Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness

Kathleen G Dobson,1 Cameron Mustard,1,2 Nancy Carnide,1,2 Andrea Furlan,1,3 Peter M Smith1,2

ABSTRACT

Objectives While most individuals physically injured at work will make a complete medical recovery, a portion of workers will experience persistent pain following their injury. This study estimated persistent pain prevalence and its association with health and return-to-work outcomes 18 months following the incidence of a disabling work-related injury.

Methods We studied 1131 workers disabled by a work-related injury who were recruited from a sampling frame of disability benefit claimants in Ontario, Canada. Work injuries and claim benefits characteristics from administrative data were linked with measures of work status, pain symptoms, and physical and mental health obtained from telephone interviews completed 18 months postinjury. Associations of persistent pain symptoms with health and employment outcomes 18 months postinjury were estimated using multinomial and linear regression.

Results Roughly 30% of participants reported no pain symptoms in the previous 4 weeks, 45% reported mild pain symptoms and 25% reported severe pain symptoms accompanied by substantial functional impairment. Workers with severe pain symptoms were more likely to not be currently working at 18 months (33%) vs those without pain symptoms (16%), and had poorer self-reported physical and mental health. Workers with severe pain symptoms had higher probabilities of benefit durations of 12–18 months (OR=9.35), higher lost-earnings costs (~47.7% higher) and higher healthcare expenditure costs at 18 months (~125.9% higher) compared with those with no pain symptoms.

Conclusions Persistent pain symptom prevalence 18 months postinjury is high among workers disabled by a work-related injury and associated with substantial functional impairment and longer wage replacement benefit duration.

INTRODUCTION

The incidence of work-related injury is substantial among developed economies. Among working-aged adults, one of every six injuries requiring medical attention are caused by work exposures, with ~35% of these work-related injuries resulting in periods of disability and work absence. A considerable proportion of work injury or illness results in some degree of permanent impairment. In a representative sample of Canadian adults, 25% of those with permanent disabilities attributed the underlying impairment to a work exposure.

The economic burden of work-related injury and illness is considerable. The cost of non-fatal...
occupational injuries and illness is approximately US$185.8B annually. Much of this cost is attributed to durations of work disability among workers whose recovery requires periods of absence from work. Compelling evidence exists for the long-lasting adverse impacts of work disability episodes on injured workers’ labour force participation and earnings.13

Chronic or persistent pain may occur after experiencing an injury that requires medical attention. Over the past two decades, approaches to defining chronic pain have been standardised, typically defined as pain of moderate or severe intensity that is persistent or recurrent for at least 3 months coupled with functional impairment, and cannot be better accounted for by an alternate medical diagnosis.6 7 Recent definitions have distinguished between moderate pain syndromes with mild impairment and more severe pain with high impairment.8 9

An American study using a representative survey of −15 000 adults reported a prevalence of chronic pain (pain occurring most days and at least one limitation in daily life lasting at least 3 months) of 16.8% among adults aged 18–64.7 Applying similar measures, a representative survey of −131 000 Canadians estimated chronic pain prevalence among adults aged 20 and older to be 18.5%, with 4.7% reporting no activity restrictions, 10.0% reporting a few or some activity restrictions, and 3.5% reporting limitations in most activities.8 The prevalence of chronic pain is generally higher among women, increases with age,6 and is correlated with poor mental health.10 11

The annual direct healthcare costs (not including lost productivity costs) associated with managing chronic pain in Canada is SC 7.2B, straining individuals and welfare systems.12 Chronic pain has deleterious effects on maintaining employment and performing job duties.13 In a European survey conducted on adults experiencing chronic pain, 19% of participants had lost their job due to pain, 16% changed job responsibilities, and 13% changed their job completely due to their pain.13

It is unclear how common persistent pain is among workers who experience a work-related injury. Little evidence exists quantifying how persistent pain following a work-related injury is associated with the time and disability costs it takes to return to work. Therefore, this study sought to (1) estimate the proportion of workers disabled by a work-related injury experiencing persistent pain 18 months after their injury occurred; (2) describe the demographic, health, work and disability-related profile of those experiencing persistent pain; and (3) quantify the association between persistent pain and return-to-work outcomes, defined by duration and cost of a disability claim.

METHODS

Sample

This study uses data from the Ontario Life After Work Injury Study (OLAWIS), a cohort study exploring health and labour market outcomes of workers in Ontario, Canada who were disabled by a physical work injury or illness and received lost-time claim benefits.14 The Workplace Safety & Insurance Board (WSIB) is the single-payer, publicly administered workers’ compensation insurance authority in Ontario that provides benefits to entitled workers who experience a work-related illness or injury. The WSIB administers benefits that cover medical care services and wage replacement where the injury leads to an absence from work. The WSIB provides incentives for timely return-to-work practices by employers through employer insurance premiums.

The OLAWIS study sample was composed of Ontario workers 18 years or older, who were employed by an insured employer, able to conduct an interview in English or French, and had experienced a physical work-related injury or occupational disease that resulted in a WSIB accepted lost-time compensation claim.14 To obtain sufficient representation of more serious and complex claims, −400 participants were to be recruited in each of three wage-replacement duration sample groups: short duration (1 day to 3 months), medium duration (3 to 12 months) and long duration, (12+ months). The short duration sample represented 85% of all lost-time claimants in the WSIB system, the medium duration sample represented 9% of all lost-time claimants, and the long duration sample represented 6% of all lost-time claimants.

Participant recruitment occurred between June 2019 and March 2020 in two phases. In the first phase, a WSIB representative randomly sampled monthly quotas of lost-time claimants meeting eligibility for the three sample groups. Lost-time claimants were then contacted and asked for their consent to share their name and contact information with the research team. A total of 2816 randomly sampled claimants were contacted, of which 1674 (59.4%) agreed to share their information.

In the second phase, a survey services contractor contacted consenting workers and conducted an interviewer-administered telephone interview. The survey services contractor could not establish contact with 385 claimants, received 125 interview refusals, and completed interviews with 1132 claimants (40.2% of eligible claimants, and 87.8% of eligible claimants successfully contacted). 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. More details of the study cohort may be found elsewhere.14 This study included all cohort members who had information on persistent pain status at 18 months (n=1131).

Data collection

Primary outcome measures and potential predictors of the primary outcomes were drawn from WSIB administrative records and an interviewer-administered telephone questionnaire 18 months after the original injury occurred. Information from an 18-month follow-up of administrative records of work disability insurance benefits was integrated with the information obtained from an interviewer-administered questionnaire for the 94% of claimants consenting to this use and included measures of the nature of injury and injury event, benefit duration and expenditure, workers’ occupation, geographical location, employer size and economic sector.

Study measures

Persistent pain

The study questionnaire included two questions related to persistent pain. The first question asked participants about pain interference, ‘During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and household)?’, in which participants could respond: not at all, a little bit, moderately, quite a bit, or extremely (n=1131). Participants indicating at least a little pain interfered ‘On a scale from 0 to 10, how would you rate your pain due to your injury at the PRESENT TIME (that is right now), where 0 is no pain and 10 is pain as bad as it could be?’ (n=878). The first question originated in the RAND 36-Item Health Survey, an adaptation of the SF-36,15 and the second question is an adaptation of the numerical rating scale for pain.16 Both of these questions are commonly used for pain assessment by clinicians and researchers.

Dobson KG, et al. Occup Environ Med 2022;79:697–705. doi:10.1136/oemed-2022-108383
To align to persistent pain definitions proposed in previous literature, we defined three pain groups based on pain symptoms over the past 4 weeks: (1) no pain, if participants responded that pain did not interfere with their normal activities; (2) mild pain with an unlikely or low impact on functional impairment, if participants reported that their pain interference was ‘a little bit’ or ‘moderate’, and their pain intensity score was less than 6/10; and (3) severe pain in which functional impairment was likely, if respondents reported pain interference of ‘quite a bit’, ‘extremely’ or their pain interference was ‘moderate’ but pain intensity score was greater or equal to 6/10.

Demographic, work, health and injury factors

Participants were asked about demographic, work, health-related and injury-related factors when surveyed at 18 months post-injury claim. Demographic factors measured included: participant age, sex (female vs male or not specified), highest level of education, country of birth, household income and industry at time of claim. Nature of injury was measured through administrative records (described further below). Participants were also asked if they were still receiving claim benefits, if this was their first WSIB claim, if they experienced financial difficulties during their work absence, and their current employment status. Respondents were asked about their healthcare experience (including receipt of healthcare for their injury, having multiple providers, if they were currently receiving healthcare and how stressful their healthcare experience was), as well as their current health profile (including prevalence of chronic conditions before and after the injury occurred, measures of overall physical and mental health, distress levels, sleeping difficulties, cannabis use, opioid use and sedative use).

Return-to-work outcomes

We explored four disability-related outcomes: wage-replacement duration (less than 3 months; 3–12 months; 12–18 months), total number of loss of earnings (LOE) days, total amount of LOE benefit dollars, and total amount of healthcare expenditure benefits (in dollars). The latter three variables were ascertained through the WSIB administrative records. As ~6% of participants did not consent to the linkage use of their administrative record, this resulted in missing data. For the total number of LOE days (nmissing = 141), participants not agreeing to be linked were assigned the number of days they reported receiving WSIB lost earnings benefits from the questionnaire (n = 83). If they did not answer that question (n = 12), participants were assigned a value of 39 days (the median value). For the LOE benefit amount (nmissing = 95) and healthcare expenditure benefits (nmissing = 117), we completed a multiple imputation using a predictive mean matching imputation model using the mice package in R software. We specified 20 imputations, based on wage replacement duration group, age, sex, pain group and nature of injury.

Analysis

Analyses were completed in R software. We first stratified the cohort into three groups: those who reported experiencing no pain, those experiencing mild pain, and those who were experiencing severe pain. We explored distributions in proportions using χ² tests. Tests were completed using the unweighted sample and a sample that was reweighted to make inferences to the target population of all claimants (as longer duration claims were oversampled as part of the study design). For the pain groups, we compared the distribution of pain scores with a two-sample t-test.

For each pain group, we then explored differences in demographic, work, health, and injury characteristics (measured at the cohort inception), and return-to-work and recovery characteristics measured at 18 months postinjury. We compared variable distributions in the unweighted sample between pain groups using χ² tests for categorical variables and analysis of variance tests for continuous variables.

To explore the association between persistent pain and wage-replacement duration, we employed a multinomial logistic regression, comparing wage replacement durations of 3–12 months and 12–18 months to durations of less than 3 months. For the remaining outcome variables, we employed an ordinary least squares (OLS) regression in which the log of the outcome variables was regressed on pain group. This modelling approach takes into account the skewed nature of the outcome variable.

Each regression was adjusted for claimant age, sex, nature of injury, and presence of a back problem, arthritis, mood disorder or high blood pressure prior to the injury as they were key confounders of interest and unbalanced between pain groups. Lastly, regressions were stratified by participant sex to explore potential sex differences in chronic pain and return-to-work outcomes. These analyses were conducted in the unweighted sample. As those who have experienced a previous work-related injury may be at higher risk of reporting more pain symptoms, we ran a sensitivity analysis including if it was a participant’s first WSIB claim as an additional predictor variable.

RESULTS

At 18 months postinjury claim, a total of 254 participants (30.2% of the weighted sample, 22.4% of the unweighted sample) reported no pain interference over the past 4 weeks, 479 participants (44.8% of the weighted sample, 42.4% unweighted) were categorised as having mild pain interference, and 398 participants were categorised as having severe pain interference (24.9% of the weighted sample, 35.2% of the unweighted sample) (table 1). The average pain score (unweighted) was statistically significantly higher among the severe pain (M = 6.10, SD = 2.23) group compared with the mild pain group (M = 2.46, SD = 1.95, t = 25.76, p < 0.001).

When exploring the cohort characteristics across pain groups (table 2), more participants were over 50 years old in the two persistent pain groups compared with the no pain group. A greater proportion of participants in the two pain groups were born outside of Canada, had annual household incomes less than $C 70 000, or reported back problems, arthritis or a mood disorder prior to the injury. No proportion differences in sex, highest education level, industry at time of claim, or nature of the injury were seen between the three groups. A greater proportion of those in the no pain group reported that this was their first disability claim (~65%).

At the 18-month follow-up (table 3), 16.1% of respondents with no pain, 18.2% of respondents with mild pain and 32.9% of respondents with severe pain reported not currently working. A gradient in outcomes was seen, in that persistent pain groups typically had a higher proportion of participants with unfavourable outcomes at 18 months, and generally this proportion was highest among the severe pain group. A higher proportion of participants in the severe pain group reported having a benefit duration of 12–18 months (52.0% vs 15.7% among the no pain group); a similar gradient was seen for the LOE duration, LOE benefit amount and healthcare benefits. Among those with severe pain, 35.9% reported still receiving WSIB benefits, 56.1% reported currently receiving healthcare for the treatment...
of the disabling injury, 20.2% reported an opioid prescription in the past year and roughly half reported poor/fair physical and mental health.

When compared with no pain, mild pain at 18 months was associated with wage replacement durations of 12–18 months (OR 3.09, 95% CI 1.99 to 4.81) compared with durations less than 3 months (table 4). Severe pain at 18 months was associated with increased odds of having a wage replacement duration of 3–12 months (OR 2.04, 95% CI 1.34 to 3.10) or 12–18 months (OR 9.35, 95% CI 5.85 to 14.94) when compared with durations less than 3 months. When using the 3–12 month wage replacement group as reference, those with mild pain (vs no pain, OR 2.38, 95% CI 1.53 to 3.72) and severe pain at 18 months post injury (OR 4.58, 95% CI 2.92 to 7.20) had higher odds of belonging to the 12–18 month wage replacement group (online supplemental table 1). Associations were not attenuated when adjusted for the preinjury prevalence of chronic conditions and were generally of similar magnitude and direction for men and women (online supplemental table 2).

After controlling for age, sex, nature of injury and prior chronic conditions, experiencing mild pain was associated with an average of 11.6% more total LOE days (not statistically significant), whereas experiencing severe pain was associated with an average of 51.1% more LOE days (95% CI 30.0% to 72.2%) when compared with those who experienced no pain (table 5). Similar associations were seen for amount of LOE benefits received: if a participant had reported severe pain at 18 months, the amount of LOE benefits received was 47.7% greater vs those who did not report pain (95% CI 25.4% to 69.9%). Experiencing either mild or severe pain was associated with higher amounts of healthcare expenditure benefits (mild pain vs no pain: $\beta=47.9\%$, 95% CI 22.5% to 73.2%; severe pain vs no pain: $\beta=125.9\%$, 95% CI 99.7% to 152.2%). These associations were of similar magnitude and direction for men and women (online supplemental table 3). In our sensitivity analysis, results were not attenuated when adjusting for first disability claim (online supplemental tables 4 and 5).

**DISCUSSION**

This study describes a high prevalence of persistent pain in a cohort of workers who experienced a disabling work-related injury. Weighted to represent the population of all workers in Canada’s most populous province disabled by a work-related injury or illness, ~70% of the cohort indicated experiencing pain 18 months following a disabling work-related injury, with 24.9% reporting severe pain intensity with substantial functional impairment. The prevalence of severe persistent pain in this cohort is approximately six times higher than Canadian and US adult populations, where ~4% of adults experience persistent pain that limits most activities.19 While the prevalence of persistent pain is likely similar to other cohorts of disabled workers,19, 20 the consequences of persistent pain may differ depending on the generosity of a jurisdiction’s work disability insurance scheme.

A dose–response gradient was seen in the disability-related return-to-work outcomes. Compared with participants with no pain, participants with mild persistent pain demonstrated three times greater odds of having a wage-replacement duration of at least a year, and participants with severe persistent pain had nine times greater odds of having a wage-replacement duration of at least a year. Persistent pain was also associated with the total amount of LOE and healthcare-related disability benefits participants received. This high burden of persistent pain draws attention to the important contribution of work-related traumatic
injury and non-traumatic musculoskeletal disorders to the population burden of chronic pain.

A dose–response gradient was seen in the majority of health-related variables measured across pain groups at 18 months post-injury. A gradient across the three pain symptom groups was seen for participants taking prescription opioids, sedative use, and self-reported physical and mental health. A similar gradient was observed for healthcare utilisation. For example, 6% of participants in the no pain group were still receiving healthcare for the injury at 18 months, compared with 28% of participants in the...

| Table 2 | OLAWIS cohort demographic, work, health and injury characteristics at cohort inception, by persistent pain status |
|---------|-----------------------------------------------------------------------------------------------------------------|
|         | All respondents | No pain | Mild pain, functional impairment unlikely | Severe pain, functional impairment likely | P value |
| N       | 1131            | 254     | 479                                      | 398                                       |
| Row per cent, unweighted (weighted) | 100.0 (22.4 (30.2)) | 42.4 (44.8) | 48.6 (42.9) | 35.2 (24.9) |
| Age, mean (SD) | 47.37 (12.81) | 44.45 (13.90) | 47.86 (12.42) | 48.66 (12.29) |
| Age, by decade, n (%) | | | | |

OLAWIS, Ontario Life After Work Injury Study; WSIB, Workplace Safety & Insurance Board.
Workplace

mild pain group and 56% in the severe pain group. Measures of self-reported healthcare utilisation were mirrored in estimates of healthcare service benefit expenditure from administrative records and are consistent with estimates obtained from previous studies.24

While early studies of disability episode duration following a work-related injury have documented the relationship between high pain symptoms in the acute period of injury recovery and longer durations of work disability,25 few studies have estimated the persistence of high pain symptoms beyond the acute period of injury recovery. As an example of the latter, among a cohort of Ontario workers disabled by a back injury or upper extremity musculoskeletal disorder, the mean pain intensity score was 4.6 at a 12-month follow-up interview.26 Although the precise contribution to the population burden of chronic pain is unclear, traumatic injury’s role in the aetiology of persistent pain symptoms is recognised.27 28 In Canadian surveys of individuals with chronic pain, ~15% attributed their chronic pain to a traumatic injury.18 Consistent with this emerging recognition of the aetiology of chronic pain, proposed revisions to the classification of chronic pain in the international classification of diseases (ICD-11) includes ‘chronic postsurgical and post-traumatic pain’ as one of seven aetiologic categories.29

We have confidence that the burden of persistent pain documented in our study is a consequence of the injury that resulted in an episode of work disability. It is unlikely that the high burden of persistent pain observed in this cohort of workers was prevalent prior to the incidence of a disabling work-related

Table 3  OLAWIS cohort, return to work and recovery status at 18-month follow-up, by persistent pain status

|                              | All respondents (n=1131) | No pain (n=254) | Mild pain, functional impairment unlikely (n=479) | Severe pain, functional impairment likely (n=398) | P value |
|------------------------------|--------------------------|---------------|-----------------------------|----------------------------------------|---------|
| Current employment status, n (%) |                          |               |                             |                                         | <0.001  |
| Working with at injury employer | 695 (61.5)               | 165 (65.0)    | 312 (65.1)                  | 218 (54.8)                            |         |
| Working with different employer | 177 (15.6)               | 48 (18.9)     | 80 (16.7)                   | 49 (12.3)                             |         |
| Not currently working         | 259 (22.9)               | 41 (16.1)     | 87 (18.2)                   | 131 (32.9)                            |         |
| Sample group, n (%)           |                          |               |                             |                                         | <0.001  |
| Benefit duration 1 day–3 months | 358 (31.7)               | 119 (46.9)    | 164 (34.2)                  | 75 (18.8)                             |         |
| Benefit duration 3–12 months  | 373 (33.0)               | 95 (37.4)     | 162 (33.8)                  | 116 (29.1)                            |         |
| Benefit duration 12–18 months | 400 (35.4)               | 40 (15.7)     | 153 (31.9)                  | 207 (52.0)                            |         |
| Loss of earnings duration (days)*, mean (SD) | 71.93 (88.40) | 55.30 (64.10) | 62.45 (80.40) | 93.58 (105.13) | <0.001  |
| Loss of earnings*, $C, mean (SD) | 7885 (11,087)           | 6026 (7,215)  | 7223 (10,391)               | 9890 (13,461)                         | <0.001  |
| Median | 4132                     | 3206          | 3450                        | 5183                                   |         |
| Healthcare benefits*, $C, mean (SD) | 7398 (13,186) | 4064 (6,551) | 6335 (11,378) | 10,841 (17,122) | <0.001  |
| Median | 2657                     | 1466          | 2144                        | 5288                                   |         |
| Current WSIB services, n (%) |                          |               |                             |                                         | <0.001  |
| Received healthcare for injury, n (%) | 223 (19.8) | 9 (3.5)      | 72 (15.1)                   | 142 (35.9)                            |         |
| Current healthcare for injury, n (%) | 1067 (94.4)           | 232 (91.3)    | 450 (94.1)                  | 385 (96.7)                            | 0.013   |
| Received multiple healthcare providers for injury, n (%) | 356 (33.5) | 14 (6.0)     | 127 (28.4)                  | 215 (56.1)                            | <0.001  |
| Current healthcare experience (%) | 872 (81.7)           | 178 (76.7)    | 357 (79.3)                  | 337 (87.5)                            | 0.001   |
| Not at all stressful | 627 (58.8) | 166 (71.6) | 278 (61.9) | 183 (47.5) | <0.001 |
| Not very stressful | 163 (15.3) | 30 (12.9) | 76 (16.9) | 57 (14.8) | <0.001 |
| A bit stressful | 157 (14.7) | 17 (7.3) | 65 (14.5) | 75 (19.5) |         |
| Quite a bit stressful | 76 (7.1) | 10 (4.3) | 24 (5.3) | 42 (10.9) | <0.001 |
| Extremely stressful | 43 (4.0) | 9 (3.9) | 6 (1.3) | 28 (7.3) |         |
| Prescription opioid use (past year), n (%) | 151 (13.5) | 13 (5.1) | 60 (12.6) | 78 (20.2) | <0.001 |
| Prescription sedative use (past year) n (%) | 272 (24.2) | 34 (13.4) | 94 (19.7) | 144 (36.5) | <0.001 |
| Poor fair physical health, n (%) | 294 (26.0) | 13 (5.1) | 76 (15.9) | 205 (51.5) | <0.001 |
| Poor fair mental health, n (%) | 313 (27.7) | 32 (12.6) | 88 (18.4) | 193 (48.7) | <0.001 |
| Kessler Distress Scale (K6) Score >12, proportion (SD) | 169 (15.1) | 12 (4.7) | 30 (6.3) | 127 (32.2) | <0.001 |
| Troubles going to or staying asleep, n (%) | 187 (16.6) | 12 (4.7) | 58 (12.1) | 117 (29.5) | <0.001 |
| All of the time | 265 (23.5) | 31 (12.2) | 102 (21.3) | 132 (33.2) |         |
| Most of the time | 324 (28.7) | 78 (30.7) | 151 (31.6) | 95 (23.9) |         |
| Sometimes | 182 (16.1) | 67 (26.4) | 85 (17.8) | 30 (7.6) |         |
| Never | 171 (15.1) | 66 (26.0) | 82 (17.2) | 23 (5.8) |         |
| Financial difficulties during work absence, n (%) | 576 (51.2) | 79 (31.2) | 222 (46.5) | 275 (69.8) | <0.001 |
| Yes | 349 (30.9) | 70 (27.6) | 136 (28.4) | 143 (35.9) | <0.001 |

$C$ indicates that values are in Canadian dollars. *Indicates outcome variables. Non-imputed mean and median values shown.
OLAWIS, Ontario Life After Work Injury Study; WSIB, Workplace Safety & Insurance Board.
### Table 4  Adjusted multinomial logistic regression models for the associations between persistent pain status at 18 months and wage replacement duration group, overall cohort (n=1131)

| Wage replacement duration 3–12 months vs 1 day to 3 months | Volvo replacement duration 12–18 months vs 1 day to 3 months |
|------------------------------------------------------------|---------------------------------------------------------------|
| **Model 1** OR 95% CI P value | **Model 1** OR 95% CI P value | **Model 1** OR 95% CI P value | **Model 1** OR 95% CI P value |
| Model intercept | 0.70 0.44 1.12 0.14 | 0.76 0.47 1.21 0.25 | 0.24 0.14 0.41 <0.01 | 0.25 0.15 0.44 <0.01 |
| Pain group | | | | |
| Mild pain, functional impairment unlikely | 1.29 0.90 1.85 0.17 | 1.30 0.90 1.87 0.16 | 2.93 1.90 4.52 <0.01 | 3.09 1.99 4.81 <0.01 |
| Ref: no pain group | | | | |
| Severe pain, functional impairment likely | 2.00 1.33 3.02 <0.01 | 2.04 1.34 3.10 <0.01 | 8.46 5.35 13.38 <0.01 | 9.35 5.85 14.94 <0.01 |
| Claimant age | | | | |
| <30 years old | 0.63 0.37 1.09 0.10 | 0.63 0.36 1.09 0.10 | 0.79 0.45 1.41 0.43 | 0.79 0.44 1.42 0.43 |
| Ref: 30–39 years old | | | | |
| 40–49 years old | 0.95 0.58 1.55 0.85 | 0.95 0.58 1.55 0.83 | 1.10 0.66 1.84 0.72 | 1.13 0.67 1.91 0.65 |
| 50–59 years old | 1.20 0.77 1.88 0.41 | 1.23 0.78 1.93 0.37 | 1.33 0.83 2.14 0.23 | 1.35 0.83 2.19 0.23 |
| Over 60 years old | 1.20 0.71 2.01 0.49 | 1.14 0.67 1.94 0.62 | 1.77 1.04 3.01 0.03 | 1.75 1.02 3.01 0.04 |
| Sex | | | | |
| Female | 0.84 0.62 1.14 0.26 | 0.83 0.61 1.13 0.23 | 0.82 0.60 1.12 0.20 | 0.85 0.62 1.17 0.32 |
| Ref: male and other not specified | | | | |
| Nature of injury | | | | |
| Fracture | 2.72 1.61 4.61 <0.01 | 2.74 1.61 4.54 <0.01 | 2.96 1.72 5.10 <0.01 | 2.98 1.72 5.16 <0.01 |
| Ref: sprain/strain/dislocation | | | | |
| Superficial or open wound | 0.50 0.30 0.84 0.01 | 0.50 0.30 0.83 0.01 | 0.70 0.43 1.13 0.15 | 0.71 0.44 1.16 0.17 |
| Organ/blood vessel/muscle injury, internal injury, crushing, amputation | 1.33 0.83 2.15 0.24 | 1.36 0.84 2.20 0.21 | 1.56 0.96 2.53 0.07 | 1.57 0.97 2.56 0.07 |
| Other | 3.64 1.70 7.79 <0.01 | 3.71 1.73 7.95 <0.01 | 0.52 0.15 1.74 0.29 | 0.53 0.16 1.78 0.30 |
| Unknown | 1.47 0.87 2.47 0.15 | 1.46 0.85 2.50 0.17 | 2.29 1.37 3.80 <0.01 | 2.30 1.36 3.90 <0.01 |
| Prior chronic condition | | | | |
| Back problems prior to the work injury | -- -- -- -- | 0.86 0.57 1.30 0.47 | -- -- -- -- | 0.65 0.42 1.00 0.05 |
| Ref: no prior condition | | | | |
| Arthritis prior to the work injury | -- -- -- -- | 0.95 0.62 1.47 0.82 | -- -- -- -- | 1.04 0.68 1.61 0.84 |
| Mood disorder prior to the work injury | -- -- -- -- | 0.64 0.40 1.03 0.07 | -- -- -- -- | 0.45 0.27 0.76 <0.01 |

Model 1 independent variables: pain group, claimant age, sex and nature of injury. Model 2 independent variables: Model 1 + presence of back problems prior to the work injury, presence of arthritis prior to the work injury and presence of a mood disorder prior to the work injury. Bold values indicate OR statistically significant at the α=0.05 level.
injury or illness. Respondents were specifically asked to describe pain intensity that they attributed to their disabling work-related injury. That all members of the cohort were actively employed at the time of the disabling injury or illness suggests a low prevalence of functional impairment prior to the injury. Chronic condition prevalence associated with pain symptoms prior to the disabling injury or illness was equivalent to the prevalence of these conditions among working adults in Ontario (unpublished data, available from authors). Statistical adjustment for preinjury prevalence of these conditions did not attenuate the association between persistent pain and the probability of long-duration disability episodes at the 18-month interview. Among cohort members without pain symptoms at the 18-month interview, the proportion reporting poor or fair self-rated health (5.1%) was similar to the prevalence of poor/fair self-rated health among working adults in Ontario (6.0%, unpublished data, available from authors).

Overall, our findings indicate that persistent pain of severe intensity arising from work-related traumatic injury impedes the ability to return to work. Among the population of individuals who experience persistent pain, most are unable to work, yet express a desire to do so. In a European survey asking 487 chronic pain sufferers about their goals, only −26% were employed in some capacity, −31% were receiving workers compensation and 38% reported being able to return to work as a goal. 30

This study found that three chronic conditions (back problems, arthritis and mood disorders) prior to the work injury did not attenuate the association between persistent pain and return-to-work outcomes following an injury. Previous literature suggests that these chronic conditions may increase the risk of work-related injuries and time required to return to work. 31 Third, missing data were present in the LOE distribution, the amount of lost earnings benefit dollars and amount of healthcare benefits outcome variables. While no differences in health or demographic characteristics were seen among those with missing data compared with those with no missing data, if data are not missing at random, results will be biased.

Fourth, it was our expectation that both the nature of injury and economic sector (industry) would have been associated with persistent pain (with industry being a determinant of nature of injury). The absence of a strong association between specific nature of injury categories and persistent pain may be an artefact of the somewhat coarse nature of injury applied in this analysis; further research should explore more detailed and nuanced industry and injury types associated with subsequent persistent pain. Lastly, the study sample did not include individuals who experienced a psychological-related workplace injury of illness, or workers who experienced a work-related injury at a workplace not entitled to provincial WSIB coverage; results cannot be generalised to these populations of workers.

CONCLUSIONS

Among a cohort of Ontario workers who received lost-time benefits for a work-related injury, we found −70% of participants reported persistent pain at 18 months postinjury, with −25% of participants meeting our definition of severe, persistent pain. When compared with no pain at 18 months, a gradient effect of mild and severe pain on increasing wage replacement duration, the amount of lost earnings benefit dollars and amount of healthcare benefits was seen for both men and women. This study may inform employers and employee benefit providers about the highly prevalent nature of chronic pain following a

---

**Table 5** Associations between persistent pain status at 18 months and lost time disability claim benefit outcomes, overall cohort (n=1131)

| Dependent variable 1: total number of LOE days | B      | 95% CI       |
|-----------------------------------------------|--------|-------------|
| Intercept                                     | 3.191  | 2.933–3.449 |
| Pain group                                    |        |             |
| Mild pain, functional impairment unlikely vs no pain | 0.116  | −0.087–0.320 |
| Severe pain, functional impairment likely vs no pain | 0.511  | 0.300–0.722  |

| Dependent variable 2: total amount of LOE benefits | Intercept | 95% CI       |
|----------------------------------------------------|-----------|-------------|
| Intercept                                          | 7.925     | 7.654–8.197 |
| Pain Group                                         |           |             |
| Mild pain, functional impairment unlikely vs no pain | 0.134    | −0.079–0.348 |
| Severe pain, functional impairment likely vs no pain | 0.477    | 0.254–0.699  |

| Dependent variable 3: total amount of healthcare expenditure benefits | Intercept | 95% CI       |
|------------------------------------------------------------------------|-----------|-------------|
| Intercept                                                              | 6.983     | 6.661–7.304 |
| Pain Group                                                             |           |             |
| Mild pain, functional impairment unlikely vs no pain                   | 0.479     | 0.225–0.732  |
| Severe pain, functional impairment likely vs no pain                   | 1.259     | 0.997–1.522  |

Bold values indicate statistically significant estimate at the α=0.05 level. Analyses adjusted for age, sex, nature of injury and prior chronic conditions. Regression coefficients interpreted as a ‘%’ increase in the dependent variable per each unit increase in the independent variable. For example in dependent variable 1 (total number of LOE days), the coefficient of mild pain functional impairment unlikely vs no pain (β=0.116) can be interpreted as: those with mild pain had a total number of LOE days 11.6% higher, on average, compared with those with no pain.
work-related injury, and its strong impact on disability duration and amount. The findings of this study would support future research to explore how various types of healthcare access, more nuanced injury categories (eg, injuries requiring surgery), and receiving multidisciplinary treatment influences pain intensity, as well as duration and amount disability benefits received. Methodologically, future research should explore the trajectory of persistent pain after work-related injuries using longitudinal cohort studies.

Twitter Nancy Carnide @nancycamid and Andrea Furlan @adrfurlan

Contributors CM is the study guarantor. CM, NC, AF and PMS conceived the study design and obtained funding. KGD and CM specified the analysis plan, conducted analyses and authored the draft manuscript. All authors contributed to editorial review of the manuscript.

Funding This work was supported by Ontario Workplace Safety & Insurance Board, grant number LONG2018.

Competing interests None declared.

Patient consent for publication Consent obtained directly from patient(s).

Ethics approval Ethics review was conducted by the Health Sciences Research Ethics Board at the University of Toronto (Protocol 37522). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is acknowledged and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs
Kathleen G Dobson http://orcid.org/0000-0003-4504-0148
Cameron Mustard http://orcid.org/0000-0002-0747-8870
Nancy Carnide http://orcid.org/0000-0001-7892-3626
Andrea Furlan http://orcid.org/0000-0001-6138-8510
Peter M Smith http://orcid.org/0000-0001-8286-4563

REFERENCES
1 Chambers A, Ibrahim S, Etches J, et al. Diverging trends in the incidence of occupational and nonoccupational injury in Ontario, 2004-2011. Am J Public Health 2015;105:338–43.
2 Morris S, Fawcett G, Grisebois L, et al. A demographic, employment and income profile of Canadians with disabilities aged 15 years and over. 2017. Ottawa, ON: Statistics Canada, 2018: 1–25.
3 International Labour Organisation (ILO). Estimating the economic costs of occupational injuries and illnesses in developing countries: essential information for decision-makers. Geneva, 2012: 1–66.
4 Seabury SA, Scherer E, O’Leary P, et al. Using linked federal and state data to study the adequacy of workers’ compensation benefits. Am J Ind Med 2014;57:1165–73.
5 Tompa E, Saunders R, Mustard C, et al. Measuring the adequacy of workers’ compensation benefits in Ontario: An update. Institute for Work & Health. Toronto, 2016: 1–8.
6 Canadian Pain Task Force. Chronic pain in Canada: laying a foundation for action. Ottawa: Health Canada, 2019: 1–50.
7 Steiningsrud Ott Old A, Landmark T, Macfarlane GJ, et al. Defining chronic pain in epidemiological studies: a systematic review and meta-analysis. Pain 2017;158:2092–107.
8 Reitsma ML, Tranner JE, Buchanan DM, et al. The prevalence of chronic pain and pain-related interference in the Canadian population from 1994 to 2008. Chronic Dis Can 2011;31:157–64.
9 Pichler MH, Von Korff M, Bushnell MC, et al. Prevalence and profile of high-impact chronic pain in the United States. J Pain 2019;20:146–60.
10 Gerdie B, Björk I, Cässter L, et al. Prevalence of widespread pain and associations with work status: a population study. BMC Musculoskelet Disord 2008;9:1–10.
11 Aronoff GM, Feldman JB. Preventing disability from chronic pain: a review and reappraisal. Int Rev Psychiatry 2000;12:157–69.
12 Hogan M-E, Taddio A, Katz J, et al. Incremental health care costs for chronic pain in Ontario, Canada: a population-based matched cohort study of adolescents and adults using administrative data. Pain 2016;157:1626–33.
13 Breihi H, Collett B, Ventafiedra V, et al. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. Eur J Pain 2006;10:287–333.
14 Mustard C, Nadalini V, Carnide N, et al. Cohort profile: the Ontario life after workplace injury study (OLAWIS). BMC Open 2021;11:e048143.
15 Hays RD, Sherbourne CD, Mazel RM. The Rand 36-Item health survey 1.0. Health Econ 1993;2:217–27.
16 Flethe SA. Pain measurement tools for clinical practice and research. Anaesthesia 1996;64:133–40.
17 Dahlhamer J, Lucas J, Zelaya C, et al. Prevalence of Chronic Pain and High-Impact Chronic Pain Among Adults - United States, 2016. MMWR Morb Mortal Wkly Rep 2018;67:1001–6.
18 Schopflocher D, Taezre P, Iouye R. The prevalence of chronic pain in Canada. Pain Res Manag 2011;16:445–50.
19 Boonstra AM, Schiphorst Preupper BH, Balk GA, et al. Cut-off points for mild, moderate, and severe pain on the visual analogue scale for pain in patients with chronic musculoskeletal pain. Pain 2014;155:2545–50.
20 Von Korff M, Orem J, Keele FJ, et al. Grading the severity of chronic pain. Pain 1992;50:133–40.
21 Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med 2002;32:959–76.
22 Buuren SV, Groothuis-Oudshoorn K, m. : Multivariate Imputation by Chained Equations in R. J Stat Softw 2011;45:1–67.
23 Hill RC, Griffiths WE, Lim GC. Principles of Econometrics. 4th ed. Danvers, MA: John Wiley & Sons Ltd, 2011.
24 Tripp DA, VanDenKerkhof EG, McAlister M. Prevalence and determinants of pain and pain-related disability in urban and rural settings in southeastern Ontario. Pain Res Manag 2006;11:225–33.
25 Turner JA, Franklin G, Turk DC. Predictors of chronic disability in injured workers: a systematic literature synthesis. Am J Ind Med 2000;38:707–22.
26 Carnide N, Franche R-L, Hogg-Johnson S, et al. Course of depressive symptoms following a workplace injury: a 12-month follow-up update. J Occup Rehabil 2016;26:204–15.
27 Elliott AM, Smith BH, Penny KI, et al. The epidemiology of chronic pain in the community. Lancet 1999;354:1248–52.
28 Rusten T, Wahl AK, Handal BK, et al. Prevalence and characteristics of chronic pain in the general Norwegian population. Eur J Pain 2004;8:555–65.
29 Barke A, Korwisi B, Cاسر H-R, et al. Pilot field testing of the chronic pain classification for IC-11: the results of ecological coding. BMC Public Health 2018;18:1–9.
30 Gouldman L, De Smedt A, Linderboh B, et al. Identifying goals in patients with chronic pain: a European survey. Eur J Pain 2021;25:1959–70.
31 Schwatka N, Shore E, Atherly A, et al. Reoccurring injury, chronic health conditions, and behavioral health: Gender differences in the causes of workers’ compensation claims. HHS Public Access. J Occup Environ Med 2018;60:710–6.
32 Jetha A, Besen E, Smith PM. Comparing the relationship between age and length of disability across common chronic conditions. J Occup Environ Med 2016;58:485–91.
Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness – Supplementary Material
Dobson et. al (2022)

SUPPLEMENTARY TABLES

Supplementary Table 1: Associations between Persistent Pain Status at 18 Months and Wage Replacement Duration Group, Using the 3-12 Month Group as Reference, Overall Cohort (n=1,131)

| Predictor                      | Wage Replacement Duration 12-18 Months vs. 3-12 Months (Ref) | OR  | 95% CI |
|--------------------------------|-------------------------------------------------------------|-----|--------|
| Model Intercept                | Model Intercept                                             | 0.33| 0.19   | 0.58  |
| **Pain Group**                 |                                                              |     |        |
| Ref: No Pain Group             |                                                              |     |        |
| Mild Pain, Functional Impairment Unlikely |                                              | 2.38| 1.53   | 3.72  |
| Severe Pain, Functional Impairment Likely |                                             | 4.58| 2.92   | 7.20  |
| **Claimant Age**               |                                                              |     |        |
| Ref: 30-39 years old           |                                                              |     |        |
| < 30 years old                 |                                                              | 1.26| 0.69   | 2.28  |
| 40-49 years old                |                                                              | 1.19| 0.72   | 1.99  |
| 50-59 years old                |                                                              | 1.10| 0.69   | 1.75  |
| Over 60 years old              |                                                              | 1.53| 0.91   | 2.57  |
| **Sex**                        |                                                              |     |        |
| Ref: Male & Other Not Specified|                                                              |     |        |
| Female                         |                                                              | 1.03| 0.76   | 1.40  |
| **Nature of Injury**           |                                                              |     |        |
| Ref: Sprain/Strain/ Dislocation|                                                              |     |        |
| Fracture                       |                                                              | 1.09| 0.70   | 1.69  |
| Superficial or Open Wound      |                                                              | 1.44| 0.83   | 2.50  |
| Organ/Blood Vessel/Muscle Injury, Internal Injury, Crushing, Amputation | | 1.16| 0.73   | 1.84  |
| Other                          |                                                              | 0.14| 0.05   | 0.42  |
| Unknown                        |                                                              | 1.58| 0.98   | 2.55  |
| **Prior Chronic Condition**    |                                                              |     |        |
| Ref: No Prior Condition        |                                                              |     |        |
| Back Problems Prior to the Work Injury |                                            | 0.76| 0.50   | 1.15  |
| Arthritis Prior to the Work Injury |                                         | 1.10| 0.73   | 1.66  |
| Mood Disorder Prior to the Work Injury |                             | 0.71| 0.42   | 1.19  |
Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness – Supplementary Material
Dobson et. al (2022)

Supplementary Table 2: Associations betweenPersistent Pain Status at 18 Months and Wage Replacement Duration Group, Stratified by Sex

|                          | Women (n=497)                                                                 | Men /Other not Specified (n=634)                                                                 |
|--------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|                          | Wage replacement duration 3-12 months vs. 1 day - 3 months | Wage replacement duration 12-18 months vs. 5 days - 3 months | Wage replacement duration 3-12 months vs. 1 day - 3 months | Wage replacement duration 12-18 months vs. 1 day - 3 months |
|                          | OR  Lower 95% CI  Upper 95% CI | OR  Lower 95% CI  Upper 95% CI | OR  Lower 95% CI  Upper 95% CI | OR  Lower 95% CI  Upper 95% CI |
| **Intercept**            | 0.87  0.43  1.76 | 0.27  0.11  0.65 | 0.53  0.29  0.97 | 0.17  0.08  0.35 |
| **Claimant Age**         |                                                                                       |                                                                                       |                                                                                       |
| < 30 years old vs. 30-39 years old | 0.28  0.12  0.67 | 0.27  0.11  0.69 | 1.36  0.64  2.89 | 1.96  0.89  4.35 |
| 40-49 years old vs. 30-39 years old | 0.74  0.35  1.58 | 0.92  0.41  2.04 | 1.29  0.65  2.55 | 1.49  0.73  3.05 |
| 50-59 years old vs. 30-39 years old | 0.82  0.42  1.63 | 0.90  0.43  1.87 | 1.80  0.96  3.39 | 1.97  1.00  3.88 |
| Over 60 years old vs. 30-39 years old | 0.48  0.21  1.08 | 0.60  0.26  1.37 | 2.76  1.32  5.78 | 4.68  2.19  9.98 |
| **Nature of Injury**     |                                                                                       |                                                                                       |                                                                                       |
| Fracture vs. Sprain/Strain/Dislocation | 1.94  0.90  4.18 | 1.77  0.78  4.04 | 4.06  1.88  8.77 | 5.10  2.32  11.21 |
| Superficial or Open Wound vs. Sprain/Strain/Dislocation | 0.54  0.24  1.22 | 0.65  0.29  1.45 | 0.43  0.22  0.84 | 0.71  0.37  1.34 |
| Organ/Blood Vessel/Muscle Injury, Internal Injury, Crushing, Amputation vs. Sprain/Strain/Dislocation | 2.10  1.06  4.18 | 2.10  1.04  4.25 | 0.69  0.33  1.43 | 0.98  0.48  2.01 |
| Other vs. Sprain/Strain/Dislocation | 1.23  0.40  3.81 | 0.44  0.10  1.97 | 10.02  2.83  35.50 | 0.55  0.05  5.64 |
| Unknown vs. Sprain/Strain/Dislocation | 0.89  0.37  2.16 | 1.27  0.54  2.96 | 2.14  1.03  4.45 | 3.74  1.82  7.69 |
| **Prior Chronic Condition** |                                                                                       |                                                                                       |                                                                                       |
| Back Problems Prior to the Work Injury vs. No Back Problems | 1.17  0.63  2.15 | 0.65  0.33  1.29 | 0.66  0.37  1.17 | 0.63  0.35  1.13 |
| Arthritis Prior to the Work Injury vs. No Arthritis | 1.19  0.61  2.31 | 1.45  0.74  2.83 | 0.88  0.49  1.61 | 0.87  0.48  1.57 |
| Mood Disorder Prior to the Work Injury vs. No Mood Disorder | 0.51  0.26  1.00 | 0.41  0.20  0.82 | 0.62  0.30  1.28 | 0.43  0.19  0.94 |
| **Pain Group** |                                                                                       |                                                                                       |                                                                                       |
| Mild Pain, Functional Impairment Unlikely vs. No Pain | 1.46  0.83  2.56 | 4.45  2.11  9.39 | 1.23  0.75  2.03 | 2.62  1.47  4.66 |
| Severe Pain, Functional Impairment Likely vs. No Pain | 2.42  1.28  4.60 | 13.70  6.26  30.01 | 1.98  1.11  3.53 | 8.30  4.46  15.46 |

Bold values indicate statistically significant estimate at the \( \alpha = 0.05 \) level
Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness – Supplementary Material
Dobson et. al (2022)

Supplementary Table 3: Associations between Persistent Pain Status at 18 Months and Lost Time Disability Claim Benefit Outcomes, Stratified by Sex (Women: n=497; Men/ Not Specified = 634)

| Dependent Variable 1: Total Number of LOE Days | Women          | Men/Not Specified |          |          |          |
|-----------------------------------------------|----------------|-------------------|----------|----------|----------|
| B Lower 95% CI                               | Upper 95% CI   | B Lower 95% CI    | Upper 95% CI |
| Intercept                                    | 3.072          | 2.68              | 3.463    | 3.077    | 2.753    | 3.401    |
| Mild Pain, Functional Impairment Unlikely vs. No Pain | 0.138          | -0.182            | 0.457    | 0.098    | -0.164   | 0.361    |
| Severe Pain, Functional Impairment Likely vs. No Pain | 0.568          | 0.236             | 0.899    | 0.482    | 0.208    | 0.755    |

| Dependent Variable 2: Total Amount of LOE Benefits | Women          | Men/Not Specified |          |          |          |
|----------------------------------------------------|----------------|-------------------|----------|----------|----------|
| B Lower 95% CI                                    | Upper 95% CI   | B Lower 95% CI    | Upper 95% CI |
| Intercept                                         | 7.67           | 7.263             | 8.076    | 7.777    | 7.432    | 8.122    |
| Mild Pain, Functional Impairment Unlikely vs. No Pain | 0.094          | -0.238            | 0.426    | 0.162    | -0.117   | 0.441    |
| Severe Pain, Functional Impairment Likely vs. No Pain | 0.49           | 0.144             | 0.835    | 0.48     | 0.189    | 0.771    |

| Dependent Variable 3: Total Amount of Healthcare Expenditure Benefits | Women          | Men/Not Specified |          |          |          |
|-----------------------------------------------------------------------|----------------|-------------------|----------|----------|----------|
| B Lower 95% CI                                                       | Upper 95% CI   | B Lower 95% CI    | Upper 95% CI |
| Intercept                                                           | 6.845          | 6.384             | 7.307    | 6.994    | 6.57     | 7.418    |
| Mild Pain, Functional Impairment Unlikely vs. No Pain               | 1.406          | 1.015             | 1.797    | 1.187    | 0.831    | 1.543    |
| Severe Pain, Functional Impairment Likely vs. No Pain               | -0.396         | -0.784            | -0.007   | -0.29    | -0.658   | 0.077    |

Bold values indicate statistically significant estimate at the $\alpha = 0.05$ level
Analyses adjusted for age, sex, nature of injury and prior chronic conditions
Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness – Supplementary Material
Dobson et. al (2022)

Supplementary Table 4: Associations between Persistent Pain Status at 18 Months and Wage Replacement Duration Group, Including First Wage Replacement Claim as a Predictor, Overall Cohort (n=1,131)

| Predictor | Wage replacement duration 3-12 months vs. 1 day – 3 months | Wage replacement duration 12-18 months vs. 1 day – 3 months |
|-----------|-----------------------------------------------------------|-----------------------------------------------------------|
|           | OR 95% CI p                                               | OR 95% CI p                                               |
| Model Intercept | 0.597 0.354 1.005 0.052 | 0.237 0.130 0.432 <0.001 |
| Pain Group |                                           |                                                          |
| Ref: No Pain Group |                                             |                                                          |
| Mild Pain, Functional Impairment Unlikely | 1.391 0.957 2.022 0.083 | 3.040 1.939 4.766 <0.001 |
| Severe Pain, Functional Impairment Likely | 2.097 1.367 3.218 0.001 | 9.123 5.659 14.706 <0.001 |
| Claimant Age |                                           |                                                          |
| Ref: 30-39 years old |                                             |                                                          |
| < 30 years old | 0.574 0.329 1.001 0.050 | 0.643 0.351 1.181 0.154 |
| 40-49 years old | 0.981 0.592 1.627 0.941 | 1.166 0.684 1.985 0.573 |
| 50-59 years old | 1.261 0.792 2.009 0.329 | 1.348 0.819 2.218 0.240 |
| Over 60 years old | 1.245 0.721 2.149 0.432 | 1.808 1.032 3.167 0.038 |
| Sex |                                           |                                                          |
| Ref: Male & Other Not Specified |                                             |                                                          |
| Female | 0.778 0.567 1.068 0.120 | 0.844 0.609 1.168 0.306 |
| Nature of Injury |                                           |                                                          |
| Ref: Sprain/Strain/Dislocation |                                             |                                                          |
| Fracture | 2.804 1.623 4.847 <0.001 | 3.208 1.820 5.656 <0.001 |
| Superficial or Open Wound | 0.471 0.279 0.795 0.005 | 0.735 0.449 1.205 0.223 |
| Organ/Blood Vessel/Muscle Injury, Internal Injury, Crushing, Amputation | 1.306 0.805 2.120 0.280 | 1.539 0.941 2.517 0.086 |
| Other | 3.669 1.708 7.882 0.001 | 0.528 0.156 1.781 0.303 |
| Unknown | 1.452 0.808 2.608 0.212 | 1.990 1.110 3.568 0.021 |
| Prior Chronic Condition |                                           |                                                          |
| Ref: No Prior Condition |                                             |                                                          |
| Back Problems Prior to the Work Injury | 0.918 0.599 1.408 0.696 | 0.709 0.454 1.107 0.131 |
| Arthritis Prior to the Work Injury | 0.971 0.621 1.520 0.899 | 1.024 0.657 1.595 0.918 |
| Mood Disorder Prior to the Work Injury | 0.650 0.398 1.061 0.085 | 0.452 0.268 0.764 0.003 |
| First WSIB Claim |                                           |                                                          |
| Yes vs. No | 1.496 1.073 2.085 0.018 | 1.200 0.855 1.684 0.292 |

Bold values indicate statistically significant estimate at the α = 0.05 level
Impact of persistent pain symptoms on work absence, health status and employment 18 months following disabling work-related injury or illness – Supplementary Material
Dobson et. al (2022)

Supplementary Table 5: Associations between Persistent Pain Status at 18 Months, Comparison of Original Model, and Model Including First Wage Replacement Claim as a Predictor, Overall Cohort (n=1,131)

| Dependent Variable 1: Total Number of LOE Days | Original Model | Original Model + First WSIB Claim |
|-----------------------------------------------|----------------|----------------------------------|
| B | 95% CI | B | 95% CI |
| Intercept | Intercept | 3.191 | 2.933 | 3.449 | 3.053 | 2.777 | 3.329 |
| Pain Group | | | | | | |
| Mild Pain, Functional Impairment Unlikely vs. No Pain | 0.116 | -0.087 | 0.32 | 0.095 | -0.108 | 0.298 |
| Severe Pain, Functional Impairment Likely vs. No Pain | 0.511 | 0.300 | 0.722 | 0.494 | 0.284 | 0.704 |
| First WSIB Claim | | | | | | 0.170 | 0.005 | 0.335 |

| Dependent Variable 2: Total Amount of LOE Benefits | Original Model | Original Model + First WSIB Claim |
|-----------------------------------------------|----------------|----------------------------------|
| B | 95% CI | B | 95% CI |
| Intercept | Intercept | 7.925 | 7.654 | 8.197 | 7.807 | 7.517 | 8.098 |
| Pain Group | | | | | | |
| Mild Pain, Functional Impairment Unlikely vs. No Pain | 0.134 | -0.079 | 0.348 | 0.112 | -0.101 | 0.326 |
| Severe Pain, Functional Impairment Likely vs. No Pain | 0.477 | 0.254 | 0.699 | 0.446 | 0.225 | 0.667 |
| First WSIB Claim | | | | | | 0.113 | -0.060 | 0.286 |

| Dependent Variable 3: Total Amount of Healthcare Expenditure Benefits | Original Model | Original Model + First WSIB Claim |
|-----------------------------------------------|----------------|----------------------------------|
| B | 95% CI | B | 95% CI |
| Intercept | Intercept | 6.983 | 6.661 | 7.304 | 6.928 | 6.580 | 7.277 |
| Pain Group | | | | | | |
| Mild Pain, Functional Impairment Unlikely vs. No Pain | 0.479 | 0.225 | 0.732 | 0.463 | 0.202 | 0.725 |
| Severe Pain, Functional Impairment Likely vs. No Pain | 1.259 | 0.997 | 1.522 | 1.230 | 0.955 | 1.505 |
| First WSIB Claim | | | | | | -0.005 | -0.218 | 0.207 |

Bold values indicate statistically significant estimate at the $\alpha = 0.05$ level
Analyses adjusted for age, sex, nature of injury and prior chronic conditions
Regression coefficients interpreted as a "\% increase" in the dependent variable per each unit increase in the independent variable