

Evaluation of the Logger Safety Initiative: Impact on employer-reported payroll hours and workers' compensation claim rates

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List of Abbreviations:

APC	Annual Percent Change
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
DOSH	Division of Occupational Safety and Health [within the Washington Department of Labor & Industries]
FTE	Full Time Equivalent, calculated as 1 FTE = 2000 hours
KOS	Kept on Salary
L&I	Washington Department of Labor & Industries
LSI	Logger Safety Initiative
OIICS	Occupational Injury and Illness Classification System
PPD	Permanent Partial Disability
RR	Rate Ratio
SHARP	Safety and Health Assessment and Research for Prevention program

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Executive Summary:

To foster a culture of safety throughout Washington's logging industry, The Washington State Logger Safety Initiative (LSI) was developed in partnership with private landowners and logging companies, the Washington Contract Loggers Association, the Washington State Department of Natural Resources and the Washington State Department of Labor & Industries. The goals of LSI are to promote workplace safety, reduce work-related injuries, improve the accuracy of reporting, and reduce workers' compensation costs by setting standards for worker training and performance, ensuring compliance through audits, certifying company safety programs, and promoting shared learning. Employer participation in LSI is voluntary.

The purpose of this study was to evaluate the impact of LSI on employer-reported payroll hours and workers' compensation claim rates in the manual logging risk class. We used Washington workers' compensation data to assess any impact.

Key Findings

Impact on employer-reported payroll hours

- Among LSI participants, manual logging hours increased in the quarters leading up to entry into LSI, corresponding to the time period under audit that precedes LSI enrollment.
 - Between 2010Q1 and 2014Q3, hours increased quarterly among LSI participants by an estimated 3.5%.
- The increase in hours was not sustained over subsequent quarters of LSI participation.
 - Between 2014Q3 and 2016Q4, hours decreased quarterly among LSI participants by an estimated 2.7%.
- By comparison, manual logging hours among employers that did not join LSI decreased over the entire seven-year span by an estimated 2.4% quarterly.
- LSI participants were more likely to report manual logging hours in multiple years, while non-LSI accounts ceased reporting after one year, or reported sporadically across the time period, suggesting greater longevity among LSI participants.

Impact on workers' compensation claim rates

- The rate for both traumatic injuries and compensable claims in manual logging decreased between 2010 and 2016.
 - The decrease in the claim rates were attributable to employers that did not join LSI. Among non-LSI participants, traumatic injury claim rates (claims per 100 FTE) fell from a high of 73.7 in 2010 to a low of 22.7 in 2015. Compensable

claim rates declined more rapidly, from a high of 53.3 in 2010 to a low of 12.8 in 2013.

- Among LSI participants, annual claim rates were steady in 2010–2016, averaging 31.0 traumatic injury claims and 15.6 compensable claims per 100 FTE.
- Safer employers elected to participate in LSI. In general, claim rates both before and after implementation of LSI were lower among LSI participants than among non-LSI participants.
- Both LSI and non-LSI accounts saw a decrease in the portion of manual logging compensable claims classified as time loss and an increase in the portion classified as Permanent Partial Disability (PPD); the change was most pronounced for non-LSI accounts.
- Trees, logs, and vegetation was the leading cause of injuries in manual logging for both LSI participants and non-LSI employers.
- While both manual and mechanized logging experienced a decline over time in the rate of traumatic injuries when calculated based on payroll hours, no trend was detected among either group when the rate was calculated based on harvest volume.

Sustainability of observed changes in hours and claims

- The steady decline in reported hours that followed the peak in 2014 may be due to the lack of sustained audit activity, or because of changes within the logging industry, which is increasingly relying on tethered (mechanized) logging to fell trees previously cut manually. If the decline in hours is due to under-reporting and not a broader change within the industry, the increase in hours observed in the quarters preceding an employer's entry into LSI may be repeated with sustained audit activities throughout participation in LSI.
- While claim rates were observed to decline during the study period, most of the decline occurred in the first four years evaluated (2010–2013), prior to implementation of LSI.
 - Although LSI may positively affect workplace safety, it may not be measurable in our study period using lagging indicators such as claims data.
- Like payroll hours, manual logging claim rates may be impacted by the industry's shift toward tethered logging.

Introduction:

The logging industry, central to the history of Washington State, remains pivotal in the state's economy. The Washington State Department of Commerce lists the forest products sector as the state's third largest manufacturing industry. It is particularly important in rural communities, where economic opportunities are often limited.

Logging, specifically manual (non-mechanized) logging, is also among the most dangerous occupations in Washington State. The high rate of serious, often catastrophic injuries leads to workers' compensation premiums for manual logging that are among the most expensive of any Washington State risk class.

To improve the safety culture of the manual logging industry throughout the state, private land owners, the Washington Contract Loggers Association, logging companies, the Washington Department of Natural Resources, and the Washington Department of Labor & Industries 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, and dependent on satisfactory findings from an initial audit and safety inspection. Enrollment began in 2014 and continues through today. Employers advance through the program's three tiers through satisfactory compliance with increased safety requirements, workers compensation premium audits, and on-site assessments of their safety performance, which correspond to progressive discounts on their workers' compensation premiums.

The purpose of this study was to evaluate the impact of LSI on employer-reported payroll hours and workers' compensation claim rates in the manual logging risk class, using Washington workers' compensation data.

Methods:

In this study, two primary outcomes were evaluated: 1) payroll hours as reported by employers to L&I for assessing workers' compensation premiums; and 2) Washington State funded workers' compensation claims.

Using several different comparison groups, trends in these outcomes were compared before and after implementation of LSI. Within the manual logging risk class, we compared trends among employers that participated in LSI to those that never joined LSI. To assess industry-wide trends we evaluated several logging-related risk classes: manual logging, mechanized logging, and log hauling. We also compared LSI-participants to non-LSI participants within risk classes other

than manual logging, to assess any impact that may have reached beyond manual logging across the entire employer account.

LSI allowed employers to join the program in any quarter, from 2014Q1 through the present. To accommodate this staggered entry into the program, the date of LSI implementation was defined several ways and differed based on the outcome and the comparison group.

Quarterly harvest volumes provided by the Washington Department of Revenue were assessed as a measure of logging activity alternative to payroll hours. DOR reports harvest volumes separately for manual and mechanized logging.

See the Technical Notes section at the end of this document for additional details on the methods used in this evaluation.

Results:

Employer-reported payroll hours

As of August 2017, 145 employer accounts participated in the LSI program. Although these employers accounted for only 22% of all employer accounts reporting hours in manual logging at some point between 2010 and 2016, they contributed 82% of all manual logging hours, annually employing an average 363 FTE of the total 443 annual average FTE in manual logging.

Table 1. Accounts and hours in manual logging, 2010–2016.

	Accounts ^a	Accounts reporting 1+ hours	Total hours reported	FTE ^b
Total manual logging	1,675 (100%)	670 (100%)	6,207,798 (100%)	443 (100%)
Eventual LSI ^c	145 (9%)	145 (22%)	5,087,826 (82%)	363 (82%)
Never LSI	1,530 (91%)	525 (78%)	1,119,972 (18%)	80 (18%)

^aAccounts assigned manual logging risk class for reporting payroll hours.

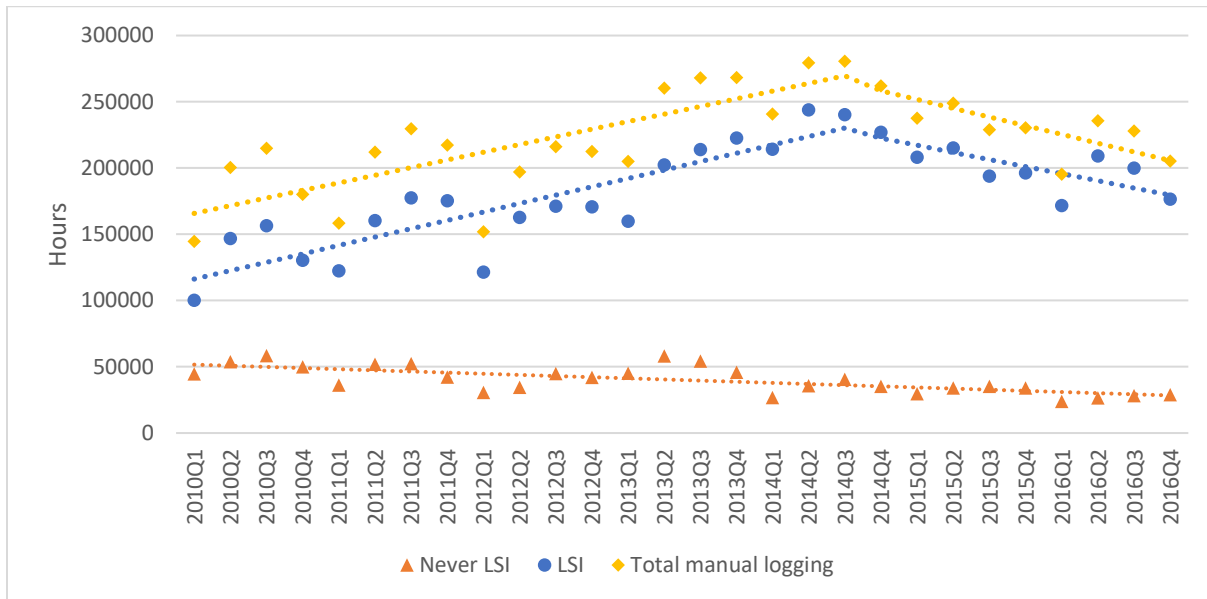
^bAverage annual FTE for entire group. FTE calculated as annual hours/2000.

^cAs of data extract on 8/10/2017.

- Most *accounts* (78%) reporting hours in the manual logging risk class did not join LSI
- Most *hours* (82%) in the manual logging risk class were reported by an LSI-participating account.

Employer-reported manual logging hours increased from 2010 through the third quarter of 2014 among LSI participating accounts. This increase was reflected in the hours for the entire manual logging risk class, which increased over the same time period. After 2014Q3, the trend in hours changed and manual logging hours decreased among LSI participants. Manual logging hours reported by accounts that never joined LSI declined throughout the entire seven-year period.

Figure 1. Total hours in manual logging by participation in LSI.



- Total manual logging:
 - 2010Q1 – 2014Q3: estimated quarterly increase of 5,321 hours (2.4%)
 - 2014Q3 – 2016Q4: estimated quarterly *decrease* of 6,857 hours (2.9%)
- LSI participants:
 - 2010Q1 – 2014Q3: estimated quarterly increase of 6,015 hours (3.5%)
 - 2014Q3 – 2016Q4: estimated quarterly *decrease* of 5,592 hours (2.7%)
- Never LSI participants:
 - estimated quarterly *decrease* of 918 hours (2.4%) between 2010Q1 and 2016Q4

Table 2. Estimated quarterly change in manual logging payroll hours by LSI participation.

	Time period	Quarterly change in hours (95% CI)	Quarterly change in percent (95% CI)
Total manual logging	2010Q1 - 2014Q3	5321 (3727, 6916)	2.4% (1.7%, 3.2%)
	2014Q3 - 2016Q4	-6857 (-10,132, -3582)	-2.9% (-4.3%, -1.5%)
LSI participants	2010Q1 - 2014Q3	6015 (4659, 7370)	3.5% (2.7%, 4.3%)
	2014Q3 - 2016Q4	-5592 (-9090, -2093)	-2.7% (-4.4%, -1.0%)
Never LSI	2010Q1 - 2016Q4	-918 (-1216, -620)	-2.4% (-3.1%, -1.7%)

Employer account-level hours

Among accounts that eventually joined LSI, the median number of manual logging hours increased slightly through 2014 before declining in 2015 through 2016.

Among accounts that never joined LSI, both the median and the upper quartile (75th percentile) decreased over time, reflecting a decline in the size of non-LSI accounts over time. The number of non-LSI accounts reporting manual logging hours decreased in 2015 and 2016, although 2012 saw the second fewest number of never-LSI accounts.

Figure 2. Median manual logging hours per account by LSI participation, among accounts reporting 1 or more hours.

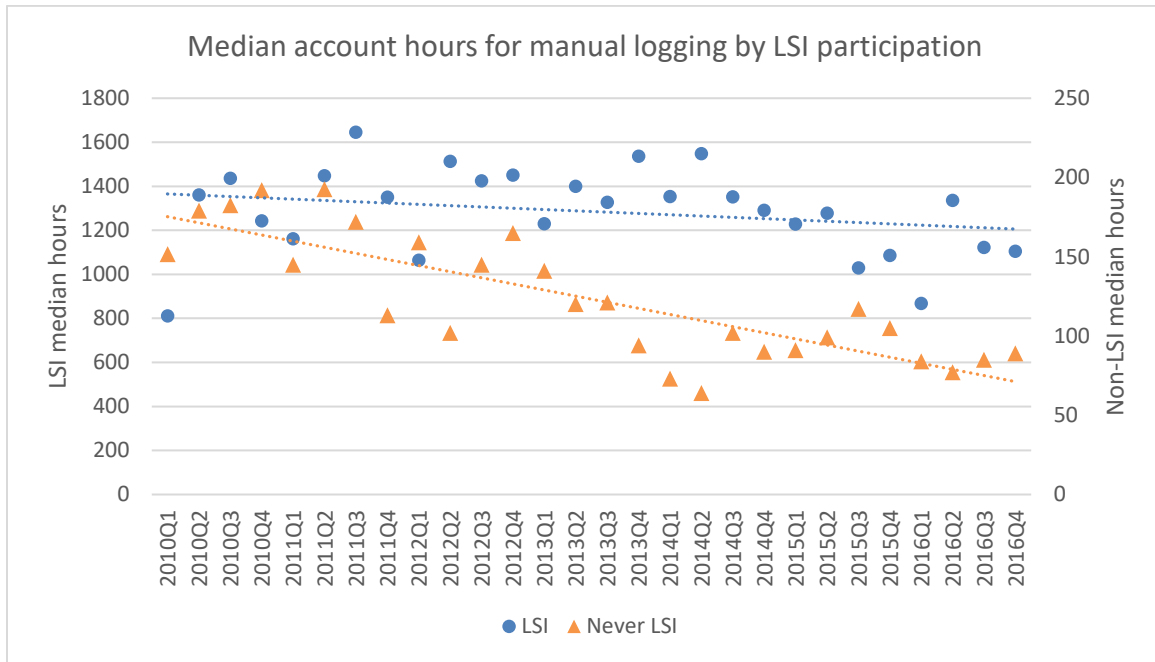


Table 3. Manual logging hours reported per account by year and LSI participation, among accounts reporting one or more hours.

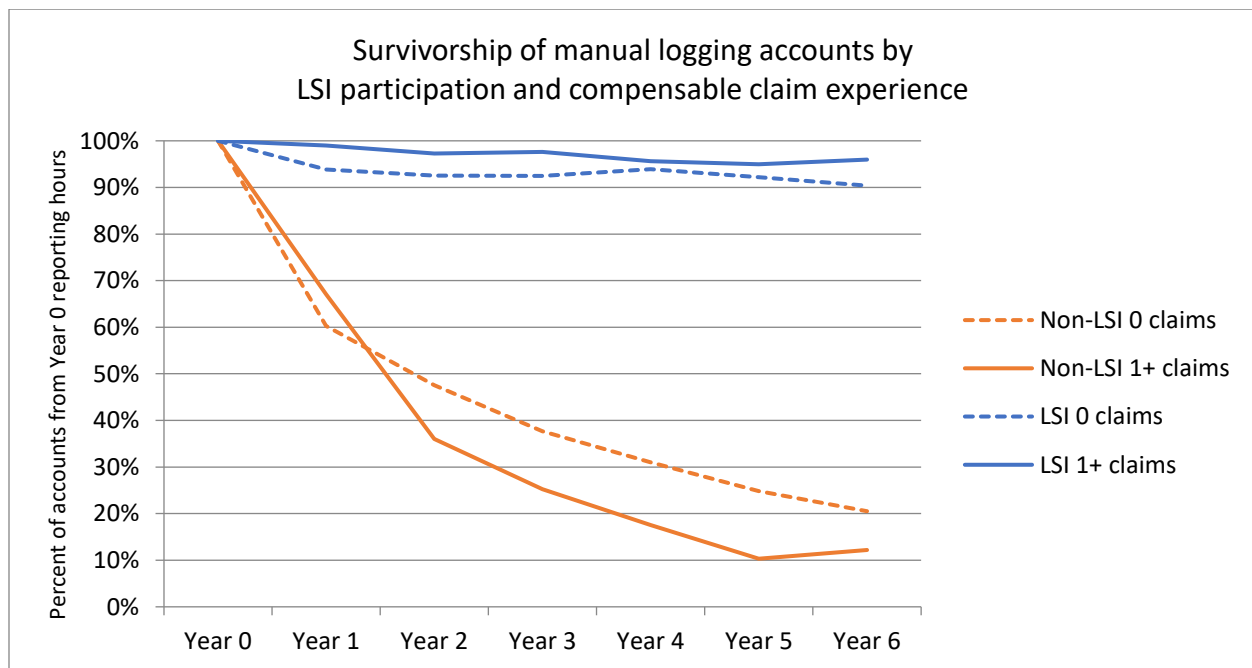
	Year	Accounts reporting 1+ hours	Reported hours: Median	Reported hours: Lower Quartile	Reported hours: Upper Quartile
LSI accounts	2010	77	5,152	1,311	8,144
	2011	84	4,357	1,702	8,376
	2012	86	5,165	1,736	8,661
	2013	113	4,499	1,253	8,965
	2014	128	4,507	1,278	8,903
	2015	125	4,317	1,416	8,449
	2016	126	3,877	1,325	8,122
non-LSI accounts	2010	197	199	47	1,250
	2011	190	245	78	925
	2012	164	234	52	832
	2013	202	190	60	912
	2014	195	139	43	495
	2015	167	159	46	582
	2016	158	144	47	499

- Although the number of LSI-participating accounts continues to increase, hours reported by each account has decreased over recent years.
- Hours are decreasing among non-LSI participants (for the group as a whole) because there are fewer accounts and because existing accounts are reporting fewer hours.

Activity of manual logging accounts

LSI participants were more likely to report manual logging hours in multiple years, while non-LSI accounts ceased reporting after one year, or reported sporadically across the time period. Averaged across years, approximately 95% of LSI accounts continued to report manual logging hours one year later (99% of LSI accounts with one or more compensable claims in year zero, and 94% of LSI accounts with zero compensable claims in year 0). Fewer non-LSI accounts survived one year: 67% of accounts with compensable claims in year 0 and 60% of accounts without compensable claims reported manual logging hours one year later. Five years later, over 90% of LSI participants continued to report manual logging hours, while among non-participants, only 25% of accounts without compensable claims in year 0 and 10% of accounts with compensable claims reported manual logging hours.

Figure 3. Average percent of accounts reporting manual logging hours in subsequent years by LSI participation and compensable claim experience (claims at year 0).



Timing of entry into LSI

Of the 145 accounts that eventually joined LSI, half entered LSI in the program’s initial quarter, 2014Q1. Seventy percent of [eventual] LSI participants joined the program within the first year.

The largest percent of LSI accounts (30.3%) advanced to Tier 3 in 2014Q3, the earliest time at which an account was allowed to enter Tier 3. By the end of 2016Q4, 119 (82.1%) LSI participants had advanced to Tier 3 status.

Table 4. Eventual LSI accounts by quarter of entry into LSI Tier 1 and Tier 3 (n=145).

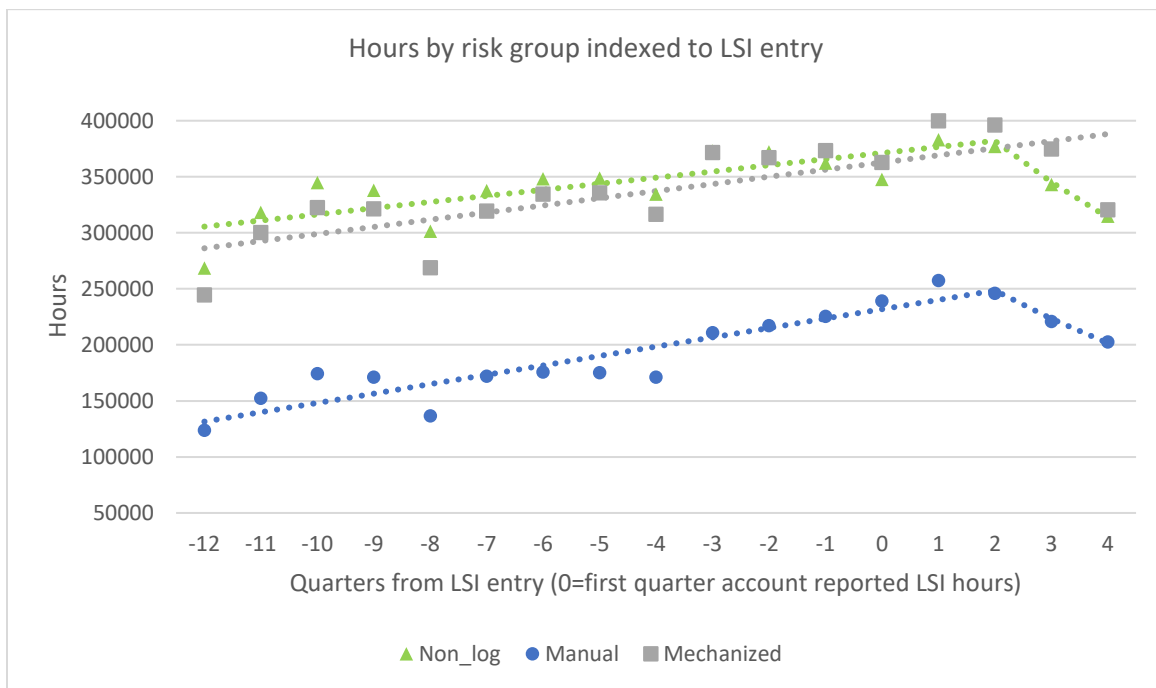
	Entry into LSI Tier 1			Entry into LSI Tier 3		
	Accounts	Percent	Cumulative percent	Accounts	Percent	Cumulative percent
2014Q1	73	50.3	50.3	-	-	-
2014Q2	12	8.3	58.6	-	-	-
2014Q3	10	6.9	65.5	44	30.3	30.3
2014Q4	7	4.8	70.3	14	9.7	40.0
2015Q1	11	7.6	77.9	16	11.0	51.0
2015Q2	5	3.5	81.4	12	8.3	59.3
2015Q3	9	6.2	87.6	6	4.1	63.4
2015Q4	2	1.4	89.0	7	4.8	68.3
2016Q1	5	3.5	92.4	6	4.1	72.4
2016Q2	6	4.1	96.6	8	5.5	77.9
2016Q3	3	2.1	98.6	3	2.1	80.0
2016Q4	2	1.4	100.0	3	2.1	82.1
Not yet entered Tier 3				26	17.9	100.0

Payroll hours across risk classes among LSI participants

Indexed to the account’s quarter of entry into LSI (defining the quarter of entry as 0, the quarter immediately preceding entry as -1, and the quarter immediately after entry as 1, etc.), reported payroll hours were observed to increase among LSI accounts for all groups of risk classes. The increase was greatest among the manual logging risk class.

Following a 15-quarter overall increase, the trend hours changed for manual logging and non-logging classes among LSI accounts. Beginning in the second quarter post LSI entry, hours no longer increased (the trend in reported hours over the last three quarters is statistically no different from zero).

Figure 4. Hours by risk group among LSI accounts, indexed to LSI Tier 1 entry (accounts=145)



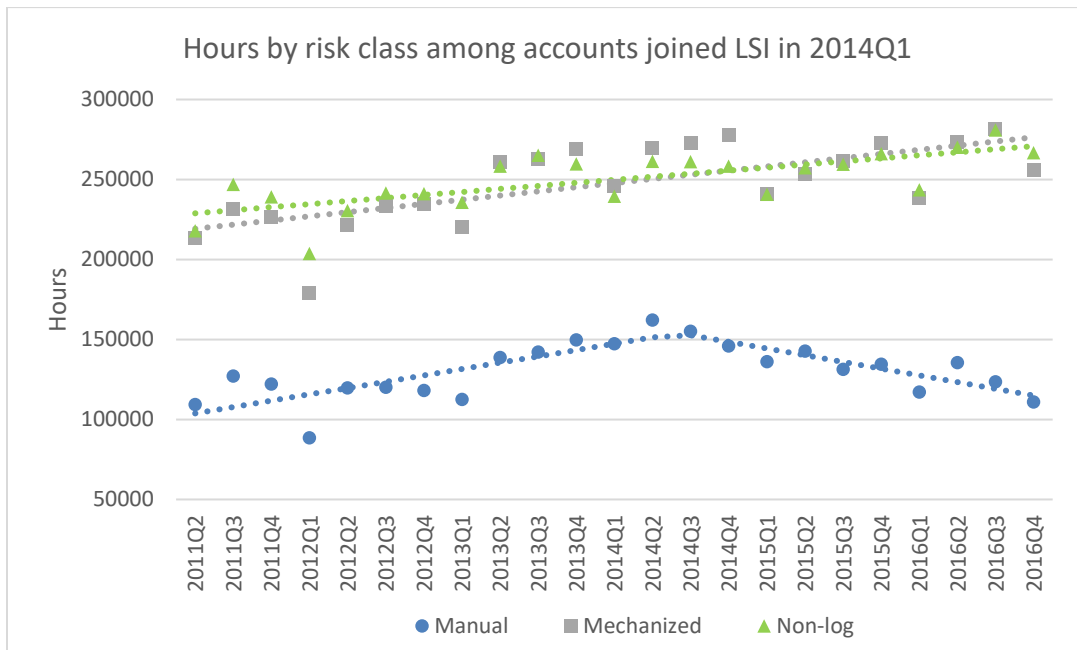
- Manual logging:
 - 12 quarters preceding LSI entry – 2 quarters post: quarterly increase of 4.5% (95% CI: 3.1%, 5.9%)
 - 2 quarters post LSI entry – 4 quarters post: no statistically significant trend
- Mechanized logging:
 - 12 quarters preceding LSI entry – 4 quarters post: quarterly increase of 1.9% (95% CI: 1.0 %, 3.0%)
- All other risk groups combined:
 - 12 quarters preceding LSI entry – 2 quarters post: quarterly increase of 1.6% (95% CI: 0.7%, 2.6%)
 - 2 quarters post LSI entry – 4 quarters post: no statistically significant trend

Payroll hours among earliest LSI participants

Because accounts entered the LSI program at different quarters over the past three years, some as recently as 2016Q4, not all accounts contribute data to quarters one or more years after LSI entry (because they have only been in LSI for a few quarters). To examine post-LSI trend in hours, we limited the data to the 73 accounts that joined LSI in its initial quarter, 2014Q1, a represent the group of accounts for which we have the greatest number of post-LSI quarterly data.

As observed for all LSI participants, hours among initial participants increased for mechanized logging, and all other risk classes combined, with the greatest increase observed for manual logging. While hours continued to increase over the entire seven-year study period for mechanized logging and the non-logging risk group, hours for manual logging decreased beginning in 2014Q3, two quarters after joining LSI. The quarterly decrease in manual logging of 2.6% was less than the preceding quarterly increase of 3.2%.

Figure 5. Hours by risk group among LSI accounts that entered Tier 1 in 2014Q1 (accounts=73).



- Manual logging:
 - 2011Q2 – 2014Q3: quarterly increase of 3.2%
 - 2014Q3 – 2016Q4: quarterly decrease of 2.6%
- Mechanized logging:
 - 2011Q2 – 2016Q4: quarterly increase of 1.0%
- All other risk groups:
 - 2011Q2 – 2016Q6: quarterly increase of 0.8%

Workers' compensation claims in Manual Logging

In the years preceding implementation of the LSI program, manual logging claim rates for traumatic injuries among accounts that never joined LSI were generally two or three times higher than the rates among accounts that eventually joined LSI, before dropping precipitously between 2012 and 2013 to rates similar to the [eventual] LSI group. The quarterly variability of rates is greater among the never-LSI group, likely reflecting the small denominator.

Rates of compensable claims, generally lower than claim rates for traumatic injuries, displayed a similar trend – declining among accounts that never joined LSI while remaining steady for the [eventual] LSI group.

The manual logging risk class as a whole experienced a decline in the traumatic injury rate estimated at 7.9% annually, and in the compensable claim rate estimated at 8.4% annually. Both declines are attributable to the substantial decreases in the rates among employers that never joined LSI. No change in the rate of either traumatic injuries or compensable claims was observed among the group that eventually joined LSI. The decline in rates generally occurred in 2010-2013, with rates changing little after 2013 among either LSI participants or the non-LSI group.

Among LSI participants, there was little difference in claim rates across the program's three tiers.

Figure 6. Claim rate for traumatic injuries in manual logging by LSI participation (claims at 9-month common maturity)

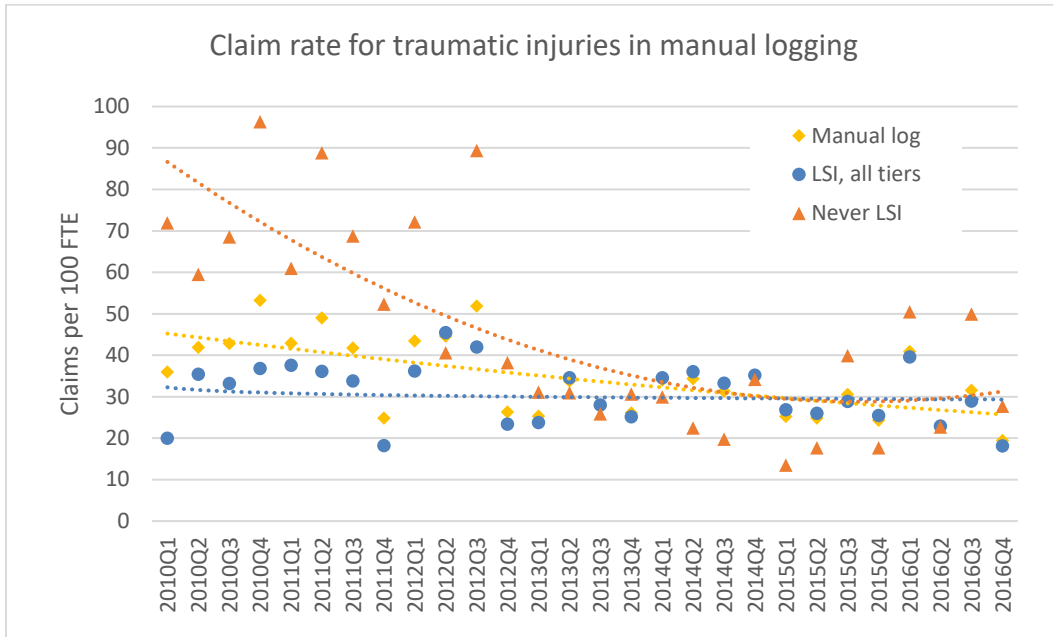


Figure 7. Rate of compensable claims in manual logging by LSI participation (compensable claims at 9-month common maturity, traumatic + non-traumatic injuries).

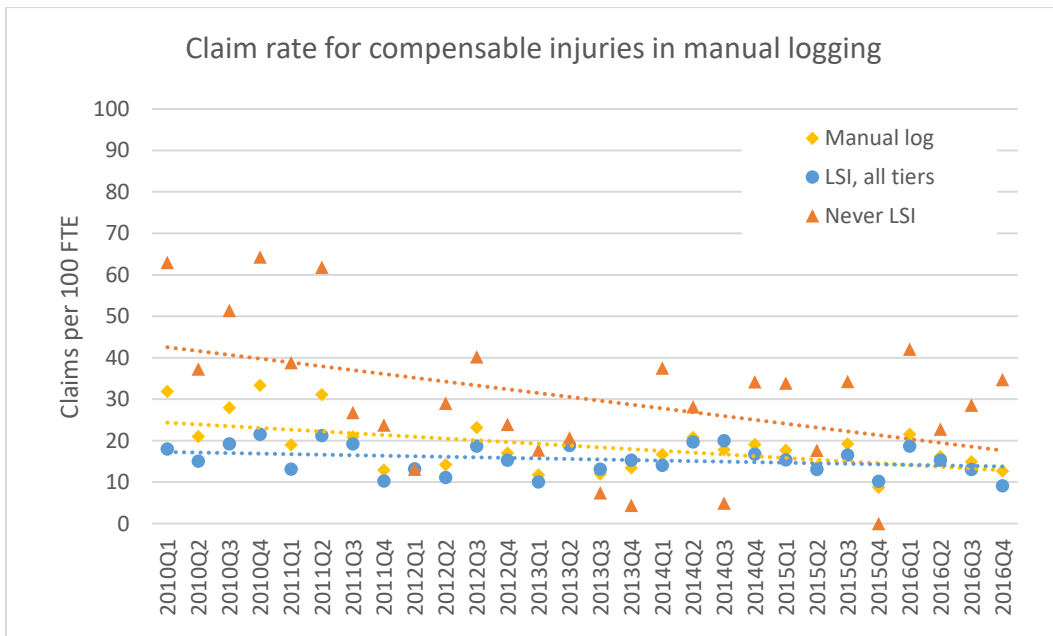


Table 5. Annual claim rates in manual logging by LSI participation, 2010–2016.

Injury year	Total Manual logging					LSI					Never LSI				
	FTE	Traumatic injury claims		Compensable claims		FTE	Traumatic injury claims		Compensable claims		FTE	Traumatic injury claims		Compensable claims	
		Claims	Rate ^a	Claims	Rate ^a		Claims	Rate ^a	Claims	Rate ^a		Claims	Rate ^a	Claims	Rate ^a
2010	370	162	43.8	104	28.1	267	86	32.3	49	18.4	103	76	73.7	55	53.3
2011	409	161	39.4	86	21.0	318	98	30.9	51	16.1	91	63	69.2	35	38.4
2012	389	161	41.4	67	17.2	313	115	36.8	46	14.7	76	46	60.7	21	27.7
2013	501	142	28.4	71	14.2	399	112	28.1	58	14.5	101	30	29.6	13	12.8
2014	531	179	33.7	99	18.6	462	161	34.8	82	17.7	69	18	26.1	17	24.7
2015	473	124	26.2	70	14.8	407	109	26.8	56	13.8	66	15	22.7	14	21.1
2016	432	123	28.5	70	16.2	379	103	27.2	53	14.0	53	20	37.4	17	31.8
APC ^b (95% CI)		-7.9% (-12.9%, -2.9%)		-8.4% (-15.5%, -0.7%)			-2.9% (-8.8%, 3.4%)		-3.0% (-8.1%, 2.4%)			-17.4% (-27.7%, -5.6%)		2010-2013: -32.9% (-51.9, -6.4%) 2013-2016: 22.8% (-22.7%, 95.0%)	

^aClaims per 100 FTE.

^bAPC=Annual Percent Change in rate. Estimates in bold font indicate significant change over time at p<0.05.

CI=Confidence interval.

Claim rates among logging-related risk groups

To examine industry-wide trends, we compared claim rates for three logging-related risk classes: manual logging, mechanized logging, and log hauling. For both traumatic injury and compensable claims, rates were highest among manual logging, and lowest among mechanized logging. Claim rates among manual logging were as much as twelve times higher than rates among log hauling and twenty times higher than rates among mechanized logging. For traumatic injury claims, rates declined both in manual logging (-7.9% APC) and mechanized logging (-6.6% APC). There was no significant change in traumatic injury rates among log hauling. Among compensable claims, only manual logging experienced a decline, estimated at -8.4% annually.

Figure 8. Traumatic injury claim rates by risk class group, 2010–2016.

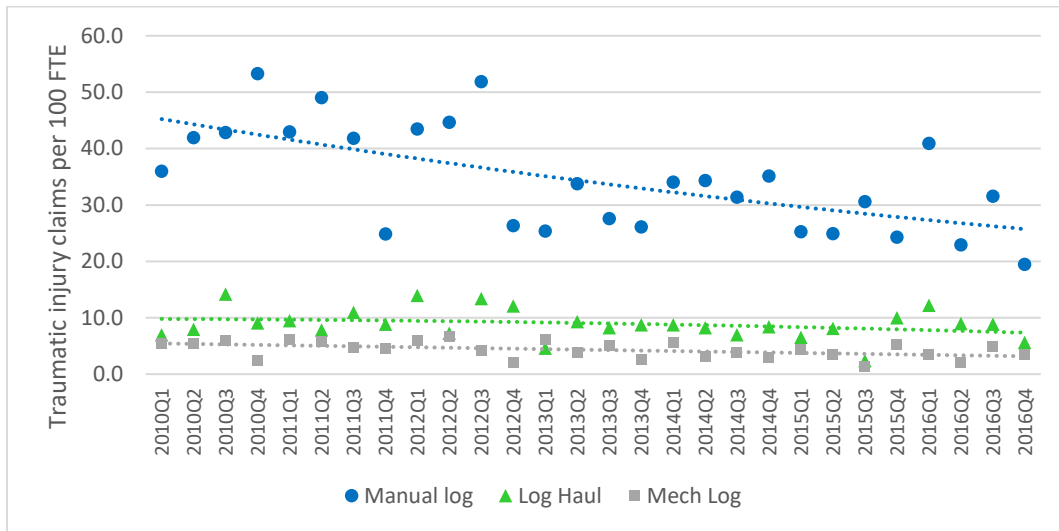
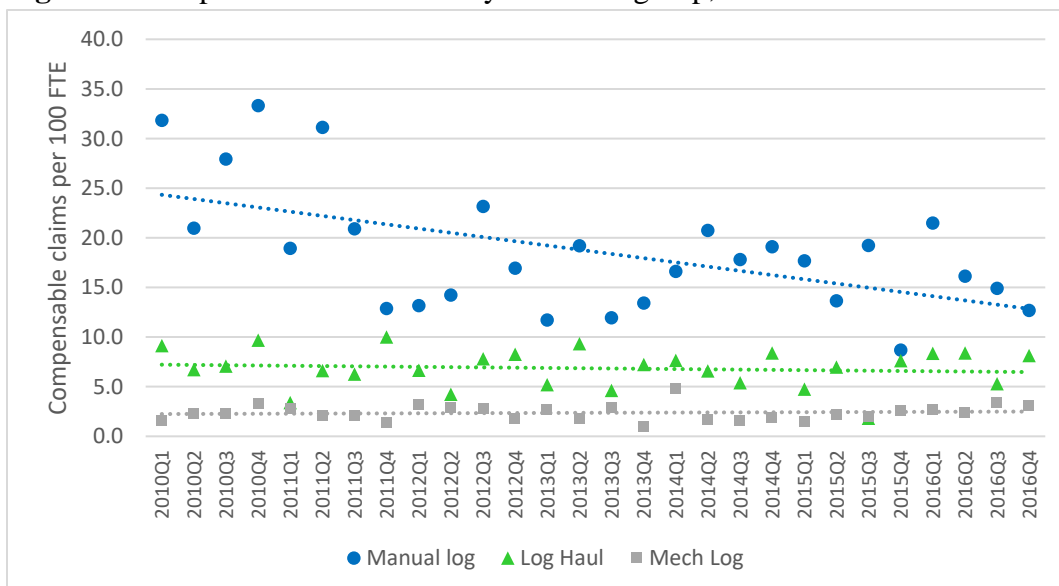


Figure 9. Compensable claim rates by risk class group, 2010–2016.



Separating risk classes based on LSI participation, the LSI accounts in the mechanized logging risk class experienced a significant decline in traumatic injuries (-11.5% APC). In manual logging, only the non-LSI accounts experienced a decline in rates (both traumatic injuries and compensable claims). In log hauling, neither the LSI participants, nor the non-participants saw a decline in rates.

Table 6. Annual percent change (95% CI) in claim rates by risk class group, 2010–2016.

	Total	LSI	Non-LSI
Traumatic injury claim rate			
Manual logging	-7.9% (-12.9, -2.6)	-2.9% (-8.8, 3.4) [No change]	-17.4% (-27.7, -5.6)
Log hauling	-4.4% (-11.8, 3.5) [No change]	-0.1% (-11.0, 12.1) [No change]	-6.2% (-12.0, 0.0) [No change]
Mechanized logging	-6.6% (-9.2, -3.9)	-11.5% (-14.7, -8.1)	-0.3% (-8.2, 8.3) [No change]
Compensable claim rate			
Manual logging	-8.4% (-15.5, -0.7)	-3.0% (-8.1, 2.4) [No change]	2010-2013: -32.9% (-51.9, -6.4) 2013-2016: 22.8% (-22.7, 95.0)
Log hauling	-2.1% (-7.8, 4.1) [No change]	1.7% (-1.8, 5.3) [No change]	-2.7% (-9.8, 4.9) [No change]
Mechanized logging	2.5% (-4.4, 9.9) [No change]	2.3% (-10.6, 17.1) [No change]	4.2% (-3.6, 12.7) [No change]

Estimates in bold font indicate significant change over time at $p < 0.05$.

APC=Annual Percent Change.

CI=Confidence interval.

Claim rates by LSI participation among logging-related risk classes

LSI participants are generally safer employers, with lower claim rates for all risk class groups compared to non-LSI participants. For traumatic injuries in manual logging, rates for non-LSI participants were 55% greater than rates for LSI participants. For traumatic injuries in mechanized logging and log hauling, rates for non-LSI participants were 31% greater than rates for LSI-participants.

The difference in rates by LSI participation was greater among compensable claims. In manual logging, compensable claim rates for non-LSI participants were almost twice as high as rates for LSI participants. In mechanized logging, non-LSI rates were over 50% higher, and in log hauling, non-LSI rates were more than two-thirds greater than compensable claims rates for LSI participants.

Table 7. Claim rates^a by risk class group and LSI participation, and rate ratios of non-LSI participants vs LSI participants, 2010–2016.

	Traumatic injury claims			Compensable claims		
	Non-LSI rate	LSI rate	RR (95% CI)	Non-LSI rate	LSI rate	RR (95% CI)
Manual logging	47.9	30.8	1.55 (1.35, 1.78)	30.7	15.5	1.98 (1.65, 2.37)
Mechanized logging	4.9	3.8	1.31 (1.05, 1.62)	3.0	1.9	1.53 (1.14, 2.05)
Log hauling	9.8	7.5	1.31 (1.07, 1.61)	8.1	4.8	1.68 (1.32, 2.14)

^aClaims per 100 FTE.

RR=Rate ratio.

CI=Confidence interval.

Indemnity classification of manual logging claims

Among LSI accounts, at a common claim maturity of 9 months, 57% of accepted claims in manual logging were limited to payments for medical treatment while 43% were compensable (covering lost wages). Non-LSI accounts had a greater portion of compensable claims; more than half of all accepted claims were compensable (52%). For both LSI and non-LSI participants, proportions of medical only and compensable claims remained similar throughout the study period (data not shown).

Among compensable claims, both LSI and non-LSI accounts saw a decrease in the proportion of claims classified as time loss at 9-month maturity, and an increase in the proportion of claims classified as permanent partial disability (PPD). The increase in PPD claims was more pronounced for non-LSI accounts.

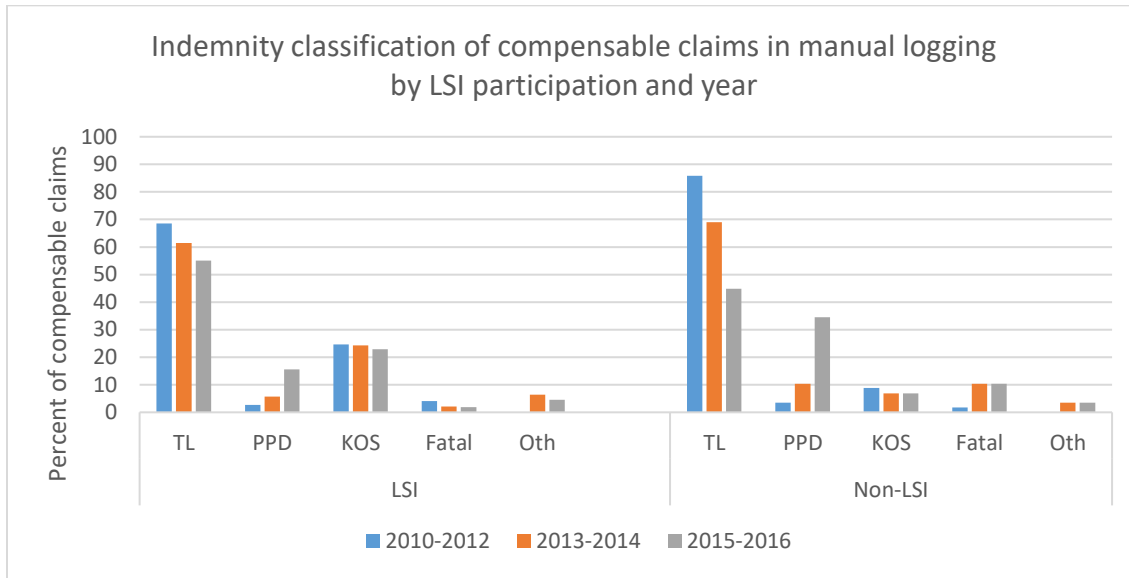
Table 8. Number and [row] percent of compensable claims in manual logging by indemnity type^a, LSI participation, and year, 2010–2016.

	Time loss (TL)	Permanent Partial Disability (PPD)	Kept on Salary (KOS)	Fatal	Other ^b
LSI Participants					
2010-2012	100 (68.5)	4 (2.7)	36 (24.7)	6 (4.1)	0 (0.0)
2013-2014	86 (61.4)	8 (5.7)	34 (24.3)	3 (2.1)	9 (6.4)
2015-2016	60 (55.1)	17 (15.6)	25 (22.9)	2 (1.8)	5 (4.6)
Non-LSI					
2010-2012	97 (85.8)	4 (3.5)	10 (8.9)	2 (1.8)	0 (0.0)
2013-2014	20 (69.0)	3 (10.3)	2 (6.9)	3 (10.3)	1 (3.5)
2015-2016	13 (44.8)	10 (34.5)	2 (6.9)	3 (10.3)	1 (3.5)

^aat 9-month maturity.

^bCategory includes Stay at Work (11 claims), Miscellaneous Accident Fund (4 claims), Temporary Partial Disability (1 claim).

Figure 10. Indemnity classification of compensable claims in manual logging^a, 2010–2016.



^aat 9-month maturity

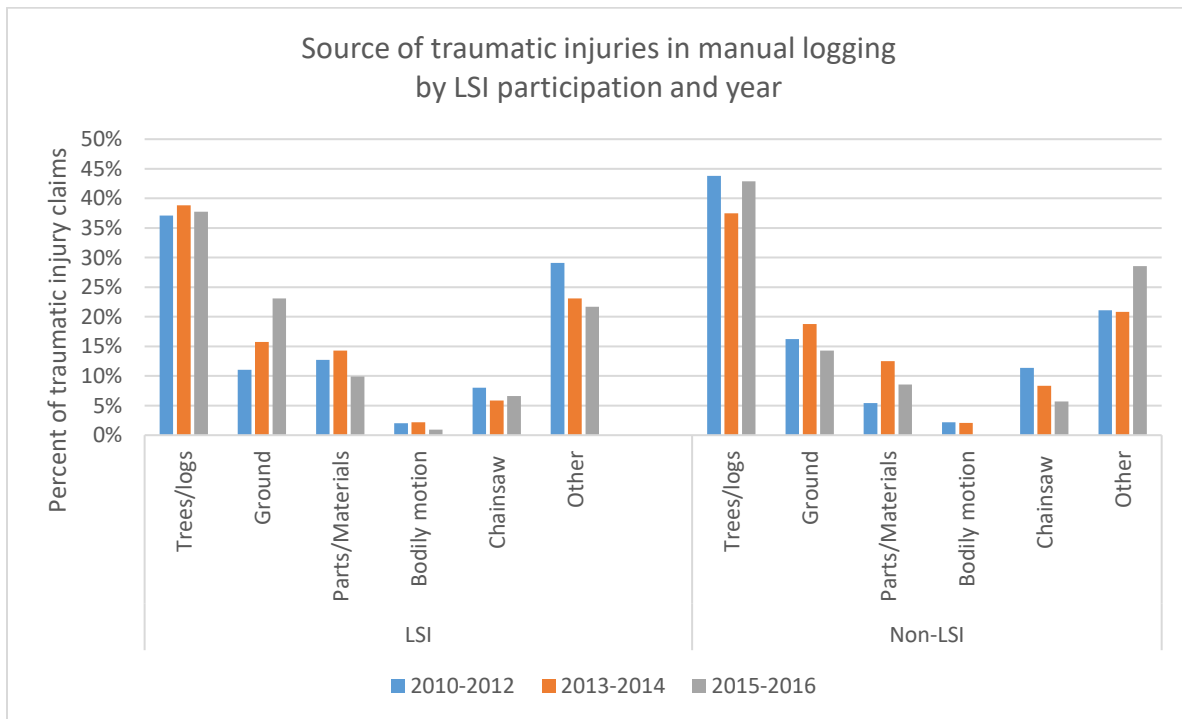
Source of Manual Logging Injuries

Among traumatic injuries in manual logging, there were slight differences in the source of injury by LSI participation ($p=0.08$). LSI participants had a slightly higher percent of injuries from parts and materials (e.g., ropes, ties, chains, winches, sheaves); non-LSI had more injuries from trees/logs, and chainsaws. Any changes in the source of injury over time are difficult to detect because of the large portion of claims classified as ‘Other’ (generally non-classifiable), but decreased over time among LSI participants, while increasing over time among non-participants.

Table 9. Number and row percent of claims for traumatic injuries by source of injury and LSI participation.

	Trees/logs	Ground surfaces	Parts and Materials	Bodily motion	Chainsaw	Other
LSI participants	297 (37.9)	125 (15.9)	98 (12.5)	14 (1.8)	54 (6.9)	196 (25.0)
Non-LSI	114 (42.5)	44 (16.4)	19 (7.1)	5 (1.9)	27 (10.1)	59 (22.0)

Figure 11. Distribution of injury source among manual logging traumatic injuries by LSI participation and year.

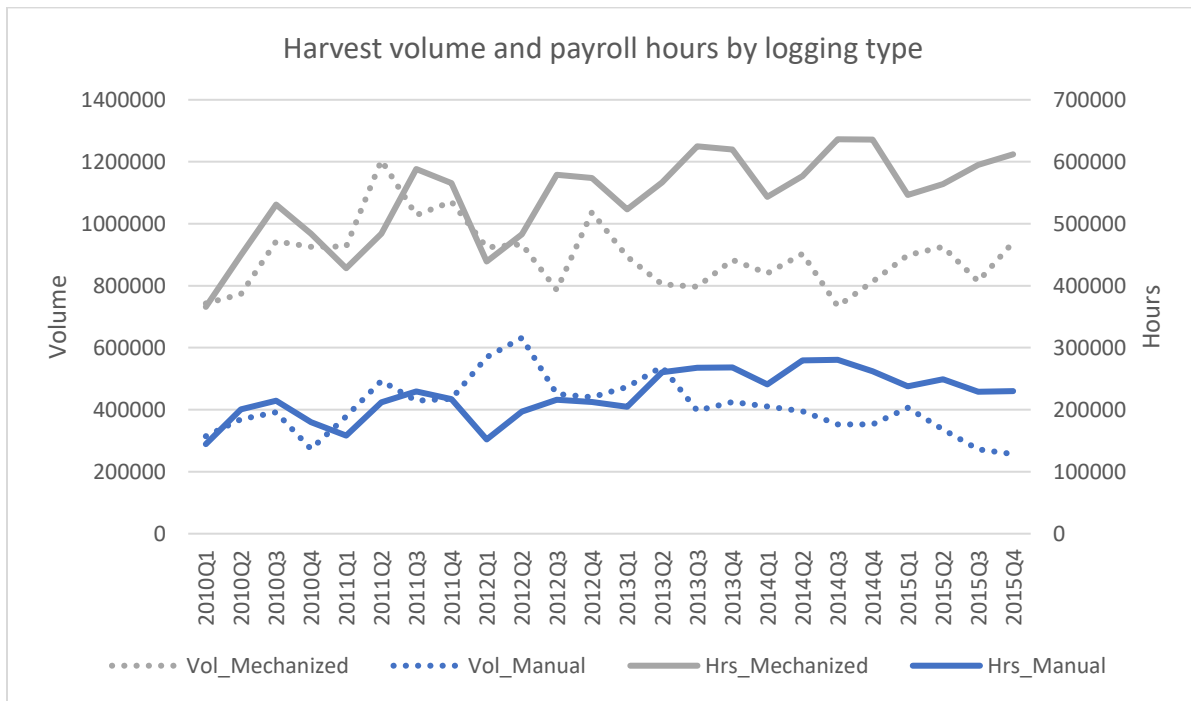


Harvest volume as measure of logging activity

We evaluated harvest volume data as a measure of logging activity alternative to payroll hours, comparing harvest volumes to payroll hours and volume-based claim rates to hours-based claim rates.

Trends differed by each measure of logging activity. Whereas employer-reported payroll hours tended to increase across the entire six years, initial increases in harvest volumes were followed by a period of decreasing volumes. In mechanized logging, harvest volumes increased over the first six quarters (by an estimated 8.1% quarterly), peaking in 2011Q2, then decreased through 2013Q3 (3.3% quarterly). The remaining nine quarters showed neither an increase nor a decrease in harvest volumes. In manual logging, harvest volumes increased by an estimated 6.5% quarterly from 2010Q1 through 2012Q2, then decreased by -4.4% quarterly from 2012Q2 through 2015Q4. (Estimates for changes in hours differs slightly from page 4 due to exclusion of 2016 data.)

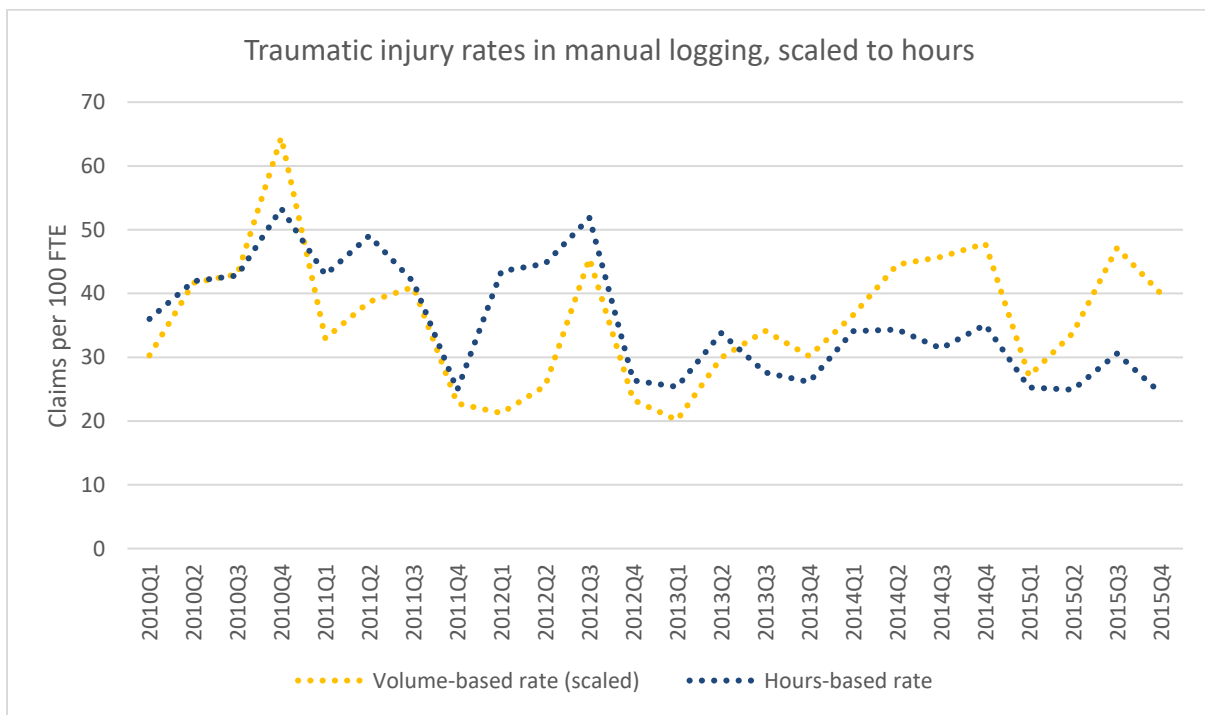
Figure 12. Logging activity as measured by harvest volume and payroll hours, for manual and mechanized logging, 2010-2015.



Among manual logging, harvest volume-based traumatic injury claim rates did not change over the six years (no statistically significant trend was identified), while hours-based claim rates declined over time (see pages 11-15 for details). Similarly for mechanized logging, hours-based rates of traumatic injuries declined, but no trend was detected volume-based rates (data not shown).

Between 2010 and 2013, standardized claim rates based on payroll hours tended to be greater than the standardized claim rates based on harvest volume. Beginning in 2013Q3, the pattern switched and standardized rates based on harvest volume exceeded standardized rates based on payroll hours. A similar pattern was observed for mechanized logging (data not shown); standardized hours-based rates generally exceeded standardized volume-based rates until 2013, after which they tended to be lower than volume-based rates. The rates reflect the trends in the measures of logging activity in the later part of the study period for both manual and mechanized logging: increasing hours and a flat or decreasing trend in harvest volumes.

Figure 13. Traumatic injury rates in manual logging, standardized to hours, by source of denominator data, 2010-2015.



Discussion:

Employer-reported Payroll Hours

We saw an increase in manual logging hours among the LSI participants through the second quarter following entry into the program. Conversely, manual logging hours decreased among accounts that never joined LSI. Within LSI accounts, reported hours for risk classes other than manual logging also increased during the study period, although at a slower rate than was observed for manual logging. These findings suggest that participation in LSI was associated with an increase in manual logging hours.

Interestingly, hours in manual logging among LSI participants declined shortly after joining the program, while the same trend was not observed for the other risk groups within LSI participating accounts, whose hours continued to increase. If the increase in manual logging hours resulted from the audit conducted prior to joining LIS (and then every three years thereafter), the hours might be expected to trend with the audit periods – increasing during the quarters under audit, then trailing off until the next audit occurs. Absent external checks for accuracy, there may be insufficient motivation for employers to report hours appropriately. On the other hand, the recent decline in manual logging hours among LSI participants may be due to a true decrease in hours worked stemming from a change in the industry, specifically the introduction of steep slope falling with tethered machines.

Work-related injuries

Among the manual logging risk class (LSI and non-LSI combined), rates for both traumatic injuries and compensable claims decreased from 2010 – 2016 by an average 8% annually. The decline is attributable to the non-LSI group, which experienced a 75% decrease in compensable claim rate between 2010 and 2013 (from 52.3 to 12.8 claims per 100 FTE) and a 60% decrease in the traumatic injury rate in the same time period (from 73.7 to 29.6 claims per 100 FTE). The claims rates among the LSI participants did not change significantly over the seven years evaluated. Rates among the LSI participants were lower than the non-LSI group at the beginning of the study period, and remained low throughout.

LSI participants appear to be safer employers prior to joining LSI, as evidenced by the lower claim rates among LSI participants, not only within manual logging, but across other logging-related risk classes.

In both LSI and non-LSI participating accounts, the portion of claims classified as time loss decreased over the study period, while the portion of claims classified as Permanent Partial Disability (PPD) increased. A greater portion of LSI claims utilized Kept on Salary (KOS) and

Stay at Work options than non-LSI claims. These trends likely impact workers' compensation costs for the entire risk class and by LSI participation.

Among LSI-participants, injury sources changed slightly over the time period. The change was most notable in the 'Other' category, the proportion of which decreased over time, largely driven by a decrease in the claims deemed 'non-classifiable'. Injuries involving the ground (generally falls) increased slightly over time. Among non-LSI participants, both the proportion and rate of claims for injuries from trees, logs, or other vegetation decreased over the years. This is notable given that 75% of fatalities in manual logging result from injuries from trees, logs, and other vegetation.

Harvest volumes

Trends in harvest volumes differed from trends in payroll hours, and trends in volume-based claims differed from hours-based claims. Harvest volumes may be a poor proxy measure of logging activity (and worker exposure), or payroll hours may continue to suffer reporting inaccuracies, even after implementation of LSI.

Limitations

The major limitation of the evaluation of the impact of the LSI program is that employer participation was voluntary rather than determined through random selection. Characteristics that led an employer to voluntarily join LSI may also explain any observed differences in outcomes between the LSI and non-LSI participants. Indeed, prior to joining LSI, employers who eventually joined LSI and those who never joined differed in at least three notable ways: LSI employers were larger, were more likely to report manual logging hours continuously over the years, and had a lower overall claim rate than non-LSI employers. Rather than changing the behavior of the employers who joined LSI, the program may have been a reward (in the form of reduced workers' compensation premiums) for employers who were already among the safest in the industry.

Another limitation is the small size of the manual logging industry, and thus the larger variance in claim rates by quarter, making it difficult to identify true changes over time.

Injuries are considered a “lagging” indicator of safety, reflecting workplace changes that may have taken effect slowly over time. Other measures may 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. LSI may have a positive effect on manual logging safety, but any impact might not be detectable for several years.

Also, it is nearly impossible to isolate the impact of the LSI program from other forces impacting the industry. Hours may have increased because the demand for manual logging increased at the same time. Claim rates may change because of the risks associated with particular job sites or

tasks, or they may change as the entire manual logging workforce changes. The increase in hours is notable given the accompanying decrease in harvest volumes. We cannot speculate which measure of logging activity – hours or volume – is more accurate, nor why harvest volumes would have decreased recently while hours increased. Additionally, harvest volume is limited in its utility as a measure of logging activity because it does not measure volumes for LSI participants separate from non-participants.

Finally, as the industry shifts toward tethered logging, the jobs that remain for manual logging may differ from jobs in the past, both in terms of required hours and risk profile. The industry's increasing reliance on tethered logging will likely impact both hours and claim rates in manual logging, although the direction and the magnitude of the impact are unknown.

Conclusion:

The LSI program appeared to increase reporting of payroll hours in quarters leading up to entry into the program. Increased reporting of hours was not sustained beyond the initial quarters of participation in LSI, and instead declined over the course of the remaining time. LSI did not appear to impact injury rates in the time period evaluated. The program's impact on claims, if any, may take longer to observe than the more immediate impact on reporting hours.

Technical Notes:

Data Sources

Washington State funded workers' compensation data were used to evaluate the impact of the LSI program. These included employer-reported payroll hours within a risk class and accepted workers' compensation claims. Claim status (acceptance and indemnity type) was determined at a 9-month common maturity, so that claims from each quarter were held to the same period of development. Data from years 2010 – 2016 were used in the analysis.

Definitions

We defined comparison groups two ways. First, we used Washington State workers' compensation risk classes (WAC 296-17) to identify groups engaged in logging-related activities: Manual logging (5001-03, plus the LSI-designated codes); Mechanized logging (5005-00, 5005-01); and Log hauling (5003-01, 5003-02). Second, we defined comparison groups based on participation within the LSI program. An employer account that reported hours in any of the three tiers in LSI was classified as an LSI participant. This classification was not limited to manual logging (although this was the primary comparison); we also compared outcomes by LSI participation among the two other logging-related risk classes to assess employer differences between LSI and non-LSI participants (an account may report hours for more than one risk class).

We used codes assigned to the incident description documented at the time of claim filling (in the Report of Industrial Injury or Occupational Disease) to identify traumatic injuries and to characterize the source of injury. Codes are assigned following the Occupational Injury and Illness Classification System (OIICS, 2007).

Time series

Hours and claim rate data are available on a quarterly basis. Because LSI allows for staggered enrollment, with employers joining in any quarter from 2014Q1 through the present, the data for any given quarter beginning with 2014Q1 consists of a mix of current LSI participants, eventual LSI participants, and employers that never joined LSI in the time period evaluated (i.e., through 2016).

When evaluating trends among LSI participants (current and eventual), we indexed quarters based on when each account joined LSI, allowing us to evaluate quarterly data relative to time zero, defined as entry into LSI. This approach is not possible with employers who never join LSI, as there is no quarter we can define as time zero. When evaluating difference between LSI and non-LSI participants, we compared calendar quarters, grouping current and eventual LSI participants into one group, and never LSI participants into another.

Statistical analysis

CDC's Joinpoint software was used to assess changes in the trends in reported hours or claim rates over time, and identify the point in time at which the trend likely changed e.g., from a period of increasing rates to decreasing rates, or from a period of no change to a period of increasing or decreasing rates. More information on Joinpoint available on the CDC website: <https://surveillance.cancer.gov/joinpoint/>

We estimated Annual Percent Change (APC) for each time period. APC with 95% Confidence Intervals that spanned 0% were considered not statically significant and suggested a trend line that was flat.

Payroll hours were modeled using linear regression controlling for season. Claim rates were modeled using poisson regression. Chi-squared tests for independence were used to evaluate differences in categorical outcomes (e.g., indemnity type, injury source) across comparison groups. Analyses were conducted using SAS 9.4.

To compare hours-based claim rates to harvest volume-based claim rates using the same scale, volumes were standardized to the hours population by multiplying the proportion of volume attributable to each quarter by the study period's total hours (e.g., 2010Q1 contained 3.2% of the total harvest volume for the study period. Standardized denominator for 2010Q1=3.2%*15,137,434 hrs).