

# Logger Safety Initiative: Findings from the initial safety consultations

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## EXECUTIVE SUMMARY

To improve the safety culture of the manual logging industry throughout Washington State, private landowners, the Washington Contract Loggers Association, logging companies, the Washington Department of Natural Resources, and the Washington Department of Labor & Industries (L&I) partnered to create the Washington State Logger Safety Initiative (LSI). Participation in LSI is voluntary. Employers who elect to participate are required to undergo an annual consultation with the L&I Division of Occupational Safety and Health (DOSH). During the consultation, DOSH evaluates each cutter and logging side to document existing hazards and evaluate the employer's safety and health program. Here we present findings from consultations conducted for initial entry into the LSI program.

### *Key Findings*

#### Safety and Health Program Assessment

- Of the 105 employers who received Safety and Health Program Assessment (SHPA) scores, most performed well: 10 (9.5%) received a perfect score and 77 (73.3%) needed only minimal improvement on one or more items in the assessment.
- Injury rates generally correlated with SHPA scores, with higher rates of traumatic injuries among employers with poorer scores, and lower rates of traumatic injuries among employers with the best scores.
- Among employers with lower SHPA scores, rates of traumatic injuries did not change from the years before the assessment to the years after.

#### Hazards

- Hazards were identified at 90% of employers, and serious hazards were identified at 74% of employers.
- The most common serious hazards involved chainsaws (29% of employers) and PPE (28% of employers).
- Rates of traumatic injuries were slightly higher among employers with the greatest number of hazards.

### *Conclusion*

Even among the employers who joined LSI – a group with low injury rates relative to employers who declined to participate in LSI – there exists a range of safety performance. Although logging hazards were documented in nearly every consultation, no hazard was present at every site, suggesting that employers can control whether logging hazards are present in their work environment. There is room for improved workplace safety in manual logging, which should lead to lower injury rates among the risk class.

## **INTRODUCTION**

Logging, specifically manual (non-mechanized) logging, is among the most dangerous occupations in the country. To improve the safety culture of the manual logging industry throughout Washington State, private land owners, the Washington Contract Loggers Association, logging companies, the Washington Department of Natural Resources, and the Washington Department of Labor & Industries (L&I) partnered to create the Washington State Logger Safety Initiative (LSI). Specifically, LSI aims to promote workplace safety, decrease the occurrence and severity of work-related injuries, improve the accuracy of reporting, and reduce workers' compensation costs. To accomplish this, LSI established standards for worker training, performance, and supervision, implemented processes for certifying company safety programs and auditing company records. Employer participation in LSI is voluntary. Enrollment began in 2014 and continues through today.

LSI requires participating employers to undergo an initial consultation with the L&I Division of Occupational Safety and Health (DOSH) before an employer can progress to higher tiers within the program. During the consultation, DOSH evaluates each cutter and logging side to document existing hazards and complete a Safety and Health Program Assessment (also known as L&I's Form 25). Employers undergo consultations annually to maintain enrollment in the LSI program. Here we present findings from consultations conducted for initial entry into the LSI program.

## **METHODS**

We summarized scores from the Safety and Health Program Assessments (SHPA) survey, and the number and type of hazards identified at the initial consultation. We compared traumatic injury claim rates (accepted claims) two years before and two years after each LSI employer's initial consultation. We evaluated SHPA survey scores, hazards, and injury rates by employer characteristics including geographic region, full time equivalents (FTE) in manual logging, length of time in business, length of time employing manual loggers, and average number of quarters employees worked for the employer (workers' average length of employment with the employer).

A workers' compensation account denoted an employer. Manual logging work hours and traumatic injury claims were identified from the Washington state funded workers' compensation data using the Washington Workers' Compensation risk classification system (codes 5001-03, 5551-03, 5552-03, 5553-03). Hours were expressed as FTE using the conversion factor 1 FTE = 2000 hours. We defined injuries as accepted claims with an injury date within two years of the employer's initial LSI consultations that were classified as traumatic injuries based on the Occupational Injury and Illness Classification System (v1.01), coded from the incident description on the claim's initial Report of Industrial Injury or Occupational Disease. Accepted claims for traumatic injuries were selected as the injury outcome because they were considered the most likely to be immediately impacted by the LSI program. Non-traumatic injuries and illnesses generally present after a longer period of work exposure and thus, would require a longer intervention period before apparent reductions in incidence.

LSI initial consultations were identified from among all DOSH consultation requests through a combination of key words in the request text and proximity of the consultation request date to the employer's date of entry into the LSI program.

The SHPA survey consisted of 25 items grouped into six sections and was designed to capture the degree to which the worksite met a series of safety and health conditions. DOSH consultants assigned each item a score ranging from zero to three, with lower scores reflecting a greater need for improvement. Not all items were assessed at each consultation. We calculated summary scores for each employer by summing the scores of each item assessed and dividing by the maximum score for those same items. When multiple SHPA tools were completed for a single employer, the lowest score for each item assessed was used for the employer's item score, reflecting a need for improvement on that item. Summary scores are displayed as a percentage. A summary score of 100% reflects a perfect score for all items assessed, and may have been awarded in instances where fewer than 25 items were assessed. Because DOSH phased out use of the SHPA tool during the study period, SHPA scores were not available for all employers.

DOSH consultants refer to specific Washington Administration Codes when identifying workplace hazards, generally under WAC 296-54: Safety Standards—Logging Operations. In consultation with a DOSH consultant, we grouped codes a priori to reflect 16 broad categories of logging hazards, plus an 'Other' category to encompass all other codes.

DOSH consultation and workers compensation data were extracted from L&I databases in March 2018.

## **RESULTS**

### ***DOSH Consultations***

Initial consultations were identified for 145 employers; each account underwent between 1 and 6 consultation visits to assess all logging sides. Initial consultation visits were conducted between September 2013 and September 2017; two-thirds were conducted in 2014.

### ***Safety and Health Program Assessment***

Of the 105 employers who received Safety and Health Program Assessment (SHPA) scores, most performed well: 10 (9.5%) received a perfect score and 77 (73.3%) needed only minimal improvement on one or more items in the assessment.

The highest item scores were awarded for "Proper workplace housekeeping practices are followed", where 88% of employers received a '3' indicating no improvement needed. The two lowest item scores were in the Hazard Surveys section: "Safety and health inspections of facilities and equipment are performed regularly and all deficiencies are corrected in a timely manner", and "Comprehensive surveys have been conducted of all tasks and processes to identify potential hazards and necessary protective measures". Over two-thirds of employers needed some improvement (either major or minor) for one of

these two items. Only two zeroes (the lowest possible score) were assigned to an item in any of the evaluations. Table 1 presents scores by survey item (tables start on page 7).

Table 2 presents scores by survey section and survey total, and injury rates by section scores. Employers scored highest on the Management and Leadership section. The average score was 92.2% and three out of five employers earned a perfect score of 100% on all items assessed within the section. The Hazard Surveys section had the lowest average score at 81.5%. Total survey scores averaged 86.6% and ranged from 61.3% to 100%. Less than ten percent of employers earned a perfect score for all survey items assessed.

In general, employers with perfect scores on survey sections had lower rates of traumatic injuries in the two years before the initial LSI consultation compared with employers who needed improvement (although differences were not statistically significant at  $p < 0.1$ ). In the two years after the initial LSI consultation, differences in injury rates widened between the perfect and less-than-perfect employers. In the two years after the initial LSI consultation, employers with less-than-perfect total scores had a traumatic injury rate of 31.6 per 100 FTE that was 81% higher than the rate among employers with perfect total scores of 17.4 traumatic injuries per 100 FTE.

Injury rates tended to decrease with higher (i.e., better) SHPA scores (Table 3), with the lowest injury rates observed among employers with perfect SHPA total scores and the highest injury rates observed among employers with the worst SHPA total scores. However, most rates differences by SHPA total score were slight. Injury rates among employers with perfect SHPA scores were the only rates significantly different than rates among other employers.

Higher (i.e., better) total SHPA survey scores were associated with fewer serious hazards identified during the initial consultation ( $r_s = -0.60$ ,  $p < 0.0001$ ), and longer employee tenure ( $r_s = 0.21$ ,  $p = 0.03$ ). Scores were not associated with FTE or number of employer-reported quarters of manual logging work hours. Table 4 presents Spearman correlation coefficients for SHPA total scores and select employer characteristics.

### ***Hazards Identified***

Initial LSI consultations identified workplace hazards at 131 of the 145 employers, and serious or imminent hazards at 107 employers. Four or more hazards were identified in over half of the visited employers (range = 0 – 36 hazards), while two or more serious hazards were identified in over half of the employers (range = 0 – 20 serious hazards).

Table 5 presents traumatic injury rates by number of hazards. The highest injury rates, both before and after the initial LSI consultation were estimated for employers with greatest number of hazards, although the differences were not statistically significant.

Table 6 presents the number of employers identified to have one or more hazards by hazard type group. The most common hazards involved logging machines, identified at 37.2% of employers. These included: a safe and adequate means of access and egress to all parts of logging machinery where persons must

go must be provided and maintained in a safe and uncluttered condition (33 employers); and each machine must be equipped with guarding to protect employees from exposed moving elements (22 employers). Logging machine hazards in 72% of employers were considered serious. Hazards involving guy lines and anchors were most often considered serious: guy line hazards in 92% of employers were considered serious, including one hazard considered imminent.

The most common serious hazards involved Chainsaws (29.0% of employers) and Personal Protective Equipment (PPE) (28.3% of employers). Common serious chainsaw hazards included failure: to hold a chain saw with the thumbs and fingers of both hands encircling the handles during operation unless the employer demonstrates that a greater hazard is posed by keeping both hands on the chain saw in a specific situation (28 employers); and to start the chain saw on the ground, log or where otherwise firmly supported – drop starting a chain saw is prohibited (18 employers). Common serious PPE hazards included inadequate head protection (23 employers), and eye and face protection (13 employers).

### ***Traumatic injury rates***

Based on multivariable regression tree models, traumatic injury rates two years after the initial LSI consultation were associated with the traumatic injury rate two years before the consultation, FTE, length of time the employer reported manual logging hours, SHPA survey score, and serious hazards involving logging machines (Figure 1).

The lowest injury rates 2 years after the initial consultation were:

- 13.0 claims per 100 FTE, among employers with a low rate of traumatic injuries before the consultation, more than 1.2 manual logging FTE annually, and a high SHPA survey score.

The highest injury rates 2 years after the initial consultation were:

- 60.3 claims per 100 FTE, among employers with the highest rates of traumatic injuries before the consultation.
- 54.4 claims per 100 FTE, among employers with low rates of traumatic injuries before the consultation and less than 1.2 manual logging FTE annually.

## DISCUSSION

Logging sites contain substantial workplace hazards in violation of Washington law. Some of the most common hazards are also the most serious. These hazards can be remediated. Intervention efforts should prioritize employers with the greatest number of hazards with the goal of lowering their traumatic injury incidence to rates comparable among employers with fewer hazards.

SHPA survey scores can differentiate safer employers from less safe employers. The employers with a perfect SHPA score had a significantly lower traumatic injury claims rate in the two-year follow-up period. While this result demands additional study, it suggests the possible use of the SHPA assessment in insurance underwriting or other safety incentive programs.

Ideally, we would hope employers could use the SHPA assessment to identify areas of their safety program needing improvement, make changes to their programs, and subsequently experience a reduction in injuries. That does not appear to have happened among LSI employers. Perhaps the SHPA survey and consultation does not sufficiently educate employers on steps they can take to create safer work environments. Perhaps the system – LSI or L&I – fails to motivate employers to improve workplace safety beyond what they already achieve. There may be barriers to workplace safety not identified here and not addressed in the consultations that impede improvement in injury rates. We did not assess SHPA surveys administered during the consultations that occur annually after the initial LSI consultation (due to discontinued use of the form, few would have been conducted). Thus, we were unable to assess whether employers improved their scores over time, and whether injury rates correlated with changes in scores.

In addition to measures collected during the initial LSI consultation, other employer characteristics appear associated with traumatic injury rates. Employers with high traumatic injury rates in the preceding the consultation continued to experience high injury rates in the years following the consultation. Employers with the fewest manual logging FTE also saw high injury rates in the years after the initial consultation, especially among those who had reported manual logging activity for more than three years. Employers with few manual logging FTE may undertake different jobs – with greater risk of injury – than employers with a larger manual logging workforce. High injury rates among employers with few FTE may also simply reflect a small denominator; the injury rate per FTE calculation causes a single injury among a small employer to result in an astronomical injury rate. In other words, perhaps FTE is a poor measure of occupational hazard exposure, and instead, number of trees felled would be a better reflection of risk.

There are several limitations to this study. First, the number of LSI-participating employers is small and the number of manual logging FTE within those employers is small. These factors limit our ability to detect statistically significant differences between comparative groups. Second, participation in LSI is voluntary. Based on a previous analysis, safer employers elected to join LSI, further diminishing differences among LSI employers. Moreover, injuries are considered a “lagging” indicator of safety, reflecting workplace changes that take effect over time. LSI and the initial consultations may have a positive effect on manual logging safety, but detection of any impact might require a time span greater

than the two years of post-LSI data we evaluated. Other measures likely capture a more immediate change in workplace safety and safe practices (such as hazard identification or near miss incidents), however these are not routinely collected by L&I. Finally, although DOSH consultants are trained to administer the SHPA survey, we do not know if there are issues of interrater reliability that would suggest systematic differences by consultant in survey data collection and documentation. Additionally, consultants establish relationships with employers over time (many logging consultants have previous work experience within the manual logging industry), which may impact the scores they give employers and the hazards they document.

## **CONCLUSION**

Even among the employers who joined LSI – a group with low injury rates relative to employers who declined to participate in LSI – there exists a range of safety performance. Although logging hazards were documented in nearly every consultation, no hazard was present at every site, suggesting that employers can control whether logging hazards are present in their work environment. There is room for improved workplace safety in manual logging, which should lead to lower injury rates among the risk class.

Table 1. Employer scores by item for the Safety and Health Program Assessment Form 25. Asterisk (\*) indicates items where fewer than 50% of employers received a score of 3.

<b>Survey Section (in bold)</b> Survey Item	Employers assessed	Item score (percent of employers assessed)			
		0=No	1=No, needs major improvement	2=Yes, needs minor improvement	3=Yes
<b>Hazard surveys</b>					
*Comprehensive surveys have been conducted of all tasks and processes to identify potential hazards and necessary protective measures.	99%	0.0	11.5	56.7	31.7
*Safety and health inspections of facilities and equipment are performed regularly and all deficiencies are corrected in a timely manner.	99%	0.0	6.7	64.4	28.8
A hazard reporting and tracking system exists.	96%	0.0	5.0	39.6	55.4
Hazard surveys are reviewed and updated whenever a change in facilities, equipment, materials, or processes occurs.	83%	1.1	0.0	29.9	69.0
A process is in place for investigating accidents and near misses to determine root causes.	97%	0.0	2.0	29.4	68.6
<b>Hazard prevention and control</b>					
*All necessary safety and health policies, rules, and safe work practice procedures are in place.	100%	1.0	4.8	53.3	41.0
*Standard engineering controls, administrative controls, and preventative maintenance procedures are in place and appropriate for types of industry standards.	92%	0.0	1.0	55.7	43.3
Personal Protective Equipment is provided, used, and maintained.	99%	0.0	2.9	41.3	55.8
Proper workplace housekeeping practices are followed.	95%	0.0	1.0	11.0	88.0
The organization is prepared for emergency situations including ensuring appropriate medical care for injured workers.	100%	0.0	1.0	24.8	74.3
<b>Administration and supervision</b>					
Goals and objectives for the safety and health program have been established and communicated to all employees.	92%	0.0	3.1	43.3	53.6
Safety and health roles and responsibilities are outlined and assigned to specific personnel.	89%	0.0	1.1	31.2	67.7

Individuals with assigned safety and health responsibilities have the authority and resources to perform their duties.	87%	0.0	1.1	24.2	74.7
Safety and health rules and policies are enforced, and unsafe behavior results in corrective action.	90%	0.0	4.3	31.9	63.8
A review of the organizations and safety and health programs is conducted at least annually and drives appropriate program changes.	83%	0.0	3.4	31.0	65.5
<b>Safety and health training</b>					
Individuals with assigned safety and health responsibilities have the necessary knowledge, skills, and information to perform their duties.	91%	0.0	1.0	35.4	63.5
All employees receive appropriate safety and health training on an on-going basis including a safety orientation for all new hires.	99%	0.0	1.9	35.6	62.5
Supervisors and managers receive appropriate safety and health training and understand their roles in helping to manage the organization's safety and health program.	90%	0.0	0.0	27.7	72.3
<b>Management and leadership</b>					
Upper management is involved in the planning and evaluation of safety and health policies and performance.	97%	0.0	0.0	14.7	85.3
Management policy establishes clear priority for safety and health.	98%	0.0	1.9	22.3	75.7
Managers support safety and health policies including allocating necessary resources.	96%	0.0	0.0	26.7	73.3
Managers personally follow all safety and health rules.	92%	0.0	1.0	25.8	73.2
<b>Employee participation</b>					
Employees participate in hazard prevention and control activities.	90%	0.0	2.1	41.1	56.8
*Employees take personal responsibility for correcting unsafe conditions and work practices.	96%	0.0	4.0	47.5	48.5
Employees are involved in the planning and evaluation of safety and health policies and performance.	74%	0.0	0.0	34.6	65.4

Table 2. Safety and Health Program Assessment section scores (displayed as percentages) and traumatic injury rates, n=105 accounts.

Survey section	Mean score	Std Dev	Perfect score n (%)	Injury rate 2 yrs before			Injury rate 2 yrs after		
				Needs improvement	Perfect score	Rate ratio <sup>a</sup> (95% CI)	Needs improvement	Perfect score	Rate ratio <sup>a</sup> (95% CI)
Management Leadership	92.2	11.4	63 (60.0)	35.0	32.6	1.07 (0.77, 1.50)	33.1	28.3	1.17 (0.85, 1.61)
Safety and Health Training	88.0	14.9	54 (51.4)	36.8	30.9	1.19 (0.85, 1.67)	34.1	26.5	1.29 (0.93, 1.79)
Administration and Supervision	87.6	13.5	40 (38.5)	35.2	30.6	1.15 (0.77, 1.72)	34.5	22.7	<b>1.51 (1.01, 2.26)</b>
Employee Participation	84.6	14.9	42 (40.8)	33.9	33.0	1.03 (0.71, 1.49)	30.5	30.2	1.01 (0.71, 1.43)
Hazard Prevention and Control	86.1	10.0	20 (19.0)	32.5	38.7	0.84 (0.50, 1.41)	30.8	27.7	1.11 (0.73, 1.69)
Hazard Surveys	81.5	14.1	22 (21.0)	33.8	32.9	1.03 (0.67, 1.58)	32.1	21.8	1.47 (0.92, 2.36)
Survey Total	86.6	10.7	10 (9.5)	34.4	26.1	1.32 (0.76, 2.28)	31.6	17.4	<b>1.81 (1.16, 2.82)</b>

<sup>a</sup>Injury rate among accounts that need improvement/Injury rate among accounts with perfect score. Bold font indicates significant at p<0.05. No additional rate ratios were significant at p<0.1.

Table 3. Rates of traumatic injuries (claims per 100 FTE) by Safety and Health Program Assessment total scores, n=105 accounts. Years before and after consultation were combined because rates were not observed to differ by time period.

SHPA total score	Number of accounts	Traumatic injuries	Injury rate (95% CI)
<70%	7	45	36.5 (28.5, 46.7)
70-79%	21	104	33.0 (25.5, 42.8)
80-89%	29	119	34.3 (28.9, 40.7)
90-99%	38	153	31.0 (23.1, 41.6)
100%	10	28	21.8 (14.3, 33.2)

Table 4. Correlation between Safety and Health Program Assessment total score and covariates (Spearman correlation coefficients and p-values).

	Survey total score	Number of serious hazards identified	FTE	Number of quarters ML hours reported	Average employee tenure
Survey total score	1	<b>-0.60445</b> <b>&lt;.0001</b>	-0.06233 0.5276	0.10316 0.295	<b>0.21386</b> <b>0.0285</b>
Number of serious hazards identified	-0.60445 <.0001	1	<b>0.34768</b> <b>0.0003</b>	-0.00426 0.9656	-0.13717 0.1629
FTE	-0.06233 0.5276	0.34768 0.0003	1	<b>0.4855</b> <b>&lt;.0001</b>	<b>0.35138</b> <b>0.0002</b>
Quarters of manual logging hours reported by employer	0.10316 0.295	-0.00426 0.9656	0.4855 <.0001	1	<b>0.8271</b> <b>&lt;.0001</b>
Average employee tenure	0.21386 0.0285	-0.13717 0.1629	0.35138 0.0002	0.8271 <.0001	1

Table 5. Traumatic injury rates (claims per 100 FTE) by number of hazards identified (grouped by quartiles) during initial LSI consultation.

	Number of employers	Rate 2 years before consultation	Rate 2 years after consultation
<b>Number of hazards</b>			
Q1: 0-2 hazards	40 (27.6)	32.9 (23.4, 46.2)	29.4 (20.6, 42.1)
Q2: 3-4 hazards	35 (24.1)	32.6 (20.6, 51.6)	33.5 (24.4, 46.1)
Q3: 5-8 hazards	39 (26.9)	31.8 (21.8, 46.3)	24.1 (16.3, 35.7)
Q4: 9+ hazards	31 (21.4)	35.5 (29.0, 43.4)	35.4 (29.7, 42.0)
<b>Number of serious hazards</b>			
Q1: 0 hazards	38 (26.2)	30.7 (21.5, 43.9)	28.4 (19.9, 40.7)
Q2: 1-2 hazards	42 (29.0)	33.6 (21.3, 52.8)	32.1 (22.5, 45.9)
Q3: 3-4 hazards	31 (21.4)	30.0 (22.4, 40.2)	26.6 (19.0, 37.3)
Q4: 5+ hazards	34 (23.4)	37.6 (30.1, 46.9)	35.4 (29.7, 42.2)

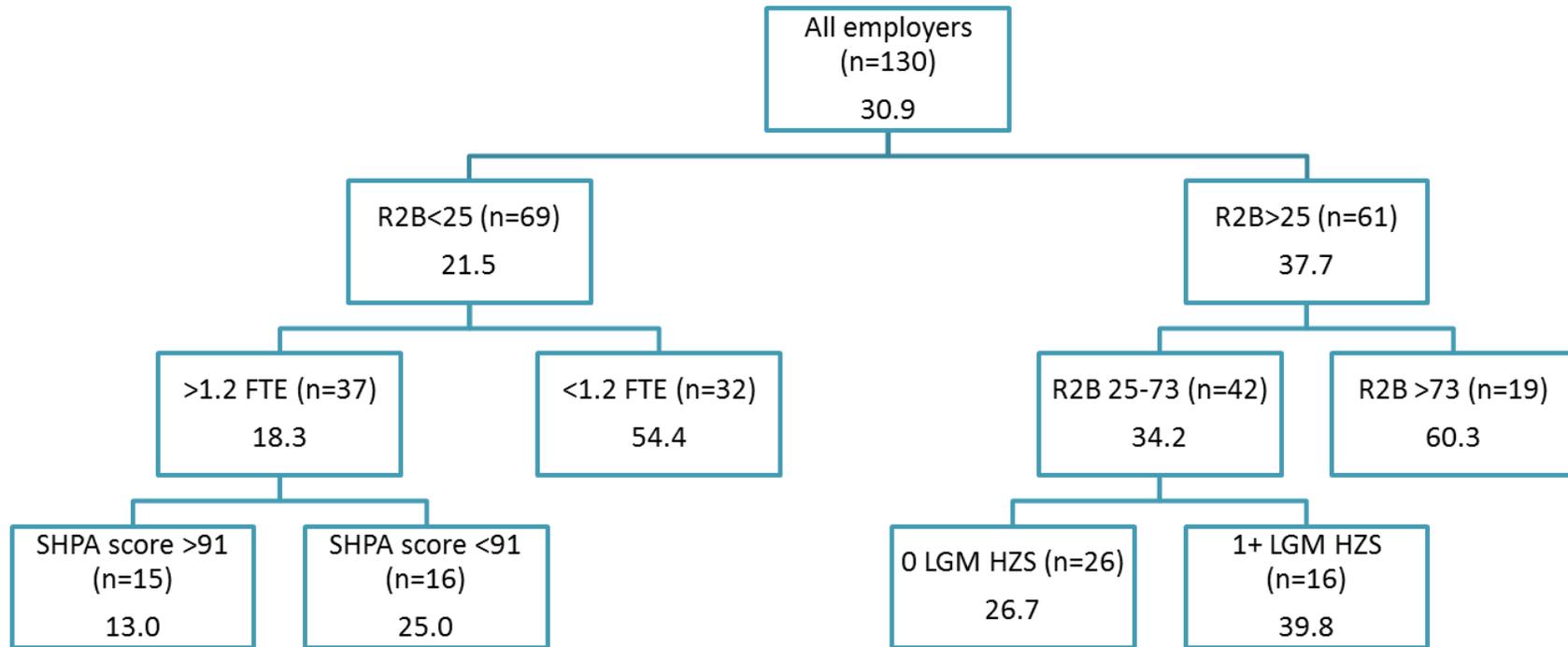
Claims per 100 FTE

Table 6. Number of employers with workplace hazards at initial LSI consultation by hazard type and severity (percent of employers with initial consultation, n=145).

Hazard group	Employers with hazard in group	Employers with serious hazard <sup>a</sup>	Percent of hazards considered serious
Logging machines	54 (37.2)	39 (26.9)	72%
APP, first aid	52 (35.9)	8 (5.5)	15%
Chainsaws	51 (35.2)	42 (29.0)	82%
PPE	48 (33.1)	41 (28.3)	85%
Signals, radios	39 (26.9)	4 (2.8)	10%
Hazard communication	35 (24.1)	1 (0.7)	3%
Motor vehicles	35 (24.1)	18 (12.4)	51%
Lockout/tagout	30 (20.7)	7 (4.8)	23%
Yarding	28 (19.3)	9 (6.2)	32%
Misc hand tools	27 (18.6)	15 (10.3)	56%
Rigging	26 (17.9)	17 (11.7)	65%
Guy lines, anchors	24 (16.6)	22 (15.2)	92%
Falling and bucking	23 (15.9)	20 (13.8)	87%
Wire rope	21 (14.5)	19 (13.1)	90%
Employer	13 (9.0)	7 (4.8)	54%
Log trucks	12 (8.3)	9 (6.2)	75%
Other	28 (19.3)	23 (15.9)	82%

<sup>a</sup> Includes one Guy lines, anchors hazard classified as imminent.

Figure 1. Regression tree results for traumatic injury rates 2 years after initial LSI consultation. Data presented in each box are: splitting characteristic, number of employees, and traumatic injury rates 2 years after initial LSI consultation (claims per 100 FTE).



R2B = Rate of traumatic injuries 2 years before initial LSI consultation (claims per 100 FTE)

FTE = Annual average manual logging FTE

LGM HZS = Serious hazards involving Logging Machines