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Work-Related Injuries Among
Adolescents in Alberta, 1993-1996:
Examination of Workers' Compensation Claims

by

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ABSTRACT

The aim of this research is to describe the epidemiology of work-related injuries among adolescents (15 to 17 years) in Alberta during the years 1993 to 1996. Workers' compensation files were used to identify work-related injuries. During the four years of the study, 4521 adolescents aged 15-17 years were compensated for work-related injuries in Alberta. The overall annual rate of injury was estimated as 7.7 per 100 full-time equivalent workers (FTE). Injury rates were found to increase with age, ranging from 3.7 per 100 FTE for 15 year-olds to 9.3 per 100 FTE for 17 year-olds. Adolescent males accounted for the majority of work-related injuries reported and had significantly higher injury rates than females. The risk of occupational injury to adolescents was high in the manufacturing, construction, and transportation industries. Lacerations were the most common type of injury, followed by sprains and strains.

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TABLE OF CONTENTS

Approval Page	ii
Abstract	iii
Acknowledgements	iv
Table of Contents	v
List of Tables	viii
List of Figures	ix
Abbreviations	x
1. INTRODUCTION / BACKGROUND	1
1.1 Childhood Injury as a Public Health Problem	1
1.1.1 Definitions	1
1.1.2 Burden	1
1.1.3 Adolescent Injury	2
1.1.4 Economic Cost of Injury	2
1.2 Adolescent Occupational Injury	3
1.2.1 Definition of Occupational Injury	3
1.2.2 Burden	3
1.2.2.1 National and Provincial Estimates	3
1.3 Youth Employment	5
1.3.1 Definition of Employment	5
1.3.2 National Youth Employment Estimates	5
1.3.3 Distribution of Young Workers by Industry	5
1.3.4 Child Labour Laws	7
1.4 Literature Review	8
1.4.1 Previous Studies	8
1.4.2 Study Findings	10
1.4.2.1 Adolescent Occupational Injury Deaths	10
1.4.2.2 Age and Sex	11
1.4.2.3 Industry	13
1.4.2.4 Nature of Injury and Body Part Involved	16
1.5 Interpretation of Current Literature	19

2. RATIONALE AND SIGNIFICANCE	21
2.1 Study Rationale	21
2.2 Significance	23
3. METHODS	24
3.1 Study Design	24
3.1.1 Inclusion Criteria	24
3.1.2 Exclusion Criteria	24
3.2 Data Collection	25
3.3 Data Handling	32
3.4 Data Coding	33
3.4.1 Adjustment of Numerator and Denominator Data	34
3.5 Data Analysis	37
3.5.1 General	37
3.5.2 Rate Calculation	37
4. RESULTS	40
4.1 Burden of Adolescent Occupational Injury	40
4.2 Employment Data	42
4.3 Exclusions from Numerator and Denominator Data	44
4.4 Patterns of Injury	44
4.4.1 Distribution of Work Injuries by Age and Sex	44
4.4.2 Distribution of Work Injuries by Industry	46
4.4.3 Comparison of Time Loss and No Time Loss Injuries	54
4.4.3.1 Age	54
4.4.3.2 Sex	54
4.4.3.3 Industry	56
4.4.4 Nature of Injury and Body Part Involved	57
4.4.5 Nature of Injury by Industry	59

5. DISCUSSION	61
5.1 Study Findings	61
5.2 Study Limitations	63
5.2.1 Design	63
5.2.2 Capture of Injuries by WCB Data	63
5.2.3 Data Quality	64
5.2.4 General	65
5.3 Study Strengths	66
5.3.1 Injury Rates	66
5.3.2 Time Loss and No Time Loss Injuries	66
5.4 Findings in the Context of the Current Literature	68
5.4.1 Patterns of Adolescent Work Injury	68
5.4.1.1 Age and Sex	68
5.4.1.2 Industry	70
5.4.1.3 Nature of Injury and Body Part Involved	73
5.5 Characteristics of Young Workers	74
5.6 Prevention	75
5.6.1 Prevention Efforts in Canada	75
5.6.2 Implications for Prevention	77
5.7 Future Research	79
References	81
Appendix A: WCB Industry Sector Divisions / SIC System	86
Appendix B: Eligibility for Compensation	96
Appendix C: WCB Forms	97
Worker's Report of Injury Form	98
Physician's First Report	100
Employer's Report of Injury Form	101
Appendix D: Labour Force Survey	103
Sample Design	104
EIR Map	105
ER Map	106
Appendix E: Nature of Injury Recoding	107

List of Tables

Table 1:	Features of Studies Examining Occupational Injuries Among Adolescents	9
Table 2:	Occupational Injuries by Age	12
Table 3:	Rates of Adolescent Occupational Injury by Sex	13
Table 4:	Rates of Adolescent Occupational Injury by Industry	15
Table 5:	Distribution of Adolescent Occupational Injuries by Nature of Injury	17
Table 6:	Labour Force Survey ER/EIR Intersections in Alberta	31
Table 7:	Nature of Injury and Body Part Involved: Broad Categories	33
Table 8:	Industry Classification	35
Table 9:	Industry Sector Exclusions	36
Table 10:	Number and Percent of Adolescent Work Injuries by Year	41
Table 11:	Distribution of Time Loss and No Time Loss Injuries by Year	41
Table 12:	Distribution of Adolescent Work Injuries by Month of Incident, 1993-1996	42
Table 13:	Number of Employed Adolescents in Alberta by Age and Sex, 1993-1996	43
Table 14:	Distribution of Employed 15 to 17 year-olds in Alberta by Industry, 1993-1996	43
Table 15:	Industry Sector Exclusions, 1993-1996	44
Table 16:	Distribution and Annual Rates of Adolescent Work Injuries by Age, 1993-1996	45
Table 17:	Distribution and Annual Rates of Adolescent Work Injuries by Sex, 1993-1996	45
Table 18:	Annual Rates of Adolescent Work Injuries by Age and Sex, 1993-1996	46

Table 19: Distribution and Annual Rates of Adolescent Work Injuries by Industry	47
Table 20: Annual Rates of Adolescent Work Injuries by Industry and Sex, 1993-1996	48
Table 21: Annual Rates of Adolescent Work Injuries by Age and Industry, 1993-1996	49
Table 22: Annual Rates of Work Injury among 15 year-olds by Sex and Industry, 1993-1996	51
Table 23: Annual Rates of Work Injury among 16 year-olds by Sex and Industry, 1993-1996	52
Table 24: Annual Rates of Work Injury among 17 year-olds by Sex and Industry, 1993-1996	53
Table 25: Distribution of Time Loss and No Time Loss Injuries by Age, 1993-1996	54
Table 26: Distribution of Time Loss and No Time Loss Injuries by Sex, 1993-1996	55
Table 27: Distribution of Time Loss and No Time Loss Injuries by Age and Sex, 1993-1996	55
Table 28: Number and Rates of Time Loss and No Time Loss Injuries by Industry, 1993-1996	56
Table 29: Distribution of Time Loss and No Time Loss Injuries by Nature of Injury, 1993-1996	58
Table 30: Distribution of Time Loss and No Time Loss Injuries by Body Part Involved	59
Table 31: Nature of Injury by Industry	60

List of Figures

Figure 1: Capture of Adolescent Work-Related Injuries by WCB in Alberta	28
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Abbreviations

BLS	Bureau of Labor Statistics
CHIRPP	Canadian Hospitals Injury Reporting and Prevention Program
ED	Emergency Department
EIR	Employment Insurance Region
ER	Economic Region
EP	Employed Persons
FLSA	Fair Labor Standards Act
FTE	Full Time Equivalent Worker
IAPA	Industrial Accident Prevention Association
LFS	Labour Force Survey
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NEISS	National Electronic Injury Surveillance System
NIOSH	National Institute for Occupational Safety and Health
NTOF	National Traumatic Occupational Fatalities surveillance system
OSHA	Occupational Safety and Health Administration
SIC	Standard Industrial Classification system
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

1. BACKGROUND

The aim of this research is to describe the epidemiology of work-related injuries among adolescents in Alberta. This chapter provides an overview of the topic in terms of relevant background information and a review of the published literature. Section 1.1 describes the morbidity and mortality associated with childhood injury. Section 1.2 introduces the topic of occupational injury among adolescents, while section 1.3 focuses on youth employment and includes an overview of current child labour laws. Published literature on adolescent occupational injury is reviewed in Section 1.4.

1.1 Childhood Injury as a Public Health Problem

1.1.1 Definitions

For the purpose of this thesis, injury is defined as damage to the body resulting from the transfer of physical energy, whether, mechanical, thermal, electrical, radiant, or chemical, or from the absence of essential energies.¹

Childhood is defined as the period from birth to 19 years,¹ whereas, an adolescent (or teen) is defined as an individual between the ages of 14 and 19 years.

1.1.2 Burden

Injury is the leading cause of lost years of life and a major cause of morbidity and disability among young people.^{2,3,4,5} In Canada, approximately 1,200 unintentional childhood injury deaths occur each year.⁶ Following the first year of life, the number of deaths because of injury outnumber those occurring from all other causes combined. Examination of hospital discharge data show that injury accounts for approximately one

fifth of all hospitalizations among children in North America, second only to respiratory disease.⁷ Each year in Canada, around 70,000 children younger than 18 years are hospitalized because of injury, with an average length of stay of about five days.⁸ Of all childhood conditions, injury accounts for the greatest number of days in hospital and the largest proportion of discharges to either long-term care facilities or home health care.^{9,10}

1.1.3 Adolescent Injury

Among adolescents, the current rate of injury has been described as an epidemic.² A review by Runyan and Gerken, found that among individuals 10-14 and 15-19 years, injuries accounted for 57% and 79% of all deaths, respectively.³ Nonfatal injuries far outnumber deaths; it has been estimated that for every injury death among youth 14 through 19 years, there are 41 injury hospitalizations and 1100 cases treated in the emergency department.³ It is clear that the social costs of premature death and disability because of injury pose a significant health care burden on society.

1.1.4 Economic Cost of Injury

Canadian estimates indicate that during 1995, the total economic cost to society because of injury (all ages) was 8.7 billion dollars.¹¹ Direct and indirect costs were estimated at \$4.2 billion and \$4.5 billion, respectively. Direct costs include the resources needed to prevent, treat, and rehabilitate injury. Indirect costs are value estimates of the goods and services not produced because of the injury (including both current and future losses of productivity.)¹²

1.2 Adolescent Occupational Injury

1.2.1 Definition

For the purpose of this thesis, an occupational injury (or work-related injury) is defined as an injury occurring at work or while on a work-related assignment.

1.2.2 Burden

In recent years, there has been an increased focus on the problem of occupational injury among adolescents.¹⁵ Teenage work injuries have come to be recognized as a significant public health concern. For example, a Massachusetts study, based on emergency department data, found that between 7% -13% of all medically-treated injuries to adolescents were work-related.²¹

Studies have shown that a substantial proportion of adolescents are employed in either full- or part-time positions.^{2,16,17,18,} Although the potential benefits of early work – development of a sense of responsibility, acquisition of new skills, opportunity to explore career goals, and economic advancement – have been argued, there is also evidence that early work experiences may have detrimental social and health effects.^{19,20}

1.2.2.1 National and Provincial Estimates

Studies from the United States and other parts of the world have demonstrated that the frequency and severity of injury among young workers is cause for concern. According to the National Institute for Occupational Safety and Health (NIOSH) in the United States, more than 64,000 adolescents aged 14 to 17 years were treated in emergency

departments for workplace injuries during 1992.¹⁷ This corresponds to an annual occupational injury rate of 5.8 per 100 full-time equivalent workers (FTE). One FTE is equivalent to 40 hours worked per week.³⁶

Although relatively little information has been gathered in Canada, statistics do indicate that a significant proportion of adolescents are injured on the job. Workers' compensation data reveal that, during 1993, compensation was awarded for 15,300 work-related injuries among 15 to 19 year-olds nationally.²⁴ The number of occupational injuries reported for youth in Canada has fluctuated over the years, rising from 27, 200 in 1982 to 36,800 in 1988, and dropping to 14,400 in 1996. It has been suggested that these variations are attributable in part to changes in the number of youth in the labour market. More youth are choosing to stay in school or to return to school and are consequently doing less full-time work, thus decreasing their exposure to the risk of occupational injury.²⁵

Provincial estimates for 1993, indicate that the highest reported rates of injury among adolescent workers were in Quebec (40 per 1,000 employed persons (E.P.)), British Columbia (28 per 1,000 E.P.) and Prince Edward Island (21 per 1,000 E.P.), and the lowest were in New Brunswick (9 per 1,000 E.P.) and Saskatchewan (5 per 1,000 E.P.).²⁶ (The specific rate for Alberta was not reported). It has been suggested that these differences may reflect different reporting, compensation and information-gathering processes in the various provinces and territories.²⁶

1.3 Youth Employment

1.3.1 Definition of Employment

For the purpose of reviewing the literature, the definition of “a worker” suggested by the Alberta Workers’ Compensation Board will be applied: a worker is “a person who enters into or works under a contract of service or apprenticeship, written or oral, expressed or implied, whether by way of manual labour or otherwise..”⁶⁰

1.3.2 National Youth Employment Estimates

Among affluent countries, the United States has the largest proportion of children in the workforce.¹⁷ More than four million 16 and 17 year-olds (60% of this age group) were employed at some time during 1989. These teens worked an average of 24 hours per week for 25 weeks per year. Close to one million 14 and 15 year-olds were employed during the same period.

Canadian employment statistics derived from the Labour Force Survey, show that more than 750,000 15 to 19-year-olds were employed during 1993, representing 40% of this age group.³¹ This is down from the peak of 51% employment, recorded in 1989. Provincial estimates indicate that among adolescents, the employment rate was highest in Alberta (47.3%), followed by Manitoba (46.1%) and Saskatchewan (45.5%), while Newfoundland had the lowest rate (19.5%).²⁶

1.3.3 Distribution of Young Workers by Industry

The majority of employed adolescents work in the retail/wholesale and service industries.¹⁶ The retail/wholesale industry includes grocery stores, wholesale operations,

yard and home improvement centres, and other retail stores. The service industry comprises restaurants and hotels, educational and health services and building and ground maintenance. A detailed description of industry classifications can be found in Appendix A. The fast-food sector is the largest single employer of young people in the United States.⁵⁴

A report from British Columbia, showed that during 1991, 29% of working teens held service jobs, 21% worked in clerical positions, 19% were employed in sales, and 7% worked in an agricultural or forestry-related occupation.³² Employed youth make up relatively large proportions of these occupational groups. During 1991, adolescents accounted for 12% of the workforce in sales and 14% of all service workers in British Columbia.

There are sex differentials related to occupational distribution. For example, young female workers are more likely to be employed in service, clerical, or sales occupations. Among female workers aged 15-19 years, 84% were employed in one of these occupations at some time during 1991, compared with 57% of adolescent males.³² Male workers, on the other hand, are more likely to be employed in primary (agriculture, forestry, mining), processing, product fabrication, or construction industries. Estimates for 1991, show that 25% of adolescent males were employed in one of these occupations, compared with 6% of adolescent females.

1.3.4 Child Labour Laws

Child labour laws are intended to protect youth under the age of 18 from oppressive and dangerous working conditions. In Sweden, labour legislation imposes specific legal restrictions for employees under the age of 18 concerning type of work, working hours and working conditions pertaining both to injury risks and those which might be hazardous or impose a heavy strain on the body.²³

In the United States, conditions under which adolescents work must comply with state child labor protection laws and with federal wage, hour, and safety regulations specified by the Fair Labor Standards Act of 1938 (FLSA). Regulations issued under the FLSA limit the hours and occupations that 14 and 15 year-olds may work, prohibit employment in specific hazardous agricultural work for youth younger than 16, and prohibit employment in specific hazardous non-agricultural work for youth younger than 18 years.⁵⁰ Hazardous occupations include manufacturing and storing of explosives, mining, logging and sawmill, slaughtering and meatpacking, motor vehicle driving, and use of many power-driven machines.⁵⁰

In Canada, all jurisdictions, whether federal, provincial, or territorial, have in place labour standards legislation, which impose minimum age requirements on a wide range of employment.³⁵ While details of the enactments vary, the usual practice has been to set a general minimum age standard, which is qualified by exemptions for specified occupations.³⁵ The Canada Labour Code provides that an employer may employ a person under 17 years of age only in certain occupations and subject to the conditions specified

by the Canada Labour Standards Regulations.³⁵ Under no circumstances may youth under 17 years be permitted to work between the hours of 11 p.m. and 6 a.m. the following day.

1.4 Literature Review

1.4.1 Previous Studies

Despite the frequency and severity of occupational injuries among adolescents, there are relatively few published studies on the topic. A computerized search of the MEDLINE and CINAHL databases (1982-1998 inclusive) was conducted to identify relevant articles. The search strategy included the following Medical Subject Headings (MeSH) and text words: “wounds and injury”, “accidents/occupational”, “occupational injury”, and “employment”. Citations were limited to “human”, “English language”, and “children and adolescents (6-17 years)”. Review of the abstracts identified 13 articles that were considered relevant.^{2,3,4,16-19,21,23,28, 36-38} The citation list for each of these articles was also examined, producing 7 additional references.^{25,27,29,34,39-41} Upon further review, 16 articles were considered key studies, based on the following inclusion criteria:

1. Target population: focus primarily on occupational injuries among adolescents.
2. Outcome: work-related injuries
3. Empirical data (i.e., review articles and editorials were excluded)

Features of the key studies are included in Table 1. All of the studies were descriptive case series that relied primarily on existing data sources to obtain injury information.

TABLE 1: Features of studies examining occupational injuries among adolescents

Author (ref)	Country	Data Source*	Age Group (yrs)	Study Period
1. Brooks et al. (18)	U.S.A	WC Massachusetts	14-17	1987-1990
2. Parker et al. (36)	U.S.A	WC Minnesota	<18	1990-1991
3. Banco et al. (38)	U.S.A	WC Connecticut	14-17	1989
5. Schober et al. (16)	U.S.A	WC (24 states)	<18	1980
6. Jacobsson et al. (23)	Sweden	ED	15-19	1981-1982
7. Belville et al. (2)	U.S.A	WC NY State	14-17	1980-1987
8. Layne et al. (17)	U.S.A	ED/NEISS	14-17	July-Dec, 1992
9. Dufort et al. (5)	N.Z.	ED	15-19	1990-1993
10. Knight et al. (34)	U.S.A	ED/NEISS	14-16	July-Sept 1992
11. Mackenzie (41)	Canada	CHIRPP	< 20	1990-1993
12. Castillo et al. (28)	U.S.A	NTOF	16-17	1980-1989
13. Suruda et al. (22)	U.S.A	OSHA	12-17	1984-1987
14. Dunn et al. (19)	U.S.A	WC	11-19	1980-1989
15. Cooper (29)	U.S.A	WC/Death Certificates	<18	1980-1990
16. Parker et al. (70)	U.S.A	WC	12-17	1986-1987

* WC: Workers' Compensation

ED: Emergency Department

CHIRPP: Canadian Hospitals Injury Reporting and Prevention Program

NTOF: National Traumatic Occupational Fatalities surveillance system

NEISS: National Electronic Injury Surveillance System

OSHA: Occupational Safety and Health Administration

1.4.2 Study Findings

1.4.2.1 Adolescent Occupational Injury Deaths

The occupational injury death rate among adolescents is comparable with, and in some cases, exceeds the rate seen among adult workers.⁵¹ Information from the National Institute for Occupational Safety and Health (NIOSH) indicate that between 1980 and 1989, 670 work-related deaths occurred among 16 and 17 year-olds in the United States.²⁷ Forty-four percent of the deaths occurred during the summer months (June through August), with 90% occurring in males. The average annual rate of death from occupational injury for 16 and 17 year-olds has been estimated at 5.1 per 100,000 FTE,²⁸ compared with a rate of 6.09 per 100,000 FTE for adults (18 years of age or older.) Estimates also indicate that approximately 13% of fatally injured youth are under the age of 16. Although the overall risk of occupational injury death is lower for 16 and 17 year-olds, compared with adults,⁵¹ the risk of occupational injury death by electrocution, suffocation, drowning, and poisoning is greater for young workers.²⁸

Studies have consistently shown that the two leading causes of adolescent occupational death are motor vehicle and machine-related.⁵¹ Examination of motor vehicle-related occupational deaths in the United States show that even though the Fair Labor Standards Act (FLSA) prohibits driving among 16 and 17 year-old workers,⁵⁰ 33% of occupational deaths involving a vehicle occurred while a youth was driving.²⁸ A study in North Carolina reported that 86% of workers younger than 18 years died in circumstances that appeared to violate the intent of the FLSA.¹⁹

Farm and construction sites are the locations most commonly associated with occupational injury deaths among youth. A study in Texas found that 23% of work-related fatalities among workers younger than 18 years occurred on the farm, 15% on construction sites, and 10% in mining/oil sites.²⁹ Agricultural machinery accounted for the majority of machine-related deaths. Canadian estimates indicate that during 1993, workers' compensation was awarded for 15 occupational injury deaths among 15 to 19 year-olds.²⁶ Among these, six occurred in the construction industry.

Homicide has also been shown to be an important cause of death among working youth in the United States.²⁸ Grocery stores and restaurants, which are common workplaces for adolescents, are among the workplaces at greatest risk for work-related homicides.³⁰

1.4.2.2 Age and Sex

There is consistent evidence that as youth move from early to late adolescence, the rate of work-related injuries increases (see Table 2).^{5,16-18,38,41} Schober et al. found that the majority of workers' compensation claims among those under the age of 18 were from 16 and 17 year-olds (30.4% and 59.5%, respectively).¹⁶ Only 1.3% of claims were from individuals less than 14 years of age. Other studies have confirmed that among workers below the age of 18, 16 and 17 year-olds account for over 90% of all reported cases of work-related injuries^{16,17,18,38} and exhibit higher injury rates.^{2,5,17,38,70} Belville et al. noted that although three times as many 17 year-olds were represented in the workforce compared with 14 year-olds, they sustained 16 times as many injuries.²

TABLE 2: Occupational Injuries by Age

	Age (years)				Total
	14	15	16	17	
Author (ref)	%	%	%	%	%
Layne et al. (17)	3	11	31	55	100
Brooks et al. (18)	2	8	31	60	100
Banco et al. (38)	1	10	35	54	100
Schober et al. (16)	4	6	30	60	100
Mackenzie et al. (41)	14	20	30	36	100
Belville et al. (2)	4	6	27	63	100

Rates of Occupational Injury by Age			
	Age in years		
	15	16	17
Author (ref)	Rate/100FTE [*]	Rate/100FTE	Rate/100FTE
Layne et al. (17)	4.7	5.5	6.3
Belville et al. (2)	*	1.1	1.9
Dufort et al. (5)	12.5	16.9	15.0

* FTE: Full-Time Equivalent workers

Parker et al. reported a rate of 1.7/100 FTE for workers 15-17 years of age, but provided no additional breakdown.⁷⁰ Other studies calculated injury rates based on the number of working adolescents regardless of the amount of time worked.^{2,23,38} Rates per 100 FTE reported by Belville et al. were restricted to 16 and 17 year-old workers.

Adolescent males account for a larger percentage of injuries and have a higher injury rate than females (see Table 3).^{2,16-18} A study in New York State reported that males and females were almost equally represented in the adolescent workforce. However, at every age, injury award rates for males exceeded those for females by almost a 3:1 ratio.² Other studies based on workers' compensation data have reported similar findings.^{18,38}

TABLE 3: Rates of Adolescent Occupational Injury by Sex		
Author (Ref) (95%CI)	Male Rate/100 FTE* (95%CI)	Female Rate/100 FTE
Brooks et al. (18)	2.6 (2.5-2.7)	1.3 (1.3-1.4)
Layne et al. (17)	7.0 *	4.7 *
Dufort et al. (5)	20.6 (19.4-21.9)	5.8 (5.1-6.6)

* CI not provided

* FTE: Full-Time Equivalent worker

1.4.2.3 Industry

Results from studies examining work-related injuries by industrial sector are more variable. In general, the largest number of occupational injuries among adolescents occur in the retail and service industries (Table 4).^{4,16-18,38,41} A 1992 study of emergency department visits in the United States showed that the retail industry accounted for over 53% of all occupational injuries attending the ED.¹⁷ The retail industry also had the highest occupational injury rate among adolescent workers. In particular, restaurants-food service, grocery stores, and department stores accounted for the greatest proportion of injuries.

Although the manufacturing industry was associated with a small proportion of injuries, it was consistently ranked among the top three in terms of injury rates.^{17,18,23,38} Layne et

al. reported that the manufacturing industry accounted for only 4% of all injuries to teens, but had the second highest injury rate (5.1/100 FTE).¹⁷ One study in New York State showed that almost half of all injuries reported in manufacturing were attributed to the newspaper industry (48%).² All 15 year-old workers killed on the job during 1980 through 1987, were struck by motor vehicles and died of head trauma. Of these, 60% were newspaper delivery persons.

The agriculture industry accounted for approximately 6% of all work injuries to adolescents and was also associated with low rates of injury. Belville et. al. reported that the majority of injuries in agriculture occurred on dairy farms (39%), crop-producing farms (37%), and in agricultural services (17%). National estimates in the United States show that the agriculture industry tends to have a higher proportion of serious injuries (fractures and dislocations) compared with other sectors.¹⁷

Consistent with other studies, estimates derived from workers' compensation data in Canada indicate that the majority of disability claims submitted by adolescents are from the service and retail industries.³² Construction and manufacturing are the industries with the third and fourth highest number of disability claims from workers of this age group. Statistics indicate that British Columbia, Alberta, Saskatchewan and Prince Edward Island account for the highest proportions of injuries in the construction industry (more than 10% of injuries), while in Quebec and Ontario, this proportion is lower (2.2% and 3.7%, respectively). Among the 47 cases of injury in the mining, quarrying and oil well sector during 1993, 15 occurred in Alberta.²⁶

TABLE 4: Rates of Adolescent Occupational Injury by Industry

Industry Sector	Author (Ref)			
	Brooks et al.(18)	Schober et al.(16)	Layne et al.(17)	Dufort et al.(5)
	(Rank) and Rate			
	/100FTE*	/100FTE	/100FTE	/100FTE
Construction	(1) 3.2	(6) 5.3	(3) 4.8	(1) 25.7
Manufacturing	(2) 3.0	(4) 7.4	(2) 5.1	(3) 14.8
Retail	(2) 3.0	(1) 11.2	(1) 6.3	(5) 9.0
Transport/Utilities	(3) 2.3	(7) 4.7	(4) 4.4	(2) 18.0
Finance/Government	(6) 0.6	(5) 6.2	(5) 4.3	*
Service	(4) 1.6	(2) 10.2	(6) 4.1	(4) 13.1
Agriculture	(5) 1.2	(3) 7.8	(5) 4.3	*
All	2.1	7.5	5.8	13.7

* Missing

* FTE: Full-Time Equivalent worker

1.4.2.4 Nature of Injury and Body Part Involved

Young workers experience injuries ranging from cuts and bruises, to injuries that have the potential for longer-term consequences, such as concussions, burns, and amputations. Injuries such as broken bones and dislocations also result in disablement.³² The majority of studies examining the nature of injury among young workers reported lacerations as being the most common,^{2,5,16-18,38} followed by sprains and strains^{5,16,18} [see Table 5]. Banco et al., in their analysis of workers' compensation data in Connecticut, found that lacerations accounted for one third of all injuries among workers aged 16 and 17 years.³⁸ Approximately 80% of all lacerations occurred to the hand and/or finger.¹⁸ CHIRPP data showed that the majority of lacerations occurred when youth were cutting food.²⁶ Knives were the most common object involved, followed by slicing machines and glass.

Estimates for Massachusetts (Brooks et al.) differed from the pattern seen in most other studies in that sprains and strains, rather than lacerations, were the leading cause of injury.¹⁸ Comparisons with U.S. census data indicate that Massachusetts teens were employed more often in occupations where sprains and strains were common (grocery stores, hospitals, nursing homes) and somewhat less in restaurants, which had a higher proportion of lacerations.¹⁸ Findings in Minnesota showed that injuries to the back accounted for 73% of all sprains and strains, with most of these associated with janitorial (48%) and nursing work (21%).³⁶ The study also reported that back injuries were directly related to the amount of weight lifted at work, and inversely related to the size of the individual. Injuries to the back are a cause for concern, as evidence indicates that a previous back injury is one of the strongest predictors for subsequent back problems.¹⁸

TABLE 5: Distribution of Adolescent Occupational Injuries by Nature of Injury						
Injury Type	Author (ref)					
	Brooks et al.(18)	Schober et al.(16)	Banco et al.(38)	Layne et al.(17)	Belville et al.(2)	Dufort et al.(5)
	%	%	%	%	%	%
Lacerations	24.3	36.5	35.0	34.5	35.3	37.2
Sprains/Strains	33.1	17.3	22.0	16.2	17.9	20.1
Contusion/Crushing	15.6	12.8	25.0	18.2	9.2	16.5
Fracture	8.5	5.8	1.5	2.1	18.1	*
Burn	5.8	9.7	7.0	12.4	7.6	7.3
Dislocation	1.3	0.7	1.5	2.1	1.5	*
Amputation	0.7	0.6	*	*	1.2	*
Concussion	0.5	*	*	*	0.6	*
Other	10.2	16.6	8.0	14.5	8.6	18.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

* Missing

Burns are one of the most common types of injury among workers under the age of 18 years, and account for about 36% of hospitalizations.³⁶ It has been reported that young workers are almost twice as likely as older workers to be hospitalized with work-related burns.¹⁹ Brooks et al. found that over 76% of burns occurred to workers in fast food and full-service restaurants. The most common sources of burns were hot oils and grills. Overall, burns constitute approximately 11% of all work-related injuries to adolescents, compared with 2% of occupational injuries among all ages.³⁶

Fractures account for roughly 7% of work-related injuries to teens.³⁶ The site most commonly affected is the finger, followed by the foot and toe. Other significant sites include the skull, face, neck, and back. Cases of dislocation and amputation have also been documented in the literature.^{2,16-18,32} Analysis of workers' compensation claims in British Columbia showed that during the years 1990-1994, there were 46 amputations among young workers aged 15-19 years.³² The majority of amputations involved fingers, however, there were also reported cases of loss of toes, arms, and legs.

Layne et al. examined nature of injury by sex and found that contusions, sprains/strains, and burns constituted a larger proportion of injuries among adolescent females (57%) compared with adolescent males (42%). In contrast, the injury rate among males for fractures and dislocations was twice that of females.¹⁷

1.5 Interpretation of Current Literature

Throughout the literature there is substantial variation in occupational injury rates reported for adolescent workers. Differences in eligibility requirements for studies using workers' compensation data and a lack of standardization in methods for calculating injury rates² have been suggested as possible explanations for the discrepancies. For example, in many parts of the United States, workers' compensation coverage is not compulsory.⁶² Findings indicate that studies based on workers' compensation data from regions with fewer restrictions (in terms of disability requirements or minimum number of days lost from work) tend to yield higher occupational injury rates. For example, studies in areas where no minimum number of days lost from work were required (in order to be eligible for workers' compensation) reported adolescent occupational injury rates between 5-10 / 100 FTE.^{16,38} Studies based on more restrictive criteria all reported rates of 1-2 /100 FTE.^{2,18,70}

As would be expected, adolescent occupational injury rates based on ED data are generally similar to those reported in studies using worker's compensation data with few restrictions.^{5,17} Layne et al., in their examination of ED visits in the United States, reported an overall rate of 5.8 per 100 FTE.¹⁷ Findings from New Zealand, however, differed from other studies, in that occupational injury rates reported for adolescent workers were consistently higher. The adolescent occupational injury rate in this study was 13.7 per 100 FTE.⁵ It is likely that the geographical isolation of the study area may have contributed to the higher rates. The hospital surveyed was the only 24-hour emergency care facility in the region, thus allowing investigators to capture a high proportion of occupational injuries requiring emergency care.

Although the majority of studies have been conducted in the United States, varying child labour laws between countries, as well as differences in the types of employment performed by adolescents in each region, may account for some of the discrepancies. How variables are classified also varies between studies. This is particularly evident when examining study findings related to industry. The industry classification systems and categories are not consistent between studies. The major discrepancy is in the classification of restaurants/food service establishments, which have been classified in some studies as Retail^{17,38} and in others as Service.²³

Rate comparisons between studies are further complicated by the lack of consistency in denominator data. The majority of studies used either census or survey data to estimate the number of working adolescents. It is likely that rates of injury vary depending upon the method used to collect denominator data. In addition, some studies used FTE (Full Time Equivalent) measures as the basis for calculating work exposure,^{5,16,17,18,70} while other studies calculated rates based on the number of working teens, regardless of the amount of time worked.^{23,38}

2. RATIONALE AND SIGNIFICANCE

2.1 Study Rationale

Studies from around the world have demonstrated that occupational injuries among adolescents are a significant public health problem. Data show that up to 13% of all medically treated adolescent injuries are work-related.²¹ In Canada, over 15,000 work-related injuries to adolescents were reported during 1993, with over 1,200 occurring in Alberta.²⁴ Statistics show that each year in Alberta, workers of all ages suffer more than 60,000 job-related injuries resulting in time away from work.⁴⁹ The workers' compensation costs related to these injuries are more than \$400 million dollars per year. Consequently, the financial and human costs of work-related injuries and illness are high. Indeed, the International Labour Organization has documented that Canada experiences more work-related injuries, including fatalities, than other developed nations.⁴⁰

Relatively little information, however, has been gathered on work-related injuries among adolescents in Canada. In addition, Alberta has one of the highest employment rates among adolescents. For example, estimates indicate that over 47% of youth aged 15 to 19 years in Alberta were employed at some time during 1993.²⁶ Furthermore, the economy of Alberta is largely based on intrinsically hazardous industries: agriculture, ranching, oil and gas, forest products, and construction under extreme weather conditions.⁴⁰ To date, there have been no studies examining the problem of occupational injuries among youth in Alberta.

While capture may not be complete, currently in Canada, the WCB is the only agency routinely collecting work injury data. Injuries eligible for compensation by the WCB are

classified as either ‘time loss’ or ‘no time loss’ injuries. ‘Time loss’ injuries are those that result in at least one additional day of missed work (aside from the day of the injury). Such injuries are eligible for compensation for lost wages. ‘No time loss’ injuries are eligible only for compensation related to medical expenses (generally under \$300). In Canada, the standard has been to calculate work injury statistics based on ‘time loss’ injuries only. However, given the part-time nature of adolescent work, estimates based strictly on ‘time loss’ injuries may underestimate the true frequency of injury among young workers. Therefore, to obtain a more accurate assessment of the work injury experience of youth in Canada, estimates including both ‘time loss’ and ‘no time loss’ injuries are needed.

One of the key gaps in the research to date has been the lack of rate calculations in studies examining work injuries among adolescents. The use of rates rather than raw numbers is essential for comparing the injury experience between different groups of workers. For example, injury rates are necessary to compare the risk of injury between different industrial sectors, and to compare the risk of injury between different age groups. Identifying which subgroups are most affected is essential to determine where prevention efforts may be most useful.

Lack of standardization in methods for calculating work exposure create difficulties when comparing studies. Calculating rates simply based on the number employed does not address differences in hours of exposure across age groups; as a result, youth rates appear on the surface to be much lower than rates for older workers.³⁶ Rate calculations based

on full-time equivalent workers (FTE workers), account for the seasonal and part-time nature of adolescent work and facilitate comparisons between studies by providing a standardized estimate.

2.2 Significance

Description of the epidemiology of work-related injury in young people is essential to informing and guiding an agenda for prevention efforts.⁵ Knowledge of which subgroups are most affected will allow for the efficient allocation of resources and ensure effective targeting of education and/or prevention programs.⁴² For example, the Alberta WCB, in affiliation with the Job Safety Skills Society of Alberta, has recently developed a program designed to prepare young workers for the workplace. To facilitate the development of prevention strategies and to ensure effective targeting of education programs, those leading these programs have expressed the need for a detailed description of the work injury experience of Alberta youth. Last, the results of this study will help identify potentially modifiable risk factors for adolescent occupational injury in Alberta.

3. METHODS

This chapter outlines the methods used in the study. Section 3.1 describes the study design along with inclusion and exclusion criteria. Data collection and handling are discussed in sections 3.2 and 3.3, while Section 3.4 addresses data coding. Methods of data analysis are described in section 3.5.

3.1 Study Design

A descriptive case series study design was used. The sampling frame was adolescents sustaining a work-related injury in Alberta during the years 1993-1996.

3.1.1 Inclusion Criteria:

1. Age 15-17 years inclusive (at the time of the incident)
2. Incident occurring during the study period (1993 through 1996, inclusive)
3. Incident identified by the WCB as being a work-related injury (including both 'time loss' and 'no time loss' injuries)

3.1.2 Exclusion Criteria:

1. Individuals suffering from a work-related "disease" as classified by the WCB were excluded. This includes all systemic diseases (e.g., diseases of the blood and blood organs, nervous system, respiratory system, and digestive system), infectious and parasitic diseases, neoplasms, tumors, and cancer.

Records obtained from the Alberta Workers' Compensation Board (with identifiers removed) were examined individually and assessed for eligibility based on these criteria.

Ages 15 through 17 were chosen for inclusion based on the Employment Standards Regulations and current labour statistics. The Employment Standards Regulations (section 51-54) separate employees under the age of 18 into two categories; those 12 years of age but under 15, and those 15 years of age but under 18.⁴⁹ The types of employment allowed for each age category differ. Hence, the work injury experience of the two age groups would likely not be comparable. Further, Statistics Canada restricts its collection of labour information to individuals 15 years of age and older. Employment statistics (i.e., estimates of work exposure) are not routinely available for persons under the age of 15.

3.2 Data Collection

Occupational injuries to adolescents were identified through the Alberta Workers' Compensation Board (WCB). Workers' Compensation Boards are corporate bodies responsible for collecting premiums from employers and paying benefits to injured workers.⁴⁹ Workers' compensation legislation provides that, in any applicable industry, workers who sustain personal injuries arising out of the course of their employment are entitled to compensation. In exchange, the workers surrender the right of legal action against their employers. Benefits are funded entirely by employer contributions and, in Canada, coverage is generally compulsory. The WCB provides compensation for lost wages, medical expenses, and disability insurance to more than 82,000 employers and approximately one million workers in Alberta alone.⁴⁹ The guidelines used by the WCB to assess a worker's eligibility for compensation are outlined in Appendix B.

Injuries eligible for compensation are classified by the WCB as either ‘time loss’ or ‘no time loss’. ‘Time loss’ injuries are eligible for compensation for lost wages, whereas ‘no time loss’ injuries are eligible only for compensation related to medical expenses. The distinction between the two types of injury is based solely on insurance benefits and is not necessarily a reflection of injury severity. Consequently, to obtain a more accurate assessment of the work injury experience of Alberta adolescents, both time loss and no time loss injuries were included.

There are limitations to using workers’ compensation records to obtain injury data. It is important to note that the data collected for this study represent a subgroup of injuries (see Figure 1). Workers’ compensation data generally do not include injuries sustained by persons performing illegal work, nor do they include many informal work arrangements, such as babysitting and lawn mowing jobs.^{2,16,21,36,38} Injured adolescents receiving compensation from another source or off the record would not be included in the data. In addition, some injuries are simply not reported. Studies suggest that underreporting may be higher among younger workers who are less aware of their rights and obligations under existing labour laws or who may be more easily intimidated into not reporting work-related injuries.^{5,15} Lack of awareness by health professionals that an adolescent may have been injured at work also contributes to underreporting.

In Alberta, certain industries are exempt from compulsory coverage under WCB legislation (e.g., agriculture, federal government employees, banking/finance).^{60,61} An employer in an industry exempted under the regulations may apply to the Workers' Compensation Board for voluntary coverage under the Act. For example, although agriculture industries are not required to have WCB coverage, some farming operations elect to have voluntary coverage. The employer must submit an application to have the Act apply, which is then reviewed by the Board. During 1996, 933 farming and ranching operations received coverage from the Alberta WCB. This represented, however, only 1.6% of the total 59,005 farms and ranches in operation during that year.⁶⁹ One of the major drawbacks for farmers is that coverage must be obtained for all persons living and/or working on the farm (this includes all family members).

The WCB maintains records only for claims receiving compensation. Workers injured on the job who do not meet the eligibility requirements for compensation (see Appendix B) are not included in the data. For example, a worker who suffers an injury as a direct result of his/her own serious and wilful misconduct is not eligible for compensation under the WCB Act.⁶⁰

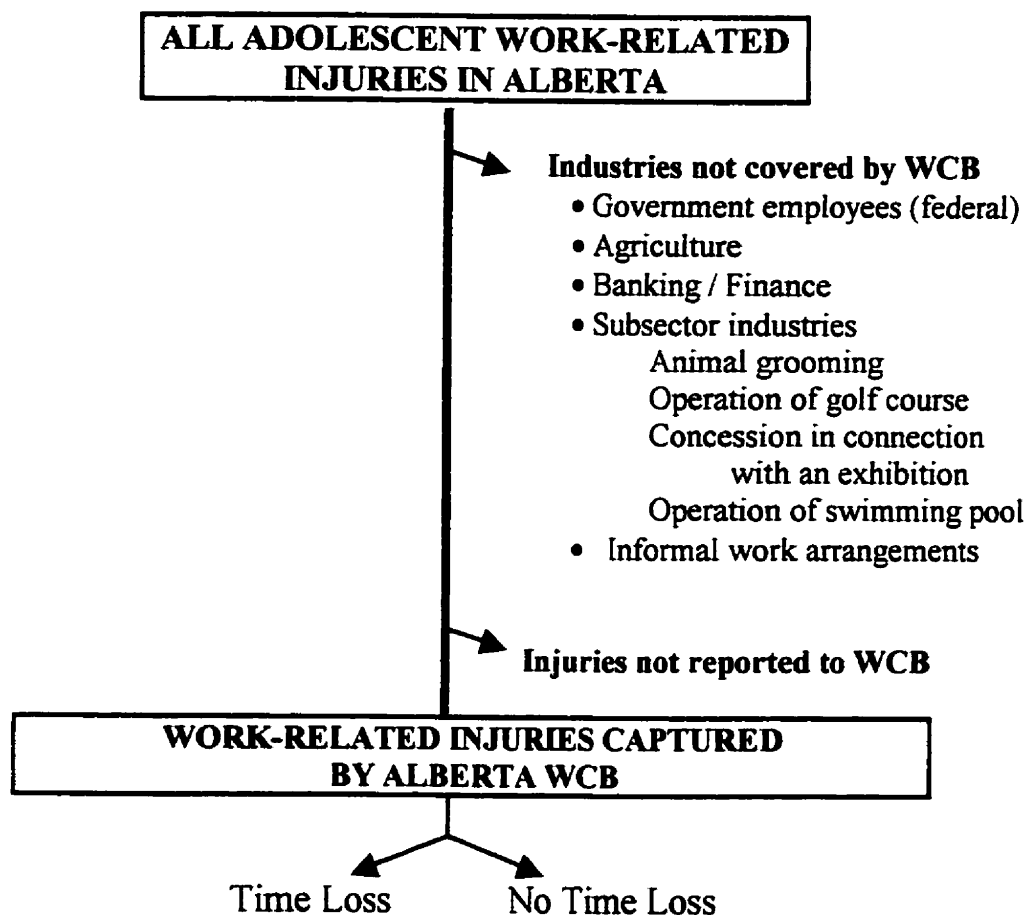


Figure 1: Capture of adolescent work-related injuries by WCB in Alberta

Currently, the WCB is the only agency collecting work injury data in Alberta. Workers filing a claim with the WCB are required to fill out a Worker's Report of Injury Form (see Appendix C), which collects basic demographic data, as well as a description of the injury event. As part of the claim, a Physician's First Report is also submitted. This form contains detailed clinical information pertaining to the injury (e.g., diagnosis, treatment, and outcome). Employers are also required to submit a Report of Injury Form.

The WCB maintains individual computer records for each claim submitted. Information on each form is coded and entered into a computer database by trained data entry clerks.

The original claim forms are also scanned into the computer and maintained as part of the claim. Each year, registration clerks at the WCB randomly audit claims to monitor and ensure the accuracy of the coded information.

Data for this study were obtained from the WCB in the form of an electronic data file containing individual claim information for those injuries meeting the inclusion criteria.

The following variables were collected for each claim.

- Age and Sex
- Date and Time of the incident
- Time Loss / No Time Loss
- Industry
- Nature of the Injury
- Body Part Involved
- Source of Injury
- Event Type
- Compensation Cost of Injury

The source of injury was defined as the object, substance, or exposure that directly produced the injury (e.g., hot oil, knife, floor).¹⁶ Event type describes the occurrence that led directly to the injury (e.g., fall, explosion).

Denominator data used to calculate injury rates were obtained from the Labour Force Survey Section of Statistics Canada. The Labour Force Survey (LFS) is a monthly household survey of a sample of individuals who are representative of the civilian and non-institutionalized population 15 years of age or older in Canada's ten provinces.⁴³ Data from the survey provide estimates of employment by industry, hours worked, labour force participation and unemployment rates at the regional as well as the national level.

The Labour Force Survey covers ninety-eight percent of the Canadian population.⁵⁵ The survey excludes from its coverage the Northwest Territories and residents of Indian

reserves and Crown lands. Also excluded are inmates of institutions and full-time members of the Canadian Armed Forces (both groups are considered to be outside the labour market).⁵⁵

The LFS is a multi-stage stratified sample of dwellings selected within clusters. For the purpose of sampling, the population in each province is partitioned into geographic strata. With the exception of Prince Edward Island, each province is divided into two types of regions known as: Economic Regions (ER's) and Employment Insurance Regions (EIR's).⁵⁵ ER's are formed by combining standard census divisions according to criteria set by each province. EIR's are formed by the Human Resources Department in each province and are roughly equivalent to census metropolitan areas. There are three EIR's in Alberta and eight ER's (see Appendix D). The LFS incorporates both sets of regions by using the intersections of the regions as the basic strata.⁵⁵ In Alberta there are eleven such intersections (see Table 6) which encompass the entire province. Each basic stratum is then divided into three types of geographic strata: (1) urban areas, (2) rural areas, and (3) remote areas. Each geographic stratum is then further divided as shown in Appendix D.

To reduce field costs, households in the final strata are not selected directly. Instead each stratum is divided into clusters, and a sample of clusters is selected. Within each selected cluster a list of dwellings is prepared and a sample of households is selected.⁵⁵ The sample size is roughly 4,000 households in Alberta. The LFS is not a mandatory survey,

however, because of intensive recruitment strategies, response to the LFS tends to average about 95% of eligible households.⁴³

Table 6 : Labour Force Survey ER/EIR Intersections in Alberta

Economic Region	Employment Insurance Region	Population 15+ (1991)
Lethbridge-Medicine Hat (810)	73 *	150,769
Drumheller-Stettler (820)	73	62,921
Calgary (830)	71 Calgary	576,134
Calgary (830)	73	37,016
Athabasca-Jasper-Banff (840)	73	79,003
Red Deer-Rocky Mountain House (850)	73	101,915
Edmonton (860)	72 Edmonton	634,690
Edmonton (860)	73	25,466
Grande Prairie-Peace River (870)	73	92,104
Fort McMurray-Camrose (880)	72 Edmonton	856
Fort McMurray-Camrose (880)	73	118,599

* EIR 73 encompasses all areas in Alberta excluding the regions of Calgary and Edmonton (refer to map included in appendix D).

The LFS follows a rotation panel sample design, in which households remain in the sample for six consecutive months.⁴³ After completing the six-month stay in the survey, outgoing households are replaced by households in the same or a similar area. LFS interviews are conducted in person in the first month and by telephone in the five subsequent months.⁵⁵ Various quality evaluation and control programs designed for different phases of the survey are applied regularly to ensure the quality of the data.

For this study, estimates of the number of 15, 16, and 17 year-olds working in Alberta were collected from the LFS for the study period 1993 through 1996. In accordance with the suppression rules set by Statistics Canada, yearly estimates were not made available, rather the entire four-year period was combined. Data were stratified on age, sex, average hours worked per week, and major industrial sector. Industry information for the LFS was coded according to the Standard Industrial Classification (SIC) system.⁵⁶ Statistics Canada is currently switching to the North American Industry Classification System (NAICS) in accordance with NAFTA (North American Free Trade Agreement), however, data processed prior to 1997 were under the old SIC system.

3.3 Data Handling

The data file provided by the Alberta WCB contained all claims compensated for 15 to 17 year-olds during the study period. To distinguish illness from injury, records were stratified based on the nature of the condition. Any claim classified by the WCB as being a work-related “disease” was excluded from further analysis. In other words, only those claims possessing an “injury” code were included.

3.4 Data Coding

The Workers' Compensation Board uses codes derived from the U.S. Bureau of Labor and Statistics (BLS) Occupational Injury and Disease Classification system to classify the nature of injury and body part involved.⁵⁷ For the purpose of simplifying the data, these variables were collapsed into broad categories (see Table 7) based on the coding system outlined in Appendix E.

Table 7: Nature of Injury and Body Part Involved: Broad Categories

Variable	Broad Categories	
Nature of Injury	<ul style="list-style-type: none"> • Laceration • Sprains/Strains • Contusion/Crush • Burn • Abrasion • Fracture 	<ul style="list-style-type: none"> • Dislocation • Amputation • Concussion • Poisoning/Electrocution • Multiple Injuries • Other
Body Part	<ul style="list-style-type: none"> • Hand/Finger • Wrist/Arm • Back • Leg/Knee/Ankle • Head/Face/Neck 	<ul style="list-style-type: none"> • Eye • Chest/Abdomen/Shoulder • Foot/Toe • Multiple • Other

Information pertaining to industry was classified according to codes specific to the WCB. Based on this coding system (included in Appendix A), industry data were collapsed into seven broad categories (see Table 8). For analytic purposes, these categories were compared with the SIC system used to classify the denominator data. Although the coding systems differed in details between the two agencies, the structure of the WCB coding system was very similar to the SIC system used by Statistics Canada, particularly at the level of industry sector.

3.4.1 Adjustment of Numerator and Denominator Data

Two different data sources were used to collect numerator (i.e., adolescent occupational injuries – WCB) and denominator data (i.e., adolescent occupational exposure – LFS). With respect to work exposure, Statistics Canada’s Labour Force Survey covers ninety-eight percent of the population and is intended to be representative of the working population 15 years of age and older in Alberta.⁵⁵ As mentioned previously, however, WCB capture of adolescent injury data, is more limited in its scope and excludes certain industries from its coverage. Therefore, to achieve greater comparability between the two sources of data, industry sectors exempt from WCB coverage were subsequently excluded from the denominator data (LFS), wherever possible (see Table 9). Likewise, adolescent occupational injuries captured in the WCB database for these industry sectors (through voluntary coverage) were excluded from the numerator. For example, although employers in the agriculture industry may elect voluntary coverage, the low proportion of farming and ranching operations covered by the WCB (less than 2%) was deemed insufficient to warrant further analysis. Therefore, agricultural injuries were excluded

Table 8: Industry Classification

WCB ⁶⁷ Sectors	Broad Categories	SIC ⁵⁶ Sectors
Manufacturing & Processing	(1) Manufacturing	Manufacturing Industries
Construction & Construction Trade Services	(2) Construction	Construction Industries
Transportation, Communication & Utilities	(3) Transportation/Communication/Utilities	Transportation, Communication & Utility Industries
Retail & Wholesale Trade	(4) Retail & Wholesale Trade	Retail & Wholesale Trade Industries
Mining & Petroleum Development	(5) Mining/Petroleum/Forestry	Mining, Quarrying, Oil Well, & Forestry Industries
Public Administration, Education & Health Services Business & Personal Services	(6) Service	Business Service Industries Educational Services Health & Social Services Accommodation, Food & Beverage Service Industries Public Administration Federal Government Service Finance & Insurance Services
Agriculture & Forestry	(7) Agriculture	Agriculture & Related Industries

from the numerator. There are other subsector industries exempt from WCB coverage (e.g., animal grooming operations, golf courses, swimming pools, restaurants/concessions in connection with an exhibition) which may be captured through voluntary coverage, however, these could not be specifically identified in either the WCB or LFS data because of insufficient detail in industry breakdowns. The proportion of adolescent occupational injuries captured by the WCB database for these subsector industries could not be determined. Nor could any estimate of work exposure be assessed.

Informal work arrangements (e.g., babysitting, lawn mowing) are generally covered under private homeowners insurance and therefore are not captured by the WCB. The number of adolescents working in these types of jobs could not be determined from the LFS data.

Table 9: Industry Sector Exclusions

<u>Industry Sectors Exempt from WCB Data</u>	<u>Subsequent Exclusions from LFS Data</u>
Agriculture	Agricultural & Related Industries
Federal Government	Federal Government Service Industries
Banking Industry, Credit Unions, Finance Companies, Insurance Companies	Finance & Insurance Industries (includes banks, credit unions, loan companies, insurance industries, and mortgage brokers)

3.5 Data Analysis

3.5.1 General

Data were analyzed using SPSS software.⁶⁸ Adolescent work injuries were described in relation to basic demographic factors as well as clinical outcome. Specifically, data were stratified on the following variables:

- Age
- Sex
- Time Loss vs No Time Loss
- Industry
- Nature of Injury
- Body Part Involved
- Date of Incident

The time of the incident, source of injury, and event type were not analysed because of missing data. For each of these variables, more than 25% of records were missing data.

To describe the distribution of each of the remaining variables, univariate statistics (frequencies and percentages) were calculated. Based on the availability of denominator data, injury rates were also calculated for age, sex, and industry.

3.5.2 Rate Calculation

Calculating rates based on the number of adolescents employed does not address differences in hours of exposure across age groups; as a result, youth rates calculated this way often appear on the surface to be much lower than rates for older workers.³⁶

Therefore, given the part-time and seasonal nature of adolescent work, rates of injury were calculated per 100 full-time equivalent workers (FTE) rather than per person. For each age group, the average hours worked per week were converted to FTE workers based on the following standard formula: (number employed) × (average hours worked per week) / 40.^{36,58} One FTE is equivalent to 40 hours worked per week.³⁶

Injury rates were then calculated as follows:

$$\text{Rate per 100 FTE workers}^{58} = \frac{[\text{Number of injuries}]}{[\text{Number of FTE's}]} \times 100$$

Confidence intervals for the injury rates were calculated using two methods. The first method, based on the exact probability function of the Poisson distribution,⁵⁹ was used when the number of injuries observed was ≤ 20 . The second method, used when the number of injuries was > 20 , was based on Byar's approximation of the Poisson distribution.⁶⁶

$$\mu_L = D \left(1 - \frac{1}{9D} - \frac{Z_{\alpha/2}}{3D^{1/2}} \right)^3$$

$$\mu_u = (D+1) \left(1 - \frac{1}{9(D+1)} + \frac{Z_{\alpha/2}}{3(D+1)^{1/2}} \right)^3$$

Where D represents the observed number of events and $Z_{\alpha/2}$ denotes the 100(1- $\alpha/2$) percentile of the unit normal distribution.⁶⁶ Byar's approximation has been shown to be sufficiently accurate when the number of events is >20 .⁵⁹

A precondition for using the Poisson distribution for confidence interval estimation, is that the number of events is seen as a stochastic variable, with a Poisson distribution $[X \sim \text{Poisson}(\mu)]$.⁵⁹ Events are also assumed to be independent. The mean and variance of the Poisson distribution are both equal to the parameter μ , which is equal to the expected number of events. Based on the methods described above, confidence limits were first

calculated for the number of events. To determine confidence intervals for the injury rates, the limits of the interval were divided by the estimate of exposure (i.e, FTE workers). Consistent with the criteria associated with the use of the Poisson distribution, the exposure is assumed to be constant.⁵⁹

4. RESULTS

This chapter presents the results of the study. Section 4.1 describes the burden of adolescent occupational injury by year, month, and type (time loss and no time loss). Section 4.2 describes adolescent employment in Alberta during the study period. Exclusions from numerator and denominator data are described in section 4.3. Last, the descriptive epidemiology of adolescent occupational injury in Alberta is described in section 4.4.

4.1 Burden of Adolescent Occupational Injury

During the four years of the study, 4617 adolescents aged 15 to 17 years received compensation from the Alberta WCB. Of these, 96 adolescents were classified by the WCB as having a work-related “disease” and were subsequently excluded from further analysis. The remaining 4521 injury claims were analysed. The distribution of injuries by year, shown in Table 10, indicates a gradual increase in the number of injuries compensated over the four years. This trend was consistent for both “time loss” and “no time loss” injuries, which accounted for 30% and 70% of claims, respectively (see Table 11). The majority of injuries occurred during the summer months (July and August) (see Table 12). The total compensation cost of these injuries (estimated by the WCB) was close to 3 million dollars.

Table 10
Number and Percent of Adolescent Work
Injuries by Year

Year	N	%
1993	958	21.2
1994	1110	24.6
1995	1190	26.3
1996	1263	27.9
Total	4521	100.0

Table 11
Distribution of Time Loss and No Time Loss
Injuries by Year

Year	Time Loss		No Time Loss	
	N	%	N	%
1993	314	6.9	644	14.2
1994	331	7.3	779	17.2
1995	340	7.5	850	18.8
1996	380	8.4	883	19.5
Total	1365	30.1	3156	69.7

Table 12
Distribution of adolescent work injuries by
month of incident, 1993-1996.

Month	N	%
January	245	5
February	233	5
March	283	6
April	277	6
May	307	7
June	363	8
July	706	16
August	655	15
September	391	9
October	399	9
November	338	7
December	324	7
Total	4521	100

4.2 Employment Data

Employment estimates derived from the Labour Force Survey showed that 173,900 15 to 17 year-olds were employed in either full- or part-time positions in Alberta during the study period. There were slightly more males employed than females. As shown in Table 13, 17 year-olds accounted for over 40% of those employed and worked an average of 18.4 hours per week. The majority of 16 and 17 year-olds were employed in the retail and service industries, while 15 year-olds were employed predominantly in service and

agriculture. Table 14 describes the distribution of employed adolescents by industry and age.

Table 13 Number of employed adolescents in Alberta by Age and Sex, 1993-1996		
Age (years)	Sex	
	Male	Female
15	21,700	22,200
16	30,700	28,500
17	35,700	35,100
All	88,100	85,800

Table 14 Distribution of Employed 15 to 17 year-olds in Alberta by Industry, 1993-1996.				
Industry Sector	Age (years)			Total N
	15 N	16 N	17 N	
Manufacturing	1,500	2,200	2000	5700
Construction	1,100	1,400	2400	4900
Transportation/ Communication/ Utilities	400	500	500	1400
Retail/Wholesale Trade	6,800	15,400	23,600	45,800
Mining & Petroleum Forestry	100	400	700	1200
Service (Finance & Insurance)	26,300 (500)	31,800 (1,000)	33,900 (900)	92,000 (2,400)
Agriculture	7,200	6,500	6,800	20,500
All	43,900	59,200	70,800	173, 900

4.3 Exclusions from Numerator and Denominator Data

As outlined in the Methods section, wherever possible, industries exempt from WCB coverage were excluded from the denominator (LFS) and numerator (WCB) data. These exclusions are summarized in Table 15. Following the exclusions, 151,000 workers remained in the denominator and 4,471 injuries were retained for further analysis.

Table 15

Industry Sector Exclusions, 1993-1996

WCB	No. of Claims Excluded	LFS	No. of Workers Excluded
Agriculture	50	Agriculture	20,500
Federal Government	0	Federal Government	0
Banking Industry, Credit Unions Finance Companies, Insurance Companies	0	Finance & Insurance	2400
Total	50	Total	22,900

4.4 Patterns of Injury

4.4.1 Distribution of Work Injuries by Age and Sex

Table 16 shows the distribution of injuries and injury rates by age for the four-year period. Over 90% of the injuries compensated were attributed to 16 and 17 year-olds. Injury rates were also found to increase with age. Overall, the average annual rate of

injury was 7.7 per 100 full-time equivalent workers (FTE). Annual injury rates ranged from 3.7 per 100 FTE for 15 year-old workers to 9.3 per 100 FTE for 17 year-old workers. Adolescent males accounted for the majority of work-related injuries (66.7%) and had higher injury rates compared with female workers. The average annual injury rate for males was 9.9 per 100 FTE, compared with a rate of 4.0 per 100 FTE for females (see Table 17).

Table 16
Distribution and Annual Rates of Adolescent Work Injuries by Age, 1993-1996

Age	N	%	Rate/100 FTE (95% CI)
15	415	9.3	3.7 (3.4 , 4.1)
16	1340	30.0	6.7 (6.3 , 7.1)
17	2716	60.7	9.3 (9.0 , 9.7)
Total	4471	100.0	7.7 (7.5 , 7.9)

Table 17
Distribution and Annual Rates of adolescent Work Injuries by Sex, 1993-1996

	N	%	Rate/100 FTE (95% CI)
Male	2981	66.7	9.9 (9.6 , 10.3)
Female	1101	24.6	4.0 (3.8 , 4.2)
Missing	389	8.7	--
Total	4471	100.0	7.7 (7.5 , 7.9)

Although males and females were almost equally represented in the workforce, the injury rates for males exceeded those for females at every age (see Table 18). At age 15 years, males had an average annual injury rate of 5.1 per 100 FTE, compared with 1.8 per 100 FTE for females. At age 17, the average annual injury rate for males was 12.2 per 100 FTE, compared with 4.8 per 100 FTE for females.

Table 18
Annual Rates of Adolescent Work Injuries by Age and Sex, 1993-1996

Age	Male	Female
	Rate/100FTE (95% CI)	Rate/100FTE (95% CI)
15	5.1 (4.5 , 5.8)	1.8 (1.4 , 2.1)
16	8.0 (7.4 , 8.5)	3.8 (3.4 , 4.3)
17	12.2 (11.6, 12.8)	4.8 (4.4 , 5.1)
All	9.9 (9.6 , 10.3)	4.0 (3.8 , 4.2)

4.4.2 Distribution of Work Injuries by Industry

Table 19 shows the distribution and rates of work-related injuries by industry. The retail/wholesale (26.7%) and service (41.2%) industries were responsible for the greatest proportion of injuries among 15 to 17 year-old workers in Alberta. Although the manufacturing industry accounted for only 3.3% of adolescent workers, it had the highest overall occupational injury rate (17.4 per 100 FTE). Construction (15.5 per 100 FTE) was the industry with the second highest injury rate, followed by the transportation/communication/utilities sector (14.7 per 100 FTE).

Table 19
Distribution and Annual Rates of Adolescent Work Injuries by Industry Sector, 1993-1996

Industry Sector	N	%	Rate /100FTE (95% CI)
Manufacturing	467	10.4	17.4 (15.9 , 19.1)
Construction	386	8.6	15.5 (14.0 , 17.1)
Transportation/ Communication/ Utilities	84	1.9	14.7 (11.7 , 18.2)
Retail & Wholesale Trade	1194	26.7	7.1 (6.7 , 7.5)
Mining / Petroleum/ Forestry	51	1.1	7.2 (5.4 , 9.5)
Service	1841	41.2	5.8 (5.6 , 6.1)
Missing	448	10.0	--
All	4471	100.0	7.7 (7.5, 7.9)

For every industrial sector, the rate of injury among adolescent males was higher when compared with rates among adolescent females (see Table 20). The manufacturing industry (4.7 per 100 FTE) remained the sector with the highest overall injury rate for females. The risk of injury for males, on the other hand, was highest in the transportation/communication/utilities sector. In fact, the annual rate for males (22.2 per 100 FTE) in this sector exceeded the rate for females (2.1 per 100 FTE) by almost a 10:1 ratio. The majority of males (78%) injured in the transportation/communication/utilities sector were employed in trucking services. Results also showed that adolescent males were five times more likely to be injured in the manufacturing industry than females,

with annual rates of 21.5 per 100 FTE and 4.7 per 100 FTE, respectively. Examining these industries in more detail showed that males were most often injured in the manufacturing and processing of wood products and primary metals, whereas females were predominantly injured in the manufacturing of food and beverage products, clothing and textile, and in the processing of meat products. The construction industry accounted for the third highest injury rate among males (16.6 per 100 FTE) but was one of the lowest among adolescent females (1.9 per 100 FTE). The subsectors most commonly associated with injury were residential and industrial construction, roadbuilders, and roofers.

Table 20
Annual Rates of Adolescent Work Injuries by Industry and Sex, 1993-1996

Industry Sector	Male			Female		
	N	Rate /100FTE	(95% CI)	N	Rate /100FTE	(95% CI)
Manufacturing	396	21.5	(19.4 , 23.7)	42	4.7	(3.4 , 6.3)
Construction	361	16.6	(15.0 , 18.4)	6	1.9	(0.7 , 4.2)
Transportation/ Communication/ Utilities	75	22.2	(17.5 , 27.8)	4	2.1	(0.6 , 5.4)
Retail&Wholesale Trade	761	8.0	(7.5 , 8.6)	338	4.6	(4.1 , 5.1)
Mining / Petroleum/ Forestry	46	8.0	(5.8 , 10.6)	1	2.8	(0.7 , 15.5)
Service	1020	7.9	(7.5 , 8.4)	643	3.5	(3.3 , 3.8)
Missing	322	—	—	67	—	—
All	2981	9.9	(9.6 , 10.3)	1101	4.0	(3.8 , 4.2)

Seventeen year-old workers had the highest injury rates for every industrial sector (see Table 21). The risk of injury for this age group was particularly high in the manufacturing (27.5 per 100 FTE) and transportation/communication/utilities sectors (25.2 per 100 FTE). The rate of injury among 16 year-olds was highest in the construction industry (12.9 per 100 FTE) and most commonly reported by youth employed as roadbuilders. Residential construction was the subsector most commonly associated with injury among seventeen year-old workers.

Table 21
Annual Rates of Adolescent Work Injuries by Age and Industry, 1993-1996

Industry Sector	AGE					
	15		16		17	
	Rate /100 FTE	(95% CI)	Rate /100 FTE	(95% CI)	Rate /100 FTE	(95% CI)
Manufacturing	5.2	(3.4 , 7.7)	10.7	(8.9 , 12.8)	27.5	(24.6 , 30.7)
Construction	5.4	(3.5 , 8.0)	12.9	(10.4 , 15.9)	18.2	(16.1 , 20.5)
Transportation/ Communication/ Utilities	3.3	(0.7 , 9.6)	9.4	(5.5 , 15.1)	20.2	(15.2 , 25.1)
Retail/Wholesale Trade	4.0	(3.1 , 5.0)	5.9	(5.3 , 6.5)	7.4	(6.9 , 7.9)
Mining /Petroleum/ Forestry	6.9	(0.8 , 25.1)	4.2	(2.1 , 7.3)	7.0	(4.9 , 9.6)
Service	3.5	(3.1 , 3.9)	5.9	(5.5 , 6.4)	7.0	(6.5 , 7.4)
All	3.7	(3.4 , 4.1)	6.7	(6.3 , 7.1)	9.3	(9.0 , 9.7)

Tables 22 to 24 show the distribution and rates of work-related injury stratified by age, sex, and industry. Because of the small number of injuries reported in certain sectors, injury rates for 15 and 16 year-old workers (especially females) were unstable. The patterns shown for 17 year-olds were consistent with the findings presented thus far. The manufacturing industry was associated with the highest rates of injury among 17 year-old workers, particularly among males, who had a rate of 36.6 per 100 FTE, compared with 6.9 per 100 FTE for 17 year-old females. The rate of injury for 17 year-old males was also high in the construction (21.5 /100FTE) and transportation/communication/utilities (21.5 /100FTE) sectors. The service industry represented the highest proportion of injuries for all workers.

Table 22
Annual Rates of Work Injury among 15 year-olds by Sex and Industry, 1993-1996.

Industry	Male			Female		
	N	Rate/100 FTE	(95% CI)	N	Rate/100 FTE	(95% CI)
Manufacturing	20	6.9	(4.2 , 10.7)	3	1.3	(0.3 , 3.9)
Construction	20	4.7	(2.9 , 7.2)	2	9.3	(1.1 , 33.6)
Transportation/ Communication	3	6.7	(1.4 , 19.5)	0	0.0	(0.0 , 8.0)
Retail / Wholesale Trade	48	4.0	(3.0 , 5.3)	21	2.9	(1.8 , 4.5)
Mining / Petroleum / Forestry	2	6.9	(0.8 , 25.1)	0	*	*
Service	152	5.7	(4.8 , 6.7)	70	1.6	(1.2 , 2.0)
Missing	30	*	*	4	*	*
All	275	5.1	(4.5 , 5.8)	100	1.8	(1.4 , 2.1)

* No denominator data

Table 23**Annual Rates of Work Injury among 16 year-olds by Sex and Industry, 1993-1996.**

Industry Sector	Male			Female		
	N	Rate/100 FTE	(95% CI)	N	Rate/100 FTE	(95% CI)
Manufacturing	103	11.6	(9.5 , 14.1)	10	4.4	(2.1 , 8.1)
Construction	81	12.9	(10.3 , 16.1)	3	4.1	(0.9 , 12.1)
Transportation/ Communication	17	14.1	(8.2 , 22.5)	0	0.0	(0.0 , 6.3)
Retail / Wholesale Trade	206	6.8	(5.9 , 7.8)	95	3.5	(2.8 , 4.2)
Mining / Petroleum / Forestry	12	4.0	(2.1 , 7.0)	0	*	*
Service	347	7.1	(6.4 , 7.9)	219	3.8	(3.3 , 4.3)
Missing	91	*	*	18	*	*
All	857	8.0	(7.4 , 8.5)	345	3.8	(3.4 , 4.3)

* No denominator data

Table 24 Annual Rates of Work Injury among 17 year-olds by Sex and Industry, 1993-1996.						
Industry Sector	Male			Female		
	N	Rate/100 FTE	(95% CI)	N	Rate/100 FTE	(95% CI)
Manufacturing	273	36.6	(32.4 , 41.2)	29	6.9	(4.6 , 9.8)
Construction	260	21.5	(19.0 , 24.3)	1	0.4	(0.01 , 2.0)
Transportation/ Communication	55	21.5	(16.2 , 27.9)	4	6.6	(1.8 , 16.9)
Retail / Wholesale Trade	507	8.4	(7.7 , 9.1)	222	5.0	(4.4 , 5.7)
Mining / Petroleum / Forestry	32	7.1	(4.8 , 10.0)	1	4.0	(0.1 , 22.5)
Service	521	9.4	(8.6 , 10.2)	354	4.3	(3.8 , 4.7)
Missing	201	--	--	45	--	--
All	1849	12.2	(11.6 , 12.8)	656	4.8	(4.4 , 5.1)

4.4.3 Comparison of Time Loss and No Time Loss Injuries

4.4.3.1 Age

Of the 4,471 injuries included in this study, 3128 (70%) were classified by the WCB as 'no time loss'. Table 25 shows that, for all ages, the rate of no time loss injury was more than double the rate of time loss injury. For both classification types, injury rates were found to increase with age. Seventeen year-old workers were twice as likely to receive compensation for either a time loss or no time loss injury, when compared with 15 year-olds.

Table 25						
Distribution of Time Loss and No Time Loss Injuries by Age, 1993-1996						
	Time Loss		No Time Loss		All	
Age	N	Rate/100FTE (95% CI)	N	Rate/100FTE (95% CI)	N	Rate/100FTE (95%CI)
15	105	1.0 (0.8 , 1.1)	310	2.8 (2.5 , 3.1)	415	3.7 (3.4 , 4.1)
16	392	2.0 (1.8 , 2.2)	948	4.7 (4.4 , 5.0)	1340	6.7 (6.3 , 7.1)
17	846	2.9 (2.7 , 3.1)	1870	6.4 (6.1 , 6.7)	2716	9.3 (9.0 , 9.7)
All	1343	2.3 (2.2 , 2.4)	3128	5.4 (5.2 , 5.6)	4471	7.7 (7.5 , 7.9)

4.4.3.2 Sex

Regardless of classification type, the results showed that adolescent males were twice as likely as females to be injured on the job. The rate of time loss injury for male workers was 3.0 /100FTE, compared with 1.4 /100FTE for adolescent females (see Table 26).

This trend was similar for no time loss injuries. Seventeen year-old males had the highest injury rates overall (3.8/100 FTE Time Loss and 8.4/100 FTE No Time Loss) (see Table 27).

Table 26
Distribution of Time Loss and No Time Loss Injuries by Sex, 1993-1996

	Time Loss		No Time Loss		All	
	N	Rate/100FTE (95%CI)	N	Rate/100FTE (95%CI)	N	Rate/100FTE (95%CI)
Male	914	3.0 (2.8 , 3.2)	2067	6.9 (6.6 , 7.2)	2981	9.9 (9.9 , 10.3)
Female	383	1.4 (1.3 , 1.5)	718	2.6 (2.4 , 2.8)	1101	4.0 (3.8 , 4.2)
Missing	46	--	343	--	389	--
Total	1343	2.3 (2.2 , 2.4)	3128	5.4 (5.2 , 5.6)	4471	7.7 (7.5 , 7.9)

Table 27
Distribution of Time Loss and No Time Loss Injuries by Age and Sex 1993-1996

<u>Sex</u>	<u>Age</u>	Time Loss			No Time Loss		
		N	Rate/100FTE	(95% CI)	N	Rate/100FTE	(95% CI)
Male	15	80	1.5	(1.2 , 1.9)	195	3.6	(3.1 , 4.2)
	16	264	2.5	(2.2 , 2.7)	593	5.5	(5.1 , 6.0)
	17	570	3.8	(3.5 , 4.1)	1279	8.4	(8.0 , 8.9)
Female	15	24	0.4	(0.3 , 0.6)	76	1.3	(1.1 , 1.6)
	16	113	1.3	(1.0 , 1.5)	232	2.6	(2.3 , 2.9)
	17	246	1.8	(1.6 , 2.0)	410	3.0	(2.7 , 3.3)
Missing		46	--	--	343	--	--
All		1343	2.3	(2.2 , 2.4)	3128	5.4	(5.2 , 5.6)

4.4.3.3 Industry

For every industry, except transportation/communication/utilities, the rate of no time loss injury was considerably higher than the rate of time loss injury. Table 28 shows that the transportation/communication/utilities sector had the highest rate of time loss injury (7.2/100FTE) compared with other sectors but was ranked third for no time loss injuries. Manufacturing (6.8/100FTE) and construction (5.5/100FTE) were the industries with the second and third highest rates of time loss injury. Overall, the patterns of injury for both classification types were found to be similar.

Table 28
Number and Rates of Time Loss and No Time Loss Injuries by Industry, 1993-1996

Industry Sector	Time Loss		No Time Loss	
	N	Rate/100FTE (95%CI)	N	Rate/100FTE (95%CI)
Manufacturing	183	6.8 (5.9 , 7.9)	286	10.7 (9.5 , 12.0)
Construction	136	5.5 (4.6 , 6.4)	251	10.1 (8.8 , 11.4)
Transportation/ Communication Utilities	41	7.2 (5.2 , 9.7)	43	7.5 (5.5 , 10.2)
Retail/Wholesale Trade	444	2.6 (2.4 , 2.9)	750	4.5 (4.1 , 4.8)
Mining/Petroleum/ Forestry	14	2.0 (1.1 , 3.3)	37	5.2 (3.7 , 7.6)
Service	521	1.7 (1.5 , 1.8)	1321	4.2 (4.0 , 4.5)
Missing	4	—	440	—
Total	1343	2.3 (2.2 , 2.4)	3128	5.4 (5.2 , 5.6)

4.4.4 Nature of Injury and Body Part Involved

Overall, lacerations were the most common type of injury, accounting for over thirty-six percent of work injuries to adolescents in Alberta (see Table 29). Sprains and strains (18.0%) were the second most common type of injury, followed closely by contusion/crush injuries (14.6%) and burns (14.0%). During the study period compensation was awarded for 181 fractures and 20 amputations.

The pattern differed somewhat for time loss injuries in that sprains and strains were the most common injury type, followed by lacerations (see Table 29). Time loss injuries also showed a greater percentage of contusion/crush injuries, fractures, dislocations, amputations, and multiple injuries.

The hand/finger was the body part most commonly associated with injury among adolescents (see Table 30). The majority of these injuries involved lacerations (78%), however, the hand/finger was also associated with a high proportion of fractures (33%), burns (44%), and all reported cases of amputations. The back was another body part commonly involved and accounted for 43% of sprains and strains. During the four years of the study, 311 injuries to the eye were reported. Of these, 54% were classified as abrasions and 36% as burns. The foot/toe was associated with 18% of fractures and 18% of contusion/crush injuries.

Although the patterns for both time loss and no time loss injuries were very similar, some discrepancies were evident. For example, time loss injuries represented a higher

proportion of injuries to the back and leg/knee/ankle. No time loss injuries, on the other hand, involved a greater proportion of injuries to the head/face/neck and eye.

Table 29

Distribution of Time Loss and No Time Loss Injuries by Nature of Injury, 1993-1996

Nature of Injury	Time Loss		No Time Loss		Total	
	N	%	N	%	N	%
Lacerations	314	23.3	1316	42.1	1630	36.5
Sprains/Strains	381	28.4	426	13.6	807	18.0
Contusion/Crush	229	17.1	425	13.6	654	14.6
Burn	161	12.0	467	14.9	628	14.0
Abrasion	16	1.2	176	5.6	192	4.3
Fracture	109	8.1	72	2.3	181	4.0
Dislocation	9	0.7	9	0.3	18	0.4
Amputation	15	1.1	5	0.2	20	0.5
Concussion	4	0.3	12	0.4	16	0.4
Poisoning/Electrocution	6	0.5	9	0.3	15	0.3
Multiple Injuries	15	1.1	25	0.8	40	0.9
Other	21	1.6	42	1.3	63	1.4
Missing	63	5.0	144	4.6	207	4.6
Total	1343	100.0	3128	100.0	4471	100.0

Table 30
Distribution of Time Loss and No Time Loss Injuries by Body Part Involved

Body Part	Time Loss		No Time Loss		Total	
	N	%	N	%	N	%
Hand or Finger	479	35.7	1534	49.0	2013	45.0
Wrist or Arm	131	9.8	295	9.4	426	9.5
Back	197	14.7	220	7.0	417	9.3
Leg, Knee, or Ankle	201	15.0	233	7.4	434	9.7
Head, Face, or Neck	52	3.9	219	7.0	271	6.1
Eye	33	2.5	278	8.9	311	7.0
Chest, Abdomen, or Shoulder	94	7.0	116	3.7	210	4.7
Foot or Toe	114	8.5	180	5.6	294	6.6
Multiple	27	2.0	30	1.0	57	1.3
Other	15	1.1	23	0.7	38	0.9
Total	1343	100.0	3128	100.0	4471	100.0

4.4.5 Nature of Injury by Industry

Lacerations were the most common type of injury in all industries except transportation/communication/utilities, which showed contusion/crush injuries as being predominant (see Table 31). Within the service industry, lacerations were responsible for >40% of injuries reported. Burns were another significant type of injury in that sector, accounting for 27% of all compensated injuries. The mining & petroleum and transportation/communication/utilities sectors were associated with a higher proportion of fractures and amputations, compared with other industries.

Table 31
Nature of Injury by Industry

Industry Sector	Manufacturing	Construction	Transportation/ Communication/ Utilities	Retail/Wholesale	Mining/ Petroleum/Forestry	Service
Nature	%	%	%	%	%	%
Lacerations	33.0	33.1	17.5	39.8	25.0	40.6
Sprains/Strains	19.8	22.7	26.3	25.0	20.8	14.3
Contusion/Crush	20.7	19.1	28.8	18.2	25.0	10.3
Burn	5.7	4.9	2.5	6.1	0.0	26.7
Abrasion	9.6	6.3	0.0	3.9	4.2	1.9
Fracture	6.4	8.7	15.0	3.4	12.5	2.9
Dislocation	0.7	0.5	0.0	0.4	4.2	0.3
Amputation	1.1	0.0	2.5	0.3	4.2	0.5
Concussion	0.2	0.3	1.3	0.5	0.0	0.3
Poisoning/Electrocution	0.0	0.0	0.0	0.4	0.0	0.5
Multiple Injuries	0.9	0.8	5.0	1.1	0.0	0.7
Other	1.8	3.6	1.3	1.0	4.2	0.9
Total	100	100	100	100	100	100

5. DISCUSSION

This chapter summarizes the key findings of the study (section 5.1) and provides a discussion of the results in relation to the published literature (section 5.4). Study limitations and strengths are presented in sections 5.2 and 5.3. Section 5.5 focuses on the unique characteristics of young workers to better understand the circumstances surrounding youth employment-related injuries. Preventive strategies are discussed in section 5.6 and suggestions for future research are introduced in section 5.7.

5.1 Study Findings

The data presented in this study show that the number of injuries sustained by working adolescents in Alberta is substantial. Close to 174,000 15 to 17 year-olds were employed in either full- or part-time positions in Alberta from 1993 to 1996. During the four years of the study, 4521 adolescents aged 15 to 17 years were compensated for work-related injuries. The total compensation cost of these injuries was close to three million dollars. The overall annual rate of injury among this age group was estimated as 7.7 per 100 FTE. Injury rates were found to significantly increase with age, ranging from 3.7 per 100 FTE for 15 year-olds to 9.3 per 100 FTE for 17 year-olds. Adolescent males accounted for the majority of work-related injuries reported and had significantly higher injury rates than females (9.9 /100 FTE compared with 4.0 /100 FTE, respectively).

Two sectors (retail/wholesale and service) contributed the greatest proportion of injuries among this age group. However, injury rates in these two sectors (and in the mining/petroleum/forestry sector) were low (around 6.0 /100 FTE), compared with rates

in the manufacturing, construction, and transportation/communication/utilities sectors (around 16.0 /100 FTE). For every industrial sector, the rate of injury among adolescent males was significantly higher, compared with rates among adolescent females. Seventeen year-old males were found to have the highest injury rates for all industry sectors.

Of the 4,471 injuries included in this study, 3128 (70%) were classified by the WCB as 'no time loss'. For all ages, the rate of no time loss injury was more than double the rate of time loss injury. This trend was consistent for both male and female workers. Injury rates were found to increase with age for both classification types. Three industry sectors (manufacturing, construction, and transportation/communication/utilities) were associated with high rates for both time loss and no time loss injuries.

Lacerations were the most common type of injury in all industries except transportation, where contusion/crush injuries were predominant. Sprains/strains and burns also accounted for a large proportion of injuries among this age group. The service industry accounted for the highest proportion of burns, while the mining/petroleum and transportation industries were associated with higher proportions of fractures and amputations, compared with other sectors.

Sprains and strains were the most common type of time loss injury, the majority involving the back. No time loss injuries, on the other hand, were most commonly associated with lacerations. Time loss injuries showed a greater percentage of

contusion/crush injuries, fractures, dislocations, amputations, and multiple injuries when compared with no time loss injuries.

5.2 Study Limitations

5.2.1 Design

There are limitations inherent in the design of this study. Descriptive studies are valuable in public health planning, program evaluation, and hypothesis generation.⁴² Inference from these studies, however, is limited, in that causal associations cannot be determined based on the descriptive design. The findings presented in this study constitute an important first step in the search for determinants and risk factors associated with adolescent occupational injury.

5.2.2 Capture of Injuries by WCB data

As discussed previously, there are limitations to using worker's compensation records to obtain injury data. Although workers' compensation legislation is widely in effect in Alberta, WCB records do not capture all work-related injuries. The data presented in this study represent only those injuries awarded compensation from the Alberta WCB.

Workers' compensation data generally do not include injuries sustained by persons performing illegal work, nor do they include many informal work arrangements, such as babysitting and lawn mowing jobs.^{2,16,21,36,38} Injured adolescents receiving compensation from another source or off the record would not be included in the data. Evidence also suggests that a sizable proportion of reportable injuries are not brought to the attention of compensation boards.⁵ This bias may be higher among younger workers who are less

aware of their rights and obligations under existing labour laws or who may be more easily intimidated into not reporting work-related injuries. A study conducted by Fingar et al. in 1992 showed that younger workers were more likely to seek emergency medical assistance than older workers, although less likely to file for workers' compensation benefits.¹⁵ Lack of awareness by health professionals that an adolescent may have been injured at work also contributes to underreporting.

Industries exempt from compulsory coverage were not included in the data. The inability to capture farm-related injuries is of particular concern when attempting to describe injury patterns among young workers. Labour statistics in Alberta show that a significant proportion of adolescents are employed in agriculture. In addition, agriculture is consistently ranked among the top three most hazardous industries for mortality and morbidity.⁶² A recent study of fatal occupational injury among adolescents in the United States indicated a disproportionate number of deaths in the agriculture industry.²⁸

5.2.3 Data Quality

When relying on secondary data systems there is always a concern with regards to the quality of the information. The possibility for error exists at any stage of the reporting and assessment process. Although no specific measure of data quality could be obtained from the WCB, it was assumed that for this study, the effect of such error would be minimal. Data entry clerks at the WCB undergo extensive training and claims are randomly audited to monitor and ensure the accuracy of the coded information.

Missing data were a problem in this study, particularly for the variables ‘source of injury’ and ‘event type’. Given the high proportion of missing information (close to 25%), these variables were not included in the analysis. Industry was another variable with a significant proportion of missing data, in this case close to 10%. No time loss claims accounted for the majority of missing information.

5.2.4 General

No measure of injury severity could be obtained for analysis in this study. It would be valuable, for example, to examine the proportion of injuries leading to permanent disability. The WCB is currently implementing measures to collect more detailed follow up information on rehabilitation requirements and outcome, however, these data were not available for this study.

Given the restrictions on the availability of denominator data, injury patterns for workers under the age of 15 could not be examined. As mentioned previously, Statistics Canada restricts its collection of labour information to individuals 15 years of age and older.

5.3 Study Strengths

5.3.1 Injury Rates

This study is unique for several reasons. First, the analysis includes the calculation of injury rates. As previously discussed, one of the key gaps in the research to date has been the lack of rate calculations in studies examining work injuries among adolescents. The use of rates rather than raw numbers is crucial when comparing the injury experience between different groups of workers. Identifying which groups are most affected is essential to determine where prevention efforts may be most useful.

5.3.2 Time Loss and No Time Loss Injuries

In this study, both time loss and no time loss injuries were included in the analysis.

During the study period, seventy percent of adolescent claims compensated by the WCB in Alberta were classified as ‘no time loss’. The results showed that the rate of no time loss injury was double the rate of time loss injury.

Given the varying restrictions in eligibility for workers’ compensation and the evidence suggesting that only 36% of all work-related injuries are treated in emergency departments,¹⁷ it appears that much of the current literature has grossly underestimated the true frequency of injury among adolescent workers. In Canada, work injury estimates have historically been derived using time loss injuries only. A national report conducted in 1993, based on WCB data, reported injury rates for 15 to 19 year-olds, 2-3 times lower than the rates presented in this study.²⁶ Those rates, estimated by Statistics Canada, were based on time loss injuries only and did not account for differences in hours of exposure

across age groups. Other estimates derived from CHIRPP data have also tended to underestimate the true scope of the problem. One such study, conducted in 1993, revealed similar patterns of injury to those reported by other researchers but found that the incidence of injury was low. The authors of this study concluded that work injuries among young people were infrequent.⁴¹ What the authors failed to address, however, was that many adolescents seeking emergency medical care are seen at general hospitals⁶⁴ and, therefore, would tend to be missed by the CHIRPP database (a surveillance system restricted primarily to children's hospitals). Only a few general hospitals currently participate in CHIRPP.⁶⁴

To reiterate, the distinction between time loss and no time loss injuries is based solely on insurance benefits and is not necessarily a reflection of injury severity. The findings of this study indicate that the general trends for both types of injuries are similar. Inclusion of both time loss and no time loss injuries in the analysis provides a more accurate assessment of the work injury experience of Alberta adolescents. With regards to the present study, 80% of lacerations, 75% of concussions, 50% of dislocations, and 25% of amputations would have been missed if the analysis had been restricted to time loss injuries only. Last, the results of this study are based on a four-year study period. Therefore, rate estimates should be relatively stable.

5.4 Findings in the Context of the Current Literature

The data presented in this study confirm the results of studies documenting that work-related injuries among adolescents are a significant public health problem. Work injuries make an important contribution to the continuing epidemic of adolescent injury. The overall rate of occupational injury for this study was estimated as 7.7 per 100 FTE.

The published literature shows that studies based on workers' compensation data from regions with fewer restrictions (in terms of disability requirements or minimum number of days lost from work) tend to yield higher occupational injury rates. Studies in areas where no minimum number of days lost from work were required (in order to be eligible for workers' compensation) reported adolescent occupational injury rates between 5-10 per 100 FTE.^{16,38} Studies based on more restrictive criteria all reported rates of 1-2 per 100 FTE.^{2,18,70}

5.4.1 Patterns of Adolescent Work Injury

5.4.1.1 Age and Sex

The patterns of injury revealed in this study are consistent with those reported in the published literature.^{2,5,16,17,18,23,28,34,36,38,41,62} For example, the number and rates of adolescent work injuries were found to increase with age. Among studies examining the frequency of injury, there is consistent evidence that as youth move from early to late adolescence the incidence of occupational injury increases.^{16,17,18,38,41,62} It has been suggested that older adolescents may be involved in more hazardous work, with less

supervision and more dangerous machinery.² Risks to older adolescents may also be increased by working longer hours.

After age 20, the risk of occupational injury begins to decline. Evidence suggests that workers between the ages of 15 and 19 years are at the greatest risk of occupational injury, compared with all ages.^{5,17,23} According to ED data in the United States, 16 and 17 year-old workers have the second highest injury rate, exceeded only by 18 and 19 year-olds.¹⁷ The average annual rate of injury among workers of all ages in Alberta has been estimated at 3.4 per 100 employed persons.³¹

Injury rates for this study ranged from 3.7 per 100 FTE for 15 year-olds to 9.3 per 100 FTE for 17 year-olds. The occupational injury rate for 17 year-old males was estimated as 12.2 per 100 FTE. Although estimates from the United States have shown a more gradual increase in injury rates with age, the overall pattern remains the same.¹⁷ Injury rates derived from ED records in New Zealand differed from the pattern seen elsewhere, in that 16 year-olds were found to have the highest injury rate, compared with 17-19 year-olds.⁵ Although no clear explanation for the difference was evident, varying child labour laws, as well as differences in the types of employment performed by adolescents in each region, may account for some of the discrepancies.

In the present study, adolescent males were found to have occupational injury rates close to double those for females. This is consistent with findings by other researchers.^{2,17,18,38} Using ED visits across the United States to identify work-related injuries, researchers

estimated an injury rate for males of 7.0 per 100 FTE, compared with 4.4 per 100 FTE for females.¹⁷ The literature shows that males tend to work in more hazardous jobs, work longer hours, and exhibit more risk-taking and reckless behaviour.⁵⁸ Employment estimates for the present study showed that males were more often employed in industries typically considered high risk (e.g., the manufacturing, construction, and transportation sectors).⁴⁰ While the rate of injury for male workers in this study (9.9/100 FTE) was similar to the findings of other investigators,¹⁷ it was much lower than the rate of 20.6/100 FTE reported by Dufort et al.⁵ Although the authors provided no explanation for the high rate of injury, their results showed that a large proportion of adolescent workers in that region were employed as labourers (28.1%), an occupation typically associated with a high risk of injury and generally held by males.⁴⁰

5.4.1.2 Industry

The majority of adolescents in our study were employed in the retail trade and service industries, which also had the highest proportions of injury claims, a finding consistent with other studies.^{2,16,18,32,38} In the service industry, the subsector most commonly associated with injury was restaurants, whereas, in retail, grocery stores accounted for the majority of injury claims.

Although, in the present study, the retail industry was associated with a large number of injuries, the overall risk of injury was found to be moderate. This finding differs from the pattern seen in studies conducted in the United States, in which the retail industry was found to have the highest injury rates.^{16,17,18,38} It is possible that variations in coding

practices may have contributed to the discrepancy. In each of these studies, restaurants/food-service were classified as retail, whereas in the present study, these establishments are classified as service. Different reporting practices between industries may also account for some of the variation. Consistent with the findings of this study, estimates from New Zealand (Dufort et al.) also found the retail industry to be associated with lower rates of injury.⁵

The findings of the present study show that the highest rates of injury for adolescents occurred in manufacturing (17.4/100 FTE), construction (15.5/100 FTE) and transportation/communication/utilities (14.7/100 FTE). Although examination of the literature shows that these industries tend to be considered hazardous,^{5,15,18,28,40} results vary in terms of the magnitude of the risk to adolescent workers. Injury rates presented in this study and in the study conducted by Dufort et al., were found to be substantially higher than those reported in the published literature. This discrepancy may be influenced by several factors, for example, the types of employment performed by adolescents in these regions. In the case of Alberta, the economy is largely based on intrinsically hazardous industries: agriculture, oil and gas, manufacturing of forest products, and construction under extreme weather conditions.⁴⁰ A study conducted in Alberta examining occupational injuries for all ages, reported similar results, in that the risk of injury was found to be highest in the construction (10.9/100 person-years), manufacturing (9.6/100 person-years), and transportation (6.0/100 person-years) industries.⁴⁰ Variation in reporting practices between industries may also affect injury rates. Finally, differences in the capture of adolescent occupational injuries may

contribute to the higher rates. As mentioned earlier, the capture of work injuries by Dufort et al. in New Zealand was thought to be high because of the geographical isolation of the study area and the fact that there was only one hospital-based emergency care facility in the region.⁵

When we examine, in more detail, the injury experience of adolescents in the construction, manufacturing, and transportation/communication/utilities sectors, a number of patterns emerge from the data. For example, the risk of injury to adolescent males is particularly high in these industries, up to ten times higher when compared with females. Results also showed that seventeen year-old workers were at the greatest risk. The injury rate for seventeen year-old males in the manufacturing industry was estimated as 36.6 per 100 FTE. The majority of injury claims were associated with the processing and manufacturing of wood products and primary metals. Data from the construction industry showed that youth were most often injured while employed in residential and industrial construction, and working as roadbuilders and roofers. The rate of injury among sixteen year-olds was highest in the construction industry. In the transportation/communication/utilities sector, the majority of adolescents injured on the job were employed in transportation, specifically in trucking services. Further examination of the circumstances surrounding youth employment in these sectors is needed. Without more detailed data, it is impossible to determine the specific tasks being performed at the time of injury.

5.4.1.3 Nature of Injury and Body Part Involved

Consistent with the findings of other studies,^{2,5,16,17,18,36,38,62} most injuries to teens were lacerations, sprains and strains, contusions and burns. Lacerations occurred mostly to the hand/finger. Analysis of CHIRPP data revealed that the majority of lacerations occurred while youth were cutting food.²⁶ Knives were the most common object involved followed by slicing machines and glass. Most sprains were due to overextension and falls and primarily involved the back. Parker et al.[1994] found that lifting heavy weights was associated with back injuries and contributed to a high proportion of severe disability, including injuries to the lumbar disc.³⁶ Burns most commonly occurred in the service industry and were primarily caused by hot oils and water. Burns, especially in restaurants, have been found to be a major cause of morbidity for adolescent workers, often requiring hospitalization.^{53,63} Injuries to the eye accounted for seven percent of claims in this study, a finding consistent with other studies relying on workers' compensation data.¹⁸

The proportions of injuries resulting in amputations and dislocations (.04% and 0.4%, respectively) in this study are similar to those reported in a national study of ED visits in the United States.¹⁷ Data revealed that amputations occurred more often in the mining/petroleum and transportation industries. Fractures accounted for four percent of injuries in this study, the greatest proportion occurring in the transportation sector. Estimates based on workers' compensation data in New York State showed that fractures represented more than eighteen percent of injuries to adolescents.² These data were based on restrictive criteria, in terms of eligibility requirements for compensation

(minimum of 8 lost work days), and therefore, would tend to include only the more severe injuries.

5.5 Characteristics of Young Workers

Risk-taking behaviour is a typical characteristic of adolescence as individuals explore their capabilities, but often lack perception of their limitations and vulnerability.⁵⁸ A desire for increased challenges and responsibility, combined with a reluctance to ask questions or make demands on their employers, can result in young workers taking on tasks for which they are neither prepared nor capable of doing safely.⁶⁵ In a workplace setting, teens may not feel capable of refusing to perform a task that is inappropriate or dangerous.

Although all workers face hazards on the job, a number of factors raise special concern about working adolescents. For example, it has been suggested that a lack of work experience may increase the risk of occupational injury.²³ As new workers, adolescents are likely to be inexperienced and unfamiliar with the tasks required of them and therefore, may be less able to recognize workplace hazards.³³ Also, adolescents typically work in part-time or temporary jobs, often going to their jobs following a full day of school. Consequently, the risk of injury may be increased because of fatigue and reduced alertness.

It has been suggested that the physical characteristics of young workers may also be important. Given that teens grow at different rates, smaller individuals may not be able

to reach parts of machines and may lack the strength required for certain tasks.⁶⁵ Work-related back injuries have been shown to be a problem among adolescents, especially among smaller workers.^{18,36} In addition, adolescents generally do not receive adequate occupational health and safety training either in school or on the job.³³ Many of the training materials that are available are not geared for youth. A national survey of adolescents injured on the job in the United States, found that 54% had received no safety training.³⁴ Another factor to consider is that employers may not be well informed about child labour laws when hiring and supervising adolescents.

5.6 Prevention

5.6.1 Prevention Efforts in Canada

Increased prevention efforts – regulatory, educational, and technological- are needed to reduce the risk of occupational injury for all workers. Given the unique characteristics of young workers, however, certain prevention efforts should be targeted specifically towards youth.

In response to the unacceptably high levels of injury and fatality seen among Alberta's young workers, a unique partnership was forged between Industry, Education, and Government. Through this collaboration, the Job Safety Skills Society was formed in 1993.⁴⁵ The mission of the Society is to see that: "All youth are properly prepared to be safe workers". Since its inception, the Society has developed a school-based training program to teach job safety skills to students in Grades 10, 11, and 12. The Job Safety Skills for Young Workers program is run through the public and separate school systems

and is part of Alberta Education's Career and Technology Studies Program.⁴⁵ The primary focus of the program is to prevent the occurrence of disease and injury through public health intervention. There are currently 600 eligible schools approved by Alberta Education for the program and approximately 140,000 eligible students in each cohort (grades 10, 11, and 12).⁴⁵ The aim is to have these safety courses available in every eligible school in Alberta and to promote the courses as mandatory training in the school system.

The Job Safety Skills for Young Workers program consists of three 25 credit hour modules that provide training in Personal Safety, Workplace Safety, and Safety Management.²⁶ Teachers receive a resource manual for the program with accompanying video tapes. The training materials are curriculum approved in Alberta.

The first module teaches Personal Safety Management.²⁶ Topics covered include:

- Fire Prevention
- First Aid at the Worksite
- Identifying Hazards
- Job Safety and the Law
- Workplace Injuries
- Hazardous Materials
- Protective Equipment

The second module covers issues related to Workplace Safety Practices.²⁶ These include:

- Ergonomics
- Hazard Assessment
- Transportation of Dangerous Goods
- Farm Safety
- Electrical Safety

The third module covers Safety Management Systems.²⁶ Topics include:

- Introduction to Safety Management Systems
- Accident / Incident Investigation
- Developing a Safety Program
 - Health and Safety policy
 - Identifying / Controlling Hazards
 - Safety Inspections
 - Training Programs
 - Emergency Response Planning

Similar programs have been developed in British Columbia and Ontario. The Young Worker Awareness Program in Ontario was jointly developed by the Workers Health & Safety Centre and the Industrial Accident Prevention Association (IAPA)⁴⁷ and is available to all Ontario high schools. Similar to the curriculum in Alberta, trained instructors use video and other materials to inform students of their rights and responsibilities in the workplace, and how to identify hazards they may face on the job.⁴⁷ The program also introduces the Occupational Health and Safety Act, the Workplace Hazardous Materials Information System (WHMIS) and other relevant legislation. The British Columbia Workers' Compensation Board has also been instrumental in the development of a training program to help educators heighten student awareness about workplace health and safety issues.⁴⁸ One of the goals of the Student Worksafe program is to establish a sound foundation for further workplace training.

5.6.2 Implications for Prevention

The present study was undertaken on the assumption that occupational injuries to adolescents occur in predictable patterns and are preventable. By providing a detailed

description of the work injury experience of Alberta youth, the intent of this study is to elevate awareness of the problem and facilitate the further development of prevention strategies. It is essential that education/prevention programs, such as the Job Safety Skills for Young Workers program in Alberta, be directed specifically towards youth and reflect the injury experience of Alberta's young workers. The findings of this study point to particular areas where prevention efforts may be most useful. For example, males appear to be at a greater risk of injury, especially those who are 17 years of age. Evidence suggests that males tend to work in more hazardous occupations and exhibit more risk-taking and reckless behaviour.⁵⁸ Lacerations are a common type of injury among this age group and account for the majority of injury claims. Use of protective gloves and identification of hazardous equipment or techniques might be useful in preventing lacerations. Back injuries are also a problem among young workers and are often associated with permanent disability.¹⁸ Although older workers often receive instruction on how to avoid back injury, this type of training may be lacking for adolescents. Work-related burns appear to be a substantial, but largely neglected problem among working youth. Burns most commonly occur in the service industry and are primarily caused by hot oils and water. The high incidence of eye injuries also warrants further attention and may reflect a need for protective equipment. Finally, the risk of injury for adolescents appears to be particularly high in the transportation, construction, and manufacturing industries. The majority of injuries in these sectors were reported by adolescent males employed as roofers, roadbuilders, in the processing of wood products and primary metals, and in trucking services. Given the high rates of injury revealed in this study and the fact that injuries in these sectors tend to be more severe,^{2,5,17,40} an

evaluation to assess the appropriateness of youth employment in these sectors may be warranted.

5.7 Future Research

To contribute to the reduction and ultimately the prevention of health hazards for working adolescents, improved population-based surveillance using multiple sources for ascertainment is required. Improved techniques to monitor work injuries are needed to gain a better understanding of the causes, circumstances and severity of these injuries.

Currently there is a lack of even the most basic descriptive information on adolescent work injuries in Canada. Efforts are needed on the part of Workers' Compensation Boards to improve the collection and coding of work injury data. Although the Alberta WCB does collect detailed information on the events and circumstances surrounding each injury, this information is not routinely coded and thus not readily available for research purposes. Prevention efforts rely on the timely availability of data and the completeness of case reporting. The usefulness of workers' compensation data as a source of occupational injury surveillance requires that detailed information (i.e., occupation, source of injury, event type, injury severity, rehabilitation requirements etc.) be collected and coded for each claim. This should include both Time Loss and No Time Loss injuries.

More comprehensive epidemiologic studies are required to identify the types of work situations and events associated with injuries. It may also be necessary to increase

awareness of primary care providers and emergency department staff to the possibility that traumatic injury to adolescents may be work-related. Working youth, their parents, and employers must be informed about child labour laws, the risk of injury to adolescent workers, and the workplace hazards that exist in industries where adolescents are employed.

Currently, 1000 adolescents each year in Alberta are compensated by the WCB because of a work-related injury, giving an annual occupational injury rate of 7.7 /100 FTE. In other words, for every 100 adolescent full-time equivalent workers, 8 will be injured on the job. Therefore, comprehensive preventive efforts are required to reduce the burden and severity of adolescent occupational injury in Alberta.

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Appendix A

Alberta WCB Industry Sector Divisions

1. Agriculture & Forestry

<u>Subsectors</u>	<u>Industry Codes</u>
Agriculture	01100, 01101, 01102, 01300, 01501, 01700, 01900, 01901, 01903, 02102, 02109, 02110, 02124, 04100, 60200, 60201, 62908, 85902
Forestry	03100, 03902

2. Mining & Petroleum Development

<u>Subsectors</u>	<u>Industry Codes</u>
Coal Mining	06100, 06110, 06111
Pipeline Cleaning and Transmission	51500, 51501
Petroleum Producers	06300
Mine/Process Tar Sands & Salt	06600, 07700
Exploration	09200, 09201
Drilling of Wells	09600
Well Servicing with Service Rigs	09903
Oilfield Downhole Services	09911

3. Manufacturing & Processing

<u>Subsectors</u>	<u>Industry Codes</u>
Meat, Hides, and Pelt Products	01103, 10100, 10104, 17200
Clothing and Textile Products	17900, 21300, 22900, 22901, 24900
Food and Beverage Products	02101, 02112, 10500, 11202, 12301, 12400, 12900, 13100, 13101, 13300, 13500, 13900, 13904, 13905, 14100, 14300, 14500, 37402
Wood Products	25100, 25401, 25900, 25901, 27102, 27103
Furniture and Allied Products	26101, 26104
Printing and Publishing Products	27402, 28600, 28700, 28800, 28900, 86202, 89301
Foundries (not steel), Rubber And Nonmetallic Products	08701, 16901, 27200, 34100, 34101, 34300, 34500, 35200, 35401, 29700, 34700, 34702, 38500, 34800
Fabricated and Primary Metal (e.g., steel) Products	29102, 29100, 29200, 26401, 30100, 30101, 30407, 33606, 89401, 30412, 30700, 33602, 30403, 30801
Instrumentation	38100
Gases, Fertilizer, and Petrochemical-Refining	36500, 37201, 27801, 27805
Plastic Products	37301

4. Construction & Construction Trade Services

<u>Subsectors</u>	<u>Industry Codes</u>
Drywall/Residential Construction	02100, 40401, 42111, 42113, 42115, 42125, 42133, 42135, 42136, 42141
Glaziers	30302, 42121
Masonry	42102
Mechanical, Electrical and Insulation	31508, 42110, 42117, 42122, 42124, 42144, 42169, 42184, 89600
Roadbuilders	40602, 40604, 40905, 42103
Roofers	42118, 42139, 42151
Scaffolders	89928

5. Transportation, Communication & Utilities

<u>Subsectors</u>	<u>Industry Codes</u>
<i>Transportation</i>	
Air Services	50100, 50104, 50105, 50106, 50107, 50200, 50201, 50203
Rail Services	50607
Trucking Services	42155, 50701, 50714, 50720
Bus, Taxi, & Limousine Services	50800, 50801, 50802, 51200
<i>Communication/Entertainment</i>	
Radio, TV, Movies, Live Theatre & Ballet	5430, 58100, 85907, 85914, 85918, 85934
Telecommunication, Closed Circuit TV & Cable Vision	54501, 54301
<i>Utilities</i>	
Utilities-Electric	57200
Utilities-Natural Gas	57400
Garbage Collection, Recycle Disposal and Towing Services	27400, 57901, 65402

6. Retail & Wholesale

<u>Subsectors</u>	<u>Industry Codes</u>
Wholesale Operations	62900
Food & Beverage Stores (Grocery Stores)	63100, 63103, 63105, 65406, 69916
Industrial & Farm Equipment and Products	16902, 42179, 52400, 60800, 62200, 62201, 62302, 62303, 62304, 62500, 69300, 89910, 86905, 37902
Automobiles, Sport Vehicles, Small Engines and Trailers	16300, 62701, 65400, 69906, 69912, 69915, 89922, 65600, 65800, 65808, 65809
Office, Medical, and Entertainment Equipment	33901, 62300, 67602
Yard and Home Improvement Centres	25403, 69301
Other Retail Services	62903, 66300, 66900, 68100, 69100, 69500, 69904, 89100, 64200, 67300, 67601, 67604, 67802, 69200, 69901, 69914, 86909, 89908

7. Public Administration, Education & Health Services

<u>Subsectors</u>	<u>Industry Codes</u>
<i>Public Administration</i>	
Alberta Govt Public Services	93200, 93201, 93202
Villages, Town, and Cities	95100, 95101, 95104
Other Public Administration	36502, 57601, 57602, 82712, 86930, 95102, 95105, 95108
<i>Education Services</i>	
Education, Museums, and Libraries	80102, 80103, 80105, 80106, 80301, 80301, 80305, 80311, 80500, 80700, 80701, 80900, 86927, 89923
<i>Health Services</i>	
Health Care Centres (Hospitals)	82100
Health and Social Services	82704, 82710, 82801, 82806, 82808, 82812, 85909, 89925

8. Business & Personal Services

Subsectors

Industry Codes

Business Services

Building & Ground Maintenance

87500, 87510, 89702

Engineering, Architectural, Designing
and Research Services

09900, 86400, 86403, 86405, 86408
86409, 86410, 86411, 86414, 86913,
86923

Personal Services

Personal Services-Maintenance

87300, 87301, 89701, 89703, 89704,
89705

Restaurants, Hotels &
Recreational Services

51902, 85900, 85904, 87501, 87502,
87503, 87600, 87603, 51701, 80703,
85300, 85901, 85916, 85919, 85922,

Appendix A (Continued)

Standard Industrial Classification (SIC) system 1980 ⁵⁶

Industry Divisions

Manufacturing Industries

Food production industries (101-109),
 Beverage industries (111-114),
 Tobacco industries (121-122),
 Rubber products industries (151-159),
 Plastic products (161-169),
 Leather products (171),
 Primary textile (181-183),
 Textile products (191-199),
 Clothing industries (243-249),
 Wood industries (251-259),

Furniture & fixtures (261-269),
 Paper products (271-279),
 Printing & publishing (281-284),
 Primary metal (291-299),
 Fabricated metal products (301-309),
 Machinery industries (311-319),
 Transportation equipment (321-329),
 Electronic products (331-339),
 Chemical products (371-379),
 Other manufacturing industries (391-399).

Construction Industries

Building, developing & general contracting (401-402)
 Trade Contracting industries (421-449)
 Service incidental to construction (441-449)
 Industrial & heavy engineering (411-412)

Transportation, Communication & Utilities

Transportation Industries (451-459)
 Pipeline Transport Industries (461)
 Storage & Warehousing (471-479)
 Communication Industries (481-484)
 Utility Industries (491-499)

Wholesale & Retail Trade Industries

Farm products (501)
 Petroleum products wholesale (511)
 Food, beverage, drug, & tobacco wholesale (521-524)
 Apparel & dry goods (531-532)
 Household goods wholesale (541-543)
 Metals, hardware, plumbing, heating, & building materials wholesale (561-563)
 Machinery, equipment wholesale (571-579)
 Other product industries wholesale (591-599)

Food, beverage & drug retail (6011-6032)
 Shoe, apparel, & fabric retail (6111-6151)
 Household furniture, appliances retail (621-623)
 Motor vehicle, parts & accessories (551-552)
 Automotive retail (631-639)
 General merchandising (641)
 Other retail stores (651-659)

Mining, Quarrying & Oil Well Industries

Metal mines (061)
 Non-metal mines (062)
 Coal mines (063)
 Crude petroleum and natural gas industries (071)
 Stone quarries (081)
 Sand and gravel pits (082)

Forestry Industries

Forestry services industry (051)

Business Service Industries

Business service industries (e.g., accounting, lawyers, advertising) (771-779)

Educational Service Industries

Educational service industries (e.g., schools, universities, libraries) (851-859)

Health & Social Service Industries

Health and social service industries (e.g., hospitals, nursing homes) (861-869)

Accommodation, Food & Beverage Services

Accommodation service industries (e.g., hotels, motels, camping grounds) (911-914)

Food and beverage industries (e.g., restaurants, take-out food services, bars) (921-922)

Other Service Industries (811-841, 961-999)

Public administration (834-837)

Federal government service industries (811-817)

Agriculture Industries

Livestock farms (011)

Other animal specialty farms (012)

Field crop farms (013)

Field crop combination farms (014)

Fruit and other vegetable farms (015)

Horticultural specialties (016)

Finance & Insurance

Deposit accepting industries (701-709)

Consumer & business financing (711-712)

Investment industries (721-729)

Insurance industries (731-733)

Other financial industries (741-749)

Appendix B

Eligibility for compensation⁶⁴

19(1) Subject to this Act, compensation under this Act is payable

- (a) to a worker who suffers personal injury by an accident, unless the injury is attributable primarily to the serious and wilful misconduct of the worker, and
 - (b) to the dependants of a worker who dies as a result of an accident.
- (2) The Board shall pay compensation under this Act to a worker who is seriously disabled as a result of an accident notwithstanding that the injury is attributable primarily to the serious and wilful misconduct of the worker.
- (3) If a worker is found dead at a place where the worker had a right, during the course of his employment, to be, it is presumed that his death was the result of personal injury by accident arising out of and during the course of his employment, unless the contrary is shown.
- (4) If the accident arose out of the employment, unless the contrary is shown, it is presumed that it occurred during the course of the employment, and if the accident occurred during the course of the employment, unless the contrary is shown, it is presumed that it arose out of the employment.
- (5) If a worker is required as a condition of his employment to attend any classes or take any course of instruction, the classes or course of instruction are, for the purposes of this Act, deemed to be part of his employment.
- (6) If a worker suffers disablement from or because of any occupational disease and at some time during the 12 months preceding the disablement was employed in the industry or process deemed by the regulations to have caused that disease, the disease is deemed to have been caused by that employment unless the contrary is shown.
- (7) If a worker suffers disablement or potential disablement caused by an occupational disease, the date of the accident for the purposes of this Act is deemed to be
- (a) in the case of disablement, the date the disablement occurs, and
 - (b) in the case of potential disablement, the date the potential disablement comes to the Board's attention.

Appendix C

WCB Forms

- (1) Worker's Report of Injury Form (p. 98-99)**
- (2) Physician's First Report (p.100)**
- (3) Employer's Report of Injury Form (p.101-102)**

Worker Information

Will you be off work past the day of injury? ☐ Yes ☐ No

Last Name: _____ **First Name:** _____ **Initial:** _____

Address: _____ Social Insurance #: _____

City: _____ Province: _____ Prov. Health Care #: _____ Prov. _____

Postal Code: _____ Home Telephone: _____ Date of Birth: | Y | | M | | D | Sex: ☐ M ☐ F

Occupation and Job Title at time of injury: _____ Self employed? ☐ Yes ☐ No

If yes, account #:

Employer Information

Employer Name or Government Dept. Supervisor's Name:

Address: _____ **Fax:** _____

City _____ **Province:** _____ **Postal Code:** _____ **Telephone:** _____

Injury or Occupational Disease Information

1 Date and time of injury: | Y | | M | | D | | Time: | | am | | pm | OR Did this condition develop over a period of time? | |

Hours of employment on the day of accident: From To

2 When did you report injury to your employer? | Y | M | D

3 To whom did you report the injury? Name: Title: Telephone:

If not reported immediately, give reason:

4 Did injury occur on your employer's premises? ☐ Yes ☐ No Location where accident happened (address or general location):

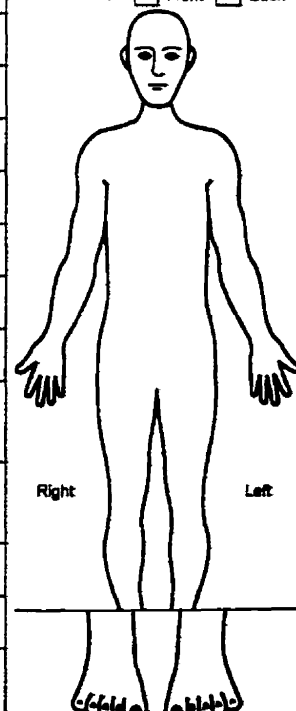
Did injury occur in Alberta? ☐ Yes ☐ No

5 Was the work you were doing for the purpose of your employer's business? ☐ Yes ☐ No If yes, was it part of your usual work? ☐ Yes ☐ No

6 Describe fully what happened to cause this injury or disease. Describe what you were doing and include any tools, equipment, materials, etc. you were using. State any gas, chemicals or extreme temperatures you have been exposed to.

Circle part injured:

Please check: ☐ Front ☐ Back



If you have any other information or a list of witnesses, attach a letter. Letter attached? ☐ Yes

7 What part of body injured?
(hand, eye, back, lungs, etc.)

☐ Left side

☐ Right side

8 What type of injury is this?
(sprain, strain, bruise, etc.)

9 Have you had a similar injury before? ☐ Yes ☐ No If yes, attach a letter with details

10 Have you reported or claimed this injury to another WCB? ☐ Yes ☐ No If yes, Province:

Name and address of treating Doctor/Hospital:

Your Last Name:	First Name:	Initial:
Social Insurance #:	Date of Birth:	

Lost Time / Return to Work Information

11 a. Date and time you first missed work: Y M D Hour: am pm

b. If you have returned to work indicate date: Y M D and time: am pm regular work or modified work

c. If you have not returned to work give expected return to work date: Y M D d. Date you were hired: Y M D

d. Is there any other work you can do until you are medically fit to return to your regular job? Yes No

Who can we call? Telephone:

e. Will your employer pay you for the time you missed work? Yes No Provide the exact gross amount: \$ per

Type of Employment FILL IN A OR B OR C

12 A Permanent full time Permanent part time

B Seasonal work Summer student Irregular / casual Temporary

Had this injury not happened, what would have been your last day of employment: Estimated or Actual Y M D

With this employer how many months per year would this job last?

Did you have any other earnings or income from any other employers during this last 12 months? Yes -Please attach copies of pay stubs and/or T4 slips

C Sub Contractor Piece work Vehicle Owner/Operator Welder Owner/Operator Apprentice

Other or Self Employment - Explain:

Note: Please submit a detailed income and expense statement if you check any box in 12 C.

Wage Information

13 a. Your rate of pay: \$ hourly weekly bi-weekly monthly other:

b. Additional taxable benefits:

Vacation / Stat holiday Pay	%:	Taken as time off with pay	Paid on regular basis
Shift Premium # 1	Amount	Paid per:	
Shift Premium # 2	Amount	Paid per:	
Regular Overtime	Rate:	Number of hours:	per week month shift cycle
Other	Explain:	Amount	per week month shift cycle

c. Do you have a second job? Yes No If yes - Employer's Name: Telephone :

Hours of Work

14 a. Number of hours: per day week shift cycle other:

b. Does work schedule repeat? Yes No Report average hours worked per week:

	Sun	Mon	Tues	Wed	Thur	Fri	Sat
Hrs per day							
Hrs per day							
Hrs per day							

c. Date shift cycle commenced: Y M D

OR If your schedule is more than 21 days, attach a copy of schedule. Circle the day the injury occurred on this schedule.

IMPORTANT: Circle day of injury. See instructions

I declare the information in this report to be true and correct. I understand and agree that my social insurance number may be used by the Workers' Compensation Board for identification and record keeping purposes. I understand the WCB is allowed to collect all relevant personal information from me and other sources. If I am collecting temporary total disability benefits, it is my obligation to inform the WCB immediately if I return to work of any kind or become capable of working. I understand that criminal prosecution may result from any attempt on my part to collect benefits by providing false information (including my ability to work) or other fraudulent means. I understand my claim may be examined by any person with a direct interest in my claim, including my employer, regarding any decision under review or appeal.

Date: Name (please print): Signature:



Workers'
Compensation
Board
Alberta

PAYMENT OF A REPORT FEE REQUIRES COMPLETE AND LEGIBLE
INFORMATION. ALL SECTIONS MUST BE FILLED IN.

P.O. BOX 2415
EDMONTON, ALBERTA T5J 2S5

FAX: (403) 427 - 5863

PHYSICIAN'S FIRST REPORT
If you wish to discuss this case with a
WCB physician, (or leave a message)
please call Physician's Information Line
498-4400 Edmonton; 297-3460 Calgary
OR 1-800-661-5419.

See reverse for reporting responsibilities.

Please type or print.
(Black ink - press firmly)

WCB CLAIM NUMBER

SOCIAL INSURANCE NUMBER

HEALTHCARE INSURANCE NUMBER

PROVINCE

SURNAME

GIVEN NAMES

BIRTHDATE (D M Y)

ADDRESS

PHONE

JOB TITLE - OCCUPATION

POSTAL CODE

EMPLOYER'S NAME

PHONE

EMPLOYER'S ADDRESS

1. WHICH PHYSICIAN OR FACILITY RENDERED FIRST TREATMENT?

D M Y

2. PATIENT'S WORK - RELATED INJURY/ILLNESS (HOW AND WHERE):

ACCIDENT (D M Y)

3. PATIENT'S COMPLAINT (NATURE AND SITES OF SYMPTOMS):

4. OBJECTIVE FINDINGS:

EXAMINATION (D M Y)

5. DIAGNOSIS:

AHCIP DIAG. CODE

AHCIP DIAG. CODE

AHCIP DIAG. CODE

6. HAS PATIENT HAD A
SIMILAR PROBLEM PREVIOUSLY?

☐

NO

☐

YES

DESCRIBE:

7. RELEVANT TESTS:

☐

NO

☐

YES

TYPE:

FACILITY:

D M Y

A) X-RAYS

☐

NO

☐

YES

TYPE:

FACILITY:

D M Y

B) OTHER - SPECIFY

8. ADMITTED TO HOSPITAL?

☐

NO

☐

YES

WHERE:

D M Y

9. BOOKED FOR SURGERY?

☐

NO

☐

YES

PROCEDURE:

D M Y

10. REFERRED TO CONSULTANT PHYSICIAN?

☐

NO

☐

YES

WHOM:

D M Y

11. TREATMENT PLAN:

☐

NO

☐

YES

NAME:

DOSAGE:

A) MEDICATION

☐

NO

☐

YES

DESCRIBE:

B) OTHER TYPES OF TREATMENT

12. ANY COMPLICATING FACTORS
AFFECTING RECOVERY?

☐

NO

☐

YES

DESCRIBE:

13. ANY PERMANENT IMPAIRMENT
ANTICIPATED?

☐

NO

☐

YES

DESCRIBE:

14. IS INJURY PREVENTING PATIENT FROM PERFORMING
DATE OF ACCIDENT WORK? (IF NO, GO TO #17)

☐

NO

☐

YES

ESTIMATED DATE OF RETURN TO
PRE - ACCIDENT WORK:

D M Y

15. CAN "MODIFIED OR ALTERNATE" WORK
BE PERFORMED?

☐

NO

☐

YES

DESCRIBE WORK CAPABILITY: (SEE OVER FOR DEFINITION)

SEDENTARY ☐

LIGHT ☐

MEDIUM ☐

HEAVY ☐

VERY HEAVY ☐

16. ANY WORK RESTRICTIONS?

☐

NO

☐

YES

DESCRIBE:

☐

PERMANENT

☐

TEMPORARY

DURATION:

17. PHYSICIAN'S NAME AND ADDRESS TO WHOM FEE IS PAYABLE: (PLEASE PRINT)

DATE OF NEXT VISIT:

PHYSICIAN'S SIGNATURE:

D M Y

PHONE NUMBER

PROFESSOR NUMBER

PLEASE PROVIDE YOUR PREVIOUS AHCIP PHYSICIANS BILLING NUMBER

THIS DOCUMENT MAY BE EXAMINED BY ANY PERSON WITH DIRECT INTEREST IN A CLAIM THAT IS UNDER REVIEW.

EMPLOYER'S REPORT OF ACCIDENT OR INDUSTRIAL DISEASE

THE WORKERS' COMPENSATION BOARD
Box 2415, Edmonton, Alberta T5J 2S5

ANSWER ALL PERTINENT QUESTIONS. SIGN ON REVERSE AND MAIL TO
THE BOARD WITHIN 24 HOURS IN EVERY CASE OF ACCIDENT OR SICK-
NESS DUE TO INDUSTRIAL DISEASE.

WORKER'S LAST NAME

FIRST NAME(S)

FULL ADDRESS

POSTAL CODE

SOCIAL INSURANCE NO. MARITAL STATUS Date of Birth SEX

WAS WORKER INJURED ON THE EMPLOYER'S PREMISES? YES NO

STATE ADDRESS WHERE ACCIDENT
HAPPENED IF NOT THE SAME AS
EMPLOYER MAILING ADDRESS

STREET PLANT MILL OR SITE NAME

DATE AND HOUR ACCIDENT FIRST REPORTED 19 at M. DID ACCIDENT OCCUR IN ALBERTA? YES NO IF NO, PROVINCE

WHAT TIME DID WORKER COMMENCE WORK? M. WHAT WERE WORKER'S REGULAR HOURS OF EMPLOYMENT? M. TO M. WORKER'S OCCUPATION

NAME OR ADDRESS OF ATTENDING DOCTOR OR HOSPITAL

HEALTH CARE INSURANCE NO PROVINCE

DESCRIPTION OF ACCIDENT — ATTACH SHEET IF NECESSARY

- WHAT HAPPENED TO CAUSE INJURY?
- WHAT WAS THE WORKER DOING?
- WHAT MACHINE, TOOL, EQUIPMENT OR MATERIAL WAS THE WORKER USING?
- STATE ANY INVOLVEMENT OF GAS, CHEMICAL OR EXTREME TEMPERATURE

2. NATURE OF INJURY — IF INDUSTRIAL DISEASE, GIVE DETAILS

- WHAT PART OF THE BODY WAS INJURED? (HAND, EYE, BACK, ETC., STATE LEFT OR RIGHT)
- WHAT TYPE OF INJURY WAS SUSTAINED? (BURN, FRACTURE, BRUISE, ETC.)

3. QUESTIONS ANSWERED "NO" REQUIRE FULL EXPLANATION — ATTACH SHEET IF NECESSARY

- WERE THE WORKER'S ACTIONS AT THE TIME OF INJURY FOR THE PURPOSE OF YOUR BUSINESS? YES NO
- WERE THEY PART OF THE REGULAR WORK? YES NO
- ARE YOU SATISFIED INJURY OCCURRED AS STATED? YES NO
- WAS FIRST AID RENDERED? IF YES, STATE WHEN AND BY WHOM YES NO

- DO YOU HAVE AN ACCOUNT ESTABLISHED WITH THIS BOARD? IF YES, QUOTE FILE NUMBER YES NO
- DOES THIS WORKER HAVE PERSONAL COVERAGE WITH THE BOARD? IF SO, PLEASE QUOTE HIS ACCOUNT NUMBER YES NO
- IS THE INJURED PERSON A PARTNER IN THE BUSINESS? YES NO
- IS THE INJURED PERSON A DIRECTOR OF THE CORPORATION? IF YES, SPECIFY YES NO
- DOES HE EMPLOY HIS OWN WORKERS? IF YES, EXPLAIN YES NO

5. IS WORKER OFF WORK, OR WAS HE OFF WORK LONGER THAN DAY OF ACCIDENT. IF YES, COMPLETE REVERSE YES NO

THIS SPACE FOR WCB USE ONLY	EMPLOYER'S ACCOUNT NO.	
	OCCURRENCE CLASS	
	CLAIM NUMBER	
	EMPLOYER'S AREA CODE	
	AMOUNT OF PERSONAL COVERAGE	

DATE AND HOUR OF ACCIDENT 19 at M.

EMPLOYER'S FULL NAME PROPRIETORS, PARTNERS OR CORPORATIONS

TRADE NAME

MAILING ADDRESS

POSTAL CODE

TYPE OF INDUSTRY PHONE No.

B. HAS WORKER RETURNED TO WORK?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	IF YES, GIVE DATE AND TIME	DAY	MO.	YR.	TIME	AM
C. DID CLAIMANT WORK BETWEEN FIRST LAYING OFF AND FINAL RETURN?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	IF YES, GIVE DATE AND TIME	FROM				
				TO AND INCLUDING				
D. IF WORKER HAS NOT RETURNED TO WORK, PROVIDE ESTIMATED LENGTH OF LAYOFF								
<input type="checkbox"/> LESS THAN 7 DAYS <input type="checkbox"/> 7 TO 14 DAYS <input type="checkbox"/> MORE THAN 14 DAYS								
E. WILL YOU PAY OR ALLOW WORKER ANYTHING FOR THE PERIOD OF LAYOFF? IF SO, EXPLAIN								

7	A. USUAL DAILY WORKING HOURS WERE FROM M TO M														
	B. HOW MUCH TIME OFF FOR LUNCH? IS WORKER PAID IN FULL FOR THIS TIME?														
	C. NUMBER OF DAYS IN USUAL WORK WEEK DAYS NUMBER OF HOURS IN USUAL WORK WEEK HRS.														
	D. CHECK USUAL DAYS OFF <table style="float: right; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">MON</td> <td style="border: 1px solid black; padding: 2px;">TUE</td> <td style="border: 1px solid black; padding: 2px;">WED</td> <td style="border: 1px solid black; padding: 2px;">THU</td> <td style="border: 1px solid black; padding: 2px;">FRI</td> <td style="border: 1px solid black; padding: 2px;">SAT</td> <td style="border: 1px solid black; padding: 2px;">SUN</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	MON	TUE	WED	THU	FRI	SAT	SUN							
MON	TUE	WED	THU	FRI	SAT	SUN									

8	A. RATE OF PAY AT TIME OF ACCIDENT WAS \$ PER
	B. IF BOARD PROVIDED IN ADDITION TO WAGES, GIVE DETAILS
	C. HOW LONG WAS WORKER EMPLOYED BY YOU? FROM 19 TO 19

9	GIVE GROSS EARNINGS AND INCLUDE ANY ENTITLEMENT FOR HOLIDAY PAY FOR 12 MONTHS PRIOR TO ACCIDENT (NOT BEYOND DATE OF ACCIDENT) OR SUCH LESSER PERIOD AS WORKER WAS EMPLOYED BY YOU.												
	FROM <table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">DAY</td> <td style="border: 1px solid black; padding: 2px;">MO.</td> <td style="border: 1px solid black; padding: 2px;">YR.</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> </tr> </table> TO <table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">DAY</td> <td style="border: 1px solid black; padding: 2px;">MO.</td> <td style="border: 1px solid black; padding: 2px;">YR.</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> </tr> </table> \$ GROSS	DAY	MO.	YR.				DAY	MO.	YR.			
DAY	MO.	YR.											
DAY	MO.	YR.											

10	GIVE DETAILS OF ANY TIME LOST WITHOUT PAY DURING THIS PERIOD OF EMPLOYMENT INCLUDING SICKNESS, AND SHUTDOWN
	TOTAL WEEKS DAYS

11	ESTIMATED EARNINGS FOR SIMILARLY EMPLOYED WORKER OVER PAST YEAR \$
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12	A (i) IS THE WORKER INVOLVED IN A ROTATING SHIFT SCHEDULE? YES <input type="checkbox"/> NO <input type="checkbox"/> (ii) IS IT A SET SCHEDULE? YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES, SUPPLY ONE COMPLETE SHIFT CYCLE. <table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td> </tr> <tr> <td style="height: 20px;"></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>F</td><td>S</td><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td><td>S</td><td></td> </tr> <tr> <td style="height: 20px;"></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> B. NUMBER OF DAYS ON NUMBER OF DAYS OFF C. DATE SHIFT CYCLE COMMENCED D. NUMBER OF HOURS PER DAY NUMBER OF HOURS PER YEAR	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T																			F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S																			
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T																																																								
F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S																																																									

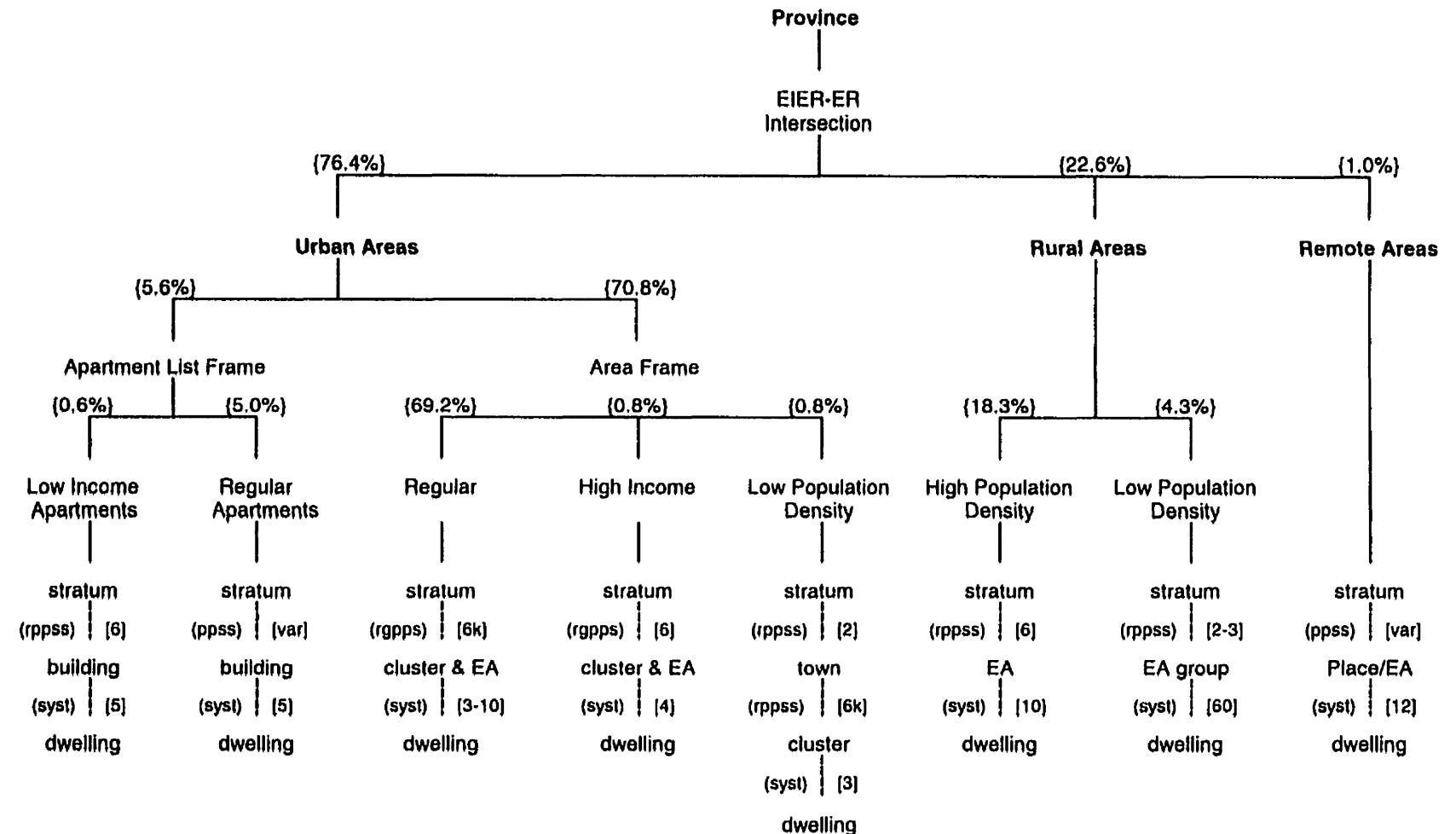
I DECLARE THE ABOVE TO BE TRUE AND CORRECT AND I AM AUTHORIZED TO SIGN THIS REPORT ON BEHALF OF THE EMPLOYER.											
EMPLOYER'S NAME	SIGNED BY										
<table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%; text-align: center;">DATE</td> <td style="width:15%; text-align: center;">Day</td> <td style="width:15%; text-align: center;">Month</td> <td style="width:15%; text-align: center;">Year</td> <td style="width:50%; text-align: center;">SIGNED AT</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> <td></td> <td style="text-align: center;">....., ALBERTA</td> </tr> </table>	DATE	Day	Month	Year	SIGNED AT				, ALBERTA	TITLE
DATE	Day	Month	Year	SIGNED AT							
			, ALBERTA							

Appendix D

Labour Force Survey

- **Sample Design (p. 104)**
- **EIR Map (p. 105)**
- **ER Map (p. 106)**

: Labour Force Survey Sample Design - 1995+



| = level of stratification

| = stage of sampling

EIER - Employment Insurance Economic Region

ER - Economic Region

(%) - percentage of total sample

EA - Census Enumeration Area

cluster - set of blockfaces

() - selection method

[] - number of units selected

(6k = multiple of six,
var = variable number)

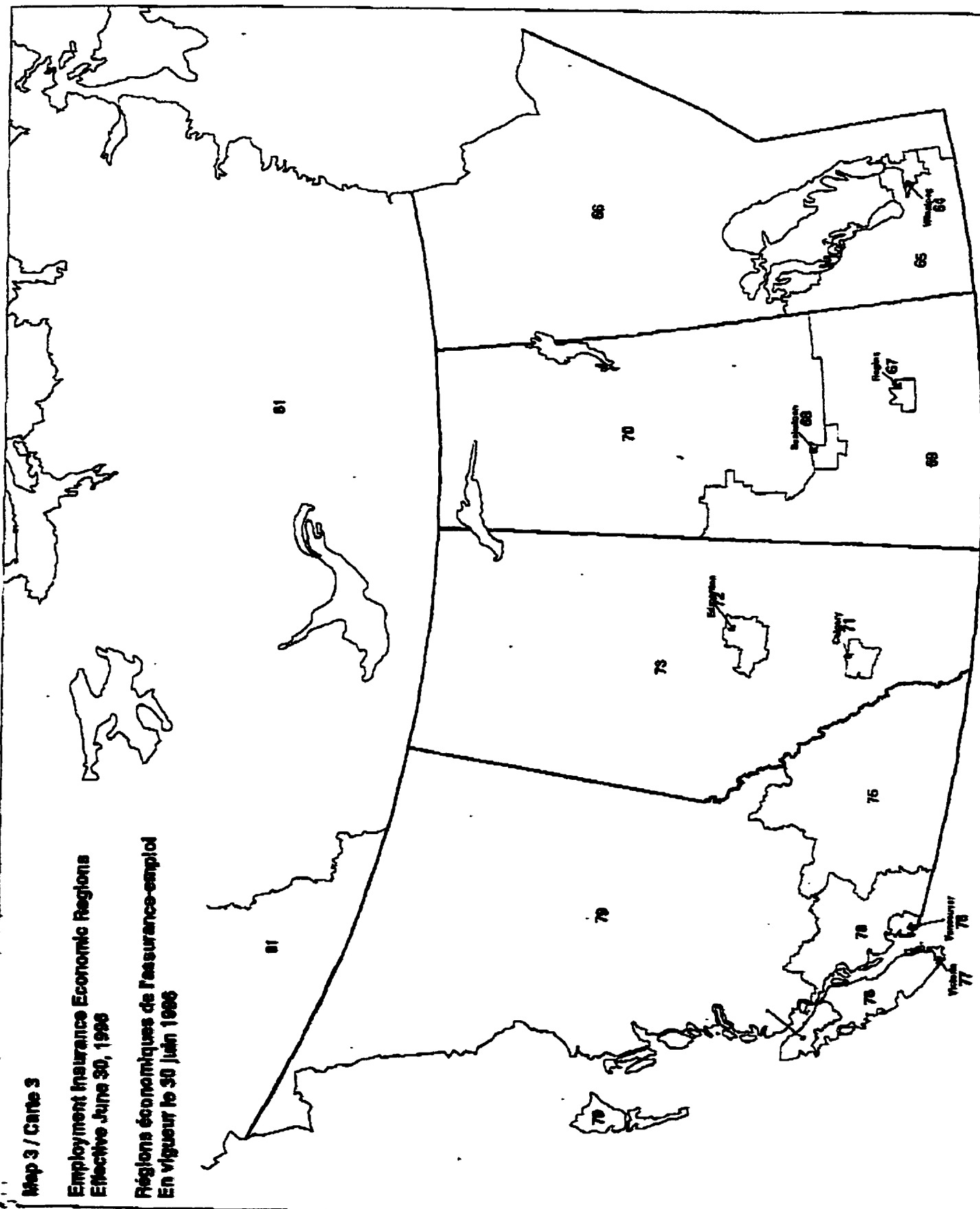
pps - probability proportional to size

ppss - pps systematic

rppss - randomized pps

rgpps - random group pps

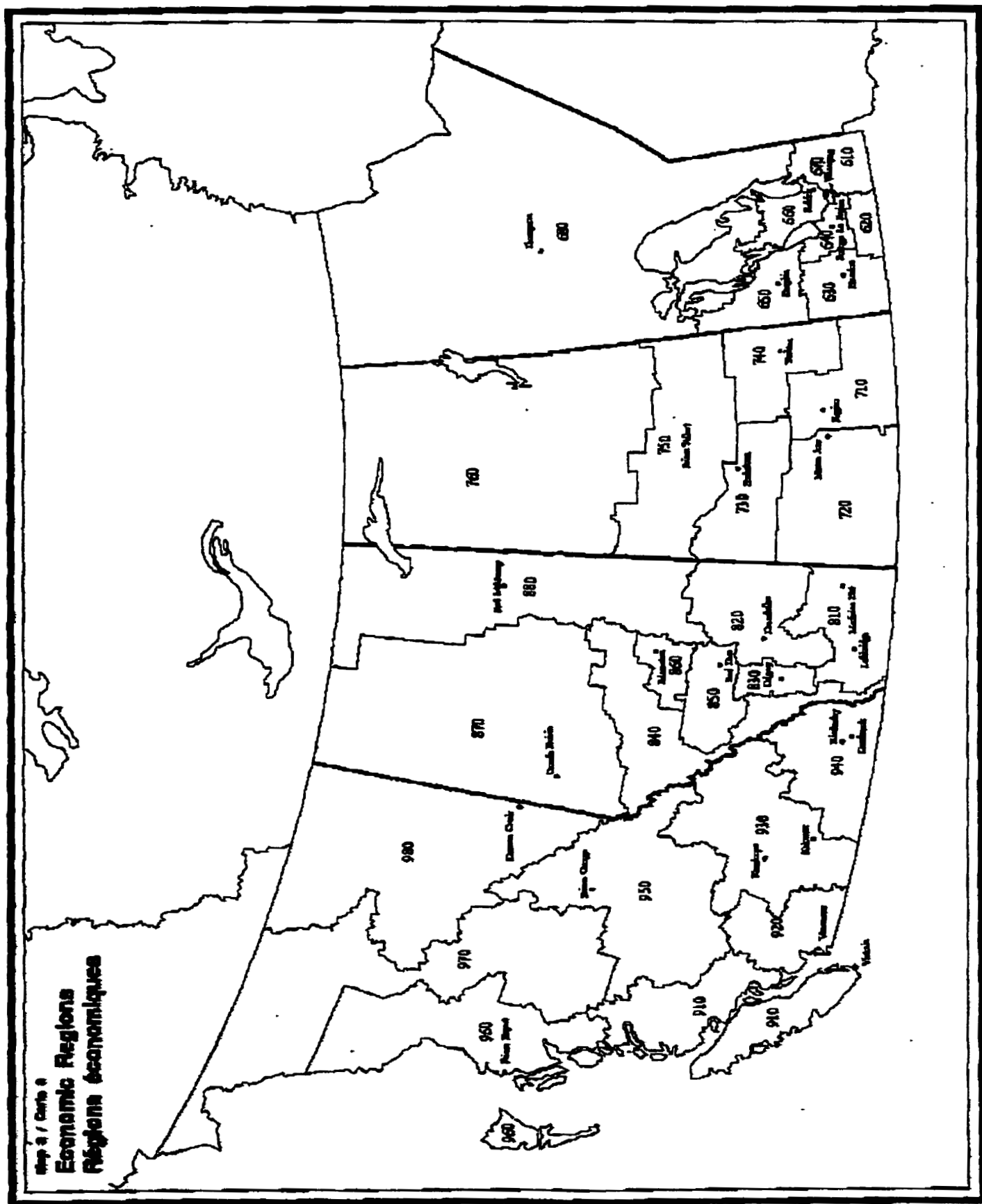
syst - systematic



Map 3 / Carte 3

Employment Insurance Economic Regions
Effective June 30, 1996

Régions économiques de l'assurance-emploi
En vigueur le 30 juin 1996



Appendix E

Nature of Injury – Recoding

Nature of injury codes were collapsed into broad categories based on the United States Bureau of Labor and Statistics (BLS) Occupational Injury and Disease Classification system.⁵⁷

<u>Category</u>	<u>Inclusions</u>
Lacerations	cuts, lacerations (code 3400)
Sprains/Strains	avulsion (joint capsule, ligament, muscle or tendon), hemarthrosis, muscle “pull”, “twist, sprain, strain (code 2100)
Contusion/Crush	hematoma, nonspecified crushing injuries (codes 4300, 9710)
Burn	first, second and third degree chemical, electrical, radiation, and heat burns (codes 5000 – 5900)
Abrasion	traumatic injury where the skin, mucous membrane, or superficial epithelium have been removed or marked as a result of rubbing or scraping (code 4100)
Fracture	closed and open fractures; compound, depressed, fissured, greenstick, simple, linear, impacted, and spiral fracture (code 1200)
Dislocation	dislocated disc, subluxations, partial displacement, and fractured or broken cartilage (code 1100)
Amputation	nonfatal amputations resulting from gunshot wound, medical amputation due to irreparable traumatic injuries (codes 3110,3190)
Concussion	concussions (code 6200)
Poisoning/ Electrocution	carbon monoxide poisoning, toxic effects of food contaminants of noxious food stuffs, non-viral and non-bacterial, and lead poisoning (codes 9500-9590). Fatal and nonfatal traumatic injuries that result from contact with electric current (code 9300).
Multiple Injuries	multiple traumatic injuries of equal severity (codes 8000 – 8902)
Other	all other traumatic injury types, unspecified traumatic injuries (codes 9000- 9200, 9710-9790)

Appendix E (Continued)

Body Part Involved – Recoding

Body part codes were collapsed into broad categories based on the United States Bureau of Labor and Statistics (BLS) Occupational Injury and Disease Classification system.⁵⁷

<u>Category</u>	<u>Inclusions</u>
Hand/Finger	hand, knuckles, distal phalanges, medial phalanges, proximal phalanges, thumb (codes 33000, 34000-34002)
Wrist/Arm	upper arm(s), elbow, forearm, region between the arm and hand (codes 31000-31900, 32000)
Back	back (including spine and spinal cord); lumbar region, thoracic region, sacral region coccygeal region (codes 23000-23901)
Leg/Knee/Ankle	leg; thigh, knee, lower, multiple leg locations (codes 41000-41900). Hinge joint between foot and lower leg (code 42000)
Head/Face/Neck	head; cranial region (including skull), ear (codes 00000-02003). Face; nose, cheeks, jaw, chin, mouth (codes 03000-03100, 03300-09000). Neck (including throat); cervical region, internal neck location, vocal cords, larynx, laryngopharynx, pharynx, trachea (codes 10000-19000).
Eye	eye; conjunctiva, cornea, eyeball, inside and outside of eyelids, iris, lacrimal, lacrimal glands, lens, optic nerve, orbit, retina, and upper and lower eyelashes (codes 3200-3202).
Chest/Abdomen/Shoulder	chest; esophagus, heart, bronchus and lungs, pleura, breast (codes 22000-22900). Abdomen; stomach, spleen, urinary organs, intestines, peritoneum, other digestive structures (codes 24000-24900)
Foot/Toe	foot; instep, and sole (codes 43000-43900). Toe(s), toenail(s) (code 44000)
Multiple	multiple body parts involved (codes 80000,80001)
Other	all other body parts