Summer 8-2017

# The Effectiveness of Workers' Compensation Loss Control Services in Reducing Workers' Compensation Claims

Justin S. Thygerson

# THE EFFECTIVENESS OF WORKERS' COMPENSATION LOSS CONTROL SERVICES IN REDUCING WORKERS'COMPENSATION CLAIMS

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Philosophy

Justin S Thygerson

Indiana University of Pennsylvania

August 2017

Indiana University of Pennsylvania
School of Graduate Studies and Research
Department of Safety Sciences

We hereby approve the dissertation of

Justin S Thygerson

Candidate for the degree of Doctor of Philosophy

| | |
|---|---|
| _____ | _____ |
| | Christopher Janicak, Ph.D, CSP, CEA, ARM<br>Professor of Safety Sciences, Chair |
| _____ | _____ |
| | Tracey Cekada, D.Sc., CSP<br>Associate Professor of Safety Sciences |
| _____ | _____ |
| | Majed Zreiqat, Ph.D., ASP<br>Assistant Professor of Safety Sciences |

ACCEPTED

_____ _____

Randy L. Martin, Ph.D.
Dean
School of Graduate Studies and Research

Title: The Effectiveness of Workers' Compensation Loss Control Services in Reducing Workers' Compensation Claims

Author: Justin S Thygerson

Dissertation Chair: Dr. Christopher Janicak

Dissertation Committee Members: Dr. Tracey Cekada
Dr. Majed Zreiqat

It can be argued that insurance carriers have been one of the primary influences on improving safety in the workplace (Collins et. al., 2002; Dembe, 1995). While workers' compensation insurance carriers have long been a resource for companies to help in preventing workplace injuries, there have been very few empirical studies conducted on the subject of loss control services and their effects on workers' compensation claims and it is considered a "neglected topic" (Nave et al., 2004). The purpose of this study was to add to the current body of knowledge by gaining a better understanding of workers' compensation loss control services. This study examined the relationship between the use of workers' compensation loss control services and the frequency and severity of workers' compensation claims in the manufacturing industry. Other objectives were to analyze if recommendations given by loss control consultants result in a significant reduction in claims frequency and severity averages. Another area that was analyzed is the significance that a dedicated safety professional, employed by the company, has on workers' compensation losses.

The study determined there was a significant difference in the reduction in claims frequency based upon the number of visits by a loss control consultant, specifically when companies are visited between 1-19 times in a five-year period compared to having no visits by a loss control consultant in that same five-year period.

The study also determined that types of recommendations given by loss control consultants had no impact on claims frequency or claims severity. Likewise, there was no evidence that the presence or absence of full-time safety professionals significantly impacted claims frequency or claims severity. While these variables were not statistically significant, some variables did indicate a decrease in both claims frequency and claims severity based on $1 million in payroll. This study can serve as a baseline for future studies to examine the effect on loss control services provided by workers' compensation insurance companies.

ACKNOWLEDGEMENTS

I would like to thank Dr. Christopher Janicak for all the help he has been in finishing this dissertation, without him I would still be lost in SPSS. I thank my dissertation committee Dr. Cekada and Dr. Zreiqat for their time and efforts in helping me. I would like to thank WCF Insurance for giving me the data possible to do this project. I specifically like to thank Merlin Pratt and Kathryn Clark who, without their help, I would not be able to do this project. I would like to thank my parents Alton and Ardith Thygerson for giving me the passion for learning and hard work. Their support has been integral in completing this endeavor. My dad always says, "You can always work, but you can't always go to school." To my kids Lukas, Cora and Finley for their patience while daddy is stuck in his office for hours during these past few years. I hope this gives them an example of motivation and perseverance. Lastly, to my sweet wife Melissa for helping me through the hard times and talking me down off the edge on several occasions. I hope you know I love you all and this has been a great adventure.

TABLE OF CONTENTS

Chapter Page

Chapter Page

LIST OF TABLES

# CHAPTER 1

## INTRODUCTION

According to the U.S. Bureau of Labor Statistics (BLS), in 2014, there were almost 3 million nonfatal injuries and illnesses and 4,679 fatal work-related injuries. It has been estimated that the national annual direct and indirect costs for occupational injuries and illnesses is $250 billion, $31 billion more than the direct and indirect costs of all cancer, $76 billion more than diabetes and $187 billion more than strokes (Leigh, 2011). Approximately 129.6 million employees were covered by either state or federal workers' compensation laws in 2014 (SSA, 2016). In that same year, $6.8 trillion total workers' wages were paid in the workers' compensation system (SSA, 2016).

As these numbers indicate, workplace safety and health is still a major issue in today's world and insurance companies and employer's need to understand the importance of utilizing loss control safety and health services to help combat these costs. The purpose of this study is to investigate how utilizing loss control safety and health services can have an effect on workers' compensation claims.

Loss control safety and health services have always played an important role in helping to control workers' compensation claims and costs to insurance companies. In general, many people's perspective is that loss control safety and health services that insurance carriers provide is helpful in controlling claims, but little if any quantifiable studies are available to prove this.

In the early 1990s, workers' compensation carriers experienced a rise in the number of safety and health claims, which resulted in the increase in compensation paid. This had a direct impact on the carrier's bottom line. To combat these increases, insurance carriers increased premiums (Buresh, 2000). To help reduce premiums, insurance companies knew they had to try

to reduce the number of claims. To help in this process workers' compensation insurance carriers developed loss control departments that provided services to their policyholders to help reduce the number of injury claims (Buresh, 2000).

To help us understand how loss control safety and health consultants can help reduce workers' compensation claims, we need to understand what they do. According to the *Career Guide to the Safety Profession* by the American Society of Safety Engineers (ASSE) and Board of Certified Safety Professionals (BCSP), loss control consultants are primarily used in the insurance industry, whether it is for workers' compensation, property, auto, liability or other forms of business insurance. Insurance companies utilize loss control consultants to support underwriting by evaluating the risk and level of control of the policyholder's operations, while helping their clients prevent workplace incidents that could lead to claims, which then could lead to higher insurance costs for the policyholder.

Each insurance company develops their own loss control services based on the insurance they provide. Loss control consulting services typically include identifying and evaluating hazardous exposures and developing plans to control those hazards identified.

Loss control consultants service many different types of industries that have different types of exposures. Their knowledge, research and vast database of injury trends help identify potential loss exposures that are not always apparent to their clients.

Loss control consultants engage in a wide variety of consulting activities. These activities include, but are not limited to training employees; training can include educating employees on Occupational Safety & Health Administration (OSHA) standards as well as helping them understand and identify potential hazards and find controls to prevent them. Industrial hygiene services provided by loss control consultants include sampling for air contaminants, chemical,

biological, noise and ergonomic hazards. General workplace safety can involve machine safeguarding, controlling hazardous energy, confined spaces, walking and working surfaces including slips and fall hazards, developing and evaluating safety programs, investigating incidents, training employees on safety, providing industrial hygiene services, inspecting operations for safety hazards, and providing technical advice on such topics like ergonomics and environmental safety.

## Statement of the Problem

Many insurance companies have financed and provided loss control services for many years and have actively participated in the modern safety movement (Nave & Veltri, 2004). However, there have been very few empirical studies available on the subject of loss control services and the effects on workers' compensation claims and it is considered a "neglected topic" (Nave & Veltri, 2004).

The objective of this study is to determine the relationship between the use of workers' compensation loss control services and the frequency and severity rates of workers' compensation claims in the manufacturing industry. Other objectives are to analyze if recommendations given by loss control consultants result in a significant difference in the average reduction in claims frequency and severity. Another area that will be analyzed is the significance that a dedicated safety professional, employed by the company, has on workers' compensation losses.

## Research Questions

RQ1: Is there a significant difference in the difference in claims experience based upon being visited 20 times or greater, visited less than 20 times or not visited at all over a five-year period?

RQ2: Is there a significant difference in the difference in claims severity based upon being visited 20 times or greater, visited less than 20 times or not visited at all over a five-year period?

RQ3: Does the percentage of recommendations closed result in significant differences in the difference in claims experience over a five-year period?

RQ4: Does the percentage of recommendations closed result in significant differences in the difference in claims severity over a five-year period?

RQ5: Does the presence of a safety professional result in significant differences in the difference in claims experience over a five-year period?

RQ6: Does the presence of a safety professional result in significant differences in the difference in claims severity over a five-year period?

RQ7: Does giving recommendations result in significant differences in the difference in claims experience over a five-year period?

RQ8: Does giving recommendations result in significant differences in the difference in claims severity over a five-year period?

RQ9: Are the presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of loss control visits significant predictors of the difference in claims experience over a five-year period?

RQ 10: Are the presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of loss control visits significant predictors of the difference in claims severity over a five-year period?

## Research Hypotheses

1. The researcher hypothesizes that there will be a significant reduction in the difference in claims experience when comparing 20 or greater visits, less than 20 visits and no visits at all by loss control consultants over a five-year period.
2. The researcher hypothesizes that there will be a significant reduction in the difference in claims experience for those insured companies that close out the greater amount of loss control recommendations over a five-year period.
3. The researcher hypothesizes that there will be a significant reduction in the difference in claims experience for recommendations given versus not given by a loss control consultants over a five-year period.
4. The researcher expects a greater reduction in the difference in claims experience for insured companies with a fulltime safety professional versus those who do not over a five-year period.
5. The researcher hypothesizes that the presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of loss control visits will be significant predictors of the difference in claims experience over a five-year period
6. The researcher hypothesizes that there will be a significant reduction in the difference in claims severity, measured by claims losses, when comparing 20 or greater visits, less than 20 visits or no visits at all by loss control consultants in a five-year period.
7. The researcher hypothesizes that there will be a significant reduction in the difference in severity of claims, measured by claims losses, for those insured companies that close out the greater amount of loss control recommendations in a five-year period.

8. The researcher hypothesizes that there will be a significant reduction in the difference in claims severity, measured in claims losses for the recommendations given versus not given by a loss control consultant in a five-year period.
9. The researcher expects a greater reduction in the difference in claims severity, measured by claims losses, for insured companies with a fulltime safety professional versus those who do not in a five-year period.
10. The researcher hypothesizes that the presence of a safety professional, percentage of recommendations closed, recommendation given, and frequency of loss control visits will be significant predictors of the difference in claims severity over a five-year period.

## Assumptions

The researcher will assume the following:

1. It is assumed that all participants answered honestly to survey questions.
2. It is assumed the loss control records maintained by WCF Insurance are accurate.
3. It is assumed the workers' compensation loss information maintained by WCF Insurance is accurate.

## Limitations

The researcher has identified the following limitations:

1. The sample is comprised of WCF Insurance policyholders in the state of Utah. The sample is comprised of companies with annual workers' compensation premiums $20,000 and greater.

## Delimitations

The research has identified the following delimitations:

1. This study is delimited to those variables that are supported by the literature and are of interest to the researcher, which are workers' compensation frequency, workers'

compensation severity, measured by claim costs, four visits versus zero visits by loss control consultants, percentage of loss control recommendations closed, the presence of a fulltime safety professional.

2. This study is delimited to claim frequency, severity, and loss control activities that occurred over a five-year period.

## Definitions of Terms

ASSE – The American Society of Safety Engineers represents over 37,000 safety professionals who are "committed to protecting people, property and the environment and are at the forefront of safety engineering, design, standards development, management and education in virtually every industry, governmental agency, labor and in institutions of higher education" (ASSE, 2017).

Best Practice Recommendation – Safety practices that have been proven effective in controlling hazards and preventing injuries.

BLS – The Bureau of Labor Statistics is "the principal Federal agency responsible for measuring labor market activity, working conditions, and price changes in the economy. Its mission is to collect, analyze, and disseminate essential economic information to support public and private decision-making" (BLS, 2017).

Claim Frequency – The raw number of workers' compensation claims a company experiences.

Claim Severity – The cost of the workers' compensation claims experienced by companies.

Claims per $1 million payroll **–** The company's annual number of claims divided by the company's annual payroll then multiplied by $1 million dollars.

Loss Control Consultant – Safety and health professionals who work for an insurance carrier and work with insured employers to prevent injuries.

Loss Control Recommendations – Safety recommendations given by loss control consultants in an effort to prevent injuries. For this study, recommendations classified as serious or best practice were analyzed.

Loss Control Recommendations Closed Out – Recommendations given by loss control consultants to insured employers and have been implemented by the insured employer.

Loss Control Recommendations Close Out Rate – The percentage of recommendations closed out by insured employers. Companies will be grouped into different levels of the percentage of recommendations they close out. The four levels include 0-25, 26-50, 51-75, and 76-100 percent.

Loss Control Visit – Visits conducted by loss control consultants to companies insured by the workers' compensation insurance carrier. Visits can include safety inspections, review of losses, safety training, and general consultation of safety practices.

NCCI – The National Council on Compensation Insurance "gathers data, analyzes industry trends, and prepares objective insurance rate and loss cost recommendations" (NCCI, 2017).

NIOSH – The National Institute for Occupational Safety and Health is a US Federal agency responsible for conducting research to help prevent work-related injuries and illnesses.

OSHA – Occupational Safety and Health Administration is responsible for promulgating and enforcing safety and health regulations in the workplace.

Safety Professional – A dedicated employee that recognizes and devises methods to control hazards. Responsibilities of a safety professional include promoting safety awareness, coordinating and conducting safety training and safety inspections, investigating injuries and developing control measures, and providing safety advice to upper management.

Serious Recommendation – A hazard that could cause death or serious physical harm.

# CHAPTER 2

# LITERATURE REVIEW

## History of Workers' Compensation

During the Industrial Revolution, workplace injuries were considered as an interruption to production and the primary concern for employers' was finding a replacement as quickly as possible (Eure, 2005). By 1880, more people were dying from workplace accidents each year than the Civil War (Witt, 2004).

Injured workers only option to receive their medical and compensation benefits before workers' compensation was to file a tort suit, hoping to find negligence on the side of the employer (Sengupta & Baldwin, 2015). However, once those tort claims were filed, employers used "three common law defenses" to avoid liability. These include; "assumption of risk" (this is simply that the injured worker should have known about the hazards of the job before they started); "fellow servant rule" (the injury was the fault of the actions of a fellow worker's negligence); and "contributory negligence" (this is when the worker was responsible for his or her own injury) (Sengupta & Baldwin, 2015). Because of these three defenses, it was unheard of that an injured employee filed a suit against their employer. They were either too impoverished to seek legal aid or the possibility of the loss of their job was too great (Eure, 2005).

While the United States was struggling to protect their workers, The Sickness and Accident Laws were established in 1884 in Germany, becoming the first modern workers' compensation laws (Sengupta & Baldwin, 2013). In the late 1800's several states in the United States enacted "Factory Acts," which established regulations and inspections to ensure workplaces had adequate ventilation, emergency exits and safe machinery repair (Eure, 2005). In a 1907 speech by President Theodore Roosevelt at the World's Fair in Norfolk, Virginia, he

spoke about the increasing number of workplace accidents, saying, “the great increase in mechanical and manufacturing operations means a corresponding increase in the number of accidents to the wage-workers employed therein” (Moseley, 1908). During this time, one worker in every fifty was killed or disabled at work for a minimum of four weeks each year (Eure, 2005). President Roosevelt goes on to say, “workmen should receive a certain, definite, and limited compensation for all accidents arising as an incident of the performance of their duties.” He felt that this would make employers take greater care of their employees and create safe workplaces, thereby reducing the number of accidents (Eure, 2005). Finally, in 1908 the United States enacted workers’ compensation laws to protect certain federal civilian workers (Sengupta & Baldwin, 2015). In 1911, Wisconsin and New Jersey workers’ compensation laws were the first to pass constitutional challenges in the U.S., which fueled the spread of workers’ compensation legislation by other states and by 1921, forty-three states had passed workers’ compensation laws (Sengupta & Baldwin 2015; Eure, 2005). Mississippi was the last state to pass a workers’ compensation law in 1948 (Sengupta & Baldwin, 2015).

While the country was progressing toward a safer workplace with the establishment of workers’ compensation laws, a battle ensued as to whether the workplace injury was the fault of the employer or the fault of the employee. To make workers’ compensation fair the legislation enacted had to be a no-fault system. This means that injured workers will receive the defined benefits provided by the workers’ compensation system, but cannot sue their employers or co-workers in court for damages. It spares them and their employers from judicial litigation. Now that workers’ compensation focused on reduction or elimination of workplace injuries without worrying about finding fault, the workers’ compensation insurance industry has become a major

driver in the fields of occupational safety and health (Eure, 2005; Collins et al., 2002; Dembe, 1995).

Many workers' compensation insurance companies started to promote safety in the workplace; they published safety posters and booklets. As workers' compensation insurance companies grew, they became more and more interested in accident prevention, but they needed standards to follow to be able to recommend improvements to their insurers (Eure, 2005). The standardization of safety codes was a consistent problem. In 1918, The National Bureau of Standards and the American Engineering Standards Committee passed voluntary codes, but companies were hesitant in following voluntary codes without legislation (Eure, 2005). The Bureau of Labor Statistics started using statistics to form parameters around what was acceptable risk. This data program started the use of a comparative data program. By starting this program, companies that paid no attention to safety took notice when the statistics revealed that their company was in the bottom half of their industry (Eure, 2005).

By this time insurance companies developed specialized expertise in engineering and inspection services that employers could not match. Many insurance companies developed "trade mutual" such as Lumberman's Mutual, which only insured lumber and woodworking injuries. Hardware Mutual and Integrity Mutual were others that insured only hardware and flour mills workplace injuries (Eure, 2005).

As a result of establishing workers' compensation laws, which motivated companies to establish better safety practices, from 1907 to 1920 workplace fatality rates per man-hour dropped by two-thirds and nonfatal accidents decreased by one-half (Eure, 2005).

**The Evolution of Workers' Compensation Loss Control Services**

Once the workers' compensation insurance companies became more established they needed some way to control workplace injuries to keep their costs down. For this reason, the need for loss control consultants began.

In the early years of workers' compensation, the main use of loss control consultants was to inspect the insured company's facilities for safety hazards that could potentially cause an injury. For instance, if the insurance representative found a hazardous situation, they would give suggestions on how to remedy the safety hazard. The main reason for these visits were to prevent injuries to employees, to obtain a lower premium, and to control the insurance company's losses (Pettinger, 2000). In 1915, The Travelers Insurance company had 220 inspectors that performed 235,000 inspections, which is about 3 ½ inspections per day (Eure, 2005).

Many of the first safety and health consultants were attorneys and physicians (Cohen, 1982). Attorneys interpreted legislation and provided advice about employer liability while physicians were contracted to evaluate workplace injuries and illnesses (Buresh, 2000).

As employers saw the need for occupational safety and health in the workplace, in-house employees were tasked to provide oversight of their occupational safety and health programs. While this looked good for the employer many of these early occupational safety and health managers lacked formal safety and health education or training (Buresh, 2000).

In the late 1980's, formalized occupational safety and health educational programs were developed (Buresh, 2000). While many large organizations were financially capable to hire an educated full time occupational safety and health manager, many medium and small organizations were not able to and several only had employees who were tasked to conduct safety and health activities on a part time basis. Safety professionals who received a formalized

education in occupational safety and health became highly specialized in one area of occupational safety and health and transitioned into the consulting world, to meet a growing market niche (Buresh, 2000). Several of these educated safety and health consultants found that instead of the hassle of creating their own consulting business they were lured over to the insurance industry. Here they were able to consult employers on safety and health while having a secure job with the insurance company.

Prior to the workers' compensation reform efforts of the 1990's, loss control services provided by insurers were merely focused on support of the underwriting function, but safety service beyond those required by underwriting varied by insurer (Nave and Veltri, 2004).

In the early 1990's, there was a rise in the number of workplace claims, which resulted in an increase in the amount of compensation paid. This had a direct impact on workers' compensation insurance carrier's bottom line. To help offset this, insurance companies refused to provide coverage to companies until they could prove that they had a safety and health program in place. This requirement propagated the growth of workers' compensation insurance loss control consultation services (Wheal, 1992).

## Workers' Compensation Costs and Workplace Injury Statistics

In the 2015 Workers' Compensation: Benefits, Coverage and Costs report by the National Academy of Social Insurance (NASI), in 2013 workers' compensation covered an estimated 129.6 million U.S. workers, which is a 3.8 percent increase from the last five years. In 2013, worker's compensation paid a total of $63.6 billion in benefits an increase of 8.2 percent over 2009. Medical payments to providers increased 10.3 percent to $31.5 billion compared to 2009. Benefits paid to injured workers increased 6.2 percent to $32 billion compared to 2009 (Sengupta & Baldwin, 2015). NASI reported that in 2013, $88.5 billion was paid by employers

in workers' compensation costs. NASI showed an increase in costs of 19.1 percent from the years 2009 to 2013. The increase could be due in part to the recession that the U.S. economy saw in 2008. After the economic recession, the economy saw more employees enter the workforce, which increased the number of workers covered by workers' compensation and in turn saw an increase in work-related injuries. (Sengupta & Baldwin, 2015).

There are a few ways companies can be insured with workers' compensation. The most traditional way is to be insured by an insurance carrier. Some carriers are multiline carriers that insure several different risks such as general liability and auto insurance. However, there are some insurance carriers that are monoline carriers who only insure one line of risk such as workers' compensation.

Each state has different laws governing their workers' compensation. Some states require that all companies purchase workers' compensation insurance through the state. These states are called monopolistic states. Most states let you choose the insurance company with who you want to insure. In some states, certain people are exempt such as company owners, agricultural workers, and independent contractors. Companies purchase workers' compensation and pay an annual premium to the insurance company. Premium is based on payroll, company size; type of work performed and claims experience. Rating agencies such as The National Council on Compensation Insurance (NCCI) give a class code for the different types of work performed by the company. The riskier the work the higher the cost of the class code. After the base premium is calculated, the insurance carrier can provide discounts to companies who show that they have implemented safe work practices such as a safety program and drug policy. A workers' compensation premium is heavily weighted by the claims companies' experience; therefore, it is imperative to prevent injuries at work to control workers' compensation costs.

Another way companies are covered with workers' compensation is to be self-insured. Self-insured companies, also known as self-funded, are companies who do not pay a workers' compensation insurance carrier, rather they assume all financial risks and provide the medical and compensation benefits to their injured employees (SIIA, 2017). Companies who choose to be self-insured have to control their own costs and make sure injured workers are receiving appropriate care. Most companies who choose to be self-insured are larger companies who have the revenue to cover their financial risks. One benefit of being self-insured is that self-insured companies only pay for the incurred claims and do not have to pay a premium up front, maximizing cash flow (SIIA, 2017).

Lastly, a company can receive workers' compensation coverage through an insurance pool or an assigned risk plan. This plan is a method of providing workers' compensation insurance for those companies that are unacceptable in normal insurance markets. These are reserved for businesses that are unable to be insured in a voluntary market because either they are a high risk or they have a history of high injury rates and claims. Unfortunately, for these companies the premiums that they pay will be much higher in comparison to those companies that can be insured in a voluntary market.

**Workplace Injury Statistics**

Estimates of workplace injuries and claims come from two sources The National Council on Compensation Insurance (NCCI) and the Bureau of Labor Statistics (BLS). NCCI gathers workers' compensation claims information from private insurance carriers in 37 states. The BLS gathers work-related injury and illness statistics by sending out surveys to employers across the country (Sengupta & Baldwin, 2015).

Based on the BLS data in 2013 4,585 fatal work-related injuries occurred in the United States. It was reported that a total of 3 million Occupational Safety and Health Administration (OSHA) recordable nonfatal workplace injuries and illnesses occurred in the workplace in 2013. (U.S. BLS 2014).

Strains/Sprains injuries was the most common type of injury accounting for 35.7% of nonfatal workplace injuries in 2013 that resulted in days away from work. Other common types of injuries in the workplace that resulted in days away from work include back pain at 16.8%, cuts, lacerations and punctures at 9.6%, fractures at 8.5% and bruises and contusions at 7.9%. (U.S. BLS, 2014).

According to the NCCI in 2010, the most recent year reported, 3,491 claims were reported per 100,000 insured workers. Of those 2,625 per 100,000 insured workers (75%) were medical only claims while 532 per 100,000 insured workers (15%) were temporary total claims and 329 per 100,000 insured workers (9%) were permanent partial claims (Sengupta & Baldwin, 2015).

This information shows that while workers' compensation costs increase due to more employers and employees in the workforce, work-related injuries and claims have declined. This can be due to several factors such as the evolution of safety and health efforts conducted by employers in the workplace and the use of workers' compensation loss control services.

## The Use of Workers' Compensation Data for Research Studies

Workers' compensation provides medical care, cash benefits and rehabilitation services to injured workers (Sengupta & Baldwin, 2015). Every state is required to have its own distinct workers' compensation system. Most workers' compensation insurance carriers are private

entities. Twenty-one states have partial state funds, while North Dakota, Ohio, Washington and Wyoming are exclusive state insurance programs (Utterback & Schnorr, 2010

In 2012, ninety percent of the American civilian workforce was covered by one of the state workers' compensation systems (Sengupta & Baldwin, 2015). Because workers' compensation systems are intended to cover most occupational injuries and illnesses in the workplace, the data produced by these systems would be a valuable resource for research, surveillance and prevention activities that promote occupational safety and health (Dworsky, 2014).

While workers' compensation insurance has been around for over 100 years the full potential of workers' compensation data to improve research and practice in occupational safety and health has not yet been realized (Dworsky, 2014). In recent years there have been organizations such as NIOSH that have focused efforts to advance the use of workers' compensation data, including the creation of the Center for Workers' Compensation Studies (CWCS) (Dworsky, 2014).

**Studies on the Effect of Workers' Compensation Loss Control Services**

There have been very few empirical studies conducted on the effectiveness of workers' compensation loss control services on claims or injury rates. In fact, a study by Nave and Veltri from 2004 cited a literature review done by McCarten-Gibbs for the Commission on Health and Safety and Workers' Compensation (CHSWC) noted that there was "very little empirical data available on the subject of loss control services provided by insurance carriers." They even went on to say the subject is considered a "neglected topic."

From the literature reviewed for this study, the subject of the effectiveness of loss control services is still a neglected topic. This study only found two studies that specifically researched

the subject of the effectiveness of workers' compensation loss control services on claims frequency and/or injury rates.

The first study was a perception survey study done by Daniel Buresh entitled, "*The Use of Occupational Safety and Health Consultative Service Among Oregon Industries*" in 2000. This study focused on safety and health consultative services among Oregon industries. The study looked at three consultation services that include consultation services from workers' compensation, private consultation services and Oregon Occupational Safety and Health Division. Eighty-nine percent of those surveyed about workers' compensation loss control services indicated that the recommendations given by the loss control consultant from the workers' compensation carrier were effective in achieving the corporation objectives and seventy percent indicated that these recommendations reduced the number of accidents or the severity of the accidents in their operations. Ninety-seven percent of those surveyed reported there were no adverse effects from implementing the recommendations given. Ninety-four percent said they would use the consultative services in the future. Buresh concludes that workers' compensation insurance consultative services meet the needs of the corporations they served. However, a limitation of this study was that it was based solely on surveys that were returned to the researcher. There was no quantitative analysis that showed that workers' compensation loss consultative services reduced claim frequency.

The second study conducted by Nave and Veltri in 2004 entitled, *"Effect of Loss Control Service on Reported Injury Incidence"* evaluated if loss control services, provided by workers' compensation carriers, can reduce workers' compensation claims frequency and severity rates. The purpose of this study was to assess if a "flexible loss control service strategy" would have an effect on workers' compensation claims. A "flexible loss control service strategy," described by

Nave and Veltri is, “one that gives the loss control consultants of the insurance carrier the freedom to participate actively in the identification, planning and delivery of outcome-based loss control service activities.” Eighty-two companies were randomly assigned to loss control consultants for two or more years then the study randomly selected 45 companies with no loss control service as their comparison group. They based their study off claims per $10,000 in insurance premium. The results showed that for those companies that were assigned a loss control consultant for the two or more years had an average claim rate of 1.24 per $10,000. When compared with the companies without a loss control consultant they saw a claims rate of 1.60 per $10,000, which is almost a 30% difference. In regards to claims severity, the companies with a loss control consultant saw a 0.32 severity rate compared to a 0.46 severity rate for those who did not have a loss control consultant. Nave and Veltri concluded that, “a loss control service strategy that provides service flexibility and develops partnership between employer and consultant can help reduce the frequency and severity of workers’ compensation claims.” (pg. 46).

This quantitative study showed that the utilization of loss control services could be effective. The limitation to this study was underlying factors that could influence claims results were not analyzed. While the loss consultants service activity time, it did not analyze to see if these activities by the consultants played a significant role in reducing workers’ compensation claims.

### Studies on Safety and Health Activities

While the purpose of this dissertation is to analyze the effectiveness of loss control services on workers’ compensation claims there are other factors that could play a role in reducing claim and injury rates. The utilization of a dedicated fulltime safety professional who is

responsible for the company safety program will be analyzed to see if they play a significant role in reducing claim frequency and severity.

**Safety Professionals**

While there are many names and titles that are associated with the person who is responsible for the safety program of a company such as, safety professional, safety officer, safety director, environmental safety & health (EHS) manager, etc. safety professional is the most well-known and recognized and will be used for this dissertation.

According to a 2011 National Assessment of the Occupational Safety and Health Workforce, which was prepared for by NIOSH to assess the current supply and future demand of safety professionals, there are 48,000 safety professionals in the U.S. workforce. Fifty-nine percent, or about 28,722, are occupational safety professionals. Of the occupational safety professionals, 37% spend 100% of their time working in their primary field. Seventy-five percent have a bachelor's degree in their field. Twenty-eight percent hold a professional certification in the occupational safety and health field. Occupational safety and health is important to employers and according to this NIOSH study, employers intend to hire 17,801 occupational safety professionals over the next five years. The most important skills employers want to see out of these professionals include the ability to investigate accidents (47%) and conduct job safety analysis (43%).

There are no empirical studies that exclusively compared the use of a dedicated safety professional with injury prevention. However, there are studies that analyzed the impact of a safety management system or safety program as a whole that had a safety professional or safety department as a component of that system.

A study done by Abudayyeh et al., found that those construction companies that typically have a safety professional on-site had an incident rate statistically different (2.04) than those that had no safety professional on-site (7.60). The study also concluded that construction companies who have a safety budget and that allow the safety professional to spend more than $1,000 without higher approval have fewer injuries and illnesses than those companies that do not.

In a study conducted in 2002 on the *Essential Safety Measures for Accident and Injury Reduction in the Workplace* the author examines the safety measures that play a role in accident and injury reduction in the workplace. It compares an old safety program with a new safety program that had 21 additional safety measures. One of the safety measures included in the new safety program was that it, "identified a safety director to manage the safety efforts." The new safety program decreased the recordable injuries by 48%, decreased lost workday cases by 3%, and decreased the incidence rate by 51% (Ulinfun, 2002).

**Loss Control Strategies**

To help control losses, businesses and loss control consultants use various strategies to prevent injuries and claims. Loss control consultants provide insured companies recommendations with those loss control strategies in an effort to keep employees safe and reduce claims.

The National Institute for Occupational Safety and Health (NIOSH) has stated that controlling exposures to occupational hazards is the fundamental method of protecting workers. NIOSH goes on to say that traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective control solutions. In the 1950's the National Safety Council began describing the hierarchy of controls. Today, most models of the hierarchy of controls consist of, elimination, substitution, engineering controls, administrative

controls and personal protective equipment (PPE) (NIOSH, 2016). By using controls at the top of the model, you will have a better chance of preventing injuries because you are reducing the potential of encountering a hazardous situation. Continuous improvement standards, such as the American National Standard for Occupational Health and Safety Management Systems (ANSI Z-10) prescribe hierarchy of controls in dealing with hazards to achieve acceptable risk levels.

Hazard elimination is the most effective means of reducing the risk of a particular hazard. Since risk is a function of probability and severity, eliminating the hazard reduces the risk down to zero. Hazard substitution involves replacing a hazard with a lesser hazard. This can be substituting out lead based paint for acrylic paint. While these two controls are the most effective at reducing hazards they also tend to be the most difficult to implement.

**Engineering controls.** Engineering controls are ways to protect workers from coming into contact with a hazard. Examples include machine guarding and ventilation systems. While it can be very costly to install engineering controls, in the long term companies can see lower operating costs and savings from preventing workers from being injured on the job. If the engineering controls are designed properly, it can be highly effective in protecting workers from injuries. (NIOSH, 2016).

**Machine guards.** Machine guards have widely been used as an engineering control in the manufacturing industry to control serious injuries to employees. In an updated National Emphasis Program on Amputations, 2,000 manufacturing workers suffered an amputation in 2013. It goes on to say the manufacturing sector saw a rate of 1.7 amputations per 10,000 full-time employees in 2013. This was twice the rate as that of the private industry, which saw a rate of .7 amputations per 10,000 full-time employees (U.S. DOL, 2015). There are studies that suggest this number should be higher due to employees and employers not reporting their

amputations. (Parker et al., 2015). According to one study, 33% of guards were missing or inadequate at the point of operations (Parker et al., 2015). In the manufacturing industry, older machines are used for their reliability and durability; however, they are less likely to be properly guarded compared to newer machines because of the difficulty and cost to install. (Parker et al., 2015).

According to OSHA's *Concepts and Techniques of Machine Safeguarding,* "a good rule to remember is that any machine part, function, or process, which may cause injury, must be safeguarded." Three basic areas require safeguarding. The point of operation, power transmission apparatus and all other moving parts. Any motions that rotate, reciprocate, transverse or actions that cut, punch, shear or bend need to be safeguarded. (OSHA, 1992).

There are five general classifications of safeguards that can be used depending on the operation, size or shape of stock, the layout of the work area, the type of material and production requirements. These include guards, devices, location/distance, potential feeding and ejection methods, miscellaneous aids.

Guards are barriers that prevent access to danger areas (OSHA, 1992). They can be either fixed, interlocked, adjustable or self-adjusting. A device can stop the machine if a body part inadvertently is placed in the danger area. Devices can also restrain or withdraw the operators hand from the danger zone. Examples of devices are presence sensing, pullback, restraint, safety controls and gates.

To be considered a safeguard by location/distance the danger zone of the machine must be positioned so as not to be accessible to the employee during normal operation. Most times companies position the operator's control station at a safe distance from the point of operation,

therefore, making it difficult for the operator to come into contact with the danger zone of the machine.

Feeding and ejection methods do not require the operator to place their hands in the danger area. However, this does not eliminate the need for safeguarding. Anytime the operator needs to gain access to that piece of machine a guard or device should be incorporated into the design of the piece of machine.

While machine safeguarding can be an effective way to reduce amputations and other injuries due to machinery in the manufacturing industry, much more is needed to be done to ensure that the safeguards are properly put in place and are adequate to prevent serious injuries.

**Lockout/Tagout.** Uncontrolled release of energy is another serious hazard that manufacturing industries encounter. A study done by NIOSH investigated 185 fatalities during 1982 to 2006. This study looked at the relationship to maintenance work that included installation, maintenance, service and repair tasks on machines and uncontrolled release of energy (NIOSH, 2011). Of these fatalities, 142 (77%) were caused by maintenance workers failing to completely deenergizing the energy source. Thirty-one of the fatalities did not have any lockout and tagout energy control devises on the isolation points (NIOSH, 2011).

Lockout/Tagout is one of the main ways to control the uncontrolled release of energy. According to OSHA, it is estimated 120 fatalities and 50,000 injuries can be prevented by complying with the lockout/tagout standard (OSHA, 2002).

Lockout/Tagout should be applied when workers are servicing and maintaining equipment, and anytime workers remove or bypass a guard or safety device. (NIOSH, 2011).

A basic lockout/tagout procedure includes, de-energizing all sources of energy, locking and tagging all forms of energy, blocking or dissipating stored energy, making sure only one key

exists for each assigned lock, verifying that all energy sources are de-energized, inspecting repair work before removing locks and activating equipment, making sure only the authorized employee removes the assigned lock and finally, making sure that employees are clear of the danger areas before re-energizing the system.

According to NIOSH, the following steps are particularly important to ensure that hazardous energy is controlled. Employers should develop and implement a hazardous energy control program, make sure all workers have a clear understanding of when lockout/tagout should be applied, develop a lockout/tagout procedure for each piece of machine, provide sufficient amount of lockouts and tags to ensure proper isolation, and clearly label isolation devices.

**Administrative controls.** Administrative controls are controls modify the work patterns to avoid potential hazards. These controls can include work breaks, job rotations, implementation of work policies and training. Since the hazard is not removed there is still potential for injuries, making administrative controls less effective. The biggest concern with administrative controls is that they are difficult to implement and manage by a companies making them unreliable to reduce hazards. (CCOHS, 2017). Other administrative controls used most widely in the manufacturing industry are job hazard analysis, risk assessments, safety and health committees and incident investigations.

**Job hazard analysis/risk assessment.** A job hazard analysis (JHA), sometimes called job safety analysis (JSA), is a procedure used to review the steps of the job task to help uncover potential hazards. While it important to use JHA's before a process has been installed or implemented, it is mostly used after the process is already in production to find hazards that may have arisen due to changes in procedures or work practices. (Hagan et al., 2001).

The first use of the process of JHA was a safety engineer from General Electric who wrote in 1930 that, “job analysis should bring out the hazards of the operations” so that standard procedures could be established around these hazards (Glenn, 2011).

The benefits of a JHA include reducing the frequency and severity of injuries, providing information to develop effective training programs, providing instruction for new hires, giving pre-job instructions on non-routine job tasks, reviewing job procedures after an incident occurs, and studying job tasks for possible improvement to job methods (Hagan et al., 2001). Other benefits from conducting JHA’s are improvement in safety practices done by management and employees, which can lead to better productivity and loss control and overall profitability of the company. (Agwu, 2012).

A JHA can be performed in three simple steps. The first step is to break the job task down into individual steps to observe how the task is performed. The second step is to work with your employees and managers to identify potential hazards of each step of the job task. Lastly, once you know the potential hazards you work together as a team to create job procedures to help eliminate or reduce the potential hazards (Hagan et al., 2001).

Before breaking down a job, management must carefully select a job to be analyzed. Priority is typically given to those jobs that have had a history of frequent incidents or a job that has had a disabling injury or jobs with a high risk factor. Finally, assess jobs that are new or non-routine.

During a job break down, observe the employee performing the job and write down the basic steps to the job being performed. Completely describe each step in detail. A good practice is to work in pairs or as a team to identify the steps.

After the job is broken down into steps, you must identify potential hazards and its cause. You should identify all hazards, including hazards that are due to the conditions and environment of the workplace and the behaviors of the employee (Hagan et al., 2001). Work with the observed employee to make sure you identify all the potential hazards that may exist even if not observed.

Once hazards are identified, a risk assessment is usually conducted. The purpose of this is to rank hazards by risk. Rankings are based on the severity and probability of the risk. This process is to address hazards according to the principle of "worst first" (Hagan et al., 2001). Rankings provide a consistent guide for the prioritization of corrective actions. Once you have your hazards prioritized, you can determine which ones need immediate action and which ones can wait for a future time (Hagan et al., 2001). Most risk assessments use a four by four matrix with severity being between negligible to severe and a probability of low to high. Once the hazard has a risk ranking the necessary controls can be determined to help eliminate or reduce that risk to an acceptable level.

**Incident investigation.** An incident investigation is one administrative control that has been utilized by companies in the manufacturing industry to help prevent injuries. Every day in The United States over a dozen workers die and nearly 4 million American workers suffered a serious workplace injury. (OSHA, 2015). According to OSHA's Incident (Accident) Investigations: A Guide for Employers, practically all harmful incidents and close calls are preventable and they encourage, "all incidents – regardless of size or impact – to be investigated." OSHA gives six reasons why incident investigations are important for employers. These include; "they prevent injuries and illnesses, save lives, save money, demonstrate

commitment to health and safety, promote positive workplace morale and improve management."

To be successful, an incident investigation should be fact-finding and not faultfinding; otherwise, they can do more harm than good. Investigating a worksite incident provides employers and workers the opportunity to identify hazards in their workplace. Most importantly, if companies identify root causes and work to control those root causes, rather than blaming the employee, it can help prevent future workplace incidents in the future. By doing this it can help improve morale and increase productivity. (OSHA, 2015).

Many times owners do not understand the importance of an incident investigation and do not realize how much injuries are truly costing their company. Companies should understand that on average preventing a workplace injury could save the company $39,000 while preventing a fatality can save the company $1.4 (OSHA, 2015). This stresses the importance of incident investigations.

OSHA encourages all employers to investigate all work place incidents and "close calls." In the safety industry this is called a "near miss." This is when an incident happened, but did not result in a serious injury or illness. These are warnings that if not investigated could lead to a serious injury.

Incident investigations should be complex enough to get data that will help identify root causes. Root causes are the base for an unsafe condition or unsafe behavior. (OSHA, 2015). Root causes should be linked to deficiencies in the company's management systems. These can include issues with supervision, communication, hiring processes, assessments, procurement and procedure methods. Like the old saying goes, "eliminating the immediate causes is like cutting weeds, while eliminating the root causes is equivalent to pulling out the roots so that the weed

cannot grow back" (OSHA, 2015). Root cause analysis is more complex and sometimes takes more time to achieve. This is where many employer fail in their incident investigations. The more information provided the better it helps create more efficient and useful data to prevent future injuries.

To have a good incident investigation you should preserve and document the scene, collect information from any managers, employees and witnesses, you should determine the root causes using a root cause analysis and lastly, you should implement corrective actions making sure they are effective in controlling the hazards identified. (OSHA, 2015).

Preserving the scene includes preventing material evidence from being removed or altered. To document the scene a form should be used to gather the essential information. This information at the minimum should include employee characteristics such as their age, department and job title. Other employee characteristics can include full-time or part-time, the experience of the worker, how long the worker has been on the job.

Document the characteristics of the injury by describing exactly the injury or injuries and the part or parts of the body affected by the incident. Preparing a narrative description and incident sequence with diagrams and maps can help investigators visualize how the incident may have occurred. (Hagan et al., 2001). Other areas to document include identifying characteristics of the equipment such as missing guards, recording the tasks being performed, and recording the time including the shift.

As you move to the third step this is where you gather information through interviews with supervisors, witnesses and the injured employee. You can also use documents such as equipment manuals, company policies and training records to help collect information necessary to identify the root cause.

Fourth, you should conduct the root cause analysis. There are many techniques used to help determine root causes. Some traditional techniques include Management Oversight and Risk Tree (MORT). This asks investigators questions about the losses that constitute the top event, that are key events, as identified in other phases of the investigation of the incident. Another technique sometimes used are fault trees. These start at the top event and work its way down to the potential causes using logical "AND" and "OR" gates (Pranger, 2009).

A more simplistic method is the "what-if" method in which a team asks questions about the failures of equipment, people, environment, etc. (Pranger, 2009). Another simple method is the five-why approach. This is where the team of investigators ask the question "why" at least five times to get back to a management system. Lastly, a fishbone or a cause and effect diagram helps the team brainstorm potential root causes in major categories of the problem that include methods, machines, people, materials, measurement, and environment. Using one or more of these methods will help determine the root cause that will help ensure the incident does not happen again.

Finally, the investigation is not complete until corrective measures are put into place. Corrective actions should address the root causes of the incident rather than superficial conclusions such as "Bob should have used common sense," and weak corrective action such as "Bob should be trained." These corrective actions are most likely not to improve the safety or prevent future incidents (OSHA, 2015). Corrective actions should be specific and direct and should address the program or system for the incident investigation to be most successful.

Personal Protective Equipment (PPE) is the least effective control method because the hazard is still present and PPE may fail with little or no warning that can lead to serious injury. PPE may include hardhats, gloves, boots, hearing protection and eye protection. PPE should be

used in conjunction with more protective controls such as engineering or administrative controls to ensure worker safety.

**Safety and health committees.** Safety and health committees have long been used as a tool to help provide active participation and cooperation between key people in the organization in order to aid and advise both management and employees on matters of safety and health pertaining to a company's operation (Hagan et al., 2001).

Studies of the association between the presence of safety and health committees and injury rates in the United States have been mixed (Yassi et al., 2013). However, a study in the United Kingdom, Reily et al (1995), found that workplaces with safety and health committees had, on average, 5.7 fewer injuries per 1.000 employees compared with workplaces without safety and health committees. Most of the literature confirms that merely having a safety and health committee is not sufficient; it must be an effective committee (Yassi et al., 2013). Factors that make a safety and health committee effective and are associated with lower injury rates include empowerment of the committee, delegation of safety activities, and an active role in health and safety of top management (Yassi et al., 2013).

Responsibilities of an effective safety and health committee include actively participating in safety and health training and instruction, regularly inspecting the facility to detect unsafe conditions, planning improvements, recommending suitable hazard elimination, reviewing work practices, assessing the implications of changes to the work processes, monitoring and evaluating the effectiveness of safety and health recommendations, investigating workplace incidents, and studying injury data (Hagan et al., 2001).

## Summary

This literature review showed the impact that workers' compensation losses have on businesses. It identified the importance of loss control services and how they can help with workers' compensation losses. It showed how controlling workers' compensation losses is an important business strategy. One control reviewed was the impact a safety professional can have on losses. Lastly, effective loss control strategies such as engineering and administrative controls, when implemented properly, can significantly reduce workers' compensation losses.

# CHAPTER 3

# METHODOLOGY

## Introduction

The purpose of this study was to determine the relationship between the use of workers' compensation loss control services and frequency and severity rates of workers' compensation claims in the manufacturing industry. In previous studies, such as Buresh (2000), the focus was on perceived effectiveness of loss control services provided by workers' compensation insurance carriers. While these perception studies identify if companies feel that loss control services help them be safer, they do not identify specific safety activities conducted by the loss control consultant that significantly reduce workers' compensation claims. This study's intended purpose was to see if workers' compensation insurance carrier loss control services play a significant role in reducing workers' compensation losses and claims frequencies.

## Population

The intended populations for this study was manufacturing companies in the state of Utah insured by WCF Insurance for the past five years, 2012 through 2016, and have premium sizes of $20,000 and above. The population size consisted of these companies because WCF Insurance loss control consultants frequently service only those companies with $20,000 premium or higher. Companies that have premiums lower than $20,000 are not frequently visited and are only visited on a case-by-case basis. These companies consisted of food, beverage and apparel, metal and machinery and wood, plastics and chemical manufacturers. Based on these criterions, 229 manufacturing companies composed the population size for this study.

## Research Variables

### Dependent Variables

For this study, the researcher used the difference in number of claims per $1 million of payroll for a five-year period to measure claims experience. The difference in claim losses per $1 million dollar of payroll over a five-year period was used to quantify the claim severity. This followed acceptable practices in the insurance industry (Davis & Bar-Chaim, 2011; Smith et al., 2006). The differences were calculated for each by subtracting the average of years 2012, 2013 and 2014 values from 2016 values.

### Independent Variables

The independent variables included the following: visited by a loss control consultant 20 times or greater, visited less than 20 times, or not visited at all during a five-year period. Recommendations given by the loss control consultant (Serious or Best Practices), the percentage of recommendations closed by the company and the presence of a full-time safety professional versus their absence.

Safety recommendations given by WCF Insurance loss control consultants were categorized in three groups. These included Serious – a hazard that could cause serious physical harm or death; Best Practices – practices that have been proven effective in controlling hazards and preventing injuries and Observations – suggestions that are given that would assist in preventing injuries and complying with regulatory standards. For this study, only serious and best practices recommendations that were given by WCF Insurance loss control consultants were used because these type of recommendations address safety systems and policies that are more effective in reducing injuries. Observation recommendations address minor compliance issues that tend to be less effective in reducing injuries. Each serious and best practice

recommendations were time stamped with a “date given” and a “date completed.” These were measured by number of serious and best practice recommendations given by a WCF Insurance loss control consultant and number of serious and best practice recommendations closed by insured company.

Full-time safety professionals employed by the company were used as a variable to see if they are significant predictors in reducing claims. According to ASSE, a safety professional is one who is a dedicated employee that recognizes and devises methods to control hazards. Responsibilities of a safety professional include promoting safety awareness, coordinating and conducting safety training and safety inspections, investigating injuries and developing control measures, and providing safety advice to upper management.

## Instrumentation

To help identify companies who have internal safety professionals a survey questionnaire was used. This will help answer if internal safety professionals play a significant difference in the claims frequency and severity based upon the presence of a safety professional. These questionnaires were emailed to a representative of the manufacturing companies insured by WCF Insurance using the Qualtrics survey software. Closed ended questions were used in the questionnaire such as a dichotomous question in which the respondent must answer yes or no. This helped limit the responses that were within the scope of this study. The survey questionnaires were accompanied by a letter explaining the purpose of the study. The explanatory letter contained assurances that the researcher will maintain the confidentiality of the participants. The completed survey questionnaires were kept secured in the Qualtrics database. The participants in the study were be informed they could receive a summary of the findings of

the study after its completion by contacting the researcher. A copy of the survey is provided in Appendix C.

## Data Collection

While a questionnaire was the main source to help answer if safety professionals impact workers' compensation claims, The WCF Insurance database also helped identify if companies had a full time safety professional.

Data for the WCF Insurance database answered if regular visits from loss control consultants provided by WCF Insurance played a significant role in reducing claims frequency and severity. It answered if recommendations given by workers' compensation loss control consultants was a significant factor in reducing claims frequency and severity. Any cases with missing data were excluded.

## Research Questions and Hypothesis

This study attempted to answer the following research questions:

RQ1: Is there a significant difference in the difference in claims experience based upon being visited 20 times or greater, being visited less than 20 times, or no visits at all over a five-year period?

RQ2: Is there a significant difference in the difference in claims severity based upon being visited 20 times or greater, being visited less than 20 times, or not at all in a five-year period?

RQ3: Does the percentage of recommendations closed result in significant differences in the difference in claims experience over five-year period?

RQ4: Does the percentage of recommendations closed result in significant differences in the difference in claims severity over five-year period?

RQ5: Does the presence of a safety professional result in significant differences in the difference in claims experience over a five-year period?

RQ6: Does the presence of a safety professional result in significant differences in the difference in claims severity over a five-year period?

RQ7: Does giving recommendations result in significant differences in the difference in claims experience over a five-year period?

RQ8: Does giving recommendations result in significant differences in the difference in claims severity over a five-year period?

RQ9: Are the presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of loss control visits significant predictors of the difference in claims severity over a five-year period?

RQ 10: Are the presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of loss control visits significant predictors of the difference in claims experience over a five-year period?

## Data Analysis

### Descriptive Analysis

A descriptive analysis was conducted on the variables used in this study. This included frequencies, percentages, averages, and standard deviations.

### Multiple Regression Procedure

A multiple regression procedure was used to determine which of the independent variables were significant predictors of losses and claims. A multiple regression procedure was appropriate for this study because it was used to determine the value of a dependent variable based on two or more independent variables (Sheposh, 2016). The data helped predict the factors

that resulted in an outcome or forecast an effect or trend (Sheposh, 2016). By using multiple variables in a multiple regression method, it helped guard against making inaccurate conclusions based only on partial correlation (Sheposh, 2016).

Model 1:

Dependent variable (Y): Difference in losses as measured in dollar over a 5-year period

Independent variables (Xs): Presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of visits.

Model 2:

Dependent variable (Y): Difference in claims experience over a 5-year period

Independent variables (Xs): Presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of visits.

**Assumptions**

Prior to performing a multiple regression model, the following assumptions were tested (Laerd, 2016):

1. The dependent variables should be measured at the interval or ratio level of measurement.
2. There should be independence of observations. This will be tested using the Durbin-Watson statistic in SPSS.
3. There needs to be a linear relationship between the dependent variable and each of the independent variables, and the dependent variable and the independent variables collectively. This will be tested using scatter plots in SPSS to check for linearity.

4. The data needs to show homoscedasticity. This will be tested using scatter plot to show residuals versus fitted values. The variation of residuals should be uniform across the band to be homoscedastic.

5. The data must not show multicollinearity, which occurs when two or more independent variables are highly correlated with each other. The variance of inflation (VIF) and tolerance output will be used to determine multicollinearity.

6. There should be no significant outliers. This will be tested using the studentized residuals (each residual divided by its standard error) for each regression equation.

7. All continuous variables should be normally distributed. To test for normality a histogram and a fitted normal curve or a Q-Q-Plot will be used.

**Statistical Hypotheses**

The hypotheses tested using the multiple regression procedure were:

Null: There will be no significant prediction of the dependent variable (Y) by the independent variables (Xs) used in the model

Alternative: There will be significant prediction of the dependent variable (Y) by the independent variables (Xs) used in the model

**Multivariate Analysis of Variance (MANOVA)**

A MANOVA was used to determine if there are any effects from the independent variables on more than one continuous dependent variable (Leard Statistics, 2016).

The dependent variables was the difference in claims losses per $1 million dollar of payroll and the difference in number of claims per $1 million of payroll. A five-year span from 2012-2016 was used to calculate the difference. This was calculated by subtracting the 2016 value from the average of 2012, 2013 and 2014.

The independent variables were:

1. Visit: Visited by a loss control consultant 20 times or greater, visited less than 20 times, or no visits at all during a five-year period
2. Recommendations given or not given by the loss control consultant (Serious, Best Practices or combination of both Serious and Best Practices)
3. The percentage of recommendations closed by the company (0-25%, 26-50%, 51-75%, 76-100%)
4. The presence of a full-time safety professional versus their absence

**Assumptions**

Prior to performing the MANOVA, the following assumptions were tested (Laerd Statistics, 2016):

1. The dependent variables will be measured at the interval or ratio level.

2. Independent variables will consist of two or more categorical, intendent groups.

3. There should be independence of observations. This is more of a study design issue making sure there are different participants in each group with no participant being in more than one group.

4. There should be adequate sample size.

5. There should be no univariate or multivariate outliers. This will be tested using box plots in SPSS Statistics.

6. There should be multivariate normality. This will be tested using the Shapiro-Wilk test of normality.

7. There should be a linear relationship between each pair of dependent variables for each group of independent variables. A scatter plot matrix will be used to test this assumption.

8. There should be a homogeneity of variance-covariance matrices. This can be tested using Box's M test of equality of covariance. If the data fails this assumption, a Levene's test of homogeneity of variance will be used to determine where the problem may lie.

9. There should be no multicollinearity. This is tested by checking the correlations among the dependent variables. Any correlation over .80 presents a concern for multicollinearity.

**Statistical Hypotheses**

Null: The group mean vectors are equal (There is no multivariate significance present)

Alt: The group mean vectors are not equal (There is multivariate significance present)

**Four-Way Analysis of Variance (ANOVA)**

If the data fails the multicollinearity assumption of the MANOVA procedure, then the four-way analysis of variances (ANOVA) was used to determine if there was significant differences in loss frequency and loss severity reductions across the independent variables. A four-way ANOVA was used to determine if there was significant interaction affect between the four independent variables on the continuous dependent variable (Leard Statistics, 2016). Two of these models were run, one for the loss frequency dependent variable and one for the loss severity dependent variable.

The dependent variables were the difference in claims losses per $1 million dollar of payroll and the difference in number of claims per $1 million of payroll. A five-year span from 2012-2016 was used to calculate the difference. This was calculated by subtracting the 2016 value from the average of 2012, 2013 and 2014.

The independent variables were:

1. Visit: Visited by a loss control consultant 20 times or more, visited less than 20 times, or not visited at all during a five-year period

2. Recommendations given or not given by the loss control consultant (Serious, Best Practices or combination of both Serious and Best Practices)

3. The percentage of recommendations closed by the company (0-25%, 26-50%, 51-75%, 76-100%)

4. The presence of a full-time safety professional versus their absence

If the four-way ANOVAs are significant, then appropriate post hoc tests were performed using Tukey etc.

**Assumptions**

Prior to performing the ANOVA, the following assumptions were tested (Laerd Statistics, 2016):

1. The dependent variables should be measured at the interval or ratio level of measurement.

2. There should be independence of observations. This is more of a study design issue making sure there are different participants in each group with no participant being in more than one group.

3. There should be no significant outliers. This will be tested using box plots in SPSS Statistics.

4. The residuals should be normally distributed for each combination of the groups of the four independent variables. This will be tested using the Shapiro-Wilk test of normality.

5. There should be homogeneity of variances for each combination of the groups of the four independent variables. This will be tested using the Levene's test of homogeneity.

If it is determined the data violates any of the assumptions of the Four-Way ANOVA procedure, appropriate non-parametric procedures will be used including Kruskal-Wallis tests and Dunn Bonferroni follow up tests.

**Statistical Hypotheses**

Null: There is no significant difference in the dependent variables across the independent variables.

Alt: There are significant differences in the dependent variables across the independent variables.

# CHAPTER 4

# RESULTS

This chapter describes the analysis of data followed by a discussion of the research findings. The findings relate to the research questions that guided the study. Data was analyzed to identify, describe and explore the relationship between the use of workers' compensation loss control services and the frequency and severity rates of workers' compensation claims in the manufacturing industry. Other objectives were to analyze if recommendations given by loss control consultants result in a significant difference in the average reduction in claims frequency and severity. Lastly, what is the significance that a dedicated safety professional, employed by the company, has on workers' compensation losses.

## Source of Data

### Population

The population for this study consisted of manufacturing companies that had a premium of $20,000 or more between the years 2012 to 2016. All of the companies were insured in Utah by WCF Insurance. There were 229 companies identified and selected for this study.

### Instrumentation

The WCF Insurance database was used to compile data used to calculate the number of claims per $1 million of payroll and the claim losses per $1 million of payroll. WCF Insurance data was also used to determine the number of visits made by loss control consultants, the recommendations given by loss control consultants, and recommendations closed by the policyholders.

A survey tool was used to determine if companies had a fulltime safety professional and it was administered using the Qualtrics survey software online. After administering this survey,

30 companies answered the online questionnaire. Because the online survey resulted in only an 8% response rate, the researcher used company information to identify more companies that had a fulltime safety professional. The researcher was able to determine the status of the presence or absence of a safety professional for 204 out of the 229 companies that were used for this study. Based on these results, 33% of companies had a fulltime safety professional while 67% did not have a fulltime safety professional during the years 2012-2016.

**Software**

The SPSS statistical package was used to conduct the MANOVA, ANOVAs, and the multiple regressions. Microsoft Excel was used to code and sort the data.

## Descriptive Statistics

Tables 1 and 2 contain the means, standard deviations for the difference in claims experience and difference in claims severity. Difference in claims experience was measured by claims per $1 million in payroll, while difference in claims severity was measured by claims costs per $1 million in payroll. A five-year span from 2012-2016 was used to calculate the difference by subtracting the average of 2012, 2013 and 2014 from the 2016 value. A negative result indicated the losses and claims decreased while a positive value indicated an increase.

Referring to Tables 1 and 2, 79% of companies were visited by a loss control consultant one time or more during the five-year period. Visits in the 1 to 19 range were the most frequent category accounting for 44% of reported visits. Companies in the 1-19 number of visits category had on average a decrease of 1.75 claims per $1 million in payroll and an average of $22,489.36 decrease in claims losses per $1 million dollar payroll.

When examining the percent recommendations closed, 68% of companies received no recommendations. For the companies that closed their recommendations 51-75% of the time, they experienced an average decrease of 2.82 claims per $1 million in payroll.

Examining the presence or absence of a safety professional, determined 67% of companies did not have a full-time safety professional. Companies without a full-time safety professional had on average a decrease of 1.50 claims per $1 million of payroll compared to companies with a fulltime safety professional experiencing a decrease of 1.42 claims per $1 million in payroll. In addition, companies that did not have a fulltime safety professional had on average a decrease of $13,850.96 in losses per $1 million of payroll compared to those that did have a fulltime safety professional with, $12,017.04 in losses per $1 million of payroll.

The researcher analyzed the recommendations given by loss control consultants. Thirty-two percent of companies that had recommendations given by a loss control consultant saw on average a decrease in claims of 1.63 per $1 million of payroll. This was a larger decrease on average than those that did not have any recommendations given by a loss control consultant with 1.39 per $1 million of payroll.

When examining claims severity, companies that received recommendations by a loss control consultant on average experienced a decrease of $12,390.74 in claims losses per $1 million of payroll while companies that did not receive recommendations experienced an average of $17,999.12 decrease in claims losses per $1 million per payroll.

Table 1

*Descriptive Statistics for Difference in Claims Experience*

| Variable | N | Mean (Claims per $1M in Payroll) | SD |
|---|---|---|---|
| Number of Visits | | | |
| No Visits | 47 | -.75 | 2.71 |
| 1-19 Visits | 100 | -1.75 | 3.59 |
| >=20 Visits | 82 | -1.53 | 1.72 |
| Total | 229 | -1.47 | 2.88 |
| Percent Closed | | | |
| No Recs | 156 | -1.39 | 3.20 |
| 0-25% | 28 | -1.31 | 2.13 |
| 26-50% | 5 | -.64 | .3637 |
| 51-75% | 6 | -2.82 | 3.20 |
| 76-100% | 34 | -1.85 | 1.80 |
| Total | 229 | -1.47 | 2.88 |
| Safety Professional | | | |
| Yes | 67 | -1.42 | 1.79 |
| No | 137 | -1.50 | 3.13 |
| Total | 204 | -1.48 | 2.76 |
| Recommendations Given | | | |
| Yes | 73 | -1.63 | 2.04 |
| No | 156 | -1.39 | 3.20 |
| Total | 229 | -1.47 | 2.88 |

Table 2

*Descriptive Statistics for Difference in Claims Severity*

| Variable | N | Mean (Claim Losses per $1M in Payroll) | SD |
|---|---|---|---|
| Number of Visits | | | |
| No Visits | 47 | -$10,853.43 | $107,052.47 |
| 1-19 Visits | 100 | -$22,489.36 | $58,754.23 |
| >=20 Visits | 82 | -$11,626.09 | $28,216.16 |
| Total | 229 | -$16,211.29 | $64,223.69 |
| Percent Closed | | | |
| No Recs | 156 | -$17,999.12 | $75,130.61 |
| 0-25% | 28 | -$11,737.46 | $24,296.59 |
| 26-50% | 5 | -$12,425.40 | $53,268.47 |
| 51-75% | 6 | -$12,469.00 | $15,474.40 |
| 76-100% | 34 | -$16,564.35 | $31,032.60 |
| Total | 229 | -$16,211.29 | $64,223.69 |
| Safety Professional | | | |
| Yes | 67 | -$12,017.04 | $34,568.18 |
| No | 137 | -$13,850.96 | $54,053.47 |
| Total | 204 | -$13,248.65 | $48,442.76 |
| Recommendations Given | | | |
| Yes | 73 | -$12,390.74 | $29,802.34 |
| No | 156 | -$17,999.12 | $75,130.61 |
| Total | 229 | -$16,211.29 | $64,223.69 |

## MANOVA

A MANOVA was used to determine if there were any differences in the independent variables, which included the presence of a safety professional, percentage of recommendations closed, recommendations given, and frequency of loss control visits with the dependent variables of difference in claims losses and difference in claims experience. It was determined that the data failed to meet multivariate normality. This was determined by using the Shapiro-Wilk test for normality for both losses ($df = 229$; $p = .000$) and number of claims ($df = 229$; $p = .000$) where $\alpha = .001$ level of significance. Therefore, the MANOVA could not be run.

## Four-Way ANOVA

Because the data failed the MANOVA assumption of normality, two four-way ANOVAs were used, one for number of claims and the other for losses. The four-way ANOVA was used to determine if there is a significant effect and interaction affect between the four independent variables on number of claims and losses. Again it was determined that the data failed to be normally distributed for losses ($df = 204$; $p = .000$) and number of claims ($df = 204$; $p = .000$) where $\alpha = .001$ level of significance.

## Kruskal-Wallis Test

Because the data failed to meet the normality assumption for both the MANOVA and ANOVAs, a series of Kruskal-Wallis tests were used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable. The Kruskal-Wallis test is considered the nonparametric alternative to the one-way ANOVA, and an extension of the Mann-Whitney U test to allow the comparison of more than two independent groups.

Of the four different independent variables, only the number of visits variable with the difference in claims experience dependent variable saw a significance when the Kruskal-Wallis test was used. A Kruskal-Wallis test was conducted to evaluate the differences among the three visit groups (No visits, 1-19 visits and 20 or greater visits) on the difference in claims experience and difference in claims severity. While there was no significance for difference in claims severity the test was significant for difference in claims experience (K-W = 6.111, df = 2, p = .047, (See Table 3

below).

Table 3

*Kruskal-Wallis Tests – Difference in Claims Experience*

| | KW | df | p |
|---|---|---|---|
| Number of Visits | 6.111 | 2 | .047* |
| Percent Recs Closed | 6.747 | 4 | .150 |
| Recs Given | 2.841 | 1 | .092 |
| Safety Professional | .229 | 1 | .632 |

*p = <.05

Follow-up tests were conducted to evaluate pairwise differences among the three groups, controlling for Type I error across tests by using the Bonferroni approach. The results of these tests indicated a significant difference between the no visit group and the 1-19 visit group (p = .05). (See Table 4).

This indicates that those companies visited by a loss control consultant between 1-19 times compared to those that were not visited at all in the five-year period had a significant difference in claims experience. Companies in the 1-19 visit group had a decrease in claims experience that was significantly different from companies who had no visits.

Table 4

*Kruskal-Wallis Tests – Number of Visits and Difference in Claims Experience*

| Group | Mean Rank | Pairwise Comparison Group | Sig | Adj Sig |
|---|---|---|---|---|
| No Visits | 136.16 | 1-19 - >=20 | .779 | 1.00 |
| 1-19 | 108.29 | 1-19 – No Visits | .017 | .05* |
| > = 20 | 111.05 | >= 20 – No Visits | .038 | .12 |

*p = .05

A Kuskal-Wallis test was run comparing differences in claims severity across the different independent variables. No significance differences were identified. (See Table 5).

Table 5

*Kruskal-Wallis Tests – Difference in Claims Severity*

| | KW | df | p |
|---|---|---|---|
| Number of Visits | 3.129 | 2 | .209 |
| Percent Recs Closed | 1.589 | 4 | .811 |
| Recs Given | 1.285 | 1 | .257 |
| Safety Professional | .254 | 1 | .614 |

## Multiple Regression

Multiple regression procedures were used to determine if the number of visits, the percentage of recommendations closed, the type of recommendation given, and the presence of a safety professional are significant predictors of difference in claims severity and difference in claims experience.

An examination of outliers was conducted using the standardized residuals. The criteria requires cases > 3.0 be removed. There were seven cases meeting this criteria and were removed

for the difference in claims severity variable. There was only one outlier for the difference in claims experience, which was removed. The multicollinearity assumption was tested through examination of VIF values. VIF values of $> 2$ indicate multicollinearity. This was met for both difference in claims severity and difference in claims experience.

The results in Tables 6 and 8 indicate the variables entered into the model are not significant predictors of the difference in claims severity ($F=.241$, $df = 5, 55$, $p = .942$) nor the difference in claims experience ($F = 1.354$, $df = 5, 61$, $p = .254$). Tables 7 and 9 provide the summaries of the predictor variables for each equation.

Table 6

*ANOVA Summary – Difference in Claims Severity*

| | Sum of Squares | df | Mean Squares | F | P |
|---|---|---|---|---|---|
| Regression | 189035974.200 | 5 | 37807194.840 | .241 | .942 |
| Residual | 8620828710.000 | 55 | 156742340.200 | | |
| Total | 8809864685.000 | 60 | | | |

Table 7

*Multiple Regression – Difference in Claims Severity*

| | B | SE | β | t | P | VIF |
|---|---|---|---|---|---|---|
| (Constant) | -8776.820 | 4524.812 | | -1.940 | .058 | |
| # of Events | -22.765 | 63.193 | -.057 | -.360 | .720 | 1.390 |
| % Closed | 24.050 | 37.941 | .091 | .634 | .529 | 1.167 |
| Recs Serious | -1442.127 | 5275.765 | -.043 | -.273 | .786 | 1.362 |
| Rec Best Practice | -1701.266 | 3931.383 | -.070 | -.433 | .667 | 1.471 |
| Safety Professional | 2176.010 | 3834.131 | .090 | .568 | .573 | 1.399 |

Table 8

*ANOVA Summary – Difference in Claims Experience*

| | Sum of Squares | df | Mean Squares | F | P |
|---|---|---|---|---|---|
| Regression | 23.146 | 5 | 4.629 | 1.354 | .254 |
| Residual | 208.525 | 61 | 3.418 | | |
| Total | 231.671 | 66 | | | |

Table 9

*Multiple Regression – Difference in Claims Experience*

| | B | SE | β | t | P | VIF |
|---|---|---|---|---|---|---|
| (Constant) | -1.208 | .605 | | -1.997 | .050 | |
| # of Events | .008 | .009 | .129 | .907 | .368 | 1.373 |
| % Closed | -.010 | .005 | -.242 | -1.887 | .064 | 1.119 |
| Recs Serious | .823 | .708 | .164 | 1.162 | .250 | 1.349 |
| Rec Best Practice | .159 | .538 | .043 | .296 | .768 | 1.410 |
| Safety Professional | -.670 | .548 | -.174 | -1.223 | ..226 | 1.375 |

# CHAPTER 5

# DISCUSSION & CONCLUSIONS

The purpose of this study was to examine whether workers' compensation loss control consultant services had any significance in reducing the frequency of workers' compensation claims and losses. The frequency of claims was measured as claims per $1 million in payroll and the claims severity was measured as claims losses per $1 million in payroll. This study looked specifically at number of visits conducted by a loss control consultant, recommendations given by a loss control consultants and recommendations closed out by the company. Lastly, this study examined if a full-time safety professional, employed by the company, had any impact on workers' compensation claims number or claim losses in a manufacturing sector.

Prior to this study there had been very few empirical studies that examined the impact that loss control consultants play in reducing workers' compensation claims and losses. Of the limited studies that were done, they concluded that services by loss control consultants meets the needs of the corporations served and that loss control services provided by workers' compensation carriers can be effective. (Buresh, 2000, Nave & Veltri, 2004). However, this study differs with prior studies in that this study tried to identify the impact underlying loss control services played in reducing claims number and losses.

## Research Findings

### Number of Visits and Reduction in Claims Frequencies

The researcher hypothesized that there would be a significant reduction in the difference in claims experience and in the difference in claims severity when comparing 20 or greater visits, less than 20 visits, and companies that received no visits at all by loss control consultants over a five-year period. A Kruskal-Wallis test determined there was a significant difference in the

frequency of claims based upon the number of visits ($p < .05$). The pairwise comparisons revealed companies who were visited 1-19 times in a five-year period had significantly greater decreases in claims frequencies over the five year period compared to those who were never visited ($p = .05$).

Companies that were visited 1-19 times during the five-year period accounted for 43% of companies in this study, while no visits accounted for 21% and companies visited greater than 20 times accounted for 35%. Companies that were visited between 1-19 times experienced a decrease of 1.75 claims per $1 million in payroll, while companies never visited experienced a decrease of .75 claims per $1 million in payroll and companies visited greater than 20 times experienced a decrease of 1.47 claims per $1 million in payroll.

The researcher concluded that those companies that were visited by a loss control consultant between 1-19 times for the five-year period between 2012-2016 compared to those that were not visited during that time period could expect a significant different reduction in their claims experience compared to sites that are not visited. It could be concluded if the study had more cases; it could be possible to see a positive correlation between these two variables. This study did not see a significant difference in claims severity. The significance in the difference in claims frequency is similar with a prior study where they found that the use of loss control consultants can contribute to the decrease in workers' compensation claims frequency (Nave & Veltri, 2004).

Factors not examined in this study that may have influenced these findings could be the type of visits performed by the loss control consultants. The implications of these findings suggest that the more companies are visited by a loss control consultant from a workers' compensation insurance carrier the greater the decrease in claims frequency. While companies

that were visited greater than 20 times showed a decreased in claims frequency, they did not experience as large of a decrease compared to companies that were visited between one and 20 times. It could be concluded that visits by a loss control consultant are based on the quality not quantity of visits performed by a loss control consultant. Insurance carriers should stress to their loss control consultants to focus their visits on quality visits such as safety trainings, inspections, safety culture assessments, etc. rather than dropping by several times throughout the year giving them minimal safety service.

**Number of Visits and Reduction in Claims Severity**

A Kruskal-Wallis test determined there was no significance in the difference in claims severity based upon the number of visits, however, descriptive statistics revealed decreases in losses over the five-year period across all groups. The greatest decrease in claim losses were companies visited between one and 19 times. On average, this group saw a decrease of $22,489.36 in claims per $1 million of payroll. Overall, across all groups the average decrease in claims per $1 million of payroll was $16,211.29. Companies with no visits by a loss control consultant saw a decrease in claims losses of $10,853.43. However, the standard deviation was $107,052.47. This shows that some companies had a single high loss experience during the five-year period that could influence the results. There were a few companies, based on the data, that had three or four low loss years with zero losses, however they had one or two single high loss years thus affecting the results.

Again similar to claims frequency, the types of visits were not examined for this study. If those were examined it could show the quality of visits conducted by the loss control consultants which could influence these results. It could be concluded that if loss control consultants focus

their visits on quality visits such as trainings, inspections, and risk assessments that help prevent injuries, those companies could see a larger decrease in claims severity.

**Percent of Claims Closed and Reduction in Claims Frequencies**

The researcher hypothesized that there would be a significant reduction in claims experience for those insured companies that close out the greater amount of loss control recommendations over a five-year period. This was not proven. However, while not significant, companies that closed out more than half of their recommendations experienced the greatest decrease in claims frequency. It could be concluded that companies who addressed a greater percentage of recommendations saw a larger decrease in claims frequency. For insurance companies, this means that they should track the closure of recommendations and motivate the insured to implement corrective actions.

**Percent of Claims Closed and Reduction in Claims Severity**

The researcher hypothesized that there will be a significant reduction in claims severity for those insured companies that close out the greater amount of loss control recommendations over a five-year period. This was also not proven. There was no significant difference in the decrease in claims severity based upon the percentage of claims closed over a five-year period, however, the results could be impacted by single large losses. Companies that received no recommendations had the greatest decrease in severity. However, an average of $17,999 and a standard deviation of $75,999 indicated potential outlier cases. Examining the data set, there were two cases with large single losses that resulted in a large standard deviation, which in turn influenced the results.

It is important to note that there was a steady decrease in losses as the percentage of closed cases increased. For the 0-25% closed category there was a decrease of $11,737.46 in

losses per $1 million in payroll, for the 26-50% category there was a decrease of $12,425.40 in losses per $1 million in payroll, for the 51-75% category there was a decrease of $12,469.00 in losses per $1 million in payroll, and lastly there was a decrease of $16,564.35 in losses per $1 million in payroll for the 76-100% percent closed category.

This pattern suggests that for companies that close their recommendations given by their loss control consultants, they should see a decrease in claim costs. While, this is a good for the insured company, it is great for the workers' compensation insurance carrier. This shows that the more they encourage their insured companies to follow the recommendations given by their loss control consultants the insurance company will see a decrease in claims costs, which will help them save money and become more profitable.

**Recommendations Given and Reduction in Claims Frequencies**

The researcher hypothesized that there will be a significant reduction in the difference in claims experience for recommendations given versus not given by a loss control consultants over a five-year period. Loss control consultants are tasked to visit various insured companies and help them identify potential safety hazards. While on these inspections if the loss control consultant observes a hazardous condition or behavior s/he will give the insured company a recommendation on how to control the hazard observed. These recommendations are based on the professional opinion of the loss control consultant. Not all visits are safety inspections; therefore, some visits do not generate a recommendation.

The results for this hypothesis was not statistically significant and could not be proven for this study. Only 32% of companies were given a recommendation by their loss control consultant. However, those companies saw a decrease of 1.63 claims per $1 million in payroll frequency compared to a decrease of 1.39 per $1 million in payroll for those companies that were

not given a recommendation. Assuming some corrective actions were taken on the recommendations, this suggests that loss control consultants who give recommendations to insured companies could have an effect on claims frequency.

While the hypotheses for recommendations given by loss control consultants may have been statistically insignificant, there were some limitations for this study. The first limitation is that this study only looked at serious and best practice type of recommendations given by loss control consultants at WCF Insurance. These types of recommendations were analyzed because they are system based rather than merely compliance based recommendations. A system safety approach is an effort to make things as safe as practical by systematically using engineering and management techniques to identify, analyze and control hazards. Compliance based recommendations are a minimalist approach and may not be as effective in controlling hazards. While these are defined by WCF Insurance, the loss control consultants use their professional judgement making it very subjective as to what recommendation is "serious" and "best practice" compared to what is compliance based.

**Recommendations Given and Reduction in Claims Severity**

The researcher hypothesized that there would be a significant reduction in the claims severity for sites that received recommendations versus those sites that did not receive recommendations from a loss control consultants over a five-year period. Companies that received recommendations from a loss control consultant saw a decrease of $12,390.74 in losses per $1 million in payroll compared to $17,999.12 in losses per $1 million in payroll for sites that were not given recommendations. However, the standard deviation for companies that were not given a recommendation was $75,130.61 in losses per $1 million in payroll. Similar to previous

findings, it was determined that two companies had a single high losses thus creating a large standard of deviation and as a result may have influenced the results.

**Presence of a Safety Professional and Reduction in Claims Frequencies**

The researcher hypothesized that there would be a greater reduction in claims experience for companies with a full-time safety professional compared to companies that did not. Out of the 204 companies where it was possible to determine the presence or absence of a safety professional, 137 did not have a safety professional at their workplace while 67 did. The results for this hypothesis were not statistically significant.

This study only focused on full-time safety professionals. A full-time safety professional is one who is dedicated employee that recognizes and devises methods to control hazards. While, this study showed that companies that had a full-time safety professional saw a decrease of 1.42 claims per $1 million in payroll, those without saw a decrease of 1.50 claims per $1 million in payroll. While companies with a full-time safety professional saw a smaller decrease in claims frequency compared to those that did not have a full-time safety professional, they still saw a decrease in claims frequency, which is a positive result. Factors that could have influenced these results are that this study only examined Utah companies insured by WCF Insurance. Utah is a small market that, in general does not have many full-time safety professionals. These results may be different if the entire United States was included or at least the western region of the United States was included. Another factor is that this study only looked at the manufacturing industry. It could be beneficial if all industries were included in future studies. Another aspect not examined in this study was backgrounds of the full-time safety professionals at the sites. There is no standard established for people who hold the title “safety professional” in an

organization. While sites indicated they had a full-time person with the title, the backgrounds of the people in those positions may vary greatly from one location to another.

**Presence of a Safety Professional and Reduction in Claims Severity**

The researcher hypothesized that there would be a greater decrease in claims severity for companies with a full-time safety professional. The results for this hypothesis was not statistically significant and could not be proven for this study. Sixty-seven of the 204 companies included for this study indicated that they did have a full-time safety professional. Companies with a full-time safety professional saw a decrease of $12,017.04 in losses per $1 million in payroll. However, sites that did not have a full-time safety professional experienced a decrease of $13,850.96 in losses per $1 million in payroll. Like claims frequency there are factors that could have influenced these results that should be examined in future studies. These factors include upper management support, which includes allocating sufficient resources such as sufficient staff, time and money to accomplish safety goals. Another factor to examine is the personal competency of the full-time safety professional. The full-time safety professional should have the appropriate education and experience to manage a safety program effectively.

## Conclusions

The purpose of this study was to determine the effectiveness that loss control consultants have on workers' compensation claims. In this study, the researcher examined the frequency of visits conducted and the types of recommendations given by loss control consultants, the presence or absence of a full-time safety professional, the types of recommendations given, and the percentage of claims closed as a way to examine their effectiveness on workers' compensation claims. The impact of these variables were examined in terms of their ability to decrease the frequency of claims and the severity of losses.

There was a significant difference in the reduction in claims frequency based upon the number of visits by a loss control consultant, specifically when companies are visited between 1-19 times in a five-year period compared to having no visits by a loss control consultant in that same five-year period.

The study determined that types of recommendations given by loss control consultants had no impact on claims frequency or claims severity. Likewise, there was no evidence that the presence or absence of a full-time safety professional significantly impacted claims frequency or claims severity. While these variables were not statistically significant, some variables did indicate a decrease in both claims frequency and claims severity based on $1 million in payroll. This study can serve as a baseline for future studies to examine the effect on loss control services provided by workers' compensation insurance companies.

## Recommendations for Future Research

This study has contributed to the growing body of research designed to understand the effectiveness that loss control consultants have on workers' compensation claims. Future research should be conducted to determine the impact that loss control consultants have on workers' compensation claims. Other opportunities for future research include:

- Expand the current study to all industries such as construction rather than just focusing in one specific industry. This will provide a wider analysis of how loss control services may affect workers' compensation claims.
- This study only examined companies with premiums of $20,000 or greater. Future studies could benefit by examining all companies regardless of premium size.
- Examining all recommendations may be beneficial as well. While this study examined recommendations considered system based, it might be beneficial to analyze all

recommendation types regardless if they are system based or compliance-based recommendations. By doing this, the case numbers would increase and provide a larger sample.

- The final recommendation would be to examine more loss control services. These could include trainings performed by loss control consultants, safety inspections conducted by loss control consultants, and safety programs and procedures developed by loss control consultants.

References

Abudayyeh, O., Fredericks, T. K., Butt, S. E., & Shaar, A. (2006). An investigation of management's commitment to construction safety. *International Journal of Project Management*, *24*(2), 167-174.

Agwu, M. O. (2012). Impact of job hazard analysis on organizational performance in Shell Bonny terminal integrated project. *Journal of Emerging Trends in Economics and Management Sciences*, *3*(2), 161.

American Society of Safety Engineers. (n.d.). *What is the American Society of Safety Engineers?* Retrieved from http://www.asse.org/about/history/

American Society of Safety Engineers Foundation & Board of Certified Safety Professionals. *Career guide to the safety profession.* Retrieved from http://www.asse/org/foundation/publications/docs/2007_Career_Guide.pdf

Buresh, D. J. (2000). The use of occupational safety and health consultative services among Oregon industries (Doctoral Dissertation). Available from ProQuest Dissertations & Theses Global database. (UMI No. 9973870)

Cohen, K.S. (1982). Health and safety consultants: Uses and abuses. *Occupational Health and Safety*, *51*(11), 10-12

Collins, L., Belke, J. C., & Halpern, M. (2002). The insurance industry as a qualified third-party auditor. *Professional Safety*, *47*(4), 31-38.

Davis, J., & Bar-Chaim, Y. (2011). Workers' compensation claims frequency. Retrieved from https://www.ncci.com/articles/documents/ii_2011_claim_freq_research.pdf

Dembe, A. E. (1995). Alternative approaches for incorporating safety into workers' compensation reform legislation. *Journal of Insurance Regulation*, *13*(4), 445–461.

Dworsky, M. (2014, December). The National Institute for Occupational Safety and Health workers' compensation leaders research colloquium, *Proceedings*, Santa Monica, Calif.: RAND Corporation, CF-333-NIOSH.

Eure, G. (2005). An historical retrospective on the origin of and changes to the worker's compensation insurance industry (Master Thesis). Rochester Institute of Technology. Retrieved from http://scholarworks.rit.edu/theses/7758

Canadian Centre for Occupational Health and Safety (CCOHS) (2017). Hazard control: OSH answers. Retrieved from http://www.ccohs.ca/oshanswers/hsprograms/hazard_control.html

Glenn, D. D. (2011). Job safety analysis: Its role today. *Professional Safety*, *56*(3), 48.

Hagan, P., Montgomery, J., O'Reilly, J., (2001). *Accident prevention manual for business and industry, engineering & technology* (12th Ed.). National Safety Council, Chicago, Ill.

Laerd (2016). Four-way ANOVA in SPSS statistics. Retrieved from https://statistics.laerd.com/spss-tutorials/four-way-anova-using-spss-statistics.php

Laerd (2016). Multiple regression analysis using SPSS statistics. Retrieved from https://statistics.laerd.com/spss-tutorials/multiple-regression-using-spss-statistics.php

Leigh, J. P. (2011). Economic burden of occupational injury and illness in the United States. *Milbank Quarterly*, *89*: 728–772.

McCarten-Gibbs, A., (1995). *Workers' compensation loss control services: Background summary and literature review*. Unpublished manuscript, Commission on Health and Safety and Workers' Compensation, San Francisco, CA.

Moseley E. A., (1908) The penalty of progress. *The Independent*, *64* (3106) 1340-1343

Nave, M. E., & Veltri, A. (2004). Effect of loss control service on reported injury incidence. *Journal of Safety Research*, *35*(1), 39-46.

National Council on Compensation Insurance. (n.d.). About us. Retrieved from https://www.ncci.com/pages/aboutus.aspx

National Institute for Occupational Safety and Health (2011). *Using lockout and tagout procedures to prevent injury and death during machine maintenance*. Morgantown, WV: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2011-156.

The National Institute for Occupational Safety and Health (NIOSH). (2016). Retrieved from https://www.cdc.gov/niosh/engcontrols/

The National Institute for Occupational Safety and Health (NIOSH). (2016). Retrieved from https://www.cdc.gov/niosh/topics/hierarchy/

Occupational Safety & Health Administration (2002). *Lockout/Tagout fact sheet publication.*

Occupational Safety & Health Administration (2015). *Incident (accident) investigations: A guide for employers, a systems approach to help prevent injuries and illnesses*. Retrieved from www.osha.gov/dte/IncInvGuide4Empl_Dec2015.pdf

Occupational Safety & Health Administration (1992) Publication 3067. *Concepts and techniques of machine safeguarding*.

Parker, D. L., Yamin, S. C., Brosseau, L. M., Xi, M., Gordon, R., Most, I. G., & Stanley, R. (2015). National machine guarding program: Part 1. Machine safeguarding practices in small metal fabrication businesses. *American Journal of Industrial Medicine*, *58*(11), 1174-1183.

Pettinger Jr, C. B. (2000). *Improving occupational safety & health interventions: A comparison of safety self-efficacy & safety stages of change* (Doctoral dissertation, Virginia Polytechnic Institute & State University).

Pranger, J. (2009). Selection of incident investigation methods. *Loss Prevention Bulletin*, *209*, 12.

Self-Insurance Instutute of America (SIIA). Workers' compensation programs. (n.d.). Retrieved from https://www.siia.org/i4a/pages/index.cfm?pageID=4547

Sengupta I., Baldwin M. (2013). *Workers' compensation: Benefits, coverage, and costs*, Washington D.C.: National Academy of Social Insurance

Sheposh, R. (2016). Multiple regression. *Salem Press Encyclopedia*

Smith, G. S., Huang, Y., Ho, M., & Chen, P. Y. (2006). The Relationship between safety climate and injury rates across industries: The need to adjust for injury hazards. *Accident Analysis and Prevention*, *38556*-562. doi:10.1016/j.aap.2005.11.013

Ulinfun, C. E. (2002). *Essential safety measures for accident and injury reduction in the workplace* (Doctoral dissertation). California Coast University.

United States Bureau of Labor Statistics. (n.d.). Retrieved from https://www.bls.gov/bls/infohome.htm

United States Bureau of Labor Statistics (2014). Safety and health statistics. Retrieved from http:www.bls.gov\stat

United States Department of Labor (2015). Retrievedfrom https://www.osha.gov/news/newsreleases/trade/08132015

United States Social Security Administration (2016). Annual statistical supplement to the social security bulletin. Washington, D.C.: Social Security Administration, Office of Policy.

Utterback, D. F., & Schnorr, T. M. (2010). *Use of workers' compensation data for occupational injury & illness prevention*. National Institute for Occupational Safety and Health, US Department of Labour, 2010-152.

Wheal, C. (1992). Paying to make the risks go away. *Engineer*, *275* (7108), 27-29.

Witt, J. F. (2004). *The accidental republic: Crippled workingmen, destitute widows, and the remaking of American law*. Cabridge, Mass. Harvard University Press.

Yassi, A., Lockhart, K., Sykes, M., Buck, B., Stime, B., & Spiegel, J. M. (2013). Effectiveness of joint health and safety committees: A realist review. *American Journal of Industrial Medicine*, *56*(4), 424-438.

Appendix A

Permission to use Data

WCF Insurance
100 West Towne Ridge Parkway, Sandy, UT 84070
800.448.2567 | wcf.com

**Permission to use Data**

To Whom It May Concern,

I am completing a doctoral dissertation at Indiana University of Pennsylvania on the relationship between the use of workers' compensation loss consultants and workers' compensation claims. I would like your permission to use data from your database of manufacturing insured companies that have a premium of $20,000 or greater from the years of 2011-2015.
The data will consist of; claims frequency, claims per $1 million payroll, number of safety visits made by loss control consultants throughout the year to insured companies, types of recommendations given by your loss control consultants and the number of those recommendations closed by the insured companies.

All data will be confidential and anonymous. Study information will be kept in a secured manner and electronic records will be password protected. All information will be used as aggregate data, to be compared to different manufacturing companies. There are no foreseeable risks in this study.

Sincerely,

Justin Thygerson M.S., CSP

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE

Signature: _____

Printed Name & Title: DAN M. HAIR
SVP - CHIEF RISK OFFICER

Conditions, if any: _____

Date: 12-7-16

Appendix B

Survey Invitation

Greetings,

My name is Justin Thygerson. I am a doctoral student in the Department of Safety Science at Indiana University of Pennsylvania. I am currently conducting my dissertation study on the effectiveness of safety professionals. I sincerely invite you to complete this quick one question anonymous survey to help me complete my data collection.

Justin Thygerson, M.S.
Doctoral Candidate
Indiana University of Pennsylvania
Department of Safety Sciences
j.s.thygerson@iup.edu

Appendix C

Survey Instrument

**Determining the use of full-time safety professionals in the manufacturing industry**

**Directions:** Please read the following questions and select the best answer that pertains to you and your company.

Q1. Have any fulltime safety professionals been employed by this location during the years 2012-2016?

Yes No

- By a fulltime safety professional, we mean a person who has spent significant amount of time devising and implementing methods to identify and control safety hazards.