Antecedents of Work Disability Absence Among Young People: A Prospective Study

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PURPOSE: This study examined the relative contribution of individual factors, job characteristics, and temporal factors to the likelihood of lost days of work due to a work-related disability or illness among Canadians 16 to 24 years old.
METHODS: Using a prospective Canadian survey with up to 6 years of follow-up, the job-based analyses included 45,125 job episodes generated from a representative sample of young workers. A hazard model on work disability absence included the following predictors: age, gender, physical demands of the job (manual, nonmanual, and mixed), hours worked, highest education achieved, multiple concurrent job, job tenure, school activity, and living in a rural or urban area.
RESULTS: The overall 1-week work disability absence rate was 0.78 per 1000 person-months. In the multivariate model, young workers holding manual jobs were 2.65 times more likely to have a work disability absence compared with young workers with nonmanual jobs. Also, those with less than a high school education were almost 3 times more likely to have a work disability absence. Other demographic factors such as gender were not independently associated with work disability absences.
CONCLUSIONS: This prospective study finds that job characteristics are the predominant risk factors for work disability absences for young workers. Young workers with less education appear to be particularly vulnerable, possibly because of inadequate job skills or particularly dangerous job tasks.
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KEY WORDS: Adolescent, Disability, Longitudinal Studies, Risk Factors, Work.

INTRODUCTION

Work injuries and illnesses among American and Canadian young people 15 to 24 years old are a public health concern. In developed countries, both teenagers and young adults have consistently higher rates of work injury than older workers (1–3).

Many of the work injuries youth sustain have a clear health and economic consequence. Fifteen percent to 26% of injured adolescent workers have reported permanent impairments such as chronic pain, scarring, sensory loss, and loss of range of motion (4, 5). Sixteen- to 24-year-olds who sustained a work injury showed significantly lower earnings in the year after they returned to work than their uninjured counterparts (6).

Among young workers, the risk of work injuries is often attributed to individual characteristics. For example, young male workers sustain injuries at about twice the rate of young female workers (7). Also, two narrative reviews place a teenager's level of cognitive development in their lists of etiologic factors that influence injury risk. However, no specific studies on this topic are cited, and the authors acknowledge that by "mid adolescence, youngsters make decisions in ways similar to adults" (8). If such developmental factors (e.g., perceived invulnerability) were a predominant factor, one would expect to see injury risk diminish as young people mature.

The job characteristics are consistently associated with injury risk. Young workers in manual jobs (e.g., stockhandlers, janitors/cleaners), jobs in the goods producing sectors (e.g., agriculture, manufacturing, and construction), and food service jobs have higher work injury rates than youth in sales jobs or administrative/clerical jobs (7, 9, 10). In particular, the physical demands of the job have been shown to be associated with the chance of a work injury (11).

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Selected Abbreviations and Acronyms

CI = 95% confidence interval
HR = hazard ratio
SLID = Survey of Income and Labour Dynamics
WDA = work disability absence

With regard to temporal factors, working longer hours is sometimes associated with injury risk (12), possibly due to fatigue or simply a function of increased exposure time (13). Some studies of compensation claim records find that new workers are at increased risk of work injury compared to their more experienced counterparts (14–16). However, self-report studies find the opposite relationship (13) or no association between experience and work injury risk (17). These mixed findings may be due to self-report studies not pinpointing when the injury occurred during each worker's job tenure. Had the studies done so, it would have been possible to track the specific risk of injury for each phase of job tenure. Without this detailed analysis, such job tenure findings address cumulative injury risk versus phase-specific risk.

Several methodological limits complicate the risk estimates provided in previous studies. First, most studies of young workers are descriptive and do not adjust for the fact that males are more likely to hold hazardous jobs (e.g., manual work, jobs in industries with higher injury rates) than young females.

Second, for studies using administrative data sources, underreporting may be an issue. For example, studies which rely on workers' compensation claims could fail to capture all work injuries (18), especially if filing a claim might affect a firm's insurance premium or increase their risk of being inspected. Underreporting of claims could bias risk factor estimates if the likelihood of reporting injuries to the compensation system differs by industry or by young worker characteristics. Relying on health records (i.e., health care visits) as a data source can also be problematic and lead to reporting bias, since not all injured workers seek healthcare services. Research shows that only 34% of occupational injuries are treated in emergency departments (19).

Finally, virtually no studies have utilized longitudinal data to examine risk of work injury. An exception is the 1-year follow-up study by Feldman and colleagues of high school students on incidence of musculoskeletal pain (20). In this study, jobs such as babysitting or nonmanual work led to more neck/upper limb pain and back pain (respectively) than those not working at all. We used longitudinal data from a nationally representative sample of teenagers and young adults to examine the relationship between demographic, job, and temporal factors and self-reported work absence due to a work-related illness or disability. In particular, we sought to determine whether the association of demographic factors such as gender, age, and education level persisted when controlling for nature of work.

MATERIALS AND METHODS

Data

The Survey of Labour and Income Dynamics (SLID) is a longitudinal survey conducted by Statistics Canada. The SLID is designed to capture changes in the economic well-being of individuals and families over time, and information is collected about their labor market experiences, income, and family circumstances.

The SLID consists of a series of 6-year overlapping panels (each of the 6 years is considered a wave within a panel), with a new panel being introduced every 3 years to replace the oldest panel (21). Each panel is a representative sample of the target population. Available data from these panels cover the time period from 1993 to 2003 inclusive. The first panel started in 1993 and provided 6 waves of data from 1993 to 1998. The second panel started in 1996 and provided 6 waves of data from 1996 to 2001. The third panel started in 1999 and provided 5 waves of data from 1999 to 2003. Finally, the fourth panel started in 2002 and provided 2 waves of data from 2002 to 2003.

Respondents are interviewed annually about their work experiences over the previous calendar year in up to 6 jobs and report monthly on the characteristics of each job and the occurrence of any work absences. These secondary data analyses were approved by the Health Sciences ethics committee at the University of Toronto.

Population

The target population for SLID is all persons living in Canada, excluding people in the Yukon or Northwest Territories, residents of institutions, persons living on Reserves, and full-time members of the Canadian Armed Forces living in barracks. The initial representative sample of each panel is drawn from respondents of Statistics Canada's Labour Force Survey (21, 22). For each panel, the sample is approximately 15,000 households, comprising about 31,000 persons aged 16 years and older (21). The average response rate across waves within each panel is 82.6% (23).

This analysis focused on respondents who were between the ages of 16 and 24 years and were employed at some point during the observation period. All jobs, including work at a job, business or self-employment regardless of remuneration received, were considered.

The 4 panels consisted of 5323, 5825, 4421, and 1472 respondents, respectively. There were fewer respondents in Panels 3 and 4 because they were in progress at the time of the analyses and did not have all waves completed. The percentages of respondents who were male in the 4 panels were

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51.6%, 51.0%, 49.8%, and 51.4%, respectively. The mean age at the start of each panel was 17.2 (standard deviation [SD] = 3.7), 16.7 (SD = 3.8), 17.2 (SD = 3.3), and 18.7 (SD = 2.1) years old, respectively.

Outcome: Work Disability Absence

The outcome measure (event) was the first observed occurrence of a work disability absence (WDA) for a person in a given job. A WDA was defined as any absence for 1 week or longer due to a work-related illness or disability. Providing evidence of concurrent validity, this WDA measure showed similar time trends as workers' compensation claim rates in a Canadian province (24).

For each respondent, every job start over the 6 waves of the panel provided a new person-job episode to be used for the analysis. However, person-job episodes that started prior to the respondent entering the panel were not included in the analysis because of difficulties in determining exposure time and because a WDA could have occurred prior to panel entry.

The SLID assessed WDA at the end of each wave with two questions, the first question assesses the occurrence of absence ("Was [the respondent] absent from this job for a period of one week or longer, not counting fully paid vacations?") while the second clarifies the work-related nature of the absence ("Was this [absence] due to a work related illness or injury?").

WDAs were not linked to a specific job when multiple concurrent jobs were being held. Given this, we attributed the work absence of respondents who held multiple concurrent jobs and experienced a WDA to the job identified as the main-job for that month (the job with highest usual hours for that month). A sensitivity analysis was undertaken to assess the impact of assigning the WDA to the respondent's main-job.

For person-job episodes with a WDA, all months of observation after the month of the WDA were excluded. For respondents who held multiple concurrent jobs at the time of a WDA, observed months in all concurrent jobs after the month of the WDA were excluded.

Covariates

Covariates for each person-job episode included in the model were age, gender, job type, hours worked, highest education achieved, having multiple concurrent jobs, job tenure, school activity, living in an urban versus rural area, and a flag indicating what panel the person-job episode arose.

Age was considered a time-varying covariate, calculated in months and updated each month.

Jobs were classified into 3 categories of physical demands: manual, mixed, nonmanual using the Institut de Recherche Robert Sauvé en Santé et en Sécurité du Travail (IRSST) occupation coding system (25). Manual occupations included (a) the handling of heavy or average loads on a regular basis; (b) the handling of lighter loads in static postures; or (c) continuous repetitive work. Mixed occupations included (a) the handling of heavy or average loads on only an occasional basis or (b) the handling of light loads, but not in continuous static postures. Nonmanual occupations rarely involve the handling of loads or physical activity. The coding system is based on observations in workplaces and agreement among experts in the occupational health and safety field on the typical frequency of handling loads and the weight of the load.

Hours worked in a given month for a particular job were assessed by multiplying the average number of paid hours in weeks by the number of weeks worked in that month, with 160 hours per month representing full-time employment (i.e., 40 hours per week). Total hours were categorized into 4 groups based on an examination of the data for natural break points (0 to 60, 61 to 120, 121 to 160, and 161 or more hours per month).

Highest education achievement was identified with a 3-category variable (no secondary degree, secondary degree, postsecondary degree) in December of each year of observation.

Job tenure was calculated as the number of months between the start date of the person-job and the current month of observation.

A flag indicating current full-time school activity in a given month of observation was used to assess the differences between those respondents who were balancing work and school commitments compared to those who were not.

Given the potential differences in employment patterns and the varying types of jobs held by youth living in urban environments compared with living in rural environments, a flag indicating urban residence was used in the model.

An indicator of the panel (1–4) from which the data arose was also used in the model to control for any difference that may exist between the different cohorts.

Analysis

The complementary log log model for continuous time processes, as described by Allison (26), was employed. This model is based on the assumption that events are generated by a proportional hazards model with an exponential hazard within a particular time period, but no assumptions are made about the overall shape of the hazard across time periods. The analysis was undertaken on a month-by-month basis. Therefore, a single person-job episode could contribute a maximum of 72 months of observation over the 6-year observation period. This modeling framework allows for time-dependent covariates.

A list-wise deletion was employed, deleting any observation that did not provide complete responses to all covariates (for more details related to selection bias, see next subsection). All covariates were entered in the analysis model simultaneously. All analyses were performed by using SAS version 8.12 software.

Given the complex nature of the survey and the nonindependence that arises because of the clustering of person-job episodes within individuals (respondents may hold more than one job over the 6-year period of observation either consecutively, concurrently, or both), we calculated robust variance estimates using a weighted bootstrap method with 1000 replicates to adjust variance estimates. The bootstrap technique assumes independence across respondents when estimating the coefficients but accounts for the true nonindependence of respondents when estimating the variance of coefficients (27). The weights represent the initial population of Canada at the beginning of wave 1 for each panel. Two types of adjustments are applied to the weights: first, inflation for nonresponse and, second, adjustments to ensure that estimates on relevant population characteristics respect population totals derived from other sources such as the census. The weight from the first wave of each panel was used for all subsequent waves of data.

Potential for Bias due to Sample Selection and Proxy Responses

To assess the potential impact of a person-job episode due to exclusion or nonresponse, an analysis of those jobs selected for analysis compared with those jobs not selected for analysis was undertaken. A job-based logistic regression model was developed where the outcome was whether or not the job was included in the analysis, with the independent variables being the job holder's age (at the start of the job) and gender.

The SLID allows one household member to answer questions on behalf of any or all other members of the household, provided he or she is willing and able to do so (i.e., proxy response). Given that this study examines 16- to 24-year-old respondents (and that the younger a respondent the greater the potential to have responses through proxy), an estimate of the impact of proxy reporting was undertaken. A logistic regression model was estimated with the job holder's age (at the start of the job) and gender as predictors and whether or not the job was reported through proxy response as the outcome.

RESULTS

The 16- to 24-year-old respondents who had complete covariate information and met the study inclusion criteria provided 360,808 person-months of observation from 45,125 jobs. During the observation period there were a total of 281 WDAs observed. The number of jobs, person-months of observation, number of WDAs and the WDA rate per 1000 person-months is provided in Table 1 for each covariate.

Multivariate Regression Results

Results of the fully adjusted multivariate regression analysis examining the antecedents to WDA are presented in Table 2, including the hazard ratio (HR) and the corresponding CI.

Manual occupations were 165% more likely to experience a WDA compared with nonmanual occupations (HR: 2.65; CI: 1.59, 4.41), while mixed occupations had only a 70% increase (HR: 1.70; CI: 0.78, 3.68).

TABLE 1. Number of jobs, person-months of observation and work disability absence rate for SLID respondents 16 to 24 years of age: Weighted

	Jobs	Person-months		Work disability absence	
	No.	No.	%	No.	Rate per 1000 PY
Total	45,125	360,808	100.00	281	0.78
Gender					
Female	22,452	184,879	51.24	122	0.66
Male	22,673	175,929	48.76	159	0.91
Job type					
Manual	21,621	149,119	41.33	177	1.19
Nonmanual	10,231	101,546	28.14	38	0.38
Mixed	13,273	110,144	30.53	66	0.60
Total hours worked (moh)					
0–60	9623	86,995	24.11	22	0.25
61–120	11,525	94,391	26.16	40	0.42
120–160	18,837	145,518	40.33	158	1.09
161+	5140	33,904	9.40	61	1.81
Highest education					
Less than high school	11,383	65,773	18.23	98	1.49
High school	22,711	182,894	50.69	126	0.69
Postsecondary	11,031	112,141	31.08	57	0.51
Multiple concurrent jobs					
No	36,348	293,000	81.21	251	0.86
Yes	8777	67,808	18.79	30	0.44
Tenure (mo)					
0–2	13,094	24,730	6.85	43	1.75
3–4	10,290	37,597	10.42	56	1.50
5–6	4624	25,254	7.00	43	1.70
7–12	8347	18,538	5.14	58	3.11
13+	8770	194,689	53.96	81	0.42
School activity					
No	29,702	223,634	61.98	236	1.06
Yes	15,423	137,174	38.02	45	0.33
Living in urban area					
No	11,805	60,139	16.67	65	1.09
Yes	33,320	300,669	83.33	216	0.72

TABLE 2. Estimates of hazard ratios for work disability absence

	Parameter estimate	Standard error	Hazard ratio	95% CI
Intercept	−9.082	0.973		
Gender				
Female			1.00	
Male	−0.276	0.244	0.76	0.47, 1.22
Age (yr)	0.060	0.043	1.06	0.98, 1.15
IRSST job type				
Nonmanual			1.00	
Manual	0.974	0.259	2.65	1.59, 4.41
Mixed	0.530	0.395	1.70	0.78, 3.68
Total hours worked				
0–60			1.00	
61–120	0.622	0.376	1.86	0.89, 3.89
120–160	1.570	0.411	4.81	2.15, 10.76
161+	1.978	0.412	7.23	3.22, 16.22
Highest education				
Less than high school			1.00	
High school	−0.705	0.317	0.49	0.27, 0.92
Postsecondary	−1.046	0.372	0.35	0.17, 0.73
Multiple concurrent job				
No			1.00	
Yes	−0.174	0.311	0.84	0.46, 1.54
Tenure (mo)				
0–2	−0.556	0.383	0.57	0.27, 1.22
3–4	0.193	0.272	1.21	0.71, 2.07
5–6	0.320	0.286	1.38	0.79, 2.41
7–12	−0.025	0.206	0.98	0.65, 1.46
13+			1.00	
In school full time				
No			1.00	
Yes	−0.482	0.269	0.62	0.36, 1.05
Living in urban area				
No			1.00	
Yes	−0.152	0.198	0.86	0.58, 1.27
Panel				
1			1.00	
2	−0.224	0.244	0.80	0.50, 1.29
3	−0.228	0.263	0.80	0.48, 1.33
4	−0.678	0.388	0.51	0.24, 1.09

CI = Confidence interval; ISSRT = Institut de Recherche Robert Sauvé en Santé et en Sécurité du Travail.

Total hours worked per month showed a dose-response relationship with increasing hours and increasing risk. Jobs with monthly hours between 61 and 120 hours had a 86% increase in the likelihood of a WDA compared with jobs with hours between 0 and 60 (HR: 1.86; CI: 0.89, 3.89). A 381% increase was seen for jobs in the 120- to 160-hour range (HR: 4.81; CI: 2.15, 10.76), with a 623% increase for jobs that entailed more than 160 working hours per month (HR: 7.23; CI: 3.22, 16.22) compared with jobs with hours between 0 and 60.

Respondents who had completed high school or postsecondary education were seen to decrease their risk of a WDA by 51% to 65% (HR: 0.49; CI: 0.27, 0.92 and HR: 0.35; CI: 0.17, 0.73, respectively). Little difference in risk was noted between those who finish high school and those who have finished some sort of postsecondary education.

As noted, when a respondent had multiple concurrent jobs and a WDA, the WDA was assigned to the main-job. In a sensitivity analysis for this treatment of the WDA, the WDA was not reassigned to the main-job. The full multivariate model was then regenerated with no differences in the direction or relative relationship between the original hazards and the hazards from the sensitivity analysis noted. Given the small number of WDAs that are reassigned, this outcome was expected and demonstrates the minimal effect this decision has on the hazard estimates.

Potential for Bias due to Sample Selection and Proxy Responses Results

The 3 nonexclusive reasons for not being selected for analysis were examined. A total of 16,344 person-job episodes were excluded. For 10,345 jobs, the person-job episode started before the period of observation, 13,712 person-job episodes had missing covariate information, and 2166 person-job episodes were due to nonresponse in the first wave of the survey.

The 3 reasons for not being selected for analysis were examined (job started before the period of observation, missing covariate information, and nonresponse during the first wave of the survey). The logistic regressions showed no significant gender differences between those jobs selected for analysis compared to those jobs not selected for analysis. In addition, as age increased, the likelihood for selection of the job into the final model decreased.

Proxy responses were 1.47 times more likely to be provided for jobs held by male respondents compared to jobs held by females respondents independent of age (CI: 1.34, 1.60). The likelihood of a proxy response was decreased as age increased. For example, proxy responses were 9.72 times more likely to be provided by jobs held by 16-year-old respondents compared with jobs held by 24-year-old respondents (CI: 6.32, 14.93), independent of gender. By the time respondents were 20 years old, the likelihood decreases to 2.10 (CI: 1.36, 3.24).

DISCUSSION

This is the first prospective study of the predictors of work-related disability among young workers, to our knowledge. Job characteristics were the strongest predictors of WDA. Factors such as the physical demands and hazards of the job have been identified in previous cross-sectional studies as important variables mediating the risk of work injury in this age group (11, 13, 17). As would be expected, we observed a positive linear association between hours worked and WDA, with overtime work (> 40 hr/wk) showing more than a 600% increase in risk.

In terms of demographic factors, we found that young male workers had a higher unadjusted WDA rate than young female workers. However, there was no gender difference in the multivariate model. This pattern may indicate that gender differences in work injury among young people are largely due to differences in hazard exposure, physical job demands, and/or work pace pressure. In addition, gendered perceptions of what is considered a disability and willingness to take absences from work may also have diminished gender differences.

The comparable chance of a work injury across this age group in the multivariate model complicates any strong hypothesis about cognitive/physical developmental factors influencing risk of work injury. One would expect young adults, on average, to have attained a greater physical and maturational level than adolescents, but the predicted inverse relationship between age and injury risk was not observed. However, no firm conclusions can be made on the contribution of developmental factors until prospective data with specific development measures such as growth rate and risk perception are available.

We found that independent of individual and job factors, having completed high school was associated with a decreased risk of WDA. Studies of adult workers have found higher education levels to be associated with lower risk of work injury (28, 29). Future research might investigate the role of residual confounding since we controlled for only work hours and one of several job characteristics that may be associated with both injury risk and level of education. In addition, since education, type of job, and socioeconomic status are very interrelated, future research should examine in more detail how family socioeconomic status influences occupational health of youth during the school to work transition.

Our findings need to be interpreted in the light of certain methodological limitations. Error could have been introduced into the reporting of WDAs by respondents' different definitions of work disability, different recovery times from sustained injuries, and different financial pressures to remain at work. In addition, the type of work and the employers' policies and practices bear on whether a worker needs to take time off work when injured, or whether the worker can be accommodated on the job. These measurement biases would have generally reduced our ability to detect associations with the outcome. In addition, we cannot rule out the possibility that a WDA was a recurrence of a condition that arose in a previous job prior to entry into the panel.

The panel design led to a portion of the jobs held by youth to be excluded because we did not observe part of the work episode and therefore we did not know if a WDA occurred on the job prior to entering the panel. Therefore these findings may not generalize to young people's jobs with longer tenures. The information provided by proxy may be subject to recall biases that may further affect accuracy. Finally, there was no information collected on the nature of the work-related disability or illness that led to the absence. Although injured young workers have more acute, traumatic injuries than adults (9, 30), the distribution of work injuries leading to 1-week work absences may show a different distribution of injury types.

Implications and summary

Our findings support the notion that an important supplement to current school- and community-based education programs on work safety would be reducing the physical hazards youths encounter at work, potentially through technical safety improvements in the equipment and work environment.

In terms of work hours, US federal laws have restrictions on hours of work for youth 16 years of age and younger (30). However, our findings raise the question of whether work-hour restrictions should be considered for older teenagers as a method of decreasing work disability.

Finally, young workers with less education appear to be a particularly vulnerable population, possibly because of inadequate job skills or particularly dangerous jobs (i.e., residual confounding of hazard exposures). Consequently, job training and injury prevention programs targeting this subgroup of workers may be warranted.

In summary, this prospective study indicates that job characteristics are a key risk factor in determining occupational health among young people. This study also contributes methodologically to the young worker literature by modeling the complex work patterns during the school-to-work transition.

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