

Isfeld, Lori

From: Correspondence Group, City Clerk's Office
Sent: Monday, June 22, 2015 9:30 AM
To: Public Hearing
Subject: FW: Harm prevention

From: pamela mccoll s.22(1) Personal and Confidential
Sent: Saturday, June 20, 2015 9:06 AM
To: Correspondence Group, City Clerk's Office
Subject: Harm prevention

Smart Approaches to Marijuana Canada

The Case for Harm Prevention and not to give up on our kids by falling into the erroneous belief " that all kids will do drugs" - history proves that theory wrong. Harm reductionism is a defeatist position whereas harm prevention demonstrates a belief that when kids are given science and the facts about the impact of marijuana they will make good life decisions. The following data will put this in perspective.

Between 1955 and 1965 the rate in the USA for cannabis was between 1-2% of the population.

In 1978 more teenagers were using marijuana than ever before -10% of high school students in America smoked marijuana every day. (Sound familiar? - Canada exceeds those rates now with between 30-53% of Canadian grade 12 students using - 27% of them daily CCSA)

In 1979 the rate for the adult population was at 14.1% and marijuana use and its popularity would peak in 1979. (Canada's adult rate is currently 8.6%)

Then everything began to change:

By 1985, 7 out of 10 high school seniors believed marijuana to be harmful.

By 1991 rates had dropped by 2/3rd - to the lowest in recorded history. By 1992 the rate of high school students who smoked marijuana every day dropped to below 2%.

Just say no Just Say No was a campaign based on the work of Professor Richard I Evans and supported by The Girl Scouts of America, Kiwanis Club International and the National Federation of Parents for a Drug Free Youth. 5,000 Just Say No Clubs were all part of the campaign to educate American children to turn down drugs. **The number of high school seniors using cannabis in America dropped from 50.1% in 1978, to 12% in 1991.**

Between 1979 and 1991, a huge prevention campaign in America coincided with a dramatic decrease in drug use. Everyone cooperated, parents, teachers, police, social workers, etc. And it worked. The number of users fell from 23 to 14 million. Cannabis and cocaine use halved, daily cannabis use dropped by 75%.

The New York Times on November 17th 1986, Anatomy of The Drug Issue: How, after years it erupted. "The issue suddenly spread across newspaper front pages and nightly news broadcasts. Public concern jumped in opinion polls. And Congress, in a matter of weeks, wrote and passed anti-drug legislation backed by \$1.7 billion in financing. "

"They asked young people what was putting them off drugs and found that the largest number, more than 70% abstained from cannabis use because of fear of physical or psychological damage, 40% due to the law and 60% because of parental disapproval. A survey of a few years ago showed similar results, with around 90% saying no to drugs because of damage these substances could do to health.

Sweden is back to 2% of use - we can get rates to come down but we need huge funding for prevention and for the pot lobby to not be given any more media time or opportunities to spin our their propaganda.

Advisory Council Smart Approaches to Marijuana Canada
Chuck Doucette, David Berner, Pamela McColl
Candace Platter, Jim Simpkins, Nancy Lee

Isfeld, Lori

From: Correspondence Group, City Clerk's Office
Sent: Monday, June 22, 2015 9:18 AM
To: Public Hearing
Subject: FW: Second hand marijuana smoke and risks to children.

From: Pamela Mccoll s.22(1) Personal and Confidential
Sent: Monday, June 22, 2015 1:11 AM
To: Correspondence Group, City Clerk's Office
Subject: Fwd: Second hand marijuana smoke and risks to children.

Objection to Marijuana Dispensaries:

Secondhand marijuana smoke contains many of the same toxins

and carcinogens found in directly inhaled marijuana smoke, in

similar amounts if not more.

Secondhand smoke kills 600,000 worldwide annually: **1 in 100 people around the world die from secondhand smoke each year, a new study reveals, and nearly two-thirds of the deaths occur in children.**

More research is needed. This is not the time to normalize,

commercialize of legalize mariijuana.

Smoking marijuana can harm more than just the lungs and respiratory system - it can also affect the immune system and the body's ability to fight disease.

The benefits, risks and safety of marijuana use for medical purposes require further study. Patients considering using marijuana for medicinal purposes should make this decision in consultation with their doctor, and consider means of administration other than smoking.

We strongly discourage anyone from smoking marijuana as well as tobacco products.

The Centers for Disease Control and Prevention found more than half of children in the United States, between ages 3 and 11

show signs in their blood of exposure to secondhand smoke.

Ref:<http://thechart.blogs.cnn.com/2010/11/26/secondhand-smoke-kills-600000-worldwide-annually/>

<http://hc-sc.gc.ca/hc-ps/tobac-tabac/legislation/label-etiquette/second-eng.php>

<http://www.tobaccofreekids.org/research/factsheets/pdf/0103.pdf>

[http://www.lung.org/stop-smoking/about-smoking/health-](http://www.lung.org/stop-smoking/about-smoking/health-effects/marijuana-lung-health.html)

[effects/marijuana-lung-health.html](http://www.lung.org/stop-smoking/about-smoking/health-effects/marijuana-lung-health.html)

s.22(1) Personal and Confidential



Isfeld, Lori

From: Correspondence Group, City Clerk's Office
Sent: Friday, June 19, 2015 2:33 PM
To: Public Hearing
Subject: FW: New Study: Medical Marijuana Increases Youth Marijuana Use

From: PAMELA MCCOLL s.22(1) Personal and Confidential
Sent: Friday, June 19, 2015 1:46 PM
To: Correspondence Group, City Clerk's Office
Subject: Fwd: New Study: Medical Marijuana Increases Youth Marijuana Use

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FOR IMMEDIATE RELEASE

June 19, 2015

s.22(1) Personal and Confidential

New Study: "Medical Marijuana Laws Amplify Recreational Juvenile Marijuana Use"

Study also finds that alcohol consumption is a salient predictor of marijuana use

(WASHINGTON, D.C.) -- A new study in press published in the *International Journal of Drug Policy* found that medical marijuana laws "amplify" youth marijuana use. The study, which utilized the largest national sample of drug users available, utilized five measurement

periods calibrated in two-year intervals (2002-03 to 2010-11).

Lisa Stolzenberg, Stewart J. D'Alessio, and Dustin Dariano of Florida International University remarked in the study that "(our) research design is advantageous in that it affords us the ability not only to assess the effect of the implementation of medical marijuana laws on juvenile drug use, but also to consider other state-specific factors that may explain variation in drug use that cannot be accounted for using a single time series."

The study also found that other salient predictors of juvenile marijuana include "perceived availability of marijuana, percent of juveniles skipping school, severity of perceived punishment for marijuana possession, alcohol consumption, percent of respondents with a father residing in household, and percent of families in the state receiving public assistance."

The study apparently contradicts a study published in *Lancet Psychiatry* this week that found that although Colorado 10th and 12th grade use went up after medical marijuana, 8th, 10th, and 12th grade marijuana use did not go up across most medical marijuana states. That study relied on questionnaires of students in 8th, 10th, and 12th grade; this new study relied on a larger sample of households that could include students who dropped out of school.

Submitted by Advisory Council of Smart Approaches to Marijuana Canada
Pamela McColl, Chuck Doucette, David Berner

Isfeld, Lori

From: Correspondence Group, City Clerk's Office
Sent: Friday, June 19, 2015 1:00 PM
To: Public Hearing
Subject: FW: fatality report
Attachments: 2015 Safety Science Patterns of underlying causes paper.pdf

From: PAMELA MCCOLL s.22(1) Personal and Confidential
Sent: Friday, June 19, 2015 12:47 PM
To: Correspondence Group, City Clerk's Office
Subject: Fwd: fatality report

Dear Doctor Daly:

We wanted to make sure that you had this published report. In light of your remarks made on June 10th. pertaining to marijuana and alcohol. Marijuana is not safer. To be a statement of fact the word safer would have to be qualified. I have the permission of the author of this report to share it and please find the published report attached.

2015 Safety Science Patterns of undelaying causes paper.

BC DATA

3.9.2. Forestry There were 38 traumatic fatalities among forestry workers employed by small businesses. Toxicology screen data were available for 23 of them: 5 (22%) were positive for cannabis, 2 (9%) were positive for cocaine and cannabis (a total of 31%), and 16 (69%) were negative. There were no instances of alcohol intoxication.

There were 17 traumatic fatalities among forestry workers employed by larger businesses. Toxicology screen data were available for 10 of them: 2 (20%) were positive for cannabis, 1 (10%) was positive for codeine (a total of 30%), and 7 (70%) had a negative toxicology screen. There were no instances of alcohol intoxication.

The 10 forestry fatalities with documented recreational drug use constituted 25% of all 40 fatalities in the 2003–2007 period in which recreational drug use was documented, whereas loggers constituted less than 12% of fatalities involving recreational drug use. Odds ratio of 2.1 (95% CI = 1.5–2.7)

3.9.3. General trucking Of the 38 traumatic fatalities in small general trucking companies, there were drug/alcohol data or comments in the coroners' reports for 19 of them: 1 (5%) report of cannabis, 1 (5%) of cocaine, 1 (5%) of methamphetamine, and 1 (5%) of alcohol, while 14 (74%) fatalities had documented negative toxicology screens and 1 was documented as "irrelevant."

Shannon et al. (1993) found that, in Ontario, where the major industry is manufacturing, over the period 1986–1989, cannabis was present in 17% of fatally injured workers for whom toxicology tests were conducted (3.9% of all 470). The discrepancy between these reports and ours may reflect several factors – the period studied (cannabis use may have increased over time), the industries involved, or the different work-environment cultures. Cannabis is known to impair psychomotor and cognitive function (Solowij and Grenyer, 2002). Workers may not know or understand that although cannabinoids do initially dissipate from the brain and bloodstream within hours, they are absorbed by the fat-containing tissues, from which they are slowly released back into the bloodstream and brain over a period of many days (Johansson et al., 1989; Nahas and Latour, 1992). Among heavy marijuana users, serum levels consistent with impairment (Ramaeke)

Advisory Council of Smart Approaches to Marijuana Canada

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Patterns of underlying causes of work-related traumatic fatalities – Comparison between small and larger companies in British Columbia



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ABSTRACT

There are consistent reports of discrepancies in injury and fatality rates between small and larger businesses. This study sought to identify patterns of safety behavior that might explain the differences. We mined the database of the Workers' Compensation Board of British Columbia for data on all traumatic fatalities for the period 2003–2007. We also reviewed reports from investigators, coroners, and employers to determine underlying patterns of cause of fatalities in different industries and to assess differences between small and larger businesses. Fatality rates were 9.7 for small businesses and 2.7 for larger businesses. Factors for which there were significant differences by employer size were: fatalities within one month of employment, fatality rates in primary industries and transportation, vehicular incident fatality rates, and seat belt use. Small businesses in British Columbia have a significantly higher traumatic fatality rate than do larger businesses. Prevention strategies are needed to address training and supervision of new workers in small businesses.

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1. Introduction

Prevention of fatalities is one of the primary goals of occupational health and safety programs. Understanding the causes of fatalities can lead to better focused injury prevention strategies that will also address serious injury and overall injury rates. An extensive study by the Kauffman Rand Institute found that, although small businesses have lower reported injury rates than larger businesses, they have higher fatality rates than larger businesses in the same industry (Mendeloff et al., 2006). Other studies of specific industries including landscaping and retail support this finding (Buckley et al., 2008; Peek Asa et al., 1999). There is therefore a need to explore prevention strategies for smaller businesses. The present study compares patterns of underlying causes of work related traumatic fatalities between small and larger companies using data from a large data set from the government mandated Workers' Compensation Board of BC (WCB, operating as WorkSafeBC).

British Columbia (B.C.) is a maritime and mountainous province in western Canada with a population of 4 million. Since 1917, all businesses in B.C. that have workers have been required to participate in injury and death indemnity coverage provided by the WCB. The origin and fundamental value of workers' compensation in Canada rests on the principle of mutual protection arising from the historic compromise in which workers relinquished their right to sue their employer, and in return, employers agreed to fund a no fault insurance system. This no fault insurance system automatically covers workers regardless of whether their employer pays the insurance premiums. Self employed individuals can voluntarily participate.

The system has a one year time limit for accepting all claims. However, policies allow for exceptions based on the merits and evidence available of individual claims in favor of allowing a claim. For fatality claims, there may be under reporting of occupational disease related claims. Thus, since the present paper exclusively studies traumatic fatalities, the injury data is strong. Overall, this no fault, universal coverage, system provides a single data collection process, the Operational Data Warehouse (ODW), which includes all workers and therefore provides denominator data as well as injury data. The ODW integrates data from multiple source databases to transform and summarize injury and employer data

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to enable better analysis and decision making related to injury prevention. The data from several sources are linked through metadata. This eliminates undercounting (Rosenman et al., 2006) and the need for complex and inaccurate processes, such as that described by Cohen et al. (2006).

In an unpublished study using WCB data for the same period as the current study (2003–2007), the traumatic fatality rate among workers in small businesses (those that employed fewer than 20 person years) was 9.7 per 100,000 person years, compared to 2.7 per 100,000 person years for larger businesses (those that employed 20 or more person years) and 4.6 per 100,000 person years in all businesses in B.C. When the comparison was between businesses in similar industries, the fatality rate was up to 5 times higher, even though small businesses had lower overall injury rates than their larger counterparts (2.5 vs. 3.2 per 100 person years) and their serious injury rate (ICD 9) was only 2.5 times higher.

It seems likely that the difference between the relative fatality rates and the overall injury rates might reflect five factors that could affect reported serious injury and fatality rates. First, the overall injury rate among employees in small businesses may appear lower than for larger businesses because the workers in small businesses may discount minor or soft tissue injuries. Second, small businesses may under report their payroll for a variety of reasons, including that they tend to employ more seasonal or part time employees and they may find it cumbersome or difficult to track the overall payroll. Third, small businesses may be subcontracted by larger businesses in similar classification units (CUs) to perform tasks that carry a higher risk of injury. Fourth, small businesses may not have the necessary time, budget, knowledge, or expertise to look into health and safety issues compared to larger businesses where there are economies of scale that extend to safety programs. Fifth, small businesses hire fewer workers overall and more part time workers, making it difficult to provide effective training and supervision. Between 2003 and 2007 there was an average of 167,041 small businesses (92% of all) in B.C.; they employed 27% of the person years, compared with 70,609 of larger businesses (8% of all), which employed 73% of the person years (1% of the largest businesses employ approximately 50% of the total number of person years).

The present study describes the outcomes of a review of traumatic fatality claims accepted by WCB over the period 2003–2007. The specific aim of the study was to try to clarify the potential role of each of the underlying factors (although we realized that some would be nearly impossible to determine) and to identify patterns among the fatalities that would facilitate the development of effective injury/fatality prevention programs.

2. Material and methods

The ODW was used to obtain all fatalities for the period 2003–2007. All non traumatic fatalities, such as neoplasms, were eliminated. Fatalities for which the coding did not clearly indicate whether the cause was traumatic (for example, heart attacks) were retained until further information could be obtained to clarify the cause, but were excluded if the cause proved not to be traumatic. Data fields included were: injury date; year of injury; classification unit (CU, an industry designation unique to B.C., adapted from best practices across jurisdictions including NAICS, other provinces and states as well as industry consultation and customized to reflect the current economies in B.C.); business size as person years (a number calculated on the basis of payroll and average annual income for employees in that CU); claim cost (both projected and paid to date); work days lost; age; gender; injury description, including coding for nature of injury and body part injured; occupation code (Standard Occupation Classification System, SOC); and accident type (both coded and text). An additional data set of the

number of person years employed, separated by CU and business size, was obtained for the same period.

Using the claim number of each of the traumatic fatality claims, the source databases were manually searched for detailed information. These source databases were primarily the Claims Management System (CMS), which contains electronic copies of all documents in the claim file, including physician reports, and Firm File, which contains documents such as the investigators' reports. The source databases were searched for information related to the fatal accident, the employee, and the employer. Specific information sought for the fatal accident was whether there were written work procedures and adequate supervision, and whether the worker had been wearing or using personal protective equipment appropriate to the task. Specific information sought for the employee was: duration with the employer, duration employed in this job, experience at this job, whether the incident occurred at a familiar worksite (whether the worksite was regular or variable), and whether drugs or alcohol were contributing factors identified at autopsy. Specific information sought for the employer was how long the employer had been registered with WCB as time between first registration and fatality (whether registration followed rather than preceded the incident).

Data that were fairly consistently available from these sources included an employer report and the WCB account status of the employer. The employer report usually included the duration the worker was employed with this employer (start date) and the duration the worker was employed in this job (although this was sometimes interpreted by the employer as the specific location when the worksite was variable). The WCB account status for the employer provided the date the employer registered with the WCB. Data inconsistently available from these sources included the notice of incident report; subsequent communication with the employer; the coroner's report, which usually provided detailed information about the incident; information on the cause of the incident; recommendations for prevention of similar incidents, including written work procedures, use of seat belts in motor vehicle crashes, use of personal protective equipment, and drug and alcohol levels, with commentary on whether they were contributing factors.

Data were analyzed using Student's *t* test and the chi square test, for parametric and non parametric data, as appropriate. Results were deemed significant if alpha were less than 0.05 for a two tailed test. Odds ratios with confidence intervals were calculated to compare risk of fatality in small vs. larger businesses, and to assess cannabis use among loggers relative to other occupations.

3. Results

There were 299,805 claims: 67,595 in small businesses, 83,390 in medium sized businesses, and 143,351 in large businesses. The size of some employers was not known, leading to the discrepancy between the sum of small, medium, and large, and the total. Overall, there were significant gaps in the data, with no relevant detailed data available on approximately 15–20% of claims. A total of 435 traumatic fatalities were reviewed for the 5 year period. 251 were in small businesses and 184 in larger businesses. Of the 435 claims reviewed, 13 proved not to be traumatic after further investigation, leaving 243 in small businesses and 179 in larger businesses. 93% of these fatalities were male. The total number of fatalities varied from year to year (mean 84, standard deviation 15, range 66–107) but the percentage of fatalities attributed to small and larger businesses was stable (58 ± 3 , range 55–62%).

There were no significant differences in mean age of the claimant (44.9 ± 13.7 in small businesses vs. 44.5 ± 13.8 in larger businesses) by either gender or business size (Fig. 1).

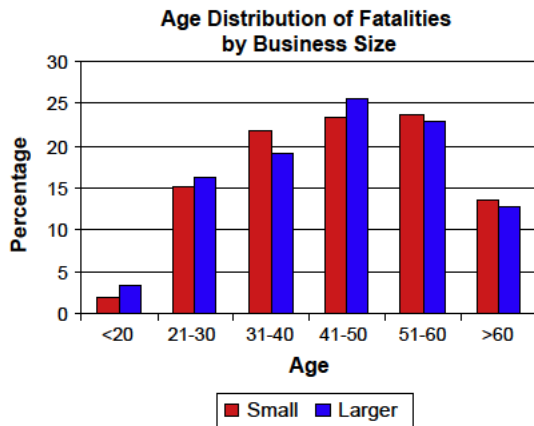


Fig. 1. Age distribution of fatalities by business size.

The data set of the number of person years by CU and business size showed that there were a total of 9,483,230 person years: 2,587,552 in small businesses and 6,895,678 in larger businesses. These data were used as denominator data in subsequent calculations. As noted above, the overall traumatic fatality rate among workers in small businesses was 9.7 per 100,000 person years, compared with 2.7 per 100,000 person years in larger businesses. Odds ratio of 3.62 (95% CI = 2.3–4.9).

3.1. Time registered with WCB

For small businesses, the mean length of time that the business with the fatal incident had been registered with WCB was 12 years (± 10 years), compared to 20 years (± 13 years) for larger businesses ($p < 0.001$).

3.2. Worker duration of employment

Workers employed by small businesses had been employed for shorter duration than those employed by larger businesses (Fig. 2). Average duration of employment for small businesses was 6 years (± 9 years), whereas average duration of employment for larger businesses was 8 years (± 10 years) ($p < 0.03$).

The number of fatalities that occurred when duration of employment was less than one month, or even less than one week, was more significant. Among small businesses, nearly 9% of fatalities occurred within 1 week of employment, whereas among larger businesses the incidence of fatalities within 1 week was only half that. Among small businesses, another 4% of fatalities occurred

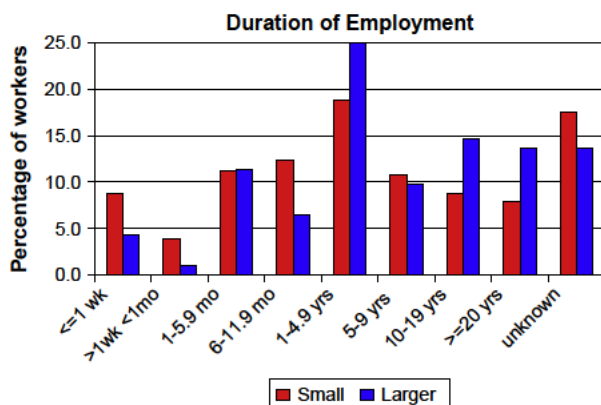


Fig. 2. Duration worker had been employed by this employer. Note that the x-axis is non-linear.

between 1 week and 1 month of commencement of employment, whereas for larger businesses this was only 1% ($p < 0.002$).

3.3. Traumatic fatality rates by industry sector and accident type

To help focus on the highest risk sectors, fatality rates were determined by industry sector (Fig. 3), and to help focus on the highest risk activities, fatality rates were determined by accident type (Fig. 4). These data show that primary industries (fishing and forestry), transportation and warehousing (trucking), general construction, vehicular incidents, and falls to lower level warranted further investigation.

3.3.1. Primary Resources

There were no significant differences in pattern between fatalities in small ($n = 68$) vs. larger ($n = 39$) businesses in this sector. Overall, the most common accident types were “struck by” (struck by a moving object other than a vehicle) at 26% (mostly loggers),

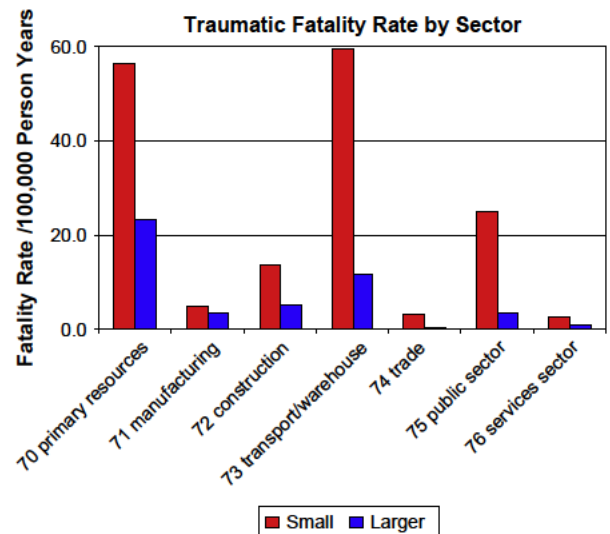


Fig. 3. Fatality rate by industry sector, showing high rates in primary industries and transportation.

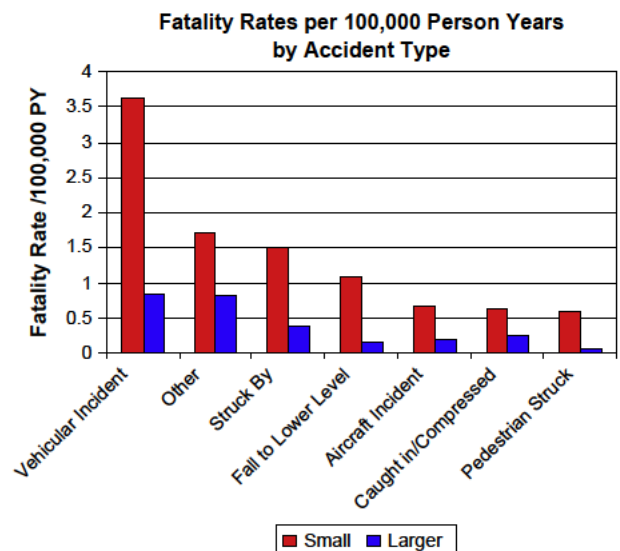


Fig. 4. Fatality rates per 100,000 person-years by accident type, showing the predominance of vehicular incidents.

and vehicular incidents (25%), water/boat incidents (12%), and aircraft crashes (11%).

3.3.2. Transportation/Warehouse

In the transportation and warehousing sector, causes of fatalities were similar in small ($n = 76$) and larger ($n = 31$) businesses. There were some differences: for small businesses, vehicular incidents accounted for 55%, followed by “struck by” incidents at 12%, and aircraft crashes at 9%. In larger businesses, 45% were vehicular incidents, 29% were from aircraft crashes, and 3% were from “struck by” incidents.

3.4. Vehicular incidents

The most common cause of a traumatic fatality was a road vehicle incident or crash (excluding aircraft, boats, and trains). Among workers in small businesses, 87 of 243 (36%) fatalities were the result of vehicular incidents, whereas among larger businesses, 44 of 179 (25%) fatalities were the result of vehicular incidents ($p = 0.0001$).

3.4.1. Location

The majority of vehicular fatalities occurred on highways. The next most common location was a logging road (Table 1). Logging roads were a more common location for small businesses, since all log hauling fatalities were among workers employed by small businesses.

3.4.2. Occupation

Vehicular fatalities were divided by whether driving was the worker's primary occupation, part of their regular employment but not their primary occupation (e.g., travelling sales, plumbers, or home care providers), or not part of their regular employment (e.g., lawyers or secretaries). Although the majority of fatalities were among professional drivers (61% in small businesses, 43% in larger businesses), almost one third (28% and 32% respectively) were among workers for whom driving was not a usual part of their job.

3.4.3. Drug and alcohol use

Drug and alcohol intoxication data were assessed where data were available (i.e., a toxicology screen was conducted at autopsy and included in the coroner's report). Vehicular deaths where toxicology information was available were due to, or contributed to, by drugs or alcohol in 15 of 45 (33%) incidents in small businesses and 8 of 26 (31%) incidents in larger businesses. Analysis by intoxicating agent is given in Table 2.

Table 1
Location of vehicular crashes by business size.

	Small businesses ($n = 87$)	Larger businesses ($n = 44$)
Highway	51 (59%)	28 (64%)
Logging road	20 (23%)	2 (5%)
Off-road	3 (3%)	1 (2%)
City	1 (1%)	4 (10%)
Unknown	12 (14%)	9 (20%)

Table 2
Analysis of drug or alcohol use by intoxicating agent in vehicular incidents.

	Toxicology negative	Toxicology positive				
		Alcohol alone	Cannabis alone	Cocaine alone	Other drugs alone	Combination of drugs or alcohol
Smaller businesses	30 (67%)	3 (7%)	4 (9%)	2 (4%)	2 (4%)	4 (9%)
Larger businesses	18 (69%)	1 (4%)	3 (12%)	1 (4%)	1 (4%)	2 (8%)

3.4.4. Seat belt use

Seat belt use was evaluated where data were available, either from police reports or from evidence at autopsy. Seat belt use data where deemed “irrelevant” and excluded if seat belt use would not have affected the outcome, such as when the driver remained in the vehicle but there was no survivable space or the vehicle burned immediately. Among small business workers, 14 (33%) had their seat belt on and 28 (67%) did not, while among larger business workers, 9 (47%) had their seat belt on and 10 (53%) did not.

3.4.5. Log hauling vehicular incidents

Thirteen of all vehicular fatalities were log hauling workers. These 13 workers were all employed by small businesses and accounted for 4 of those driving under the influence of drugs or alcohol: 3 (23%) were positive for cannabis (2 in combination with other drugs) and 1 (8%) was positive for another drug contributing to the incident. None were positive for alcohol. Thus, a total of 31% of log hauling fatalities had recreational drug use as a contributing factor.

Among these 13 fatalities, seat belt use was documented in 8, and not one was wearing a seat belt. Thus documented seat belt use was 0% among log hauling drivers.

3.4.6. Fault

Fault was evaluated by referring to coroners' reports and police reports. If the incident was a single vehicle incident, fault was assigned to the driver, independent of the conditions. Workers who were not at fault were passengers or were involved in an incident in which another vehicle was officially reported to be at fault. Among small businesses, 54 of 87 (62%) drivers were at fault compared with 24 of 44 (54%) drivers for larger businesses.

3.4.7. Run over by own vehicle

Twelve fatalities (9% of all vehicular incident fatalities) occurred when the driver was run over by his or her own vehicle: 6 among the 87 workers killed in vehicular incidents for small businesses (7%), and 6 among the 44 workers killed in vehicular incidents for larger businesses (14%).

3.5. Falls from elevation

Of the 20 fatalities in small businesses resulting from falls from elevation where some form of fall protection was required, there were data available for 13 incidents: 12 (92%) were not using personal fall protection and 1 (8%) was using personal fall protection. Of these 20 fatalities, 8 occurred where there was no fall protection available. Of the 4 fatal falls among workers employed by larger businesses, there was information on 3: all 3 (100%) were noted not to be using personal fall protection equipment. Among these 4 falls, 2 did not have adequate fall protection such as guardrails or use of fall protection or restraint.

3.6. Contributing pre activity factors

Pre activity factors include written work procedures, hazard analyses, training, and supervision. It was difficult to determine which activities should have had written work procedures, hazard

analyses, more training, or greater supervision. For example, with respect to written work procedures, there were activities such as regular vehicle operation, for which written work procedures clearly are not required, and entry into a confined space, for which written work procedures clearly are required. However, there were many activities where the need for written work procedures was less clear. For example, if a fishing boat capsized or a farmer slipped off a stack of hay bales, should there have been written work procedures? Thus, we only report here on those fatalities where some causative value was attributed to the absence of written procedures or failure to follow procedures; inadequate hazard analyses or poor equipment maintenance; or inadequate training, education, or supervision.

3.6.1. Written work procedures

Among small businesses, there were 50 (20%) fatalities where there was documentation of non-existent or inadequate work procedures, and 7 (3%) fatalities where existing work procedures were not followed. Among larger businesses, there were 43 (23%) fatalities where there was documentation of non-existent or inadequate work procedures, and 18 (10%) fatalities where existing work procedures were not followed.

3.6.2. Hazard analysis or equipment poorly maintained

Comments on hazard analysis (or lack thereof) or poorly maintained equipment were only present in 18 of the 422 cases. Among small businesses, there were 6 clearly documented cases of poor hazard analysis or poor equipment maintenance as causative factors; among larger businesses, there were 12.

3.6.3. Training and education

Among small businesses, 6 incidents were cited as involving inadequate training and education; among larger businesses, 8 were cited. Two larger businesses were noted to have extensive training and education programs related to the task.

3.6.4. Supervision

Poor supervision was cited in exactly the same instances as poor training and education for the same 6 small businesses and 8 larger businesses.

3.7. Contributing physical factors

The majority of incidents where there were comments on guarding were of the following types:

“Caught in or compressed by running equipment”, “struck by”, or “fall to lower level”.

Among small businesses, there were 24 comments on guarding, including: no guarding present in 18 (66%); inadequate guarding in 4 (17%); and guarding removed or bypassed in 2 (8%). Among larger businesses, there were 21 comments on guarding, including: no guarding present in 9 (43%); inadequate guarding in 9 (43%); guarding removed or bypassed in 1 (5%); and guarding noted to be present in 2 (10%). The extent of guarding documented to be present was significantly different between small and larger businesses ($p = 0.002$).

Among small businesses, there were 3 comments on lockout: 1 was locked out, 1 was overridden, and 1 was not locked out. Among larger businesses, there were 12 comments on lockout: 5 had inadequate lockout, 6 had no lockout, and 1 was bypassed.

3.8. Alcohol and drugs as contributing factors

Coroners' reports were available for 226 of the 422 (54%) traumatic fatalities. Of these, 129 (53%) were small business traumatic fatalities and 97 (54%) were larger business fatalities. The reports included toxicology data that indicated results for drugs and alcohol where they determined the intoxicating agent to have either impaired function (Table 3) or caused/contributed to the incident (Table 4). Although the majority of toxicology screens were negative (70% overall), a significant percentage of fatalities had alcohol

Table 3

Analysis of drug or alcohol by intoxicating agent at levels that would have impaired function. (Percentages do not add up to 100% because some workers had more than one substance documented.)

	Toxicology negative	Toxicology positive				Toxicology not reported
		Alcohol	Cannabis	Cocaine	Other	
Small business	92 (71%)	10 (8%)	15 (12%)	6 (5%)	4 (3%)	7 (5%)
Larger business	66 (68%)	10 (10%)	11 (11%)	4 (4%)	0 (0%)	8 (8%)

Table 4

Drugs or alcohol determined to have either caused or contributed to the incident by sector and industry.

Sector	Industry	Small (n = 33)		Larger (n = 22)	
		#	%	#	%
70 Primary resources	Total	10	30	4	18
	Forestry (7030)	7		3	
	Fishing (7020)	3		1	
71 Manufacturing	Total	1	3	5	23
	Oil refining, recycling, storage tanks (713019)	0		2	
72 Construction	Total	5	15	3	14
	Land clearing, excavation (721031)	2		2	
	General construction (7210, excluding 721031)	2		0	
73 Transportation	Total	11	33	6	27
	General trucking (732019)	4		2	
	Log hauling, heli-logging (732043 and 732044)	5		0	
	Tug/barge hands (732008)	1		2	
74 Trades	Total	2	6	1	0.5
75 Public	Total	0		1	0.5
76 Service	Total	4	12	1	0.5
84 Government	Total	0		1	0.5

or cannabinoids at levels that would have impaired function as documented by the coroner.

Of the 37 positive toxicology results in small businesses, 33 were determined as causing or contributing to the incident while 4 were not. In larger businesses, of the 31 that had positive results, only 22 were determined to have either caused or contributed to the fatal incident, and 9 were not.

3.9. Contributing factors in specific industries

3.9.1. Fishing and tug/barge hands

There were 9 fatalities among fishers and barge hands working for small businesses. Toxicology information was available for 8 of the fatalities. Of these, 3 (38%) had high alcohol levels and 1 (13%), a barge hand, was positive for cocaine. One was documented as not having worn a PFD.

There were 13 fatalities among fishers and barge hands working for larger businesses. There were no data on 2 of these because the boat capsized and the bodies were not recovered. Among the remaining 11, 3 were documented as not wearing PFDs. Coroners' reports were available on 5 of the 11, and 3 (60%) had high alcohol levels.

The 6 fatalities in which alcohol intoxication was a contributing factor represented 30% of all fatalities with documented alcohol intoxication in B.C., whereas fishers and barge hands constituted only 5% of all fatalities (OR = 9.8). This indicates that fishers and barge hands were 10 times more likely to have been impaired by alcohol than workers who died in other industries. Because fishing businesses do not document person years (unlike other businesses), it was not possible to determine the percentage of all person years represented by fishers and barge hands from our data.

3.9.2. Forestry

There were 38 traumatic fatalities among forestry workers employed by small businesses. Toxicology screen data were available for 23 of them: 5 (22%) were positive for cannabis, 2 (9%) were positive for cocaine and cannabis (a total of 31%), and 16 (69%) were negative. There were no instances of alcohol intoxication.

There were 17 traumatic fatalities among forestry workers employed by larger businesses. Toxicology screen data were available for 10 of them: 2 (20%) were positive for cannabis, 1 (10%) was positive for codeine (a total of 30%), and 7 (70%) had a negative toxicology screen. There were no instances of alcohol intoxication.

The 10 forestry fatalities with documented recreational drug use constituted 25% of all 40 fatalities in the 2003–2007 period in which recreational drug use was documented, whereas loggers constituted less than 12% of fatalities involving recreational drug use. Odds ratio of 2.1 (95% CI = 1.5–2.7).

3.9.3. General trucking

Of the 38 traumatic fatalities in small general trucking companies, there were drug/alcohol data or comments in the coroners' reports for 19 of them: 1 (5%) report of cannabis, 1 (5%) of cocaine, 1 (5%) of methamphetamine, and 1 (5%) of alcohol, while 14 (74%) fatalities had documented negative toxicology screens and 1 was documented as "irrelevant." Thus, 4 of 19 (21%) were driving under the influence of drugs or alcohol. Seat belt use was documented in 9 cases: 2 (22%) had seat belts and 7 (78%) had no seat belt.

Of the 13 traumatic fatalities in larger general trucking companies, there were drug/alcohol use data for 7 of them: 1 (14%) report of cannabis and 1 (14%) of alcohol and cannabis, while 5 (63%) fatalities had documented negative toxicology screens. Thus, 2 out of 7 (29%) were driving under the influence of drugs or alcohol. Seat belt use was documented in 4 cases: 2 (50%) had seat belts and 2 (50%) had no seat belt.

3.9.4. General construction

Land clearing, blasting and avalanche control, and oil and gas pipeline construction were excluded from general construction fatalities. There were 29 fatalities in small general construction businesses and 6 among larger businesses. Coroners' reports were available for 15 (52%) and 2 (33%), respectively. Among small business workers, there was 1 (7%) case of alcohol intoxication and 1 (7%) case of cannabis use. These incidences are lower than in high use occupations, such as fishing (38% alcohol intoxication) and logging (22% cannabis use).

There were 9 fatalities among small business general construction workers resulting from vehicular incidents, plane crashes, or gunshots. Of the remaining 20 fatalities, 13 (65%) were not using fall protection as required, and there was no guarding in 9 (45%) cases where there should have been. There were specific comments on 4 fatalities: 1 that the ladder used was unsafe and supervision was ineffective; 1 that there had been no hazard assessment; 1 that there were no work procedures, training, or supervision; and 1 that safe work procedures had been ignored.

Among workers in larger businesses, 1 fatality was due to a vehicular incident. Of the remaining 5 cases, 1 (20%) was attributed to incorrect use of fall protection; 1 to lack of training and supervision (20%); and 2 to not following proper procedures (40%).

4. Discussion

The discrepancy in fatality rates between small and larger businesses previously reported by others (Mendeloff et al., 2006) and noted by us is substantiated in this study. The results of the study suggest that small businesses do register with WCB. The data does not indicate that small businesses are poorer at providing written work procedures, hazard analyses, overall training and education, or supervision. However, the data does clearly indicate that workers in small businesses were at twofold risk of a fatal injury within the first week of employment, and fourfold risk of fatal injury within the first month of employment compared with new workers employed by larger businesses. This is consistent with our previous report of the time pattern of serious injuries among young workers (Holizki et al., 2008).

The difference in risk during the early stages of employment may be the result of small businesses not being as focused as larger businesses on providing new worker orientation and training, or perceiving that they do not have time to provide extensive orientation and training. The lack of documentation of these safety oriented activities in this study may be more a function of the reporting approach of the coroner when dealing with small vs. larger businesses. The need for written work procedures, hazard analyses, training and education of new employees, and supervision of all employees warrants reinforcement, particularly for small businesses.

4.1. Alcohol use among fishers

The fatality rate among fishers is extremely high and is generally reported to be on the order of 125–250 per 100,000 workers per year. This compares with an overall fatality rate in other industries of less than 4 per 100,000 workers per year. There are reports from around the world indicating that fishing fatalities are associated with alcohol abuse, including reports from both coasts of the United States (Day et al., 2010; Centers for Disease Control and Prevention, 2008), Alaska (Lucas and Lincoln, 2007), Denmark (Laursen et al., 2008), and Australia (O'Connor and O'Connor, 2006). The international scope of this problem suggests that it is a cultural issue in the fishing community, rather than a localized issue. This presents the possibility for an international program aimed at addressing this problem, although the obstacles to

disseminating information to workers who are generally living in small or remote communities and with multi generational behavior patterns may be difficult to overcome.

4.2. Cannabis use among forestry workers

We found a high incidence of cannabis use among fatally injured forestry workers (20–30%) and comparatively low rates among other fatally injured workers (<4%). In an early study (1979–1986), Alleyne et al. (1991) found that cannabis use was documented in 10 of 459 (approximately 2%) fatally injured workers in Alberta, Canada, where the major industries are farming and oil and gas. Shannon et al. (1993) found that, in Ontario, where the major industry is manufacturing, over the period 1986–1989, cannabis was present in 17% of fatally injured workers for whom toxicology tests were conducted (3.9% of all 470). The discrepancy between these reports and ours may reflect several factors—the period studied (cannabis use may have increased over time), the industries involved, or the different work environment cultures.

Cannabis is known to impair psychomotor and cognitive function (Solowij and Grenyer, 2002). Workers may not know or understand that although cannabinoids do initially dissipate from the brain and bloodstream within hours, they are absorbed by the fat-containing tissues, from which they are slowly released back into the bloodstream and brain over a period of many days (Johansson et al., 1989; Nahas and Latour, 1992). Among heavy marijuana users, serum levels consistent with impairment (Ramaekers et al., 2006) may persist for up to 8 days (Grotenhermen, 2003).

4.3. Seat belt use among fatally injured drivers

In our study, 31% of fatal injuries to workers occurred in vehicle incidents. This is consistent with other reports, such as that described by Cohen et al. (2006), which indicates that 33% of work related deaths were in vehicle incidents. In our study, seat belts were worn by only 38% of those for whom seat belt use was documented. This is much lower than the overall provincial data on seat belt use, which indicates that 94.8% of car and light truck occupants wear seat belts (Insurance Corporation of British Columbia, 2009). Since seat belt use reduces the risk of death by 50–60%, over 38 lives might have been saved if seat belts had been used. Lack of seat belt use is also highlighted as a cause of preventable occupational fatalities in a study by Brodie et al. in Australia 2009 and a study among oil and gas workers by the Centers for Disease Control and Prevention (2008).

4.4. Fall protection among construction workers

We found that fatal injuries from falls from heights were associated with workers not having fall prevention or fall arrest devices. Fatalities from falls among construction workers have also been identified as a concern by others. Jaesin et al. (2009) found that commercial roofers (usually larger businesses) were more likely to use and enforce the use of fall protection, compared with residential roofers (usually small businesses). They suggested introducing policy interventions or regulations. Kaskutas et al. (2010) developed a training program particularly for apprentices, based on an extensive needs assessment. They found that the use of experiential adult learning techniques was helpful and resulted in positive feedback from trainees, although the report has not been followed by a comparative study to evaluate the effectiveness of the program.

4.5. Gun shots, weapon use, violence

We present this information for comparison with others' data only. In the 5-year period of this study, there were only 4 (<1%) violent deaths: 2 gunshots, 1 stabbing, and 1 physical assault, whereas

for 2010, the United States reported that 18% of their workplace fatalities were due to violence (Bureau of Labor Statistics, 2011). In Washington State, between 1998 and 2002, there were 29 work related homicides out of 437 deaths (7%) (2).

5. Limitations

The principal limitation of this study is the retrospective nature, which means that the study was vulnerable to database errors, such as coding errors, and of necessity relied on somewhat inconsistent investigation techniques and reporting, as well as inconsistent availability of coroners' data. However, the potential for coding errors was mitigated by subsequent manual review of each file. Denominator data is based on the total payroll for each CU or group of CUs (i.e., by industry) rather than on occupation, and the average person-years is estimated from the average income within that CU. For example, the general construction CU would include support activities such as administration, while other CUs may include construction work that supports their main business. Due to the voluntary nature of coverage for self-employed workers, proprietors, their spouses, and partners of unincorporated businesses, both injury data and denominator data for those who have not applied for coverage have not been included. Finally, there were some significant gaps in data, with no relevant data to contributing factors or possible prevention available on approximately 5–10% of claims.

6. Conclusions

It is concluded that, in the present data set, there were several patterns that were associated with fatalities, and would therefore warrant prevention efforts. Loggers tend to use recreational drugs, while fishers and barge hands tend to use alcohol to the point of intoxication. Seat belt use is not prevalent among truckers and may be virtually absent among log hauling truckers. Many general construction workers do not wear the necessary fall protection. As well, operators of equipment who leave their vehicles to assess, repair, or investigate their vehicle can be run over by their own equipment.

Recommendations for injury prevention strategies include the following target areas: the need for orientation, education, training and effective supervision of new workers, particularly for small businesses; the culture of marijuana use in the logging industry, which could be addressed with effective supervision and education on hazards of marijuana use as well as pharmacokinetics; the culture of alcohol use and abuse in the fishing industry, which would be addressed through educating employers to provide adequate supervision and possibly enforcement (in cooperation with other regulatory agencies); use of fall protection in the construction industry, to address the culture of negative regard for the value of fall protection relative to the perceived inconvenience of using it; and use of seat belts by all drivers, including not only logging truck drivers and general drivers, but also those who drive as a casual part of their job.

References

- Alleyne, B.C., Stuart, P., Copes, R., 1991. Alcohol and other drug use in occupational fatalities. *J. Occup. Med.* 33 (4), 496–500.
- Brodie, L., Lyndal, B., Elais, I.J., 2009. Heavy vehicle driver fatalities: learnings from fatal road crash investigations in Victoria. *Accid. Anal. Prev.* 41 (3), 557–564.
- Buckley, J.P., Sestito, J.P., Hunting, K.L., 2008. Fatalities in the landscape and horticultural services industry, 1992–2001. *Am. J. Ind. Med.* 51 (9), 701–713.
- Bureau of Labor Statistics, US Department of Labor, 2011. National census of fatal occupational injuries in 2011 (preliminary results).
- Centers for Disease Control and Prevention (CDC), 2008a. Commercial fishing fatalities—California, Oregon, and Washington 2000–2006. *MMWR Morb. Mortal Wkly. Rep.* 57 (16), 426–429.

- Centers for Disease Control and Prevention (CDC), 2008b. Fatalities among oil and gas extraction workers—United States, 2003–2006. *MMWR Morb. Mortal Wkly. Rep.* 57 (16), 429–431.
- Cohen, M.A. et al., 2006. Work-related deaths in Washington State, 1998–2002. *J. Saf. Res.* 37 (3), 307–319.
- Day, E.R. et al., 2010. Utilizing United States Coast Guard data to calculate incidence rates and identify risk factors for occupational fishing injuries in New Jersey. *J. Agromed.* 15 (4), 357–362.
- Grotenhermen, F., 2003. Pharmacokinetics and pharmacodynamics of cannabinoids. *Clin. Pharmacokinet.* 42 (4), 327–360.
- Holizki, T., McDonald, R., Foster, V., Guzmicky, M., 2008. Causes of work-related injuries among young workers in British Columbia. *Am. J. Ind. Med.* 51 (5), 357–363.
- Insurance Corporation of British Columbia, 2009. The top five facts you should know about seatbelts.
- Jaesin, S., Dong-Chul, S., Sang, D.C., 2009. Comparison of risk factors for falls from height between commercial and residential roofers. *J. Saf. Res.* 40, 1–6.
- Johansson, E. et al., 1989. Terminal elimination half-life of Δ^1 -tetrahydrocannabinol (Δ^1 -THC) in heavy users of marijuana. *Eur. J. Clin. Pharmacol.* 37 (3), 272–277.
- Kaskutas, V. et al., 2010. Carpenter's Joint Apprenticeship Program Instructor Team. Changes in fall prevention training for apprentice carpenters based on a comprehensive needs assessment. *J. Saf. Res.* 41 (3), 221–227.
- Laursen, L.H., Hansen, H.L., Jensen, O.C., 2008. Fatal occupational accidents in Danish fishing vessels 1989–2005. *Int. J. Inj. Contr. Saf. Promot.* 2008 15 (2), 109–117.
- Lucas, D.L., Lincoln, J.M., 2007. Fatal falls overboard on commercial fishing vessels in Alaska. *Am. J. Ind. Med.* 50 (12), 962–968.
- Mendeloff, J., Nelson, C., Ko, K., Haviland, A., 2006. Small businesses and workplace fatality risk: an exploratory analysis.
- Nahas, G.G., Latour, C., 1992. The human toxicity of marijuana. *Med. J. Australia* 166, 495–497.
- O'Connor, P.J., O'Connor, N., 2006. Work-related maritime fatalities. *Accid. Anal. Prev.* 38 (4), 737–741.
- Peek-Asa, C., Erickson, R., Kraus, J.F., 1999. Traumatic occupational fatalities in the retail industry, United States, 1992–1996. *Am. J. Ind. Med.* 35 (2), 186–191.
- Ramaekers, J.G. et al., 2006. Cognition and motor control as a function of Delta9-THC concentration in serum and oral fluid: limits of impairment. *Drug Alcohol Depend.* 85 (2), 114–122.
- Rosenman, K.D. et al., 2006. How much work-related injury and illness is missed by the current national surveillance system? *J. Occup. Med.* 48 (4), 357–365.
- Shannon, H.S., Hope, L., Griffith, L., Stieb, D., 1993. Fatal occupational accidents in Ontario, 1986–89. *Am. J. Ind. Med.* 23 (2), 253–264.
- Solowij, N., Grenyer, B.F.S., 2002. Long term effects of cannabis on psyche and cognition. In: Grotenhermen, F., Russo, E. (Eds.), *Cannabis and Cannabinoids. Pharmacology, Toxicology, and Therapeutic Potential*. Haworth Press, Binghamton, NY, pp. 299–312.