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Working and Living in Northern vs Southern Ontario Is Associated with the Duration of Compensated Time off Work: A Retrospective Cohort Study

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Abstract

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Background: Northern Ontario, Canada has a larger elder population, more resource-based employment, and limited access to physicians and specialists compared to southern Ontario. Given these important differences, it is possible that work disability rates will vary between the two Ontario jurisdictions.

Objective: To determine the association between time lost due to workplace injuries and illnesses occurring in northern vs southern Ontario and work disability duration from 2006–2011.

Methods: The study base included all lost-time claims approved by the Workplace Safety and Insurance Board in Ontario, Canada for workplace injury or illness compensation occurring between January 1, 2006 and December 31, 2011. All eligible participants had to be 18 years of age or older at the time of making the claim and participants were excluded if one of the three variables used to determine location (claimant home postal code, workplace geographical code, and WSIB firm location) were missing. Multivariable proportional hazards regression models were used to estimate hazard ratios and 95% confidence intervals adjusted for sex, age, occupation, part of body, and nature of injury relating Ontario geographical location to compensated time off work.

Results: A total of 156 453 lost-time claims were approved over the study period. Injured and ill workers from northern Ontario were 16% less likely to return to work than those from southern Ontario. Adjustment for potential confounding factors had no effect.

Conclusion: The disability duration in northern Ontario is longer than that in southern Ontario. Future research should focus on assessing the relevant factors associated with this observation to identify opportunities for intervention.

Keywords: Return to work; Ontario; Occupational injuries; Occupational diseases; Sick leave

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Introduction

Work-related injuries and illnesses are an important public health concern. In Canada, approximately one million occupational injury claims are reported each year by provincial and territorial workers' compensation boards and roughly 400 000 receive compensation for loss of wages due to lost-time (LT) from work.¹ In 2008, 1.7% of workers in the province of Ontario suffered a LT work injury. This translates into 78 256 total LT claims (claims for compensated time off work due to injury or illness) and close to US\$ 1.6 million in benefit and administration costs incurred.² The consequences of these injuries extend beyond loss of earnings and productivity into negative social and psychological effects for the injured or ill individual, including decreased participation in activities of daily living, changes to family and personal relationships, depression, anxiety, loss of self-esteem and self-confidence, *etc.*^{3,4} To remediate the adverse effects, occupational health and safety legislation was revised in North America and Europe throughout the 1990s to promote return-to-work (RTW) practices.⁵ The RTW approach uses comprehensive onsite programs involving work accommodation, which has proven to reduce the duration of work-related disability in comparison to earlier approaches of vocational rehabilitation.⁶ Work accommodation can include lighter duties, shorter work hours, changed workstation, or a different job with the same employer, and aims to temporarily meet the workers' needs while recovering.⁷

The literature on RTW outcomes and factors involved in the course of disabled workers through the disability management process is extensive. A systematic review by Krause, *et al.*,⁸ examined the determinants of disability duration and RTW after work-related injury. Over a dozen

studies were identified detailing the negative impacts of psychological, physical, and socio-demographic factors related to work disability.⁸ A more recent systematic review on the quantitative literature examining the research on workplace-based strategies for RTW programs suggested the importance of interpersonal issues to the success of RTW interventions.⁹ More specifically, actions such as early contact, involvement of a RTW coordinator, education and training of supervisors, contact between injured worker's employer and health care provider, as well as an offer of accommodation, showed some level of effectiveness in reducing the duration of work disability.⁹

Moreover, much of the research on RTW has focused on determining workplace-based strategies effective in promoting early RTW and identifying relevant barriers faced by workers in the course of work disability. Specifically, research has focused on RTW practices from the perspectives of workers,¹⁰⁻¹⁷ employers,^{12,17,18} and physicians,^{19,20} but lacking, is a discussion of how disability duration—duration of compensated time off work—is correlated with geographical locations.

Ontario is Canada's largest province by population, with a population of more than 13.5 million and covering more than one million square kilometers—an area larger than France and Spain combined.²¹ As a whole, Ontario is growing slightly faster than Canada overall (6.6% *vs* 5.4% as of 2006); largely due to high immigration rates.²² Ontario's economy thrives through its unique combination of resources, manufacturing, service industry, agriculture, forestry, and mining; all of which generates 37% of the national GDP.²¹ The labor force exceeds over six million people of which more than half (52.8%) have jobs and around 40% work part-time.²²

Exclusive coverage for workplace injury or illness in Ontario is covered by the

Workplace Safety and Insurance Board (WSIB). The WSIB is a public insurance system mandated under the Workplace Safety and Insurance Act to promote health and safety in Ontario workplaces and to provide no-fault insurance coverage for workplace injuries and illnesses to Ontario workers and workplaces.^{23,24} Two main types of coverage exist: mandatory coverage and non-mandatory coverage. Firms covered under the mandatory coverage plan are required to submit a claim to the WSIB within three days of a worker's injury if the injury resulted in lost time from work, wage loss, or the receipt of health care.²⁴ Employers covered under the non-mandatory schedule do not pay premiums to the WSIB but are required to report all workplace injuries to the WSIB.²⁵ Self-employed workers or individuals employed by companies that are not required to have WSIB coverage are not required to report injuries to the WSIB.²⁴

There are two distinct geographical re-

gions of Ontario: northern and southern Ontario. They differ in terms of employment, demographics, and availability of local health care services. Over half (61.2%) of the population in northern Ontario participates in the labor force, primarily within natural resource-based sectors,²⁶ which contribute to roughly 27% of the region's GDP.²⁷ northern Ontario is also composed of a larger elder population, with the 60 and over category comprising roughly one-sixth of the region's population while the same cohort comprises roughly one-tenth in southern Ontario.²⁸ Lastly, northern Ontario has limited access to general physicians and specialists.²⁹ More than three-quarters of family physicians and specialists are found within southern Ontario centers, leaving northern Ontario underserved.²⁹ Despite these differences, no study has addressed the influence of geographical location in Ontario on return to work rates. Therefore, the objective of this study was to determine the association between workplace injuries and illnesses occurring in northern *vs* southern Ontario and duration of compensated lost time.

TAKE-HOME MESSAGE

- In Canada, approximately one million occupational injury claims are reported each year.
- Injured and ill workers from northern Ontario were more likely to have occupations in the health, education, law and social, community and government, as well as trades, transport and equipment operation.
- Ill and injured southern Ontario workers were more likely to have occupations in business, finance, and administration, as well as manufacturing and utilities.
- Workers in northern Ontario and those working remotely from home were more likely to have longer compensation periods than workers from southern Ontario.
- Implementation of intervention initiatives within risky geographical regions of Canada is needed to promote a healthy return-to-work of injured and/or ill workers.

Materials and Methods

Study Design

We conducted a retrospective cohort study of all workers who submitted a LT claim to the WSIB in Ontario, and who were subsequently approved for compensation due to injury or illness between January 1, 2006 and December 31, 2011.

We did not seek individual consent for participation in the study because we used secondary data and identifying variables are presented in aggregate format making it impossible to identify any workers.³⁰

Ethical approval for the study was granted by the Ethics Board of Lakehead University (Approval no. 1463364).

Sampling

The data for this study was obtained from the Ontario WSIB administrative database. Eligible participants were Ontario workers employed by firms covered by the WSIB. In Ontario, approximately 65% of the workforce is covered by the WSIB.⁴ Workers excluded from WSIB coverage include the self-employed, domestic workers, the majority of the finance industry (*ie*, large banks), as well as other minor industry groups such as barber shops.⁴ Eligible participants in the study had filed a new LT claim and were accepted for compensation benefits between January 1, 2006 and December 31, 2011. Workers were excluded if they had an accepted LT claim for a work-related injury or illness in the two years prior to 2006. This was to ensure the sample included only incident cases. All included workers had to be 18 years of age or older at the time of making the claim.

Claimants were also excluded from the study if the required information on location was missing from the claim. This included claimant home postal code, workplace geographical code, and WSIB firm location to which the claim was accepted.

Measures

Geography

Northern Ontario has no legislated boundaries. Currently, for the purpose of statistical analysis, the provincial government has defined the regions of Ontario based on 49 census divisions of which 11 comprise northern Ontario and the remaining 38 southern Ontario.³¹ We used the census division geographical codes alongside a three tier classification scheme to define a compensated workers' location.

A worker was defined as being exclusive to northern Ontario if their home postal code, workplace location, and the WSIB office to which the LT claim was submit-

ted, were found within any of the 11 northern Ontario census divisions. Similarly, a worker was defined as being exclusive to southern Ontario if their home postal code, workplace location, and WSIB office were found within any of the 38 southern Ontario census divisions. We also created a category for remote workers. This included those claimants who worked in northern Ontario but lived in southern Ontario and those who worked in southern Ontario but lived in northern Ontario.

To account for those workers who had multiple home addresses during their compensation period, we used the postal code at which the worker lived the longest to determine worker home location.

Disability duration

Compensated time on benefits was used as a proxy measure for estimating disability duration. It is defined as the period extending from the date the claim was accepted to the date corresponding to the final income replacement payment made by the insurer to the claimant.³² This approach is an informative outcome because it is associated with a definite endpoint and because it is recorded consistently; hence, providing a complete record of the event of interest.³²

Potential confounders

Demographics: Individual level variables including worker's age, gender, and occupation were derived from the LT claims submitted to the WSIB. Worker's age was measured as a continuous variable including all workers over the age of 18. Worker's gender was measured as a categorical variable including either male or female. Lastly, worker occupation was assigned into 10 broad occupational categories as designated by the National Occupational Classification (NOC).³³

Work-related injury or illness: The type of work-related injury or illness sustained by the worker was derived from

Table 1: Characteristics of Ontario workers with a new lost-time claim between January 1, 2006 and December 31, 2011 (study participants) and those excluded from the study

| Variable | Participants | Excluded* |
|--|------------------------|----------------------|
| n | 156 453 | 257 518 |
| Mean age, years (SD, range) | 40.9 (12.1, 18 to 103) | 41.6 (12, 18 to 121) |
| Sex | | |
| Male | 90 812 (58.0%) | 158 670 (61.6%) |
| Female | 65 641 (42.0%) | 98 847 (38.4%) |
| Nature of injury | | |
| Traumatic injuries and disorders | 138 062 (88.3%) | 233 839 (90.8%) |
| Systemic disease and disorders | 14 332 (9.2%) | 17 496 (6.8%) |
| Infectious and parasitic diseases | 2070 (1.3%) | 2428 (0.94%) |
| Neoplasms, tumors and cancer | 289 (0.2%) | 327 (0.13%) |
| Ill-defined conditions | 614 (0.4%) | 1003(0.4%) |
| Other diseases and conditions | 988 (0.6%) | 2174 (0.8%) |
| Multiple diseases and unknown | 98 (0.06%) | 231 (0.09%) |
| Part of body | | |
| Head | 10 187(6.5%) | 18 088 (7%) |
| Neck and throat | 3558 (2.3%) | 5110 (2%) |
| Trunk | 64 801 (41.4%) | 102 496 (39.8%) |
| Upper extremities | 32 607 (20.8%) | 53 101 (20.6%) |
| Lower extremities | 29 590 (18.9%) | 49 327 (19.2%) |
| Body systems | 2594 (1.7%) | 4815 (1.9%) |
| Multiple body parts | 12 918 (8.3%) | 24 213 (9.4%) |
| Other body parts | 15 (0.01%) | 31 (0.01%) |
| Unknown | 176 (0.11%) | 308 (0.12%) |
| Occupation | | |
| Management | 7270 (4.7%) | 12 963 (5%) |
| Business, finance and administration | 11 933 (7.6%) | 21 483 (8.3%) |
| Natural & applied science | 2619 (1.7%) | 4036 (1.6%) |
| Health occupations | 15 894 (10.2%) | 21 602 (8.4%) |
| Education, law and social, community and government | 7278 (4.7%) | 10 673 (4.1%) |
| Art, culture, and recreation | 844 (0.5%) | 1545 (0.6%) |
| Sales and service | 41 815 (26.7%) | 67 611 (26.3%) |
| Trades, transport and equipment operators | 42 882 (27.4%) | 77 471 (30.1%) |
| Natural resources, agriculture, and related production occupations | 4008 (2.6%) | 4236 (1.6%) |
| Manufacturing and utilities | 21 910 (14.0%) | 35 898 (13.9%) |

*Workers were excluded from the study if any variable (worker home postal code, workplace geographical code, and WSIB firm location to which the claim was accepted) was missing in the WSIB database to determine location.

the LT claim. A national coding standard (CSA Z-795) was used to classify information describing the injury characteristics: 1) nature of injury, and 2) part of body involved.³⁴ The nature of injury identifies the principal physical characteristic(s) of the injury or disease and is the starting point for coding any claim. Part of body, on the other hand, identifies the part or parts of the injured person's body directly affected by the nature of injury or disease.

To maintain simplicity, we used each major category within the POB and NOI codes resulting in a total of nine POB categories and seven NOI categories (Table 1).

Statistical Analysis

Statistical analyses were conducted using SAS ver 9.3.³⁵ Univariate statistics were computed on geographic location, duration of compensation, and all potential confounding variables as appropriate. Kaplan-Meier curves were generated to examine the unadjusted association between disability duration in northern and southern Ontario. The log-rank test was used to statistically test for differences in the distribution of duration on compensation.

Multivariable proportional hazards regression models (using southern Ontario as the referent category) were generated to estimate adjusted hazard ratios and 95% confidence intervals relating geographical location within Ontario to duration of compensation. Age, gender, occupation, and injury/illness sustained were considered covariates in multivariable models. Finally, to satisfy the proportionality assumption, we stratified the association of worker geographical location and disability duration by nature of injury.

Results

Table 1 shows the baseline characteristics of the cohort by participant status. Excluded participants were more likely to be

male, have a traumatic injury, and have an occupation within the trades and transport sector, whereas participants were more likely to have an injury or illness afflicted to the trunk region of the body. A large proportion of the study sample was excluded since any one or two variables (worker home postal code, workplace geographical code, WSIB firm location) on their LT claim was missing, making it impossible to determine location based on the criteria prescribed.

Table 2 shows the characteristics of participants based on exposure status. Injured and ill workers from northern Ontario were more likely to have occupations in the health, education, law and social, community and government, as well as trades, transport and equipment operation; whereas ill and injured southern Ontario workers were more likely to have occupations in business, finance, and administration, as well as manufacturing and utilities.

The unadjusted hazard ratio from the Kaplan-Meier analysis was 0.84 (95% CI 0.83 to 0.85) indicating that workers from northern Ontario are 16% less likely to return to work than workers from southern Ontario (Table 3).

In the proportional hazards model, geographical location within Ontario was significantly ($p < 0.001$) associated with duration of compensation (Fig 1). The hazard ratio adjusted for sex, age, occupation, part of body, and nature of injury was 0.84 (95% CI 0.83 to 0.86) indicating that workers from northern Ontario are 16% less likely to return to work in comparison to southern Ontario workers. Similarly, the hazard ratio for comparing remote to southern Ontario workers was 0.89 (95% CI 0.87 to 0.91) indicating that remote workers are 11% less likely to return to work when compared to workers from southern Ontario (Table 3).

Table 2: Characteristics of Ontario workers with a new lost-time claim between January 1, 2006 and December 31, 2011 (study participants)

| Variable | North* | South† | Remote‡ |
|--|-----------------------|------------------------|------------------------|
| n | 17 008 (10.9%) | 131 350 (84%) | 8095 (5.2%) |
| Mean age, years (SD, range) | 41.2 (11.9, 18 to 87) | 40.8 (12.2, 18 to 103) | 41.1 (12.1, 18 to 100) |
| Sex | | | |
| Male | 9928 (58.4%) | 76 577 (58.3%) | 4307 (53.2%) |
| Female | 7080 (41.6%) | 54 773 (41.7%) | 3788 (46.8%) |
| Nature of injury | | | |
| Traumatic injuries and disorders | 14 793 (87%) | 166 166 (88.4%) | 7103 (87.8%) |
| Systemic disease and disorders | 1660 (9.7%) | 11 867 (9%) | 805 (9.9%) |
| Infectious and parasitic diseases | 285 (1.7%) | 1744 (1.3%) | 41 (0.5%) |
| Neoplasms, tumors and cancer | 75 (0.44%) | 204 (0.2%) | 10 (0.12%) |
| Ill-defined conditions | 63 (0.37%) | 508 (0.4%) | 43 (0.5%) |
| Other diseases and conditions | 119 (0.7%) | 777 (0.6%) | 92 (1.14%) |
| Multiple diseases and unknown | 13 (0.08%) | 84 (0.06%) | NA§ |
| Part of Body | | | |
| Head | 1001 (5.9%) | 8766 (6.7%) | 420 (5.2%) |
| Neck and throat | 432 (2.5%) | 2929 (2.2%) | 197 (2.4%) |
| Trunk | 7371 (43.3%) | 53 855 (41%) | 3575 (44.2%) |
| Upper extremities | 3429 (20.2%) | 27 711 (21.1%) | 1467 (18.1%) |
| Lower extremities | 3155 (18.6%) | 24 870 (18.9%) | 1565 (19.3%) |
| Body systems | 301 (1.8%) | 2099 (1.6%) | 194 (2.4%) |
| Multiple body parts | 1296 (7.6%) | 10 956 (8.3%) | 666 (8.2%) |
| Other body parts | NA | 15 (0.01%) | NA |
| Unknown Occupation | 23 (0.14%) | 143 (0.11%) | 10 (0.12%) |
| Management | 666 (3.9%) | 6156 (4.7%) | 448 (5.5%) |
| Business, finance and administration | 684 (4%) | 10 211 (7.8%) | 1028 (12.7%) |
| Natural and applied science | 240 (1.4%) | 2119 (1.6%) | 260 (3.2%) |
| Health occupations | 2309 (13.6%) | 12 931 (9.8%) | 654 (8.1%) |
| Education, law and Social, community and government | 1231 (7.2%) | 5818 (4.4%) | 229 (2.8%) |
| Art, culture, recreation | 74 (0.44%) | 741 (0.6%) | 29 (0.4%) |
| Sales and service | 4305 (25.3%) | 34 501 (26.3%) | 3009 (37.2%) |
| Trades, transport and equipment operators | 5285 (31.1%) | 35 733 (27.2%) | 1864 (23%) |
| Natural resources, agriculture, and related production | 876 (5.2%) | 2920 (2.2%) | 212 (2.6%) |
| Manufacturing and utilities | 1338 (7.9%) | 20 210 (15.4%) | 362 (4.5%) |

*Northern workers worked, lived, and submitted a WSIB claim within a northern census division

†Southern workers worked, lived, and submitted a WSIB claim within a southern census division

‡Remote workers either worked in northern Ontario but lives in southern Ontario or worked in southern Ontario but lives in northern Ontario

§NA: Not available

Discussion

This paper addresses the association between workplace injury and illness occurring in northern *vs* southern Ontario geographical locations and work disability duration. The findings of the study supported a significant association between geographical location and disability duration. Workers in northern Ontario and those working remotely from home were more likely to have longer compensation periods than workers from southern Ontario.

Understanding how geographical location is associated with compensated time off work has important implications in the disability management agenda. It can not only help inform decisions on resource allocation for interventions but also influence relevant stakeholders in disability management such as the workers' compensation system, other insurers, health care policymakers, union representatives, as well as individuals at the worksite organizational level to address and subsequently implement strategies to promote early and safe return to work after a workplace injury/illness.

The economy of northern Ontario is concentrated in resource-based industries including agriculture, forestry, and mining and these industries may be associated with more severe injury or illness.²⁶ According to statistics provided by Workplace Safety North, a provincial safety and accident prevention organization, the LT injury rate has remained fairly constant at 1.7 per 100 full-time employees and 2.9 per 100 full-time employees in the mining and forestry industries, respectively.³⁶ However, claimants from resource-based industries are still more likely to receive health care and have higher mean health care expenditures than any other industry groups.⁴ We found higher proportions of injured and ill northern workers working

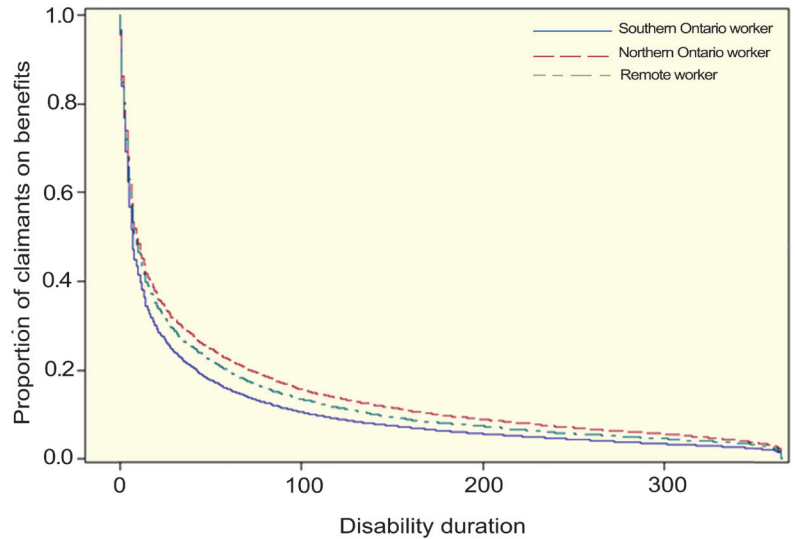


Figure 1: Kaplan-Meier survival curve for time on benefits by geographical location in Ontario.

in natural resources, agriculture, and related production in trades, transport and equipment operators. However, adjusting the proportional hazards estimate for industrial sector had no effect on the hazard ratio comparing disability duration in Northern *vs* Southern Ontario.

Northern Ontario has a greater propor-

Table 3: Unadjusted and adjusted hazard ratios (HRs) and 95% CI for disability duration by geographic location in Ontario (2006–2011)

| | n | Estimate | HR (95% CI) |
|--------------------|---------|----------|---------------------|
| Unadjusted | | | |
| South [†] | 131 350 | — | 1.00 |
| North | 17 008 | -0.175 | 0.84 (0.83 to 0.85) |
| Remote | 8095 | -0.105 | 0.90 (0.88 to 0.92) |
| Adjusted* | | | |
| South [†] | 131 350 | — | 1.00 |
| North | 17 008 | -0.170 | 0.84 (0.83 to 0.86) |
| Remote | 8095 | -0.119 | 0.89 (0.87 to 0.91) |

*Model adjusted for sex, age, industrial sector, part of body, and nature of injury.
[†]Southern Ontario workers are used as the reference category to estimate the unadjusted and adjusted hazard ratios and 95% CI.

tion of older workers. Population census data from 2006 indicated that people in the 60–74-year-old category represented 14.3% of the total population in northern Ontario, whereas the same age group represented only 11.9% of the population in Ontario as a whole.²⁸ More recent census data reported the share of seniors aged 65 and over ranged from a low of 12.4% in southern Ontario to a high of 17.8% in northern Ontario.³¹ Studies have found that older workers are less likely to return to work post-injury.^{37–39} For instance, a study by Baldwin and Butler looked at RTW and upper extremity disorders in the workplace.⁴⁰ The results of the study found that as age increased, workers were less likely to return to work after an injury.⁴⁰ Our results did not suggest a disproportionate number of older workers experiencing work-related injury and illness in northern Ontario. After adjusting for age, the hazard ratio for the association between location and disability duration did not change.

Inequitable geographic distribution of health care providers is also an ongoing issue in Ontario. In general, physicians tend to congregate in larger cities, leaving many rural, remote, and small towns underserved.⁴¹ In 2001/2002, for instance, 82% of general practitioners or family physicians and 93% of specialists were located in urban areas of southern Ontario with the remainder spread in northern communities.²⁹ This translates into a distribution of 102 general practitioners or family physicians per 100 000 population in southern Ontario while northern Ontario has a substantially lower distribution at 79 general practitioners or family physicians per 100 000 population.²⁹

The implications of physician shortage and lack of appropriate access to health services has adverse effects on the northern population. According to a recent report released by the Ministry of Health

and Long-Term care, northern Ontario residents tend to have lower self-reported health, higher infant mortality, higher rates of obesity, and lower life expectancy in comparison to their southern Ontario counterparts.⁴² We did not have a measure of health care access in the compensation data; therefore, it is possible that access to health care may be a factor in differential return to work rates in northern *vs* southern Ontario.

Our study had several strengths including access to population-based data, a large sample size, a range of industry sectors, and use of secondary data. Our study also had some limitations. First, the classification used for the exposure measure was not validated. We stipulated that an injured or ill worker had to meet all three criteria (live in the North, work in the North, and have their LT claim processed at a northern office) in order to be classified as a northern worker to increase the sensitivity of measuring northern workers. However, by doing this, slightly less than half of the LT claims could not be included in the analysis. A less sensitive measure would be to use only one variable such as worker home postal code; however, this would likely increase exposure misclassification. Second, the use of time-to-claim-closure as an outcome measure has been criticized because of its administrative nature and lack of validation studies.³⁰ However, the data is easily available and shown to be a useful surrogate measure making it cost-efficient and reliable.⁴³ Lastly, participants in this study included all claimants receiving worker's compensation. The severity of the compensated injury or illness may differ from injuries and illnesses sustained by workers not receiving compensation and therefore, the findings may not be generalizable to this group.

The knowledge and insight gained from this study will help inform decisions on resource allocation for interventions, can

help guide employer policies and practices, and more importantly, help shed light on the fact that northern Ontario is lagging in the disability management agenda in comparison to urban southern Ontario centers. Comparative data from other regions with different workers' compensation schemes are required to better understand the societal factors that are involved in reducing or prolonging disability duration.

Conflicts of Interest: None declared.

Funding Source: None declared.

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