

# Time to return to work following workplace violence among direct healthcare and social workers

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## ABSTRACT

**Objectives** This study examined time to return-to-work (RTW) among direct healthcare and social workers with violence-related incidents compared with these workers with non-violence-related incidents in British Columbia, Canada.

**Methods** Accepted workers' compensation lost-time claims were extracted between 2010 and 2014. Workers with violence-related incidents and with non-violence-related incidents were matched using coarsened exact matching (n=5762). The outcome was days until RTW within 1 year after the first day of time loss, estimated with Cox regression using piecewise models, stratified by injury type, occupation, care setting and shift type.

**Results** Workers with violence-related incidents, compared with workers with non-violence-related incidents, were more likely to RTW within 30 days postinjury, less likely within 61–180 days, and were no different after 181 days. Workers with psychological injuries resulting from a violence-related incident had a lower likelihood to RTW during the year postinjury (HR 0.61, 95% CI 0.43 to 0.86). Workers with violence-related incidents in counselling and social work occupations were less likely to RTW within 90 days postinjury (HR 31–60 days: 0.67, 95% CI 0.48 to 0.95 and HR 61–90 days: 0.46, 95% CI 0.30 to 0.69). Workers with violence-related incidents in long-term care and residential social services were less likely to RTW within 91–180 days postinjury.

**Conclusions** Workers with psychological injuries, and those in counselling and social work occupations and in long-term care and residential social services, took longer to RTW following a violence-related incident than workers with non-violence-related incidents. Future research should focus on identifying risk factors to reduce the burden of violence and facilitate RTW.

## INTRODUCTION

Workplace violence is a common occupational hazard and cause of work disability in the healthcare sector.<sup>1</sup> The prevalence of workplace violence is often under-reported and difficult to estimate.<sup>1</sup> In British Columbia (BC), Canada, the yearly rate of compensated violence-related work claims among healthcare workers ranged from 0.37 to 0.51 claims per 100 person-years of employment in the healthcare and social services sector from 2009 to 2015.<sup>2</sup> This rate is 3–10 times higher compared with other industries.<sup>2</sup> The burden of workplace violence is high in other jurisdictions as well, for example, the number of workplace assaults and violent acts in the USA averaged 24 000 annually between 2011 and

## Key messages

### What is already known about this subject?

- ▶ Healthcare workplaces are known to be psychologically demanding environments, and the effects of injuries due to violence might be exacerbated in these workplaces. There is little evidence on the effect of violence on work disability duration and the likelihood to return-to-work (RTW) after injury.

### What are the new findings?

- ▶ This study examined the difference in time to RTW among healthcare workers with violence-related incidents compared with workers with non-violence-related incidents in British Columbia, Canada. Violence-related incidents compared with non-violence-related incidents were associated with a longer time to RTW for workers with psychological injuries, those working in counselling or social work occupations, and those working in long-term care and residential social services.

### How might this impact on policy or clinical practice in the foreseeable future?

- ▶ The evidence from this study shows that in addition to primary prevention of work-related violent incidents, interventions to reduce work disability related to violence should focus on healthcare workers with psychological injuries and on workers off work between 30 and 180 days after a violent incident as these workers have a higher likelihood to remain off work for more than 1 year and in some cases permanently.

2013, with nearly 75% occurring in healthcare and social service settings.<sup>1,3</sup>

Most research has focused on the incidence and risk factors of violence among healthcare workers or violence-prevention strategies.<sup>1,4</sup> The relationship between violence and the likelihood of return-to-work (RTW) has only been studied indirectly, showing that violence can lead to a psychological injury<sup>5–8</sup> that is associated with lower RTW rates.<sup>9–12</sup> There is a lack of empirical evidence on the direct effect of violence on work disability duration and the likelihood to RTW after injury.

Violence as well as non-violence-related incidents could lead directly to psychological injuries as a primary or secondary injury diagnosis that makes it harder to cope with psychological job demands



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during the RTW process.<sup>13</sup> It may also affect an individual's capacity to RTW within the same workplace. Healthcare workplaces are known to be psychologically demanding environments, and the effects of violence might be exacerbated in these workplaces as a result.<sup>14–18</sup> Accordingly, the objective of this study is to examine the difference in time to RTW with violence-related incidents compared with similar non-violence-related incidents among direct care health and social workers in BC. We hypothesise that healthcare workers with violence-related injuries (WVI) have a lower likelihood to RTW than healthcare workers with non-violence-related injuries (WNVI) and that this difference will be greatest for those with concomitant psychological injuries and will vary between occupations and settings.

## METHODS

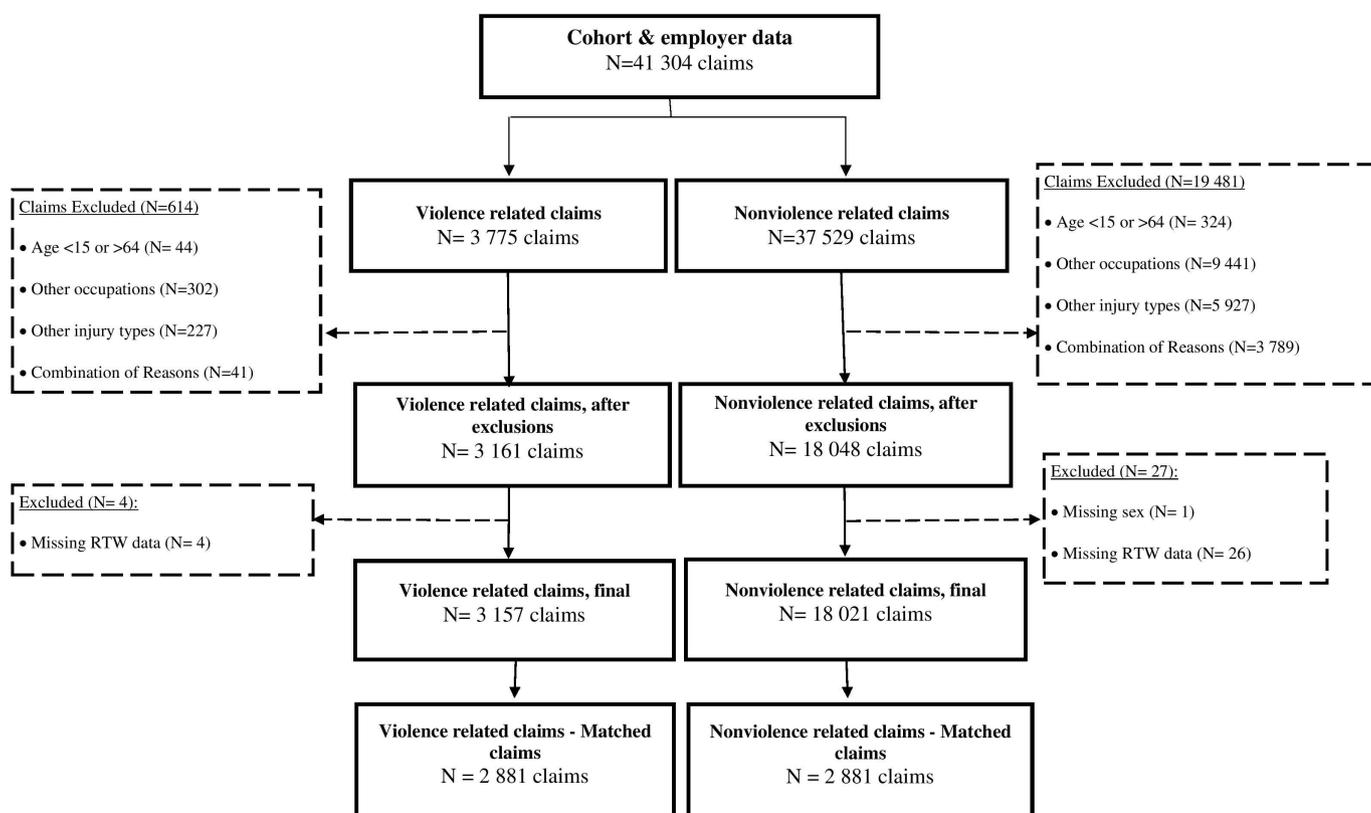
### Study design

A retrospective cohort was constructed using administrative claims data from WorkSafeBC (the Workers' Compensation Board of BC). This compensation system administers the provincial Workers' Compensation Act, which gives legal authority to set and enforce occupational health and safety standards and policies. WorkSafeBC has a prevention and rehabilitation mandate, and administers claims for workers who are adjudicated to have been injured at work.<sup>19</sup> Approximately 98% of the workforce is covered under this no-fault compensation system.<sup>20</sup> Data available from the WorkSafeBC claims database include information on industry of employment (eg, healthcare), type of benefit (eg, time loss), type of injury (eg, strain/sprain, psychological), nature of incident (eg, violent incident), sociodemographic factors (eg, age), occupations (eg, care aide), employer characteristics (eg, firm size) and RTW outcomes (eg, day-to-day RTW status information).

### Study cohort

Figure 1 depicts the construction of the cohort. The study cohort included all accepted claims for healthcare workers with an injury date between 1 January 2010 and 31 December 2014 with at least 1-day off work after injury. This represented 41 304 healthcare worker claims. Workers under the age of 15 years and over the age of 64 years (traditional retirement age in BC) at the time of injury were excluded (representing 0.9% of claims). Only healthcare workers with occupations that provided direct care to patients, and occupations with a minimum number of claims for analysis (ie, at least 5% of total cohort) were included. Excluded occupations meeting these criteria were first responders, allied health professionals (eg, occupational therapists, respiratory therapists), physicians, technicians, administrators, security personnel, and hospitality workers. Workers in these occupations represented 32.5% of all claims, but comprised only 9.0% of the violence-related claims. Counsellors and social workers, registered nurses, and nursing assistants/aides were the three occupation groups remaining in the final cohort.

Injury types not typically associated with violence were excluded from the cohort. A total of 14.9% of the cohort were excluded for claims for burns, connective tissue diseases, musculoskeletal diseases, infectious and parasitic diseases, and diseases of organ systems. Six injury types remained in the final cohort: traumatic injury, back sprains and strains, torso sprains and strains, upper extremities sprains and strains, non-traumatic non-sprain injuries (contusions and cuts), and psychological injuries (stress, adjustment disorder and post-traumatic stress disorder). This is a cohort of workers with time-loss claims, and it should be acknowledged that only injuries that were severe enough to lead to time loss were included.



**Figure 1** Construction of a cohort of healthcare workers from compensation claims data in British Columbia between 2010 and 2014. RTW, return-to-work.

Claims with missing data for any of the study variables were excluded (0.1%). One claim was excluded due to missing sex and 30 claims were excluded due to missing RTW data. The unmatched cohort included 21 178 injured workers with accepted time-loss claims; 18 021 WNI and 3 157 healthcare WVI. The matched cohort is described in the section 'selecting a comparison cohort from non-violent-related injuries'.

The healthcare workers will be referred to as 'workers' in the remainder of this manuscript.

## Outcomes

The primary outcome was time to sustained RTW measured as the number of days an employee was off work from the first day until 1-year postinjury. This was constructed by counting the number of calendar days for an injured worker to RTW at full hours and full duties, and remain at work (ie, no subsequent time loss or claim reopening).

The primary explanatory variable of interest was 'violence', defined as 'The attempted or actual exercise by a person, other than a worker, of any physical force so as to cause injury to a worker, and includes any threatening statement or behaviour which gives a worker reasonable cause to believe that he or she is at risk of injury.'<sup>21</sup> This is the WorkSafe's definition of a claim with 'violence as cause of injury'. If a worker was injured by an incident meeting WSBC's definition of violence, the claim was coded by the case manager in adjudicating the claim as a work-related violence incident.

## Covariates

Analyses were adjusted for the following potential confounders, measured at the start of time loss:

- ▶ Sex (man, woman).
- ▶ Age (15–24, 25–34, 35–44, 45–54 and 54–64 years).
- ▶ Annual wage: (<\$C20 000, \$C20 000–\$C39 999, \$C40 000–\$C59 999 and >\$C60 000)
- ▶ Occupation: WorkSafeBC claims include occupation at the time of injury coded according to the Standard Occupational Classification developed by Statistics Canada.<sup>22</sup> Three occupation groups were used for this study: counsellors/social workers/therapists, nursing aides/assistants and registered nurses.
- ▶ Injury type: Six injury categories were included in the analyses using the International Classification of Diseases V.9 coding of the work-related injuries: serious traumatic injuries (fractures, dislocations, open wounds and amputations), back sprains and strains, torso sprains and strains, upper extremities sprains and strains, non-traumatic non-sprain injuries (internal injuries, bruises and contusions) and psychological injuries (stress, anxiety and adjustment disorder).
- ▶ Care settings: Care settings were grouped as: acute care, community health support services, counselling or social services, long-term care (LTC), short-term care, residential social service facility, life and job skills training and retirement or seniors' home (accommodations only).
- ▶ Previous violence-related incident: Workers in the cohort with a time-loss claim due to violence within the past 5 years at the time of injury were coded as having had a previous violence-related incident.
- ▶ Firm size: The worker's employer was categorised by person-years of employment over the study period (<100, 100–999.9, 1000–9999.9, ≥10 000 person-years).

- ▶ Employer was defined as one of six geographically defined health authorities, mainly delivering acute healthcare that were de-identified as health authority 1 through 6. In addition, employers providing long-term or social services were grouped into these categories, while provincial healthcare services (ie, not restricted to a geographical health authority) were categorised as 'other' (eg, provincial social services).
- ▶ Shift type: Fixed shifts (work the same amount of hours, starting and stopping at the same times, for a specified period of days), variable shifts (shifts are variable or erratic, following no fixed temporal pattern of nighttime or daytime shifts), and rotating shifts (working at different times based on a preplanned pattern).

## Selecting a comparison cohort from non-violent-related injuries

Using methods as applied in Maas *et al*,<sup>23</sup> Coarsened Exact Matching was used to balance differences between workers with non-violence-related incidents workers with violence-related incidents on observed characteristics to examine the effect of violence on RTW. For matching,  $\chi^2$  tests were conducted to identify confounders that had different distributions across both groups. Confounders with different distributions were sex, age, injury types, occupations and care settings. Shift type, wage or firm size were not used for matching because the distributions were similar for workers with violence-related incidents and non-violence-related incidents. Matching was also not done by previous violent incident or employer type because only a small number of workers had a previous incident, or worked for an employer type other than LTC or social services.

The final cohort was composed of 2881 workers with violence-related incidents and 2881 matched workers with non-violence-related incidents (see figure 1). Unmatched workers with violence-related incidents were slightly older, more likely to be male, and more likely to have had a psychological injury.

## Statistical analyses

Differences were described for injury types by workers with violence-related incidents and workers with non-violence-related incidents in the matched cohort, and Kaplan-Meier survival curves were used to examine the effect of violence on time to RTW in the matched cohort. Cox regression models with HRs and 95% CIs were used to examine the difference in disability duration between the groups, adjusted for sociodemographic characteristics (age, wage and sex), occupation groups, injury types, care settings, previous violent incident and firm size. Adjusted models were stratified for injury types, occupations, care settings and shift types.

All Cox regression models were tested for the assumption of proportionality using a non-zero slope of Schoenfeld model residuals over time.<sup>24</sup> Piecewise hazard models for the full cohort and for the stratified models were used to address the violation of proportionality in the Cox regression models. HRs were calculated for the following time intervals after injury: 0–30 days, 31–60 days, 61–90 days, 91–180 days, 181–270 days and 271–365 days, as adapted from a previous study in the field.<sup>23</sup>

## RESULTS

Descriptive statistics are shown in table 1 for both the matched and unmatched cohort. The unmatched cohort consisted of 18 021 (85.1%) workers with a non-violence-related claim, and 3157 (14.9%) workers with a violence-related claim. Women comprised the vast majority of claims, and the cohort was on

**Table 1** Descriptive statistics of the matched cohort and unmatched cohort of healthcare workers for the investigation of the effect of workplace violence on return to work

	Matched cohort (n=5762)		p value	Unmatched cohort (n=21 178)		p value
	Non-violence claims n=2881 (50.0%), (%)	Violence claims n=2881 (50.0%), (%)		Non-violence claims n=18 021 (85.1%), (%)	Violence claims n=3157 (14.9%), (%)	
Sex			1.00			<0.00
▶ Men	316 (11.0)	316 (11.0)		1600 (8.9)	427 (13.5)	
▶ Women	2 565 (89.0)	2 565 (89.0)		16 421 (91.1)	2 730 (86.5)	
Age in years			1.00			<0.00
▶ 15–24	114 (4.0)	114 (4.0)		566 (3.1)	153 (4.8)	
▶ 25–34	579 (20.1)	579 (20.1)		3399 (18.9)	650 (20.6)	
▶ 35–44	772 (26.8)	772 (26.8)		4500 (25.0)	832 (26.3)	
▶ 45–54	949 (32.9)	949 (32.9)		5936 (32.9)	1019 (32.3)	
▶ 55–64	467 (16.2%)	467 (16.2%)		3620 (20.1%)	503 (15.9%)	
Injury types			1.00			<0.00
▶ Serious traumatic injuries	130 (4.5)	130 (4.5)		853 (4.7)	155 (4.9)	
▶ Spine and back sprains and strains	584 (20.3)	584 (20.3)		6165 (34.2)	592 (18.7)	
▶ Torso sprains and strains	348 (12.1)	348 (12.1)		4608 (25.6)	352 (11.1)	
▶ Upper extremities sprains and strains	959 (33.3)	959 (33.3)		4558 (25.3)	974 (30.8)	
▶ Non-traumatic non-sprain injuries	756 (26.2)	756 (26.2)		1710 (9.5)	854 (27.0)	
▶ Psychological injuries	104 (3.6)	104 (3.6)		127 (0.7)	230 (7.3)	
Occupation			1.00			<0.00
▶ Counsellor/social workers/ therapists	642 (22.3)	642 (22.3)		2310 (12.8)	773 (24.5)	
▶ Nursing aides/assistants	1 405 (48.8)	1 405 (48.8)		9 834 (54.6)	1 479 (46.8)	
▶ Nurses	834 (28.9)	834 (28.9)		5 877 (32.6)	905 (28.7)	
Care setting			1.00			<0.00
▶ Acute care	813 (28.2)	813 (28.2)		5 798 (32.2)	872 (27.6)	
▶ Community health support services	87 (3.0)	87 (3.0)		2 107 (11.7)	106 (3.4)	
▶ Counselling or social services	161 (5.6)	161 (5.6)		683 (3.8)	187 (5.9)	
▶ Life and job skills training	48 (1.7)	48 (1.7)		195 (1.1)	58 (1.8)	
▶ Long-term care	1 354 (47.0)	1 354 (47.0)		7 773 (43.1)	1 404 (44.4)	
▶ Residential social service facility	308 (10.7)	308 (10.7)		705 (3.9)	369 (11.7)	
▶ Retirement or seniors' home (accommodation only)	11 (0.4)	11 (0.4)		182 (1.0)	14 (0.4)	
▶ Short-term care	85 (2.9)	85 (2.9)		401 (2.2)	121 (3.8)	
▶ Other care setting	14 (0.5)	14 (0.5)		177 (1.0)	26 (0.8)	
Firm size			0.075			<0.00
▶ <100 person-years	654 (22.7)	640 (22.2)		3 312 (18.4)	728 (23.1)	
▶ 100–999.9 person-years	941 (32.7)	1 024 (35.5)		5 331 (29.6)	1 121 (35.5)	
▶ 1000–9999.9 person-years	790 (27.4)	720 (25.0)		5 866 (32.6)	778 (24.6)	
▶ ≥10 000 person-years	496 (17.2)	497 (17.2)		3 512 (19.5)	530 (16.8)	
Shift type			0.11			0.01
▶ Fixed	467 (16.2)	412 (14.3)		2496 (13.8)	489 (15.5)	
▶ Rotating	649 (22.5)	681 (23.6)		3931 (21.8)	726 (23.0)	
▶ Variable	1 765 (61.3)	1 788 (62.1)		11 594 (64.3)	1 942 (61.5)	
Wage per annum			0.14			0.96
▶ <\$20 000	115 (4.0)	96 (3.3)		641 (3.6)	113 (3.6)	
▶ \$20 000–\$39 999	1 061 (36.8)	1 016 (35.3)		6 441 (35.7)	1 127 (35.7)	
▶ \$40 000–\$59 999	1 140 (39.6)	1 146 (39.8)		6 945 (38.5)	1 230 (40.0)	
▶ >\$59 999	565 (19.6)	623 (21.6)		3 994 (22.2)	687 (21.8)	
Unmatched covariates						
Previous violence claims			<0.00			<0.00

continued

Table 1 continued

	Matched cohort (n=5762)		p value	Unmatched cohort (n=21 178)		p value
	Non-violence claims n=2881 (50.0%), (%)	Violence claims n=2881 (50.0%), (%)		Non-violence claims n=18 021 (85.1%), (%)	Violence claims n=3157 (14.9%), (%)	
▶ Previous violence claim exists within last 5 years	226 (7.8)	540 (18.7)		1 294 (7.2)	586 (18.6)	
▶ No previous violence claim within last 5 years	2 655 (92.2)	2 341 (81.3)		16 727 (92.8)	2 571 (81.4)	
Employer			<0.00			<0.00
▶ Health authority 1	350 (12.1)	442 (15.3)		2 760 (15.3)	482 (15.3)	
▶ Health authority 2	326 (11.3)	255 (8.8)		2 151 (11.9)	267 (8.5)	
▶ Health authority 3	271 (9.4)	210 (7.3)		2 047 (11.4)	239 (7.6)	
▶ Health authority 4	290 (10.1)	271 (9.4)		1 980 (11.0)	286 (9.1)	
▶ Health authority 5	81 (2.8)	65 (2.3)		583 (3.2)	71 (2.2)	
▶ Health authority 6	14 (0.5)	53 (1.8)		48 (0.3)	63 (2.0)	
▶ Long-term care	860 (29.8)	898 (31.2)		5 027 (27.9)	919 (29.1)	
▶ Social services	510 (17.7)	497 (17.2)		2 278 (12.6)	583 (18.5)	
▶ Other	179 (6.2)	190 (6.6)		1 147 (6.4)	247 (7.8)	

average 43–44 years of age. For workers with non-violence-related incidents, back sprains and sprains were the most common injury (34.2%), while for workers with violence-related incidents, upper extremities sprains and strains were the most common (30.8%). Psychological injuries were the least common injury. In both groups, nursing aides/assistants were the most common occupation group, followed by registered nurses, and counsellor/social workers/therapists. Over 40% of workers in both groups work in an LTC setting, followed by acute care. Workers were equally distributed across firms of different sizes, different shift types (over 60% worked variable shift types), annual median wage (on average \$C43 491) and care setting (almost 30% worked in an LTC setting). More than 90% of workers with non-violence-related incidents, and more than 80% of those with violence-related incidents, had no previous violent incident.

In the matched cohort,  $\chi^2$  tests showed no significant differences ( $p=1.0$ ) between the groups by sex, age, injury types, occupations and care settings, indicating complete balance between groups on these characteristics. There were significant differences by previous violent incident and employer size.

### Time until RTW

The majority of workers in both groups RTW within 1 year after the first time-loss day. There were no differences in the likelihood to RTW overall within 1 year after injury comparing both groups (HR 0.98, 95% CI 0.93 to 1.04) in the unadjusted model or the fully adjusted model (HR 1.00, 95% CI 0.94 to 1.05).

Piecewise hazard models for the overall matched cohort are shown in table 2. In the first 30 days, the adjusted piecewise model showed a 10% higher likelihood to RTW (HR 1.10, 95% CI 1.03 to 1.18) for workers with violence-related incidents compared with workers with non-violence-related incidents. Between 31 and 60 days after injury, the likelihood of RTW was lower for workers with violence-related incidents compared with workers with non-violence-related incidents, but the CI for the ratio included '1' suggesting no difference during this time segment of disability duration (HR 0.95, 95% CI 0.83 to 1.09). For workers who were still off work between 61–90 days and 91–180 days postinjury, the likelihood of RTW was lower for workers with violence-related incidents compared with workers

with non-violence-related incidents (HR 0.76, 95% CI 0.63 to 0.90; and HR 0.74, 95% CI 0.62 to 0.88, respectively). Effect sizes show a lower likelihood to RTW for healthcare workers with violence-related incidents from 180 to 270 days postinjury, and a higher likelihood 271–365 days postinjury, but the 95% CIs suggested variability around the estimate and no difference between the groups.

### Stratifications

Stratifications of the fully adjusted model were conducted to investigate if the relationship between violence-related incidents and the likelihood to RTW varied by injury type, occupation, care setting and shift type. All models violated the assumption of proportionality, with the exception of psychological injuries. For psychological injuries, 30% of workers with violence-related incidents were still off work 1-year postinjury compared with 13% for workers with non-violence-related incidents. This is higher compared with all other injuries. The HR for the effect of healthcare workers with violence-related incidents on RTW was 0.61 (95% CI 0.43 to 0.86).

Adjusted piecewise models for the stratifications for injury types, occupations, care settings and shift types are shown in table 3. The findings observed in the piecewise models include a u-shaped pattern with a higher likelihood of RTW for workers with violence-related incidents in the shortest and longest parts of the disability duration and a lower likelihood in the middle

**Table 2** Likelihood to return to work for workers with violence-related incidents (WVI) compared with workers with non-violence-related incidents (WNVI) on sickness absence during 1-year follow-up

Days after injury	Number of workers still on claim at end of time period (violence n=2 881, non-violence n=2 881)	Unadjusted model (HR (95% CI))	Adjusted model* (HR (95% CI))
0–30	WVI (n=1292) vs WNVI (n=1384)	1.09 (1.02 to 1.17)	1.10 (1.03 to 1.18)
31–60	WVI (n=884) vs WNVI (n=916)	0.95 (0.83 to 1.08)	0.95 (0.83 to 1.09)
61–90	WVI (n=657) vs WNVI (n=619)	0.76 (0.64 to 0.90)	0.76 (0.63 to 0.90)
91–180	WVI (n=417) vs WNVI (n=333)	0.74 (0.62 to 0.87)	0.74 (0.62 to 0.88)
181–270	WVI (n=342) vs WNVI (n=260)	0.84 (0.60 to 1.16)	0.84 (0.61 to 1.17)
271–365	WVI (n=302) vs WNVI (n=234)	1.20 (0.72 to 1.98)	1.22 (0.74 to 2.02)

\*Adjusted for age, sex, wage, occupation, injury types, previous violent incident, care setting, firm size.

**Table 3** Likelihood to return to work for workers with violence-related incidents (WVI) compared with workers with nonviolence-related incidents (WNVI) during 1-year follow-up; adjusted models, stratified by injury type, occupation and shift type (HR (95% CI))

	Injury types			Occupation			
	Serious traumatic injuries WVI (n=130) vs WNVI (n=130)	Upper extremities sprains and strains WVI (n=959) vs WNVI (n=959)	Non-traumatic non-sprain injuries WVI (n=756) vs WNVI (n=756)	Counsellor/ social workers WVI (n=642) vs WNVI (n=642)	Nurses WVI (n=1405) vs WNVI (n=1405)	Nursing aides/ assistants WVI (n=834) vs WNVI (n=834)	
Days after injury							
0–30	1.24 (0.90–1.71)	1.33 (1.16–1.52)	1.00 (0.89–1.13)	1.02 (0.88–1.18)	1.13 (1.02–1.25)	1.14 (1.00–1.30)	
31–60	1.30 (0.62–2.71)	1.10 (0.89–1.38)	0.77 (0.55–1.10)	0.67 (0.48–0.95)	1.08 (0.90–1.30)	0.94 (0.74–1.20)	
61–90	1.21 (0.35–4.21)	0.78 (0.59–1.01)	0.72 (0.43–1.21)	0.46 (0.30–0.69)	0.92 (0.72–1.17)	0.78 (0.67–1.08)	
91–180	0.67 (0.30–1.49)	0.84 (0.65–1.09)	0.91 (0.58–1.43)	0.69 (0.46–1.02)	0.72 (0.57–0.92)	0.89 (0.65–1.22)	
181–270	0.11 (0.01–0.87)	1.27 (0.73–2.20)	0.89 (0.39–2.03)	1.09 (0.54–2.23)	0.90 (0.56–1.44)	0.66 (0.37–1.19)	
271–365	0.96 (0.23–4.12)	1.01 (0.47–2.18)	4.14 (1.19–14.48)	0.75 (0.23–2.45)	1.34 (0.64–2.78)	1.50 (0.63–3.53)	
	Care setting			Shift type			
	Acute care WVI (n=813) vs WNVI (n=813)	Counselling or social services WVI (n=161) vs WNVI (n=161)	Long-term care WVI (n=1354) vs WNVI (n=1354)	Residential social service facility WVI (n=308) vs WNVI (n=308)	Fixed shifts WVI (n=412) vs WNVI (n=467)	Rotating shifts WVI (n=681) vs WNVI (n=649)	Variable shifts WVI (n=1788) vs WNVI (n=1765)
Days after injury							
0–30	1.16 (1.02–1.33)	0.91 (0.68–1.21)	1.16 (1.04–1.29)	0.95 (0.77–1.16)	1.08 (0.91–1.29)	1.19 (1.02–1.38)	1.10 (1.00–1.21)
31–60	0.92 (0.72–1.18)	0.78 (0.39–1.57)	1.05 (0.87–1.26)	0.87 (0.50–1.50)	0.90 (0.61–1.34)	1.18 (0.90–1.56)	0.90 (0.76–1.07)
61–90	0.88 (0.64–1.21)	0.63 (0.27–1.46)	0.85 (0.66–1.09)	0.23 (0.12–0.44)	0.55 (0.33–0.91)	0.81 (0.57–1.17)	0.80 (0.65–1.00)
91–180	0.86 (0.62–1.20)	0.53 (0.22–1.30)	0.73 (0.57–0.94)	0.75 (0.43–1.32)	0.49 (0.29–0.84)	0.79 (0.55–1.14)	0.79 (0.64–0.97)
181–270	0.72 (0.41–1.28)	0.83 (0.22–3.12)	0.81 (0.50–1.32)	1.24 (0.44–3.55)	0.80 (0.30–2.15)	0.67 (0.35–1.29)	0.95 (0.63–1.43)
271–365	1.56 (0.66–3.68)	0.63 (0.04–10.16)	1.17 (0.54–2.55)	0.12 (0.01–1.06)	0.89 (0.15–5.36)	1.20 (0.43–3.37)	1.31 (0.71–2.40)

of the disability duration; and 95% CIs that suggest true lower differences between 30 and 180 days of disability duration. The few findings that diverged from this pattern in the stratified analyses are noted below:

**Injury types:** Workers with serious traumatic injuries as a result of a violence-related incident showed no differences in the likelihood to RTW compared with workers with traumatic injuries as a result of a non-violence-related incident, except at 181–270 days after injury where workers with violence-related incidents were less likely to RTW (HR 0.11, 95% CI 0.01 to 0.87).

**Occupation:** Counsellors and social WVI showed a lower likelihood to RTW at 31–60 days (HR: 0.67; 95% CI: 0.48 to 0.95), and 61 to 90 days (HR: 0.46; 95% CI: 0.30 to 0.69) after injury.

**Care setting:** Workers in residential social service facilities with violence-related injuries showed a lower likelihood to RTW at 271 to 365 days postinjury (HR 0.12, 95% CI 0.01 to 1.06). Healthcare workers in LTC facilities with violence-related injuries showed a higher likelihood to RTW at 0–30 days postinjury (HR 1.16, 95% CI 1.04 to 1.29); and a lower likelihood to RTW 91–180 days postinjury (HR 0.73, 95% CI 0.57 to 0.94).

## DISCUSSION

### Main findings

This study examined the difference in time to RTW among healthcare workers with violence-related incidents compared with workers with non-violence-related incidents in BC, Canada. Using workers' compensation data from the years 2010 to 2014, we found that 14.9% of time-loss claims was related to violence incidents. In the overall matched cohort, workers with violence-related incidents compared with workers with non-violence-related incidents, had a higher likelihood to RTW within 30 days postinjury, a lower likelihood within 31–270 days after injury, and a higher likelihood within 271–365 days. This pattern was consistent for all injury types, with the exception

for workers with psychological injuries, who were less likely to RTW compared with workers with other injuries, regardless of whether it was due to violence and regardless of the disability duration. However, workers with psychological injuries due to a violence-related incident, compared with any other injury or worker characteristic, were the least likely to RTW within 1-year postinjury.

### Interpretation of results

Workers with violence-related incidents were more likely to RTW within 30 days postinjury. A minor physical non-violence-related injury may not lead to time-loss compensation, while the same minor physical violence-related injury may lead to a short period of time-loss compensation. Accordingly, a subgroup of workers with minor violence-related injuries would be expected to RTW quickly, while the corresponding group with minor non-violence-related injuries would not experience time loss at all. No time-loss claims are not comprehensively coded at the occupation and injury level, so we were not able to categorise these claims by workers with violence-related incidents and workers with non-violence-related incidents.

After the initial 30-day window postinjury, workers with violence-related incidents were less likely to RTW. Violence-related incidents can lead to a complex combination of physical and psychological injuries. The data we were authorised to access did not provide information on secondary injuries, but we hypothesise, supported by existing literature that workers with violence-related incidents, regardless of the primary nature of the injury, are more likely to have a secondary psychological injury compared with workers with non-violent incidents.<sup>25–27</sup> The complexity of diagnosing, treating and adjudicating psychological injuries for compensation purposes,<sup>28</sup> including for secondary injuries, may lead to delays in the RTW process after the initial 30 days for workers with violence-related incidents.

We found that the effect of violence on the likelihood of RTW varied across the 1-year follow-up, with the largest effect between 31 and 180 days after injury. Previous studies show that the probability to RTW decreases as length of time away from work increases,<sup>29,30</sup> regardless of the cause of absence. In this study, unmeasured psychological injuries might explain the observed difference in the likelihood of RTW between 1 and 6 months. Workplace violence has been associated with stress and mental health problems in addition to a physical injury, and workers with physical injuries and comorbid psychological injuries might be less likely to RTW for the reasons outlined above.<sup>10,31–33</sup>

Workers with violence-related incidents in counselling or social services occupations were also less likely to RTW between 1 and 6 months compared with workers in these occupations with non-violence-related incidents. This difference may be due in part that counselling and social services workplaces may have different organisational policies and practices around violence prevention, and fewer resources or supports for RTW. For example, all direct care staff in BC's health authorities are required to complete BC provincial violence prevention curriculum training<sup>34</sup> and this is not the case for many community, social services and outpatient care settings. Accordingly, workers in these settings may fear recurrences of violent incidents and reinjury because they are returning to a workplace with inadequate violence prevention plans. Additionally, counselling and social services workplaces are more likely to be smaller, non-unionised and privatised, all factors that affect the likelihood of injury due to violence and in their response in supporting or providing accommodated RTW afterwards.<sup>35</sup>

### Strengths and limitations

The major strength of this study is the use of comprehensive workers' compensation data in combination with coarsened exact matching. Coarsened exact matching allowed for the reduction of bias by balancing workers with violence and non-violence-related injuries on key study covariates, such as care settings and occupations, in order to tease out the independent effect of workers with violence-related incidents on RTW outcomes. Using a population-based dataset also provided a large study cohort and the ability to create multiple stratification groups to investigate the effect of violence-related injuries on RTW among subgroups of the healthcare population.

A limitation of this study was the reduced statistical power of piecewise and Cox regression analysis for the 181–365 days window as the majority of workers with work-related injuries had returned to work before this time window. This decreased the accuracy of results near the end of the 1-year follow-up period as evidenced by the larger 95% CIs around the model estimates.

### Recommendations

In addition to primary prevention of work-related violent incidents, intervention efforts to reduce work disability once a violent incident has happened should focus on<sup>1</sup> healthcare workers with psychological injuries due to violence,<sup>2</sup> workers likely to stay off work longer than 30 days after a violent incident as these workers have a higher likelihood to remain off work for longer than 1 year,<sup>3</sup> increasing resources for workers in counselling and social services. Future research would benefit from predictive models of longer disability durations following a work-related violent incident to help inform intervention strategies.

## CONCLUSIONS

Workers with violence-related incidents, compared with workers with non-violence-related incidents, were more likely to RTW within 30 days postinjury, less likely to RTW within 61–180 days postinjury, and were no different after 181 days postinjury. In the short term, workers might take time a day off work because of the impact of the violence-related incident, at the mid-term, violence-related incidents can lead to a complex combination of physical and psychological injuries explaining the delay to RTW, and by 180 days, the majority of the cohort returned to work, and all injuries are complicated.

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**Data availability statement** Data may be obtained from a third party and are not publicly available. The BC Freedom of Information and Protection of Privacy Act (RSBC 1996) CHAPTER 165 (the legislation that authorises us to use the data for our study) does not authorise this data be accessed or view outside of Canada. Under our obligations under this legislation and under an information sharing agreement with WorkSafeBC to use the data, we are prohibited from sharing the data outside of Canada and outside our research team. If other researchers wanted access to the data, they would need to negotiate access directly with the data provider, WorkSafeBC. The data for this project can only be accessed in Canada and making an application through <https://www.popdata.bc.ca/dataaccess> to WorkSafeBC and by entering into an Research Agreement with WorkSafeBC.

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