEPARATE SHEET IF NEEDED AND EXPLAIN WHICH SIDE AND BODY PART HAS BEEN INJURED)

MACHINE/PRODUCT FAILURE OR VEHICLE ACCIDENT? Yes ☐ No ☐ | DID INJURY OCCUR ON EMPLOYER PREMISES? Yes ☐ No ☐

ACCIDENT ADDRESS

CITY | ST | COUNTY

WITNESS NAME | WITNESS PHONE #

HAS THIS BODY PART(S) BEEN INJURED PREVIOUSLY? Yes ☐ No ☐ | EXPLAIN: (ATTACH SHEET IF NEEDED)

WAS THE PRIOR INJURY WORKERS' COMP? Yes ☐ No ☐ | IF YES, IN WHAT STATE? | DATE OF PRIOR INJURY

TREATING HEALTH CARE PROVIDER

ADDRESS | PHYSICIAN PHONE #

CITY | ST | ZIP | DATE OF INITIAL EXAM

IMPORTANT: PLEASE COMPLETE THE BACKSIDE OF THIS FORM.

NOTE: This report of injury is not a claim for benefits.
Benefits must be filed on separate forms.
An incomplete form may be returned and will delay case processing.

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Appendix A

Injury Codes – REQUIRED
(See attached Injury Code Table) CASE #: _____
PLEASE CODE ONE LINE IN EACH COLUMN FOR EVERY BODY PART INJURED.

PART OF BODY	SIDE L/R	NATURE OF INJURY	SOURCE OF INJURY	EVENT TYPE	ENVIRONMENTAL FACTORS

Employee Release: I authorize the Division of Workers' Safety and Compensation to disclose and or obtain information about my case to or from other state agencies; insurers, group health plans, third party administrators, health maintenance organizations or similar entities. The information that may be released or obtained includes: my name, my social security number, the medical services I received and the dates of those services, the amounts charged by health care providers for my medical services, and the amount of benefits paid. This information may be needed to ensure that benefit payments are not duplicated.

The information given by me herein is true and correct. I further acknowledge that misrepresentation or fraud can lead to a civil action or criminal prosecution. By filing this report, I grant the Division of Workers' Safety & Compensation full access to any records maintained by any of my health care providers, photocopies of this authorization shall be given the same effect as the original.

I agree this release shall remain in full effect until revoked by me in writing.

_____ _____ _____
Employee Signature or Employee's Representative Date Relationship to Employee

_____ EMPLOYEE SSN# _____
Print **Employee** Name

Employer Certification: I am an authorized agent of the employer. The information given by me herein is true and correct. I further acknowledge that misrepresentation or fraud can lead to a civil action or criminal prosecution.

Do you believe this injury or condition is work-related? Yes ☐ No ☐ Unsure ☐
If no, please attach letter of explanation stating the disputed facts. If yes, do you approve payment of temporary total disability benefits to which the employee may be entitled? Yes ☐ No ☐ Unsure ☐
If no, please attach letter of explanation.

Drug or alcohol test performed on date of injury? Yes ☐ No ☐ Unsure ☐

_____ _____
Employer / Supervisor Signature Date

_____ _____
Print Employer / Supervisor Name Title

WORK COMP EMPLOYER # _____ Business Name _____ PHONE #: ( ) _____

Mail ORIGINAL form to:

Wyoming Workers' Safety & Compensation Division
PO Box 20207
Cheyenne, WY 82003 - 7005

DO NOT WRITE IN THIS AREA

IMPORTANT: **For general claims information call (307)777-7441**

To order forms please call the mail room at (307) 777-6375

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Appendix A

WYOMING WORKERS' SAFETY AND COMPENSATION
INJURY REPORT CODE TABLES

Nature of Injury Codes

Code	Injury	Code	Injury
01	Amputation	02	Asphyxia
03	Bruise, contusion, abrasion	04	Burn (chemical)
05	Burn or scald (heat)	06	Concussion
07	Cut or laceration	08	Dermatitis
09	Dislocation	10	Electric shock
11	Foreign body in eye	12	Fracture
13	Freezing or frostbite	14	Hearing loss
15	Heat exhaustion	16	Hernia
17	Poisoning (systemic)	18	Puncture
19	Radiation effect	20	Strain or sprain
21	Other, please describe	22	Cancer
23	Industrial disease	24	Mental disorder
25	Coronary condition	26	Disfigurement

Source of Injury Codes

Code	Injury	Code	Injury
01	Aircraft	02	Air Pressure
03	Animal, insect, bird, reptile, fish	04	Boat
05	Bodily motion	06	Boiler pressure
07	Boxes, barrels, etc.	08	Buildings, structures
09	Chemical liquids or vapors	10	Cleaning compound
11	Cold (environmental or mechanical)	12	Dirt, sand, stone
13	Drugs or Alcohol	14	Dust, particles, chips
15	Electrical apparatus or wiring	16	Fire or smoke
17	Food	18	Furniture or furnishings
19	Gases	20	Glass
21	Hand tool (powered)	22	Hand tool (manual)
23	Heat (environmental or mechanical)	24	Hoisting apparatus
25	Ladder	26	Machine
27	Materials handling equipment	28	Metal products
29	Motor vehicle (highway)	30	Motor vehicle (industrial)
31	Motorcycle	32	Windstorm, lightning, etc.
33	Firearm	34	Person
35	Petroleum Products	36	Pump or Prime motor
37	Radiation	38	Train or railroad
39	Vegetation	40	Waste Products
41	Water	42	Working surface
43	Other, please describe	44	Fumes
45	Mists	46	Vibration
47	Noise	48	Biological agent

Part of Body Codes

Code	Injury	Code	Injury
01	Abdomen	02	Arm(s) - multiple
20 36 37	Back Neck Mid-Back (Thoracic) Low Back (Lumbar)	04	Body system
05	Chest	06	Ear(s)
07	Elbows	08	Eye(s)
09	Face	10	Finger(s)
11	Foot, toe(s), or ankle	12	Hand(s)
13	Head	14	Hip(s)
15	Knee(s)	16	Leg(s)
17	Lower arm(s)	18	Lower legs(s)
19	Multiple	20	Neck (Cervical)
21	Shoulder(s)	22	Upper arm(s)
23	Upper Leg(s)	24	Wrist(s)
25	Blood	26	Kidney
27	Liver	28	Lung
29	Nervous System	30	Reproductive System
31	Other body system, please describe	32	Thumb
33	Groin	34	Great Toe
35	Heart	36	Mid-Back (Thoracic)
37	Low Back (Lumbar)	38	Pelvis
39	Ribs	40	Teeth
41	Tailbone (Coccyx)	42	Buttocks

Event Type Codes

Code	Injury	Code	Injury
01	Struck by	02	Caught in or between
03	Bite, sting, or scratch	04	Fall (same level)
05	Fall (from elevation)	06	Struck against
07	Rubbed or abraded	08	Inhalation
09	Ingestion	10	Absorption
11	Repeated motion or pressure	12	Cardio-vascular, respiratory system
13	Shock	14	Other, please describe
15	Lifting		

Environmental Factor Codes

Code	Injury	Code	Injury
01	Pinch point action	02	Catch point or puncture action
03	Shear point action	04	Squeeze point action
05	Flying object action	06	Overhead moving and/or falling object
07	Gas, vapor, dust, etc.	08	Materials handling equipment or method
09	Chemical action/reaction exposure	10	Flammable liquid or solid exposure
11	Temperature above or below tolerance level	12	Radiation condition
13	Working surface or facility layout condition	14	Illumination
15	Over pressure or under pressure condition	16	Sound level
17	Weather, earthquake, etc. condition	18	Other, please describe

Appendix B: Propensity Score Generation and Control Group Matching

Before statistical matching can be performed, a set of key demographic variables was developed to control for factors external to the Workers' Compensation data. Because Research & Planning has access to work histories and demographics from 1992 forward, a wealth of demographic and employment data are available. Based on the available data and prior research projects (see http://doe.state.wy.us/lmi for details), the following set of variables were used in this project:

- Total inflation-adjusted earnings quintiles for 2001-2003
- Number of quarters worked from 2001-2003
- Average quarterly wage quintiles from 2001-2003
- Age group (16-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65+)
- Gender
- Industry of primary employer
- Total inflation-adjusted earnings quintile in 2004
- Average quarterly wage quintile in 2004
- Injury severity for subgroups
- Worker residency status (resident or nonresident) in 2004
- Tenure with primary employer

The above indicators were used as independent variables in a binary logistic regression model (Allison, 1999) where the dependent variable was whether a worker filed a WC claim in 2004. The estimated probabilities generated from the model indicated the probability of filing a WC claim controlling simultaneously for the independent variables.

Treatment and control case matching uses the difference in estimated probabilities as a proxy for distance between cases. The cases with the closest probabilities (or closest differences) are matched first, with succeeding iterations matching cases, which are further apart. In this instance, the desired number of control cases to be matched to each treatment case was determined by trial and error. The number of controls desired was determined by optimizing the amount of treatment cases matched and the number of controls selected. Four controls per treatment using all WC claims in 2004 and two controls per treatment using the subset of more severely injured workers were chosen. For further details regarding case control matching methodology, see Parsons (2004). Parsons' (2004) method was modified to suit the needs of Research & Planning on this project. Once the control groups (all cases and medical cases only) were created, the analysis continued as described in Results III – Results V (see pages 34-38).

See Definitions, page 28

"The [Quarterly Census of Employment and Wages] program derives its data from quarterly tax reports submitted to State Employment Security Agencies by over eight million employers subject to State unemployment insurance (UI) laws and from Federal agencies subject to the Unemployment Compensation for Federal Employees (UCFE) program. This includes 99.7% of all wage and salary civilian employment. These reports provide information on the number of people employed and the wages paid to the employees each quarter. The program obtains information on the location and industrial activity of each reported establishment, and assigns location and standard industrial classification codes accordingly. This establishment level information is aggregated, by industry code, to the county level, and to higher aggregate levels." (Bureau of Labor Statistics, 2008)

Appendix C: Statistical Test Results

Difference in Post-Injury Average Real Wages: All Industries

		N	Mean	Lower CL Mean	Upper CL Mean	Lower CL Std Dev	Std Dev	Upper CL Std Dev	Std Err
wage_post	No Injury Reported	53552	115168	116273	117377	129650	130426	131212	563.61
wage_post	Medical Claim Only	10638	105887	107662	109438	92192	93431	94704	905.86
wage_post	Diff (1-2)	6008.5	8610.3	11212	124374	125054	125742	1327.4	

T-Tests

Variable	Method	Variances	DF	t Value	Pr > |t|
wage_post	Pooled	Equal	64E3	6.49	<.0001
wage_post	Satterthwaite	Unequal	2E4	8.07	<.0001

Equality of Variances

Variable	Method	Num DF	Den DF	F Value	Pr > F
wage_post	Folded F	53551	10637	1.95	<.0001

Difference in Post-Injury Quarters Worked: Mining

	N	Lower CL Mean	Upper CL Mean	Lower CL Mean	Upper CL Std Dev	Std Dev	Std Dev	Std Err
q_post Medical Claim Only	576	11.193	11.521	11.849	3.7885	4.0073	4.2532	0.167
q_post More Severe Injuries	277	9.8737	10.433	10.993	4.3666	4.7304	5.1609	0.2842
q_post Diff (1-2)	0.4769	1.0876	1.6983	4.0624	4.2553	4.4676	0.3111	

T-Tests

Variable	Method	Variances	DF	t Value	Pr > |t|
q_post	Pooled	Equal	851	3.50	0.0005
q_post	Satterthwaite	Unequal	472	3.30	0.0010

Equality of Variances

Variable	Method	Num DF	Den DF	F Value	Pr > F
q_post	Folded F	276	575	1.39	0.0011

Difference in Post-Injury Quarters Worked: Construction

		N	Lower CL Mean	Upper CL Mean	Mean	Lower CL Std Dev	Upper CL Std Dev	Std Dev	Std Err
q_post	Medical Claim Only	755	9.7072	10.044	10.38	4.4839	4.7101	4.9605	0.1714
q_post	More Severe Injuries	376	8.6071	9.1197	9.6323	4.7175	5.0548	5.4445	0.2607
q_post	Diff (1-2)	0.3262	0.924	1.5219	4.6362	4.8273	5.035	0.3047	

T-Tests

Variable	Method	Variances	DF	t Value	Pr > |t|
q_post	Pooled	Equal	1129	3.03	0.0025
q_post	Satterthwaite	Unequal	704	2.96	0.0032

Equality of Variances

Variable	Method	Num DF	Den DF	F Value	Pr > F
q_post	Folded F	375	754	1.15	0.1092


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