Safety **2015**, *1*, 59-70; doi:10.3390/safety1010059

OPEN ACCESS

safety

ISSN 2313-576X

www.mdpi.com/journal/safety

Article

ATV-Related Workers' Compensation Claims in Montana, 2007–2012

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Academic Editor: Raphael Grzebieta

Received: 31 August 2015 / Accepted: 9 November 2015 / Published: 13 November 2015

Abstract: The objective of this study was to analyze workers' compensation injury and fatality data associated with the occupational use of all-terrain vehicles (ATVs) in Montana. Data were provided by the Montana Department of Labor and Industry Workers' Compensation Injury and Occupational Disease Database. Claims were identified based on a search of injury codes related to vehicular claims and then narrowed by a keyword search for events related to ATVs. Two hundred and fifteen ATV-related claims were identified between 2007 and 2012. The majority of claimants were identified as male (85%), with 23% of total claims between the ages 20–29 at the time of injury. The agriculture industry accounted for 59% of all claims. The results of this investigation indicated that the cost of occupational ATV injuries and deaths during the study period totaled nearly $2,600,000. The agriculture industry is disproportionally represented in ATV workers' compensation claims in Montana. Characterizing and understanding the risk factors associated with occupational-related ATV injuries is critical for developing strategies and programs aimed at injury prevention. Evaluating the gaps in data acquisition and reporting could aid in ensuring comprehensive and complete future investigations of ATV incidents.

Keywords: agriculture; all-terrain vehicles; ATV; quads; quadbikes; risk factors; workers' compensation

1. Introduction

All-terrain vehicles (ATVs) were introduced to the United States agricultural community by the Honda Motor Company in 1970 [1–5]. While first considered an occupational vehicle for agriculture operations [1,5], ATVs quickly developed into a recreational vehicle [5]. At the time of introduction, ATVs could have either three or four wheels [1], although, due to legislation passed in 1988, are now sold exclusively as four-wheeled vehicles [6]. ATVs range in size and capability based on model and intended use. Engine sizes range from 90 to 1000 cubic centimeters (cc) [7], normal ATV weight is between 300 and 700 pounds [3], and modern models are capable of speeds upwards of 80 mph [7]. A report compiled by the Consumer Product Safety Commission (CPSC) based on 2012 data estimates there are 10.7 million ATVs in use in the United States [8]. Recreationally, ATVs are used for racing, camping, hunting, and trail riding [3,9]; while the occupational rider uses ATVs to perform tasks in their given industry. Currently, ATVs are used commonly in occupational tasks related to agriculture, construction, security, and search and rescue [9,10].

In an occupational setting, the ATV offers unique advantages over other forms of transportation for its maneuverability, power, and ability to carry heavy loads over a variety of terrain surfaces [3,10]. Specific uses in the agriculture industry include checking on or mustering animals, personal transport around agriculture operations, and spraying and fertilizing [11]. Occupational riders are subject to different risks and different operating conditions than recreational riders due to the nature of use. Occupational riders are less likely to wear Personal Protective Equipment (PPE) [12], and are more likely to encounter environmental conditions and use scenarios that place the operator at risk. Activities such as mustering cattle, aftermarket alterations to the ATV such as adding plowing or spraying equipment, or carrying heavy or shifting loads place the rider at risk for injury and overturn type events [10,12].

ATVs are inherently dangerous [13] due to their ability to operate at extremely high speeds and potential for loss of control (LOC) events such as rollovers or ejection from the vehicle. Based on a 2012 report, the CPSC received notification of approximately 684 fatalities and 107,500 hospitalizations in 2011 alone [8]. While the CPSC is only responsible for investigating recreational incidents [10], these numbers reflect both occupational and recreational injuries due to the difficulty in differentiating the use purpose of the operator after a fatality occurs [14].

Risk factors for ATV injuries and fatalities include: male gender [4,6,12,14–18], inexperience [10,12,15,17], young or old age (under 16 [1,14,15] or over 65 [4,7,9]), carrying passengers [1,3,10], and use of alcohol or drugs during operation [3]. Risk factors related to operation of the ATV include towing of trailers [11], carrying heavy loads [11], operating on paved surfaces [7], and collision with obstacles or other vehicles [10,11]. Certain industries have been identified as having a higher likelihood of fatal injuries. Workers in agriculture, forestry, fishing and hunting, were found to be 100 times more likely to be in a fatal ATV crash compared to other industries [7].

The most common type of ATV LOC is a rollover event [5,10]. A review of literature suggests the most common types of injuries sustained in an ATV LOC event are fractures and dislocations, followed by strains and sprains [1]. Geographic location of injury also plays a role in the rehabilitation and long-term survivability after a LOC event. ATV incidents, especially those in the agriculture industry, often occur far from emergency medical care or treatment centers, leading to difficulty accessing both short and long-term care for injuries [1,14].

There are many prevention strategies in place with a wide range of effectiveness in reducing ATV injuries and deaths [4,10]. PPE has been specifically developed for use with ATVs. Helmets have proven effective at reducing fatalities due to head injuries [10,16]. In addition to PPE, legislation and training courses have been developed as prevention strategies. The CPSC, in response to rising injury rates, enacted the 1988 Consent Decrees which was an agreement with the largest ATV manufactures as an attempt to make ATV use safer for the operator [19]. The 1988 decree included ceasing production and sale of three-wheeled ATVs, implementation of a rider training program, and inclusion of warning labels on the vehicle [2,3,15,16,19]. The 1988 decree expired after a pre-determined 10-year period [1,19]. Due to rising injury rates seen upon expiration of the decree, the CPSC enacted the 2008 Consumer Safety Improvement Act (CPISA) in an attempt increase safety awareness regarding the dangers of ATV use. The CPISA included training incentives, increased awareness of the dangers associated with ATV use through dissemination of marketing campaigns, as well as a focus on the unique dangers that child or youth operators encounter [3,8].

Due to the rising number of ATV operators, and the expanded use in the occupational setting, additional research is needed for risk characterization and a thorough understanding of injury demographics and the financial cost associated with ATV use in the workplace. Occupational use is often associated with hazards such as a higher use rate (number of hours the ATV is used per year) [15] and different ATV design (including aftermarket additions to the vehicle) [10], than users who are operating for recreational purposes. For this reason, studies that differentiate between recreational and occupational injuries are essential and very few articles are available which examined this differentiation. Understanding the financial burden of ATV-related injuries is important as ATVs continue to infiltrate different industries, each with their own unique uses and risks.

Using workers' compensation data from 2007–2012, the purpose of this study was to examine risk factors associated with ATV-related claims in Montana. The following objectives were the focus of the study: (1) determine the demographics of injured riders; (2) examine the distribution of injuries across industries; and (3) compare the financial costs of claims across industries. Through analysis of injury data, the long-term goal of this research is to provide targeted intervention strategies to reduce the number of occupational ATV injuries and fatalities among targeted industries.

2. Methods and Materials

2.1. Data Collection

Data for this study were provided by The Montana Employment Relations Division. Six years (2007–2012) of workers' compensation claims were studied. The data were collected from the Montana

Department of Labor and Industry Workers' Compensation Injury and Occupational Disease database as of 28 January 2013.

Insurers in Montana are required to report all workers' compensation injuries and occupational diseases to the Montana Department of Labor and Industry on a First Report of Injury (FROI) form. Insurers are required to report detailed information including wage loss and medical benefits on a Subsequent Report of Injury (SROI) form for indemnity claims. SROIs are due every six months from the date of injury while payments and expenses are still occurring.

The data set included injuries from throughout the state of Montana from both private and public industry. Variables for each claim included basic demographic information pertaining to the injury such as date of injury, gender, age, and marital status. Additionally, data were provided on the nature of injury such as body part injured, type of injury, and type of loss of control event. Lastly, each data claim contained information on the industry of the claimant and cost of claim including medical expenses, if applicable time-loss compensation, and death benefits. Industry codes were assigned by the insurer, based on the North American Industry Classification System (NAICS).

Claims were identified for inclusion through use of injury codes defined by the Workers' Compensation Insurance Organizations (WCIO). The narrative reports of claims with the injury codes of Code 45, Collision or Sideswipe with Another Vehicle; Code 46, Collision with a Fixed Object; Code 48, Vehicle Upset; and Code 50, Motor Vehicle Not Otherwise Classified were examined for the following keywords: ATV, All-Terrain Vehicle, or four wheeler. Injury codes were developed by industry experts over time and are maintained by the Workers' Compensation Insurance Organization (WCIO). Two known weaknesses of using WCIO injury codes in research are: only one code is reported on an injury, whereas there may be multiple separate body parts injured and the initial assignment of the code may change over time after more information becomes available about the injury, however the code is not updated. Once identified as an ATV-related injury, a workers' compensation analyst reviewed the narrative reports to determine categorical variables pertaining to description of body part injured, nature or type of injury, and type of ATV Loss of Control (LOC) event. Thirty different types of body part injuries were identified by the workers' compensation analyst, as well as 12 different types of injury and 13 different types of LOC events. Complete claim information and narrative accounts were not available, all data obtained from the Montana Department of Labor and Industry Workers' Compensation Injury and Occupational Disease database were in summary form.

A total of 215 workers compensation claims from the years 2007–2012 were identified based on the inclusion criteria. Of these claims, all contained information on date of injury, type of industry, nature of injury, description of body part injured, and type of LOC event. Sixty-nine cases included an amount for time-loss compensation, 76 included an amount for total medical cost, and 1 case included an amount for death benefits.

Medical and time-loss costs are not available for all claims is because Montana only requires the reporting of costs for indemnity claims. Paid medical expenses are reported only when a claim has wage loss. Compensation for wage loss is considered after 4 days or 32 h of lost work time, whichever is less. The majority of claims are medical only, for which no costs are collected. Paid medical expenses were reported to the Montana Department of Labor and Industry as cumulative totals including all medical services. Total medical costs are a combination of: total payments to physicians, hospital costs, other medical costs to medical providers, and pharmaceutical/vocational rehabilitation.

2.2. Data Analysis

SAS 9.4 was used for statistical analysis. Descriptive statistics were performed on demographic and numerical data to determine mean, median, outliers and frequency statistics.

A chi-square goodness of fit test was performed to determine if there was a statistically significant difference in the number of claims per year as well as the number of claims per season.

Due to the overwhelming number of claims classified as agriculture related injuries, each claim was re-categorized as either agriculture or non-agriculture industry. The Wilcoxon-Mann-Whitney test was utilized as a non-parametric alternative to comparing the difference between agriculture *versus* non-agriculture industry groups with respect to age at injury, time-loss compensation, and total medical cost.

3. Results

As of 28 January 2013, 215 workers' compensation claims had been identified by the Montana Department of Labor and Industry as being related to the use of ATVs. Of these 215 claims, gender was identified in 213. Males filed 182 (85%) claims while females accounted for 31 (15%) claims. Workers between the ages of 20–29 were the most represented age group, accounting for 23% of claims. Refer to Figure 1 for the distribution of claims by age group.

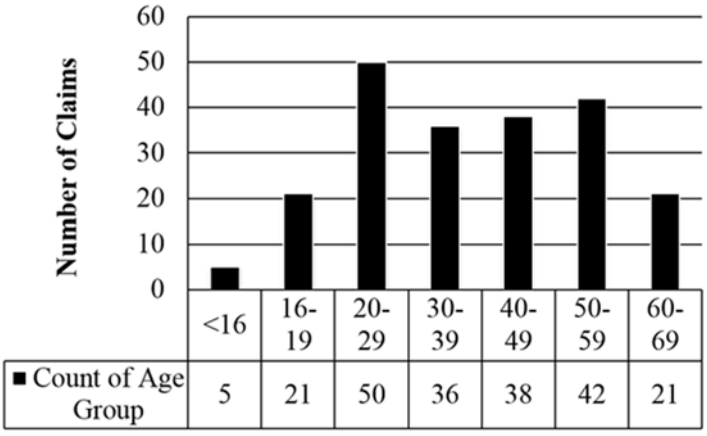

Figure 1. Claims by age at injury.

The distribution of claims by year of injury is shown in Figure 2. A chi-square goodness of fit test was performed to determine if there was a statistically significant difference in the number of claims per year. No significant difference was found in the number of claims per year, χ^2 (5, N = 215) = 8.00, p = 0.156.

The distribution of claims by season of injury is shown in Figure 3. A chi-square goodness of fit test was performed in order to determine if claims were equally distributed across the seasons of the year. Claims were not equally distributed across seasons of the year, χ^2 (3, N = 215) = 81.58, p <0.01.

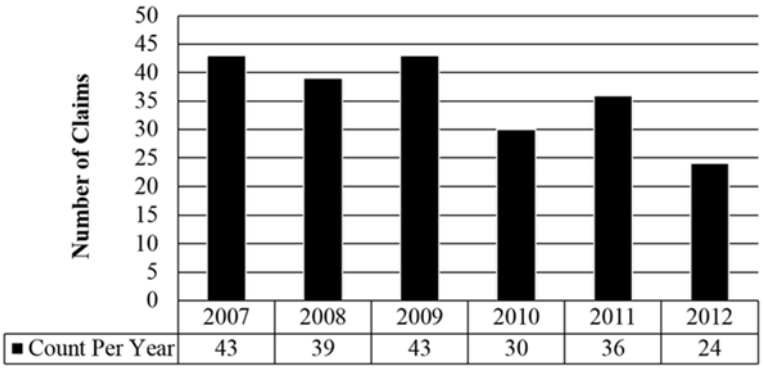

Figure 2. Number of claims per year 2007–2012.

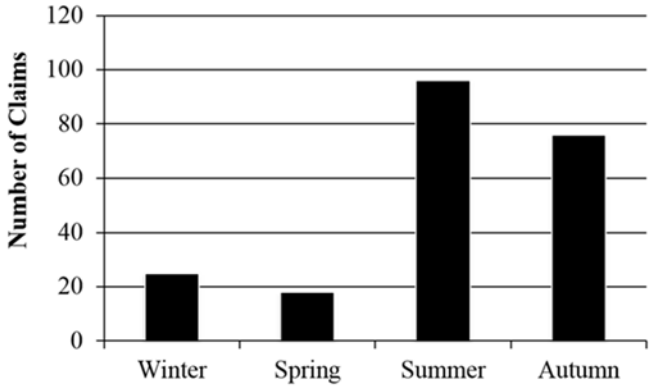

Figure 3. Number of claims by season of injury.

Table 1 outlines the characteristics of the injuries contained in the 215 claims. The first section of the table contains data related to the type of loss of control event. Twenty-nine percent of all injuries were categorized by being caused by an ATV rollover (Table 1). Together fractures and sprains account for over 52% of all workers' compensation claims (Table 1). Injuries to the trunk accounted for nearly 40% of all workers' compensation claims, with injuries categorized as pertaining to multiple locations on the trunk accounting for 20% of all claims (Table 1).

Table 1. Injury distribution table.

Desciption		Number of Claims	Percent of Total Claims
Type of Loss of Control Event	ATV Rollover	63	29.3%
	Other	45	20.9%
	ATV Hit Object	27	12.6%
	ATV Tipped	26	12.1%
	ATV Flipped	19	8.8%
	Body Fracture/Strains/Sprain	12	5.6%
	Body Cuts	8	3.7%
	Ejected	6	2.8%
	Fell off ATV	4	1.9%
	Ran Off Road	3	1.4%
	Abrupt Stop	2	0.9%

Table 1. *Cont.*

Description		Number of Claims	Percent of Total Claims
Injury Description	Fracture	58	27.0%
	Sprain	57	26.5%
	Contusion	49	22.8%
	Strain	15	7.0%
	Laceration	12	5.6%
	Multiple Injury Types	7	3.3%
	Concussion	6	2.8%
	Dislocation	5	2.3%
	Other	2	0.9%
	Crushing	2	0.9%
	Inflammation	1	0.5%
	No Physical Injury	1	0.5%
Body Part Injured	Trunk (including hip and pelvis)	85	39.5%
	Multiple Injuries	43	20.0%
	Head/Neck	34	14.9%
	Lower Extremity	30	14.0%
	Upper Extremity	24	11.2%
	No Physical Injury	1	0.5%

Claims were categorized by industry group by the workers' compensation analyst. Table 2 demonstrates the disparity in injury frequency among the different industries as the agriculture accounts for nearly 59% of all workers' compensation claims involving ATV use.

Table 2. Claims by industry group.

Industry	Number of Claims	Percent of Total Claims
Agriculture	126	58.6%
Public Administration	29	13.5%
Construction	15	6.8%
Professional and Technical Services	12	5.6%
Administrative and Support Services	9	4.2%
Utilities	6	2.8%
Arts, Entertainment, and Recreation	4	1.9%
Education Services	3	1.4%
Manufacturing	2	0.9%
Mining	2	0.9%
Retail Trade	2	0.9%
Not Classified	2	0.9%
Accommodation and Food Services	1	0.5%
Finance and Insurance	1	0.5%
Other Services	1	0.5%
Total	215	100%

Information pertaining to the WC payments related to occupational ATV injuries is contained in Table 3. After removal of an outlier present in total medical cost ($618,527), mean total medical cost, for claims with a reported monetary amount related to total medical cost, across all industries was $18,385. In total, the cost of ATV-related workers' compensation claims in Montana, including wage-loss, medical, and fatality compensation, for the years 2007–2012 totaled $2,597,747.22.

Table 3. Workers compensation benefits payments.

Type of Benefit	*N*	Mean	Median	Min	Q1	Q3	Max	Total
Time-Loss	69	$7,630	$3,903	$20	$1,114	$7,954	$59,172	$526,498
Total Medical	76	$26,282	$13,947	$202	$5,261	$25,388	$618,527	$1,997,402
Fatality	1	$73,848	$73,848	$73,848	$73,848	$73,848	$73,848	$73,848

A Wilcoxon-Mann-Whitney test indicated no significant difference in age at injury between agriculture *versus* non-agriculture industry, W (n1 = 124, n2 = 89) = 8787.5, $p = 0.097$. Similarly, Wilcoxon-Mann-Whitney tests indicated no significant difference in total medical cost nor time-loss compensation between agriculture *versus* non-agriculture industries, W (n1 = 57, n2 = 19) = 743.0, $p = 0.895$, and W (n1 = 50, n2 = 19) = 670.0, $p = 0.952$, respectively.

4. Discussion

The results of this study provide the first evaluation aimed at assessing the costs and causes of occupational ATV injuries and fatalities across industries. Separation of occupational and recreational ATV injury data is important for evaluation of the safety of this workplace vehicle and understanding the unique dangers associated with ATV use in the workplace.

While the data did not reveal significant changes in the number of reported claims by year, CPSC data of all ATV injuries indicates a statistically significant decrease in the number of ATV-related, emergency department-treated injuries in the years 2007–2012 [8]. While not measured in this study, actual occupational injury rate may be decreasing, as many studies indicate a rapidly rising number of ATVs users across the country [8].

Helmkamp, Bonauto, Spann and Aitken provided comparable results in the types and causes of occupational ATV injuries. The present study found fractures as the most common injury type, occurring in 27% of cases, with ATV rollover being the most common type of loss of control event, occurring in nearly 30% of cases. Their study, which analyzed ATV injuries in Washington's agriculture industry, found fractures as the most common injury type (49% of injuries), with rollover/overturn being the most common type of loss of control event, responsible for 37% percent of injuries [5].

The majority (59%) of ATV-related workers' compensation claims in Montana between the years 2007–2012 resulted from work in the agriculture industry. This percentage is especially concerning due to the composition of Montana's employment by industry. According to Headwaters Economics, in 2010, farm employees made up only 5% of total employment in Montana, with combined agriculture and extraction industries employing 8% of all workers [20]. The high rate of injury from ATV use in the agriculture industry is corroborated by Helmkamp, Marsh, and Aitken in their 2011 article titled "Occupational All-Terrain Vehicle Deaths among Workers 18 Years and Older in the United States,

1992–2007". The investigators found, using Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) data, the agriculture production industry accounted for 180 of 297 deaths during this period (61%). Helmkamp and Carter suggest that the agriculture industry may be highly represented due to the ATV's use as a recent substitute to truck, tractor and horse for traveling across rough terrain while carrying materials and tools specific to the trade. A study from New Zealand researchers suggested that farmers may experience higher rates of injury on ATVs due to psychosocial factors such as attitude, risk taking, and response to fatigue and stress. They also suggested these factors may alter the way the farmers make judgments about risk, leading to an increased likelihood of famers encountering dangerous situations which may lead to a LOC event [11]. In addition to increased risks due to the scenarios encountered during occupational use of ATVs, a survey of Australian farmers revealed that they were less likely to wear helmets during ATV use due to the following reasons: the helmet being uncomfortable, too hot and heavy, the perception of not being able to see or hear and that employees will not wear them [21].

Over the six-year period (2007–2012), ATV related injuries made up about 0.13% of workers' compensation claims; however, the preventable nature of many of these injuries and accidents should not be ignored. Through simple proactive changes such as requiring PPE or mandatory hands-on training courses, employers can protect their employees from risk factors associated with injuries and fatalities.

This study has a number of limitations. A major limitation is the underreporting of injuries to workers' compensation particularly in the agriculture community. A paucity of agriculture related injuries are actually reported using the workers' compensation system. Surveys administered and analyzed by Pransky, Snyder, Dembe, and Himmelstein (2010) found that workers did not report occupational injuries for a variety of reason such as: loss of pay, being assigned to less desirable tasks, separation from co-workers, and pushing a higher work load on other workers. Another reason identified by the study was a lack of knowledge on reporting requirements or how to report a workplace injury [22]. In Montana, workers' compensation coverage is required for all workers including seasonal and temporary workers in agriculture, however it is not required for family members. Potentially, lack of reporting may be present in businesses or industries where ATV use is most common, such as rural, small, or family-run businesses due to lack of required workers compensation coverage for family members.

A second limitation of this study involves the use of summary data and the lack of detailed information provided for evaluation. The data relies on the accurate summarization by a workers' compensation analyst who is in turn dependent upon injured victims or fellow employee accounts of the events. Variables, such as helmet use, presence of alcohol or drugs, speed at injury, riding surface type, operator experience and training, as well as a narrative account of the events leading up to the injury event were not made available. This information could be invaluable to both employers and insurers to establishing regulations regarding occupational ATV use.

Another piece of essential information for understanding the risks that ATVs present in the workplace is the use prevalence of ATVs by industry. Missing information includes both the number of ATV operators that are present in today's occupational sectors as well as the number of hours spent actively using the ATV for occupational purposes. Without this information, it is impossible to directly compare the risk of ATV injury by industry or calculate accurate injury and fatality rates.

Future occupational research should place an emphasis on recording and including variables such as rider experience, use of safety equipment, and narrative accounts as to the events leading up to the injury event. As ATV use continues to rise, additional research could help prevent the rising number of injuries as the number of new and inexperienced operators grows. Identification and characterization of hazards, use of PPE, and evaluation of the psychosocial factors involved in ATV LOC events may lead to targeted training programs, which could emphasize factors, conditions or demographics associated with the frequent injuries and thus reduce events and prevent injuries and fatalities. In addition to changes made by the operator, recent development of the Utility Terrain Vehicle (UTV)/Recreational Off-Highway Vehicle (ROV) or Side-By-Side is changing vehicle dynamics and overcoming many of the inherent safety design flaws of the ATV. The UTV overcomes some of the safety limitations of the ATV through the addition of engineering controls such as: roll cages, speed limiters, and seatbelts. However, as with other motorized vehicles, the newest safety equipment is only effective if used in accordance with its intended use [23].

5. Conclusions

Characterizing the demographics and injury profiles of occupational injuries is an important step in understanding risk factors contributing to ATV injuries as well as target audiences for injury prevention strategies. While the cost per claim was not significantly different between agriculture *versus* non-agriculture industry, the number of claims related to the agriculture industry is alarming. Targeting the agriculture industry as a test group for the effectiveness of training programs and other injury prevention strategies needs to be a priority. Training for ATV operators is currently available through the ATV Safety Institute and, in Montana, specific training and outreach programs for ATV safety in the agriculture industry have been promoted by Agriculture Extension Agents starting in 2011.

Acknowledgments

Contract grant sponsor: Center for Disease Control (CDC)/NIOSH Mountain and Plains Education and Research Center; Contract grant number: T42OH009229-04.

Contract grant sponsor: Center for Disease Control (CDC)/NIOSH High Plains Intermountain Center for Agriculture Occupational Health and Safety Cooperative Agreement No. 2 U54 OH008085.

Conflicts of Interest

The authors declare no conflict of interest.

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