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Cohort Profile: The Ontario Life after Workplace Injury Study (OLAWIS)

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Abstract

Purpose:

The substantial economic burden of work-related injury and illness, borne by workers, employers and social security programs, is primarily attributed to the durations of work disability among workers whose recovery requires a period of absence from work, with the majority of costs arising from the minority of workers with the longest duration absences. The objective of the Ontario Life after Workplace Injury Study (OLAWIS) is to describe the long-term health and labour market outcomes of workers disabled by work injury or illness after they are no longer receiving benefits or services from the work disability insurance authority.

Participants:

Workers disabled by a work-related injury or illness were recruited from a sample frame of disability benefit claimants with over-sampling of claimants with longer benefit durations. Characteristics of workers, their employers and claimant benefits were obtained from baseline administrative data. Interviews completed at 18 months post-injury (T1) and to be completed at 36 months (T2) measure return-to-work and work status; income; physical and mental health; case manager and healthcare provider interactions; employer accommodations supporting return-to-work and socio-demographic characteristics. Of eligible claimants, 40% (1,132) participated in the T1 interview, with 96% consenting to participate in the T2 interview.

Findings to date:

Preliminary descriptive analyses of T1 data have been completed. The median age was 50 and 56% were male. At 18 months following injury, 61% were employed by their at-injury employer, 16% had changed employment and 23% were not working. Past-year prescription opioid use was prevalent (34%), as was

past-year cannabis use (31%). Longer duration claimants had poorer function, recovery and health, and more adverse labour market outcomes.

Future plans:

Multivariate analyses to identify modifiable predictors of adverse health and labour market outcomes and a follow up survey of 96% of participants consenting to follow-up at 36 months are planned.

Strengths and Limitations of this study

This longitudinal study collected information from workers disabled by a work-related injury or illness 18 and 36 months following the beginning of an episode of work disability.

This large, representative sample will inform understanding of the long-term consequences to health and labour force participation among an important sub-group of workers who experience long durations of work disability.

As eligibility criteria for participation in this cohort was restricted to disability due to a work-related injury or illness, the many other health conditions that can result in work disability are not represented in this cohort.

Introduction

The burden of work-related injury and illness among workers in the developed economies is substantial. Among working-aged adults, 1 of every six injuries requiring medical attention are caused by work exposures(1) with approximately 35% of these work-related injuries and illnesses resulting in periods of disability and work absence. An important minority of work injury or illness results in some degree of permanent impairment. For example, in a representative sample of Canadian adults, 25% of adults with disabilities attributed the underlying impairment to an exposure at work.(2)

The economic burden of work-related injury and illness borne by workers, employers and social security programs, is also substantial.(3) Much of this economic cost is attributed to the durations of work disability among workers whose recovery requires a period of absence from work. In addition to the economic costs attributed to compensation for lost income during the period of work absence, there is compelling evidence for long-lasting adverse impacts of work disability episodes on injured workers' subsequent labour force participation and labour market earnings.(4, 5)

While the durations of work disability are relatively short for the majority of work absence episodes, for an important minority of episodes, disability durations can be long, may result in loss of employment and are responsible for the majority of work disability insurance program expenditures. Understanding the factors that influence the duration of work disability episodes has been informed by research focused on four primary domains: characteristics of the injury and the worker, the nature of workplace accommodations to support workers returning to work, access to and the appropriateness of health care, and the influence of benefit policies established by work disability insurance providers. Longitudinal cohort studies of injured workers have documented the role of injury severity, persistent pain, mental health impairments, older age, and recovery expectations as determinants of long duration disability episodes.(6-9) Understanding the influence of employer accommodation practices on disability

episode has been informed both by observational cohort studies, and by experimental study designs involving randomized controlled trials.(10-16) Quasi-experimental study designs have advanced understanding of the influence of disability insurance provider policies on the durations of work disability.(16-19)

The contributions of this literature has led to important reforms to workplace and disability insurer practices in many jurisdictions. However, there has been less attention focused on describing the experiences of workers disabled by a work-related injury or illness over longer follow-up periods, or adequately powered comparisons between the experiences of workers' compensation claimants with long wage replacement durations compared to claimants with shorter durations. The objective of the Ontario Life after Workplace Injury Study (OLAWIS) is to describe the long-term outcomes of workers disabled by work injury or illness. The study design oversampled disability benefit recipients with longer duration disability episodes and incorporates measures obtained at baseline from administrative records with measures obtained from interviews with study subjects 18 months and 36 months following the incidence of disabling injury or illness.

In designing this study, we expected that poor health recovery outcomes at 18 and 36 months will be more common among women, workers aged 50 or older, workers experiencing more severe traumatic injury or non-traumatic musculoskeletal disorders and those using opioid medications. In parallel, we hypothesized that shorter durations of wage replacement benefits will be more common among workers who report early employer contact and who report an employer offer of accommodation. In terms of labour market outcomes, we expected that a return to work with the at-injury employer will be more common among workers with longer pre-injury employment tenure, workers who are union members and workers with a positive perception of employment security. Poor labour market outcomes at 18 and 36 months will be more common among workers with low educational attainment, workers

who have recently immigrated to Canada and workers with high symptom scores for pain and poor mental health.

Cohort description

Setting

In 2018, there were approximately 6.5 million labour force participants in Ontario, Canada. The majority of employers in Ontario (approximately 70%) have a mandatory obligation to obtain work disability insurance coverage from the publicly administered, single-payer workers' compensation insurance authority, the Workplace Safety & Insurance Board (WSIB). Employers also have a legislated obligation to accommodate employees with health impairments, including the duty to accommodate employees who have experienced a work-related injury or illness. The WSIB administers benefits to entitled workers, covering medical care services and provides wage replacement benefits for workers whose recovery from a work-related injury or illness requires absence from work. In 2018, the WSIB administered benefits for 160,000 compensation claims, of which 48,000 were claims resulting in lost-time from work. The WSIB also schedules employer insurance premiums that incorporate financial incentives to encourage early return-to-work practices by employers.

Baseline recruitment

Study sample recruitment was conducted between June 2019 and March 2020. WSIB administrative records were used to identify with workers who had registered a compensation claim for wage replacement benefits due to a physical injury or illness approximately 18 months prior.

To ensure adequate representation of participants with more serious and complex claims in the cohort, the OLAWIS sampling plan specified that approximately 400 participants were to be recruited in each of three compensation duration sample groups: short duration, i.e., 5 days to 3 months; medium duration, i.e., 3 to 12 months; and longer duration, i.e., 12+ months. We excluded lost-time claimants with benefit durations of less than 5 days. These claimants represented approximately 30% of all lost-time claimants. The short duration sample represented 54% of all lost-time claimants, the medium duration sample represented 9% of all lost-time claimants and the longer duration sample represented 6% of all lost-time claimants. The rationale for recruiting three equal-sized samples of claimants, stratified by claim duration and complexity, was to obtain sufficient statistical power to identify claimant characteristics that meaningfully differ between the more frequent short-duration claimant profile and the less frequent long-duration claimant profile. A sample of 400 respondents in each group has the power to estimate statistically significant relative risks of 2.0 or greater for measures with prevalence of 10-20% (a prevalence difference of 5% in one group and 10% in a second group) and can detect relative risks of 1.5% for measures with an average prevalence of 20% or greater (a difference of 13% in one group and 20% in a second group).

Records for 9,745 lost-time claimants were randomly selected by representatives of the WSIB to meet quota targets specified by the OLAWIS research team. WSIB representatives contacted claimants by telephone to obtain monthly quotas of claimants consenting to share their contact information with the OLAWIS research team. Lost-time claimants with a primary psychological injury, who were in the survivors program or serious injury program, who had a traumatic head injury resulting in communication impairment, younger than age 18, or who could not conduct an interview in English or French were excluded.

Of the 2,816 claimants contacted, a total of 1,674 (59.4%) agreed to share their contact information. Of the claimants consenting, the survey services contractor was unable to establish contact with 385

claimants, received 125 interview refusals, 32 claimants were deemed ineligible and interviews were completed with 1,132 claimants (40.1% of eligible claimants and 87.7% of eligible claimants successfully contacted). Figure 1 shows the flow of participants.

Among participants, 358 (31.6%) were in the short duration claim sample, 374 (33.0%) were in the medium duration claim sample, and 400 (35.3%) were in the long duration claim sample. In this cohort of 1,132 claimants, 96% consented to be re-contacted for the 36-month follow-up survey and 94% gave permission to the research team to access information recorded in their WSIB administrative record.

Analyses were conducted comparing the 1,132 interview participants to consenting claimants who did not complete an interview and to the randomly selected recruitment sample. No substantive differences were observed between samples based on age, gender, geographic location, industry, and employer size. However, duration of benefits were slightly longer among participants vs non-participants (details available upon request).

Patient and public involvement

Patients and the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Data collection

Primary outcome measures and potential predictors of the primary outcomes were drawn from two sources; WSIB administrative records and an interviewer-administered questionnaire. Information available from administrative records of work disability insurance benefits was integrated with the information obtained from an interviewer-administered questionnaire. With participant's consent, information obtained from administrative records included measures of the nature of injury and injury

event, benefit duration, workers' occupation and geographic location and the employer size and economic sector.

Interview-administered questionnaire: 18 months

Questionnaire measures were grouped in the following topic domains: (1) Return-to-work and labour market status; (2) function, recovery and measures of physical and mental health; (3) interactions between the claimant and the work disability insurance case managers; (4) interactions between the claimant and their healthcare providers; and (5) basic socio-demographic characteristics and pre-injury information on occupation, industry and workplace size. Relevant measures administered in previous cohort studies of disabled workers(12, 20) and measures administered in the Canadian Community Health Survey(21) were incorporated in the OLAWIS questionnaire when available. The interviews conducted by the survey services contractor lasted approximately 40 minutes and participants were remunerated $40 CAD.

1. *Return-to-work and labour market status*

Respondents were asked whether they were currently working with their pre-injury employer and were asked a series of questions about interactions with the workplace where the injury occurred during the period of recovery and return-to-work. The questionnaire included items related to the frequency and quality of communication with the workplace, the nature of modified duties or accommodations proposed by the workplace, and perceptions of the outcome of the return-to-work experience. For employed respondents not currently working with their pre-injury employer, information was collected on the main reason they were not working with their pre-injury employer. For respondents not currently working, information was collected on whether they had made a return-to-work attempt and their perception of the main reason they were not currently working.

2. *Function, recovery and measures of physical and mental health*

The questionnaire included a range of measures of function, recovery and health outcomes. Current intensity of pain was measured by the Chronic Pain Grade Scale and pain-related interference with normal activities was assessed.(22) Measures of self-rated health status and self-rated mental health status(23-27) were administered along with the SF-12 scale(28) and the Kessler-6 screening tool for mental disorder symptoms.(29) The questionnaire included a series of items used in the Canadian Community Health Survey(21) to assess perceptions of work stress, life stress and life satisfaction, sleep quality, alcohol consumption, and medication use. Questions were also included on current cannabis use and if use was for therapeutic purposes.

3. Interactions between the claimant and the work disability insurance case managers

Respondents were asked to assess the quality of interactions with work disability insurance case managers, both in terms of interpersonal treatment and the quality of the information provided by case managers.(11, 30)

4. Interactions between the claimant and their healthcare providers

The questionnaire included items documenting the respondent's main health care provider, whether difficulty was experienced accessing health care services, whether the use of health care services was stressful and the respondent's assessment of the clarity of advice provided by health care providers concerning returning to work.

5. Socio-demographic characteristics and pre-injury information on occupation, industry and workplace size

The interview collected information on claimant age, sex, immigrant status, educational attainment, family structure, union membership, pre-injury occupational tasks and work hours, workplace size and

industry of employment. Respondents also provided information about the amount of personal and household income in the previous 12 months, and their current main income sources.

Interview-administered questionnaire: 36 months

Participants who agreed to be re-contacted will be administered an abbreviated version of the 18 month questionnaire, retaining topic domains concerning; 1) current labour market status, 2) function, recovery and measures of physical and mental health and 3) basic socio-demographic characteristics. An extended questionnaire domain pertaining to cannabis use will be administered to participants reporting current cannabis use at the 18 month interview. The 36 month interview will be administered over the period January to December 2021.

Findings to date

Unweighted descriptive analyses completed to date are summarized in Table 1 and Table 2. The median age at the time of the baseline interview (approximately 18 months after injury) was 50; participants in the short duration sample had a median age of 47, whereas those in the long duration sample had a median age of 51. Over half of the participants (56%) were male. The most common industries were health care and social assistance (15%), construction, utilities and mining (14%), and transportation and warehousing (13%), and manufacturing (13%), with significant differences in industry composition across claim duration groups (p=0.003). Approximately 40% of the sample had a household income greater than $100,000 without a significant difference in income across claim duration groups. Participants with the longest claim durations had lower education and were less likely to be presently working. They were also more likely to have suffered a head injury, to currently be receiving services

from the WSIB, to be receiving health care for the treatment of conditions related to the work injury, to have pain symptoms, and to demonstrate greater health impairment on a range of measures.

Results regarding return-to-work with the at-injury employer are displayed in Table 3. Initially, 90% of participants returned to their at-injury employer. Males, those in the longer claim duration sample, those in smaller workplaces and those in rural areas were less likely to return to work with their at-injury-employer. Union members and participants reporting a permanent employment arrangement at the time of injury were more likely to return to work with their at-injury employer.

Eighteen months following the work injury incident, 35% of participants reported that they were no longer working for the at-injury employer (Table 4). Approximately 50% of these workers chose to terminate employment and 20% reported the employer did not have work available. Approximately 14% of participants reported that the employer had fired them or terminated the employment relationship and approximately 10% of participants chose to retire.

Strengths and limitations

The Ontario Life After Work Injury Study cohort was designed to address two important limitations in previous research examining the determinants of adverse health and labour market outcomes following an episode of work disability—length of follow up, and sample size. In terms of the first, this study follows a large, representative sample of workers who experienced a disabling work-related injury or illness for a longer time period than has typically been reported in the current literature. Information provided by claimants 18 months and 36 months following a disabling work injury will inform understanding of the long-term consequences to health, function and labour force participation. In terms of the second, the recruitment of adequate numbers of study participants with the longest durations of work disability will provide sufficient statistical power to identify the modifiable and non-

modifiable characteristics of claimants associated with long disability durations, not typically possible in an inception cohort.

This study is not without limitations. Although differences between participants and non-participants on observed characteristics were minor, there may be important differences in unmeasured characteristics which may have influenced participation. We also note that the eligibility criteria for participation in this cohort was restricted to disability due to a work-related injury or illness. The many other health conditions that can result in work disability are not represented in this cohort.

Although not anticipated by the OLAWIS research team, the experiences of the longitudinal cohort between the first and the second follow-up interviews will intersect with the COVID-19 public health emergency. Nationally representative surveys conducted during the emergency found that 28% of employed Canadians were concerned that they might lose their job or self-employment income as a consequence of the emergency and 33% of respondents reported that the emergency would have a major or moderate impact on their ability to meet financial obligations.(31) To respond to the acute economic effects of the COVID-19 emergency on households and on employers, the Government of Canada has rapidly implemented a range of financial relief programs that have the potential to provide more than $140 billion in direct support.(32) We anticipate that the economic, social and health impacts of the unprecedented contraction in the Canadian labour market will have more substantive negative impacts on workers with health impairments.

Over the past two decades, many jurisdictions in the developed economies have achieved important reductions in the incidence of work-related injury and illness.(1, 33) Paralleling these achievements, progress has also been made in reducing the burden of disability among workers experiencing a work-related injury or illness. Research contributions can inform future innovations in workplace practices and disability insurance provider policies to improve the prevention and management of work disability.

Authors' contributions: VN conducted data analysis, drafted the initial manuscript and approved the final manuscript as submitted. ET, NC, PS and CM contributed to the development of the study protocol and the acquisition of research funding. They each revised the manuscript critically for important intellectual content and approved the final manuscript as submitted. CM is the principal investigator for the study. He led the conceptualisation, development and design of the study.

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Competing Interest Statement: No competing interests are declared.

Data availability statement Procedures to access data from this study are available through contacting the lead author (CM). Proposals for collaborative analyses will be considered by the study's investigator team. The study questionnaire can be provided by contacting the lead author (CM).

Table 1: OLAWIS Cohort, Demographic and Work characteristics, by sample group

	All Respondents (n=1132)	Short duration (N=358)	Medium duration (N=374)	Long duration (n=400)	*P* value
Age, mean (SD), median	47.4 (12.8), 50.0	45.3 (13.3), 47.0	47.5 (12.5), 50.0	49.0 (12,4), 51.0	P=0.0004
Male sex, n (%)	632 (55.8)	192 (53.6)	213 (57.0)	227 (56.8)	P=0.31
Highest level of education, n (%)					
Some high school	89 (7.9)	22 (6.2)	25 (6.7)	42 (10.5)	P=0.02
High school completed	248 (22.0)	67 (18.7)	91 (24.5)	90 (22.5)	
Any post-secondary	793 (70.2)	269 (75.1)	256 (68.8)	268 (67.0)	
Household Income, n (%)					
<$40K	144 (14.4)	45 (13.9)	52 (16.1)	47 (13.2)	P=0.89
$40-69K	235 (23.4)	73 (22.6)	66 (20.4)	96 (27.0)	
$70-99K	227 (22.6)	76 (23.5)	77 (23.8)	74 (20.8)	
$100-129K	185 (18.4)	64 (19.8)	54 (16.7)	67 (18.8)	
>=$130K	212 (21.1)	65 (20.1)	75 (23.2)	72 (20.2)	
Industry at time of claim, n (%)					
Health Care & Social assistance	170 (15.0)	68 (19.0)	40 (10.7)	62 (15.5)	P=0.003
Construction, Utilities, Mining, Agriculture, Forestry	156 (13.8)	42 (11.7)	48 (12.9)	66 (16.5)	
Transportation & Warehousing	147 (13.0)	36 (10.1)	58 (15.6)	53 (13.3)	
Manufacturing	142 (12.6)	32 (8.9)	50 (13.4)	60 (15.0)	
Other Services (except Public Administration)	139 (12.3)	42 (11.7)	52 (13.9)	45 (11.3)	
Retail, Wholesale Trade	93 (8.2)	34 (9.5)	35 (9.4)	24 (6.0)	
Educational Services	99 (8.8)	43 (12.0)	31 (8.3)	25 (6.3)	
Accommodation/ Food Services/ Arts/ Entertainment	87 (7.7)	29 (8.1)	26 (7.0)	32 (8.0)	
Public Administration	66 (5.8)	26 (7.3)	21 (5.6)	19 (4.8)	
Other	32 (2.8)	6 (1.7)	12 (3.2)	14 (3.5)	

Table 2: OLAWIS Cohort, Injury, Return to work and Recovery outcomes, by sample group

	All Respondents (n=1132)	Short duration (N=358)	Medium duration (N=374)	Long duration (n=400)	*P* value
Work-related condition*, n (%)					
Head injury	108 (10.5)	29 (8.7)	36 (10.5)	43 (12.1)	P<.0001
Abrasions, cuts, lacerations	122 (11.8)	63 (18.8)	27 (7.9)	32 (9.0)	
Musculoskeletal disorders and injuries	540 (52.3)	188 (56.1)	174 (50.7)	178 (50.1)	
Fractures and dislocations	139 (13.5)	24 (7.2)	57 (16.6)	58 (16.3)	
Other conditions	124 (12.0)	31 (9.3)	49 (14.3)	44 (12.4)	
Employment status, n (%)					
Working at injury employer	695 (61.4)	225 (62.9)	221 (59.1)	249 (62.3)	P=0.001
Working at different employer	178 (15.7)	68 (19.0)	71 (19.0)	39 (9.8)	
Not currently working	259 (22.9)	65 (18.2)	82 (21.9)	112 (28.0)	
Benefit Duration (days)* mean (SD), median	72.2 (95.9), 39.0	14.6 (15.3), 8.0	80.8 (53.8), 70.0	117.9 (136.1),60.5	P<.0001
Current WSIB services, n (%)	223 (19.8)	26 (7.3)	29 (7.8)	168 (42.3)	P<.0001
Current health care for injury, n (%)	356 (33.5)	68 (21.4)	80 (22.6)	208 (53.2)	P<.0001
Current pain due to injury mean (SD), median	4.1 (2.8), 4.0	3.4 (2.8), 3.0	3.8 (2.7), 4.0	4.8 (2.5), 5.0	P<.0001
Prescription opioid use (past year), n (%)	388 (34.3)	80 (22.4)	111 (29.7)	197 (49.3)	P<.0001
Prescription sedative use (past year) n (%)	266 (23.5)	60 (16.8)	82 (21.9)	124 (31.0)	P=0.0004
Poor/fair general health, n (%)	295 (26.1)	61 (17.0)	101 (27.0)	133 (33.3)	P<.0001
Poor/fair mental health, n (%)	313 (27.2)	72 (20.1)	95 (25.4)	146 (36.7)	P<.0001
Trouble going to or staying asleep, n (%)					
Never	171 (15.1)	70 (19.6)	61 (16.3)	40 (10.0)	P<.0001
Rarely	182 (16.1)	65 (18.2)	64 (17.1)	53 (13.3)	
Sometimes	324 (28.7)	101 (28.3)	115 (30.8)	108 (27.1)	
Most of the time	266 (23.5)	75 (21.0)	87 (23.3)	104 (26.1)	
All of the time	187 (16.6)	46 (12.9)	47 (12.6)	94 (23.6)	
Financial difficulties during work absence, n (%)					
No	548 (48.8)	219 (61.5)	161 (43.2)	168 (42.5)	P<.0001
Yes, minor	110 (9.8)	42 (11.8)	37 (9.9)	31 (7.9)	
Yes, concerning	187 (16.6)	41 (11.5)	74 (19.8)	72 (18.2)	
Yes, very concerning	116 (10.3)	27 (7.6)	40 (10.7)	49 (12.4)	
Yes, very serious	163 (14.5)	27 (7.6)	61 (16.4)	75 (19.0)	
Past-year cannabis use, n (%)					
Yes	348 (30.7)	115 (32.1)	114 (30.5)	119 (29.7)	P=0.67
No	784 (69.3)	243 (67.9)	260 (69.5)	281 (70.3)	

*claimants consenting to use of WSIB administrative records

Table 3: OLAWIS Cohort, Return to work at the at-injury employer

	Cohort N (%)		Returned to at-injury employer N (%)		Did not return to at-injury employer N (%)		
Total	1,132	100.0	1014	(89.6)	118	(10.4)	
Age							
<30	145	(12.8)	127	(12.5)	18	(15.3)	p=0.67
30-49	412	(36.4)	372	(36.7)	40	(33.9)	
50+	575	(50.8)	515	(50.8)	60	(50.9)	
Sex							
Male	632	(55.9)	555	(54.8)	77	(66.3)	p=0.03
Female	498	(44.1)	457	(45.2)	41	(34.8)	
Claim duration group							
Short	358	(31.6)	336	(33.1)	22	(18.6)	p=0.004
Medium	374	(33.0)	331	(32.6)	43	(36.4)	
Long	400	(35.3)	347	(34.2)	53	(44.9)	
Union Membership							
Yes	554	(49.2)	525	(52.0)	29	(24.8)	p=0.0001
No	573	(50.8)	485	(48.0)	88	(75.2)	
Company size							
<20	300	(27.5)	240	(24.6)	60	(51.7)	p<.0001
20-99	372	(34.0)	341	(34.9)	31	(26.7)	
>/=100	421	(38.5)	396	(40.5)	25	(21.6)	
Employment							
Permanent	1042	(92.1)	947	(93.4)	95	(80.5)	p<.0001
Temporary/Contract	90	(8.0)	67	(6.6)	23	(19.5)	
Residence							
Rural	197	(17.6)	167	(16.6)	30	(25.4)	p=0.02
Urban	925	(82.4)	837	(83.4)	88	(74.6)	

Table 4: OLAWIS Cohort, Reason not working with the at-injury employer at 18 month follow-up		
	N	%
Quit	197	(49.3)
No work available	77	(19.3)
Terminated / Fired	54	(13.5)
Retired	35	(8.8)
Misclassified (still with at-injury employer)	34	(8.5)
Still on WSIB benefits	3	(0.8)
Total	400	(100.0)

Figure Legend

Figure 1: Participant flow diagram

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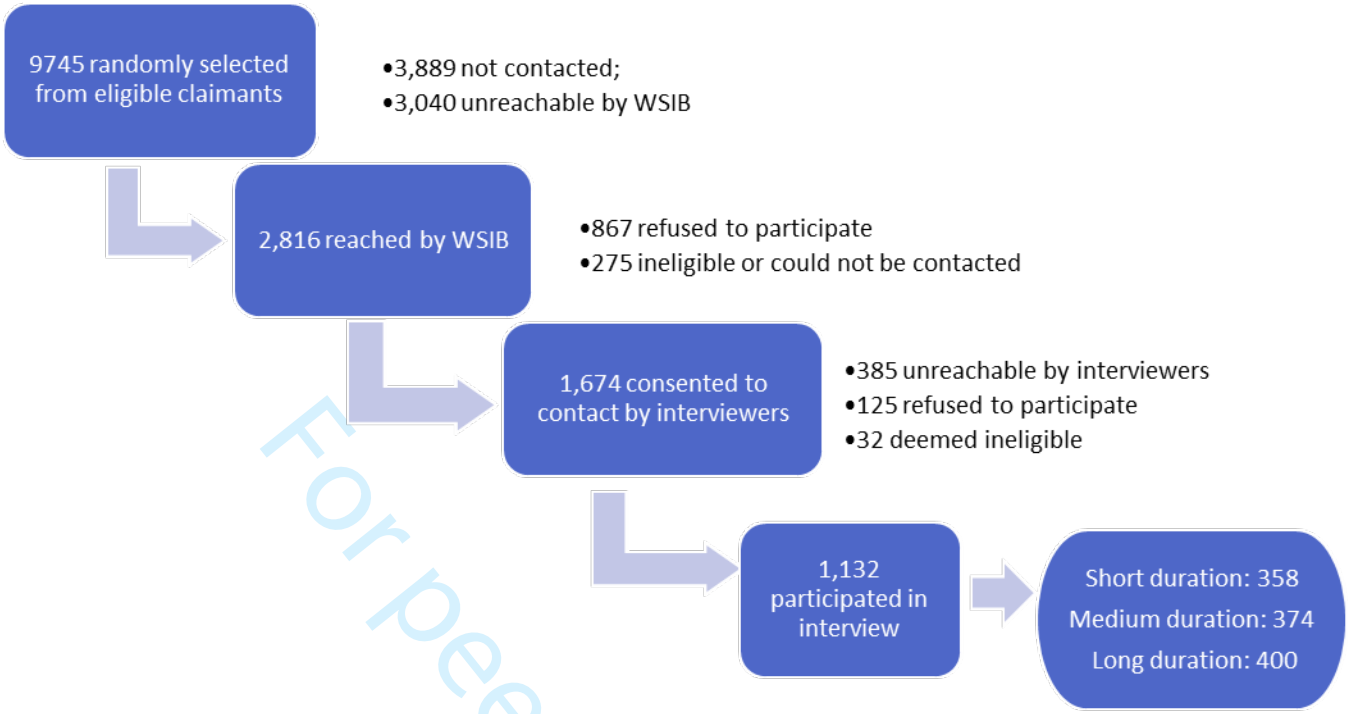

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Cohort Profile: The Ontario Life After Workplace Injury Study (OLAWIS)

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Cohort Profile: The Ontario Life after Workplace Injury Study (OLAWIS)

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Abstract

Purpose:

The substantial economic burden of work-related injury and illness, borne by workers, employers and social security programs, is primarily attributed to the durations of work disability among workers whose recovery requires a period of absence from work, with the majority of costs arising from the minority of workers with the longest duration absences. The objective of the Ontario Life after Workplace Injury Study (OLAWIS) is to describe the long-term health and labour market outcomes of workers disabled by work injury or illness after they are no longer receiving benefits or services from the work disability insurance authority.

Participants:

Workers disabled by a work-related injury or illness were recruited from a sample frame of disability benefit claimants with over-sampling of claimants with longer benefit durations. Characteristics of workers, their employers and claimant benefits were obtained from baseline administrative data. Interviews completed at 18 months post-injury (T1) and to be completed at 36 months (T2) measure return-to-work and work status; income; physical and mental health; case manager and healthcare provider interactions; employer accommodations supporting return-to-work and socio-demographic characteristics. Of eligible claimants, 40% (1,132) participated in the T1 interview, with 96% consenting to participate in the T2 interview.

Findings to date:

Preliminary descriptive analyses of T1 data have been completed. The median age was 50 and 56% were male. At 18 months following injury, 61% were employed by their at-injury employer, 16% had changed employment and 23% were not working. Past-year prescription opioid use was prevalent (34%), as was

past-year cannabis use (31%). Longer duration claimants had poorer function, recovery and health, and more adverse labour market outcomes.

Future plans:

Multivariate analyses to identify modifiable predictors of adverse health and labour market outcomes and a follow up survey of 96% of participants consenting to follow-up at 36 months are planned.

Strengths and Limitations of this study

This longitudinal study collected information from workers disabled by a work-related injury or illness 18 and 36 months following the beginning of an episode of work disability.

This large, representative sample will inform understanding of the long-term consequences to health and labour force participation among an important sub-group of workers who experience long durations of work disability.

As eligibility criteria for participation in this cohort was restricted to disability due to a work-related injury or illness, the many other health conditions that can result in work disability are not represented in this cohort.

Introduction

The burden of work-related injury and illness among workers in the developed economies is substantial. Among working-aged adults, 1 of every six injuries requiring medical attention are caused by work exposures(1) with approximately 35% of these work-related injuries and illnesses resulting in periods of disability and work absence. An important minority of work injury or illness results in some degree of permanent impairment. For example, in a representative sample of Canadian adults, 25% of adults with disabilities attributed the underlying impairment to an exposure at work.(2)

The economic burden of work-related injury and illness borne by workers, employers and social security programs, is also substantial.(3) Much of this economic cost is attributed to the durations of work disability among workers whose recovery requires a period of absence from work. In addition to the economic costs attributed to compensation for lost income during the period of work absence, there is compelling evidence for long-lasting adverse impacts of work disability episodes on injured workers' subsequent labour force participation and labour market earnings.(4, 5)

While the durations of work disability are relatively short for the majority of work absence episodes, for an important minority of episodes, disability durations can be long, may result in loss of employment and are responsible for the majority of work disability insurance program expenditures. Understanding the factors that influence the duration of work disability episodes has been informed by research focused on four primary domains: characteristics of the injury and the worker, the nature of workplace accommodations to support workers returning to work, access to and the appropriateness of health care, and the influence of benefit policies established by work disability insurance providers. Longitudinal cohort studies of injured workers have documented the role of injury severity, persistent pain, mental health impairments, older age, and recovery expectations as determinants of long duration disability episodes.(6-9) Understanding the influence of employer accommodation practices on disability

episode has been informed both by observational cohort studies, and by experimental study designs involving randomized controlled trials.(10-16) Quasi-experimental study designs have advanced understanding of the influence of disability insurance provider policies on the durations of work disability.(16-19)

The contributions of this literature has led to important reforms to workplace and disability insurer practices in many jurisdictions. However, there has been less attention focused on describing the experiences of workers disabled by a work-related injury or illness over longer follow-up periods, or adequately powered comparisons between the experiences of workers' compensation claimants with long wage replacement durations compared to claimants with shorter durations. The objective of the Ontario Life after Workplace Injury Study (OLAWIS) is to describe the long-term outcomes of workers disabled by work injury or illness. The study design oversampled disability benefit recipients with longer duration disability episodes and incorporates measures obtained at baseline from administrative records with measures obtained from interviews with study subjects 18 months and 36 months following the incidence of disabling injury or illness.

In designing this study, we expected that poor health recovery outcomes at 18 and 36 months will be more common among women, workers aged 50 or older, workers experiencing more severe traumatic injury or non-traumatic musculoskeletal disorders and those using opioid medications. In parallel, we hypothesized that shorter durations of wage replacement benefits will be more common among workers who report early employer contact and who report an employer offer of accommodation. In terms of labour market outcomes, we expected that a return to work with the at-injury employer will be more common among workers with longer pre-injury employment tenure, workers who are union members and workers with a positive perception of employment security. Poor labour market outcomes at 18 and 36 months will be more common among workers with low educational attainment, workers who have recently immigrated to Canada and workers with high symptom scores for pain and poor

mental health. Examination of these hypotheses will contribute to the international literature on the impact of health impairments secondary to traumatic injury on labour force participation, and the role of workplace accommodation in enabling employment participation among workers with health impairments.

Cohort description

Setting

In 2018, there were approximately 6.5 million labour force participants in Ontario, Canada. The majority of employers in Ontario (approximately 70%) have a mandatory obligation to obtain work disability insurance coverage from the publicly administered, single-payer workers' compensation insurance authority, the Workplace Safety & Insurance Board (WSIB). Employers also have a legislated obligation to accommodate employees with health impairments, including the duty to accommodate employees who have experienced a work-related injury or illness. The WSIB administers benefits to entitled workers, covering medical care services and provides wage replacement benefits for workers whose recovery from a work-related injury or illness requires absence from work. In 2018, the WSIB administered benefits for 160,000 compensation claims, of which 48,000 were claims resulting in lost-time from work. The WSIB also schedules employer insurance premiums that incorporate financial incentives to encourage early return-to-work practices by employers.

Baseline recruitment

Study sample recruitment was conducted between June 2019 and March 2020. WSIB administrative records were used to identify with workers who had registered a compensation claim for wage replacement benefits due to a physical injury or illness approximately 18 months prior.

To ensure adequate representation of participants with more serious and complex claims in the cohort, the OLAWIS sampling plan specified that approximately 400 participants were to be recruited in each of three compensation duration sample groups: short duration, i.e., 5 days to 3 months; medium duration, i.e., 3 to 12 months; and longer duration, i.e., 12+ months. We excluded lost-time claimants with benefit durations of less than 5 days. These claimants represented approximately 30% of all lost-time claimants. The short duration sample represented 54% of all lost-time claimants, the medium duration sample represented 9% of all lost-time claimants and the longer duration sample represented 6% of all lost-time claimants. The rationale for recruiting three equal-sized samples of claimants, stratified by claim duration and complexity, was to obtain sufficient statistical power to identify claimant characteristics that meaningfully differ between the more frequent short-duration claimant profile and the less frequent long-duration claimant profile. Survey weights are applied for analyses that focus on representing the target population of claimants with durations of 5 days or longer. A sample of 400 respondents in each group has the power to estimate statistically significant relative risks of 2.0 or greater for measures with prevalence of 10-20% (a prevalence difference of 5% in one group and 10% in a second group) and can detect relative risks of 1.5% for measures with an average prevalence of 20% or greater (a difference of 13% in one group and 20% in a second group).

Records for 9,745 lost-time claimants were randomly selected by representatives of the WSIB to meet quota targets specified by the OLAWIS research team. WSIB representatives contacted claimants by telephone to obtain monthly quotas of claimants consenting to share their contact information with the OLAWIS research team. Lost-time claimants with a primary psychological injury, who were in the survivors program or serious injury program, who had a traumatic head injury resulting in

communication impairment, younger than age 18, or who could not conduct an interview in English or French were excluded.

Of the 2,816 claimants contacted, a total of 1,674 (59.4%) agreed to share their contact information. Of the claimants consenting, the survey services contractor was unable to establish contact with 385 claimants, received 125 interview refusals, 32 claimants were deemed ineligible and interviews were completed with 1,132 claimants (40.1% of eligible claimants and 87.7% of eligible claimants successfully contacted). Figure 1 shows the flow of participants.

Among participants, 358 (31.6%) were in the short duration claim sample, 374 (33.0%) were in the medium duration claim sample, and 400 (35.3%) were in the long duration claim sample. In this cohort of 1,132 claimants, 96% consented to be re-contacted for the 36-month follow-up survey and 94% gave permission to the research team to access information recorded in their WSIB administrative record.

Analyses were conducted comparing the 1,132 interview participants to consenting claimants who did not complete an interview and to the randomly selected recruitment sample. No substantive differences were observed between samples based on age, gender, geographic location, industry, and employer size. However, duration of benefits were slightly longer among participants vs non-participants (details available upon request).

Patient and public involvement

Patients and the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Data collection

Primary outcome measures and potential predictors of the primary outcomes were drawn from two sources; WSIB administrative records and an interviewer-administered questionnaire. Information

available from administrative records of work disability insurance benefits was integrated with the information obtained from an interviewer-administered questionnaire. With participant's consent, information obtained from administrative records included measures of the nature of injury and injury event, benefit duration, workers' occupation and geographic location and the employer size and economic sector.

Interview-administered questionnaire: 18 months

Questionnaire measures were grouped in the following topic domains: (1) Return-to-work and labour market status; (2) function, recovery and measures of physical and mental health; (3) interactions between the claimant and the work disability insurance case managers; (4) interactions between the claimant and their healthcare providers; and (5) basic socio-demographic characteristics and pre-injury information on occupation, industry and workplace size. Relevant measures administered in previous cohort studies of disabled workers(12, 20) and measures administered in the Canadian Community Health Survey(21) were incorporated in the OLAWIS questionnaire when available. The interviews conducted by the survey services contractor lasted approximately 40 minutes and participants were remunerated $40 CAD.

1. *Return-to-work and labour market status*

Respondents were asked whether they were currently working with their pre-injury employer and were asked a series of questions about interactions with the workplace where the injury occurred during the period of recovery and return-to-work. The questionnaire included items related to the frequency and quality of communication with the workplace, the nature of modified duties or accommodations proposed by the workplace, and perceptions of the outcome of the return-to-work experience. For employed respondents not currently working with their pre-injury employer, information was collected on the main reason they were not working with their pre-injury employer. For respondents not currently

working, information was collected on whether they had made a return-to-work attempt and their perception of the main reason they were not currently working.

2. Function, recovery and measures of physical and mental health

The questionnaire included a range of measures of function, recovery and health outcomes. Current intensity of pain was measured by the Chronic Pain Grade Scale and pain-related interference with normal activities was assessed.(22) Measures of self-rated health status and self-rated mental health status(23-27) were administered along with the SF-12 scale(28) and the Kessler-6 screening tool for mental disorder symptoms.(29) The questionnaire included a series of items used in the Canadian Community Health Survey(21) to assess perceptions of work stress, life stress and life satisfaction, sleep quality, alcohol consumption, and medication use. Questions were also included on current cannabis use and if use was for therapeutic purposes.

3. Interactions between the claimant and the work disability insurance case managers

Respondents were asked to assess the quality of interactions with work disability insurance case managers, both in terms of interpersonal treatment and the quality of the information provided by case managers.(11, 30)

4. Interactions between the claimant and their healthcare providers

The questionnaire included items documenting the respondent's main health care provider, whether difficulty was experienced accessing health care services, whether the use of health care services was stressful and the respondent's assessment of the clarity of advice provided by health care providers concerning returning to work.

5. Socio-demographic characteristics and pre-injury information on occupation, industry and workplace size

The interview collected information on claimant age, sex, immigrant status, educational attainment, family structure, union membership, pre-injury occupational tasks and work hours, workplace size and industry of employment. Respondents also provided information about the amount of personal and household income in the previous 12 months, and their current main income sources.

Interview-administered questionnaire: 36 months

Participants who agreed to be re-contacted will be administered an abbreviated version of the 18 month questionnaire, retaining topic domains concerning; 1) current labour market status, 2) function, recovery and measures of physical and mental health and 3) basic socio-demographic characteristics. An extended questionnaire domain pertaining to cannabis use will be administered to participants reporting current cannabis use at the 18 month interview. The 36 month interview will be administered over the period January to December 2021.

Findings to date

Unweighted descriptive analyses completed to date are summarized in Table 1 and Table 2. The median age at the time of the baseline interview (approximately 18 months after injury) was 50; participants in the short duration sample had a median age of 47, whereas those in the long duration sample had a median age of 51. Over half of the participants (56%) were male. The most common industries were health care and social assistance (15%), construction, utilities and mining (14%), and transportation and warehousing (13%), and manufacturing (13%), with significant differences in industry composition across claim duration groups (p=0.003). Approximately 40% of the sample had a household income greater than $100,000 without a significant difference in income across claim duration groups.

Participants with the longest claim durations had lower education and were less likely to be presently working. They were also more likely to have suffered a head injury, to currently be receiving services from the WSIB, to be receiving health care for the treatment of conditions related to the work injury, to have pain symptoms, and to demonstrate greater health impairment on a range of measures.

Results regarding return-to-work with the at-injury employer are displayed in Table 3. Initially, 90% of participants returned to their at-injury employer. Males, those in the longer claim duration sample, those in smaller workplaces and those in rural areas were less likely to return to work with their at-injury-employer. Union members and participants reporting a permanent employment arrangement at the time of injury were more likely to return to work with their at-injury employer.

Eighteen months following the work injury incident, 35% of participants reported that they were no longer working for the at-injury employer (Table 4). Approximately 50% of these workers chose to terminate employment and 20% reported the employer did not have work available. Approximately 14% of participants reported that the employer had fired them or terminated the employment relationship and approximately 10% of participants chose to retire.

Strengths and limitations

The Ontario Life After Work Injury Study cohort was designed to address two important limitations in previous research examining the determinants of adverse health and labour market outcomes following an episode of work disability—length of follow up, and sample size. In terms of the first, this study follows a large, representative sample of workers who experienced a disabling work-related injury or illness for a longer time period than has typically been reported in the current literature. Information provided by claimants 18 months and 36 months following a disabling work injury will inform understanding of the long-term consequences to health, function and labour force participation. In terms of the second, the recruitment of adequate numbers of study participants with the longest

durations of work disability will provide sufficient statistical power to identify the modifiable and non-modifiable characteristics of claimants associated with long disability durations, not typically possible in an inception cohort.

This study is not without limitations. Although differences between participants and non-participants on observed characteristics were minor, there may be important differences in unmeasured characteristics which may have influenced participation. Further, there will plausibly be differences in labour market outcomes in the cohort that cannot be accurately accounted for by the self-reported information obtained by the interviewer-administered questionnaire. Although not available in this context, longitudinal information on workers' wage and work history from administrative sources would enhance the interpretation of differences in labour market outcomes.(31) We also note that the eligibility criteria for participation in this cohort was restricted to disability due to a work-related injury or illness. The many other health conditions that can result in work disability are not represented in this cohort.

The dual objectives of this cohort, to describe the long-term health and labour market outcomes of workers disabled by work injury or illness, may have different implications for the external validity of findings from this cohort. We would be most confident that the long-term health outcomes observed in this cohort would plausibly generalize to other developed country settings. In contrast, however, the labour market outcomes observed in this cohort will, to some degree, be a function of the labour and social security protections specific to this jurisdiction.

Although not anticipated by the OLAWIS research team, the experiences of the longitudinal cohort between the first and the second follow-up interviews will intersect with the COVID-19 public health emergency. Nationally representative surveys conducted during the emergency found that 28% of employed Canadians were concerned that they might lose their job or self-employment income as a consequence of the emergency and 33% of respondents reported that the emergency would have a

major or moderate impact on their ability to meet financial obligations.(32) To respond to the acute economic effects of the COVID-19 emergency on households and on employers, the Government of Canada has rapidly implemented a range of financial relief programs that have the potential to provide more than $140 billion in direct support.(33) We anticipate that the economic, social and health impacts of the unprecedented contraction in the Canadian labour market will have more substantive negative impacts on workers with health impairments.

Over the past two decades, many jurisdictions in the developed economies have achieved important reductions in the incidence of work-related injury and illness.(1, 34) Paralleling these achievements, progress has also been made in reducing the burden of disability among workers experiencing a work-related injury or illness. Research contributions can inform future innovations in workplace practices and disability insurance provider policies to improve the prevention and management of work disability.

Authors' contributions: VN conducted data analysis, drafted the initial manuscript and approved the final manuscript as submitted. ET, NC, PS and CM contributed to the development of the study protocol and the acquisition of research funding. They each revised the manuscript critically for important intellectual content and approved the final manuscript as submitted. CM is the principal investigator for the study. He led the conceptualisation, development and design of the study.

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Data availability statement Procedures to access data from this study are available through contacting the lead author (CM). Proposals for collaborative analyses will be considered by the study's investigator team. The study questionnaire can be provided by contacting the lead author (CM).

Table 1: OLAWIS Cohort, Demographic and Work characteristics, by sample group

	All Respondents (n=1132)	Short duration (N=358)	Medium duration (N=374)	Long duration (n=400)	*P* value
Age, mean (SD), median	47.4 (12.8), 50.0	45.3 (13.3), 47.0	47.5 (12.5), 50.0	49.0 (12,4), 51.0	P=0.0004
Male sex, n (%)	632 (55.8)	192 (53.6)	213 (57.0)	227 (56.8)	P=0.31
Highest level of education, n (%)					
Some high school	89 (7.9)	22 (6.2)	25 (6.7)	42 (10.5)	P=0.02
High school completed	248 (22.0)	67 (18.7)	91 (24.5)	90 (22.5)	
Any post-secondary	793 (70.2)	269 (75.1)	256 (68.8)	268 (67.0)	
Household Income, n (%)					
<$40K	144 (14.4)	45 (13.9)	52 (16.1)	47 (13.2)	P=0.89
$40-69K	235 (23.4)	73 (22.6)	66 (20.4)	96 (27.0)	
$70-99K	227 (22.6)	76 (23.5)	77 (23.8)	74 (20.8)	
$100-129K	185 (18.4)	64 (19.8)	54 (16.7)	67 (18.8)	
>=$130K	212 (21.1)	65 (20.1)	75 (23.2)	72 (20.2)	
Industry at time of claim, n (%)					
Health Care & Social assistance	170 (15.0)	68 (19.0)	40 (10.7)	62 (15.5)	P=0.003
Construction, Utilities, Mining, Agriculture, Forestry	156 (13.8)	42 (11.7)	48 (12.9)	66 (16.5)	
Transportation & Warehousing	147 (13.0)	36 (10.1)	58 (15.6)	53 (13.3)	

Manufacturing	142 (12.6)	32 (8.9)	50 (13.4)	60 (15.0)
Other Services (except Public Administration)	139 (12.3)	42 (11.7)	52 (13.9)	45 (11.3)
Retail, Wholesale Trade	93 (8.2)	34 (9.5)	35 (9.4)	24 (6.0)
Educational Services	99 (8.8)	43 (12.0)	31 (8.3)	25 (6.3)
Accommodation/ Food Services/ Arts/ Entertainment	87 (7.7)	29 (8.1)	26 (7.0)	32 (8.0)
Public Administration	66 (5.8)	26 (7.3)	21 (5.6)	19 (4.8)
Other	32 (2.8)	6 (1.7)	12 (3.2)	14 (3.5)

Table 2: OLAWIS Cohort, Injury, Return to work and Recovery outcomes, by sample group

	All Respondents (n=1132)	Short duration (N=358)	Medium duration (N=374)	Long duration (n=400)	*P* value
Work-related condition*, n (%)					
Head injury	108 (10.5)	29 (8.7)	36 (10.5)	43 (12.1)	P<.0001
Abrasions, cuts, lacerations	122 (11.8)	63 (18.8)	27 (7.9)	32 (9.0)	
Musculoskeletal disorders and injuries	540 (52.3)	188 (56.1)	174 (50.7)	178 (50.1)	
Fractures and dislocations	139 (13.5)	24 (7.2)	57 (16.6)	58 (16.3)	
Other conditions	124 (12.0)	31 (9.3)	49 (14.3)	44 (12.4)	
Employment status, n (%)					
Working at injury employer	695 (61.4)	225 (62.9)	221 (59.1)	249 (62.3)	P=0.001
Working at different employer	178 (15.7)	68 (19.0)	71 (19.0)	39 (9.8)	
Not currently working	259 (22.9)	65 (18.2)	82 (21.9)	112 (28.0)	
Benefit Duration (days)* mean (SD), median	72.2 (95.9), 39.0	14.6 (15.3), 8.0	80.8 (53.8), 70.0	117.9 (136.1),60.5	P<.0001
Current WSIB services, n (%)	223 (19.8)	26 (7.3)	29 (7.8)	168 (42.3)	P<.0001
Current health care for injury, n (%)	356 (33.5)	68 (21.4)	80 (22.6)	208 (53.2)	P<.0001
Current pain due to injury mean (SD), median	4.1 (2.8), 4.0	3.4 (2.8), 3.0	3.8 (2.7), 4.0	4.8 (2.5), 5.0	P<.0001
Prescription opioid use (past year), n (%)	388 (34.3)	80 (22.4)	111 (29.7)	197 (49.3)	P<.0001
Prescription sedative use (past year) n (%)	266 (23.5)	60 (16.8)	82 (21.9)	124 (31.0)	P=0.0004
Poor/fair general health, n (%)	295 (26.1)	61 (17.0)	101 (27.0)	133 (33.3)	P<.0001
Poor/fair mental health, n (%)	313 (27.2)	72 (20.1)	95 (25.4)	146 (36.7)	P<.0001
Trouble going to or staying asleep, n (%)					
Never	171 (15.1)	70 (19.6)	61 (16.3)	40 (10.0)	P<.0001
Rarely	182 (16.1)	65 (18.2)	64 (17.1)	53 (13.3)	

Sometimes	324 (28.7)	101 (28.3)	115 (30.8)	108 (27.1)	
Most of the time	266 (23.5)	75 (21.0)	87 (23.3)	104 (26.1)	
All of the time	187 (16.6)	46 (12.9)	47 (12.6)	94 (23.6)	
Financial difficulties during work absence, n (%)					
No	548 (48.8)	219 (61.5)	161 (43.2)	168 (42.5)	P<.0001
Yes, minor	110 (9.8)	42 (11.8)	37 (9.9)	31 (7.9)	
Yes, concerning	187 (16.6)	41 (11.5)	74 (19.8)	72 (18.2)	
Yes, very concerning	116 (10.3)	27 (7.6)	40 (10.7)	49 (12.4)	
Yes, very serious	163 (14.5)	27 (7.6)	61 (16.4)	75 (19.0)	
Past-year cannabis use, n (%)					
Yes	348 (30.7)	115 (32.1)	114 (30.5)	119 (29.7)	P=0.67
No	784 (69.3)	243 (67.9)	260 (69.5)	281 (70.3)	

*claimants consenting to use of WSIB administrative records

Table 3: OLAWIS Cohort, Return to work at the at-injury employer

	Cohort N (%)		Returned to at-injury employer N (%)		Did not return to at-injury employer N (%)		
Total	1,132	100.0	1014	(89.6)	118	(10.4)	
Age							
<30	145	(12.8)	127	(12.5)	18	(15.3)	p=0.67
30-49	412	(36.4)	372	(36.7)	40	(33.9)	
50+	575	(50.8)	515	(50.8)	60	(50.9)	
Sex							
Male	632	(55.9)	555	(54.8)	77	(66.3)	p=0.03
Female	498	(44.1)	457	(45.2)	41	(34.8)	
Claim duration group							
Short	358	(31.6)	336	(33.1)	22	(18.6)	p=0.004
Medium	374	(33.0)	331	(32.6)	43	(36.4)	
Long	400	(35.3)	347	(34.2)	53	(44.9)	
Union Membership							
Yes	554	(49.2)	525	(52.0)	29	(24.8)	p=0.0001
No	573	(50.8)	485	(48.0)	88	(75.2)	
Company size							
<20	300	(27.5)	240	(24.6)	60	(51.7)	p<.0001
20-99	372	(34.0)	341	(34.9)	31	(26.7)	
>/=100	421	(38.5)	396	(40.5)	25	(21.6)	
Employment							
Permanent	1042	(92.1)	947	(93.4)	95	(80.5)	p<.0001
Temporary/Contract	90	(8.0)	67	(6.6)	23	(19.5)	
Residence							
Rural	197	(17.6)	167	(16.6)	30	(25.4)	p=0.02
Urban	925	(82.4)	837	(83.4)	88	(74.6)	

Table 4: OLAWIS Cohort, Reason not working with the at-injury employer at 18 month follow-up		
	N	%
Quit	197	(49.3)
No work available	77	(19.3)
Terminated / Fired	54	(13.5)
Retired	35	(8.8)
Misclassified (still with at-injury employer)	34	(8.5)
Still on WSIB benefits	3	(0.8)
Total	400	(100.0)

Figure Legend

Figure 1: Participant flow diagram

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