Educational Status and Work Injury Among Young People

Refining the Targeting of Prevention Resources

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ABSTRACT

Objectives: To examine the risk of work injuries among young workers out of school compared to those working while still in school.

Methods: The 12,506 fifteen to twenty-four year old workers were part of a national survey that used a multi-staged, stratified sampling procedure. Respondents were divided into four groups based on current school activity (i.e., out of school vs. in school) and educational level (i.e., not having completed high school vs. completed high school). A multivariate logistic regression was conducted using a weighted bootstrap method for variance estimation on occurrence of a work injury that was medically attended.

Results: Those young workers out of school and not having completed high school (8.2 per 100 full-time equivalents [FTEs]) and those out of school with a high school degree (5.1 per 100 FTEs) had higher unadjusted rates of work injuries compared to those workers in school not having completed high school (3.1 per 100 FTEs) or those in school with a high school degree (2.7 per 100 FTEs). These differences persisted in a multivariate regression with demographic and work-related covariates included. In addition, young people out of school reported a different work environment as evidenced by decreased social support at work.

Conclusions: The elevated injury risk of young workers out of school suggests that school-based work safety education programs need to be supplemented with other prevention strategies that improve the fit between these young workers' experience and capabilities and the work environment.

Key words: Adolescent; education; occupational group; wounds and injuries

La traduction du résumé se trouve à la fin de l'article.

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Paid employment is a common part of Canadian adolescents' (i.e., 15 to 19 years old) and young adults' (i.e., 20 to 24 years old) lives. Employment figures show that 44.7% of adolescents and 70.9% of young adults held jobs in any given month in 2004.¹ Many young workers hold part-time, temporary jobs, particularly during the school year when they are juggling both school and work.² For example, 71.9% of Canadian employed adolescents and 27% of young adults worked less than 30 hours per week.³ Canadian adolescents are most likely to hold sales and service jobs (75.5%), with some representation in manual and goods-producing jobs (e.g., construction, agriculture; 15.5%).³ By young adulthood, Canadians are less concentrated in sales and service jobs (50.4%) and more likely to hold manual and goods-producing jobs (22.4%).

Across all injury settings, young people 15 to 24 years old have the highest rates of injury of any age group,^{4,5} and about 25% occur at work.⁶ Specifically for self-reported work injuries, young workers have rates 1.6 times higher than adults over 25 years of age (5.8 and 3.5 per 100 full-time equivalents, respectively).⁷ This elevated risk is more marked for young males than young females.⁸ Also, occupational category is consistently associated with injury risk, with youth holding manual and goods-producing jobs having the highest work injury rates.⁸⁻¹⁰

Many of the work injuries youth sustain have health and economic consequences. Fifteen to 26% of injured adolescent workers surveyed reported permanent impairments such as chronic pain, scarring, sensory loss, and loss of range of motion.^{11,12} Sixteen to 24 year olds who sustained a work injury show significantly lower earnings even more than a year after the injury compared to their uninjured counterparts.¹³

A common institutional response in Canada has been the dissemination of work safety education programs in high schools and colleges.^{14,15} One problem with school-based prevention efforts is that some youth leave school early and join the work force. High school non-completion rates vary from province to province but the overall average is about 10%, with more boys not completing high school than girls.^{16,17}

Currently there is no detailed information on the work injury rates of young people not in school and/or with less than a high school degree. Given that there is a

TABLE I

Background Characteristics and Work Injury Rate by Education Status (n=12,506)

	Not in School		In School		Total
	< High School	High School Degree +	< High School	High School Degree +	(column %)
	(n=1204)	(n=4132)	(n=3890)	(n=3280)	
15 to 19 years old	42.0 [38.2, 45.9]	15.8 [14.2, 17.6]	97.0 [96.4, 97.4]	35.1 [32.5, 37.8]	44.4 [43.1, 45.6]
20 to 24 years old	58.0 [54.1, 61.8]	84.2 [82.4, 85.8]	3.0 [2.6, 3.6]	64.9 [62.2, 67.5]	55.6 [54.4, 56.9]
Male	66.2 [62.3, 69.8]	52.4 [50.3, 54.6]	51.5 [49.4, 53.5]	47.4 [45.2, 49.6]	51.8 [50.6, 52.9]
Female	33.8 [30.2, 37.7]	47.6 [45.4, 49.7]	48.5 [46.5, 50.6]	52.6 [50.4, 54.8]	48.2 [47.1, 49.4]
Manual/goods-producing jobs	51.1 [47.5, 54.6]	33.1 [31.2, 35.1]	31.6 [29.5, 33.8]	25.6 [23.7, 27.5]	31.9 [30.6, 33.1]
Non-manual/service-sector jobs	48.9 [45.4, 52.5]	66.9 [64.9, 68.8]	68.4 [66.2, 70.5]	74.4 [72.5, 76.3]	68.1 [66.9, 69.4]
Working non-regular shift	23.9 [20.6, 27.5]	25.5 [23.7, 27.5]	30.9 [28.9, 33.0]	30.3 [28.2, 32.5]	28.2 [27.1, 29.4]
Working regular shift	76.1 [72.5, 79.4]	74.5 [72.5, 76.3]	69.1 [67.0, 71.1]	69.7 [67.5, 71.8]	71.8 [70.6, 72.9]
Hours worked (as proportion of one FTE)	0.95 [0.92, 0.98]	0.97 [0.96, 0.99]	0.46 [0.44, 0.47]	0.66 [0.64, 0.68]	0.74 [0.73, 0.75]
Medically attended work injuries per 100 FTEs	8.2 [6.1, 10.3]	5.1 [4.2, 5.9]	3.1 [2.0, 4.3]	2.7 [1.8, 3.6]	4.4 [3.9, 5.0]

fairly strong relationship between low level of education and working in a low-skilled, manual job even among young people,¹⁸ this raises the possibility that a subgroup of young workers are at substantial risk for a work injury, and may not be covered by current prevention efforts.

Using the Canadian Community Health Survey (CCHS), the purpose of this study was to examine the risk of work injuries among young workers out of school compared to those working while still in school.

METHODS

Using a multistaged, stratified sampling frame, the CCHS targets individuals aged 12 years or older who are living in private dwellings within Canada.¹⁹ The CCHS version 1.1 was completed between September 2000 and November, 2001, sampling a total of 130,827 respondents, from 125,159 households. The household response rate was 91.4%, and the selected person response rate was 91.9%.

For the purpose of the current analyses, only respondents aged 15 to 24 years who had worked in the previous 12 months were selected (N=15,116), which was 80% of the total respondents 15 to 24 years of age. A further 142 respondents were missing responses for student status, work hours, and shift schedule. In addition, the question regarding current school activity for respondents interviewed in the summer months was ambiguous, so those interviewed in July and August were deleted from the sample (n=2468), deletions which

TABLE II

Multivariate Logistic Regression on Work Injury (n=12,506)

Factor	Odds Ratio	95% Confidence Interval
Age (1 = 20 to 24 years old)	1.28	[0.91, 1.81]
Gender (1 = male)	1.89	[1.4, 2.55]
Job type (1 = manual/goods-producing)	1.80	[1.34, 2.41]
Type of shift (1 = not a regular shift)	1.02	[0.74, 1.42]
Mean hours of work (proportion of FTE)	1.29	[0.87, 1.91]
Education status:		
Not in school, < HS education	3.31	[2.05, 5.35]
Not in school, HS+ education	2.31	[1.51, 3.55]
In school, < HS education	0.92	[0.54, 1.56]
In school, HS+ education (Referent)	—	—

did not substantively affect the findings reported below. These deletions left a primary sample of 12,506 respondents.

For the analyses of job characteristics, the sample was 8,686 because certain provinces opted out of having the work stress module administered.

Work injury

Respondents were asked if in the previous 12 months they had been injured seriously enough to limit their normal activities. Respondents who reported such an injury were then asked if they were working at a job or business (including travel to and from work) when this injury occurred, and if they received medical attention for this injury, from a health professional, within 48 hours of the occurrence (work injury coded as '1'). In cases where the respondent experienced two or more injuries that limited activities, respondents only reported on their most serious injury.

Occupation

Each respondent reported the occupation of their main job. Due to small sample

sizes in some job categories, we flagged manual and goods-producing jobs, previously found to be associated with elevated work injury,²⁰ as 'high risk' (i.e., trades, transport or equipment operator; farming, forestry, fishing or mining; processing, manufacturing or utilities; and other), with the remaining non-manual/service sector jobs serving as the referent group (i.e., management; professionals; technologist, technician or technical occupation; administrative, financial or clerical; sales or service).

Job shift

Respondents reported the usual work schedule for their main job. Because irregular work hours have been associated with suboptimal functioning,²¹ rotating shifts, irregular, on-call shifts were coded as '1', with regular day, evening and night shifts being the referent group (coded as '0').

Educational status

Respondents were classified into four categories based on their school activity and educational attainment as follows: a) not

TABLE III

Mean and 95% Confidence Intervals for Job Characteristics by Education Status (n=8686)*

	Not in School		In School		Total
	Less Than High School	High School Degree or Greater	Less Than High School	High School Degree or Greater	
Job control†	9.7 ^a [9.4, 9.9]	8.3 ^b [8.2, 8.5]	10.2 ^c [10.1, 10.4]	9.2 ^a [9.0, 9.4]	9.2 [9.1, 9.3]
Psychological demands	4.0 ^{a,b} [3.9, 4.2]	4.2 ^a [4.1, 4.3]	3.8 ^b [3.7, 3.9]	3.9 ^{a,b} [3.8, 4.0]	4.0 [3.9, 4.1]
Physical exertion	2.6 ^a [2.5, 2.7]	2.3 ^b [2.2, 2.3]	2.3 ^b [2.2, 2.4]	2.1 ^b [2.0, 2.1]	2.2 [2.2, 2.3]
Social support	4.2 ^a [4.0, 4.4]	4.0 ^a [3.9, 4.1]	3.7 ^b [3.6, 3.8]	3.6 ^b [3.5, 3.8]	3.8 [3.7, 3.9]

* Means *within* each row were tested for significant differences at the $p < 0.05$ level. Means with *different* superscript letters are significantly different from each other. For example, the "Psychological demands" variable in the second row shows the group "Not in school with a high school degree or greater" having a value significantly different from the group "In school with less than a high school degree", but no other groups being significantly different from one another on that row.

† Higher values reflect worse work conditions

currently attending school full-time or part-time and not having completed high school; b) not attending school, but having completed high school; c) currently attending school full-time or part-time and not having completed high school; and d) attending school and having completed high school (referent group).

Hours of work

Each respondent was asked to report the hours usually worked per week, and the number of weeks they had worked in the previous 12 months. We used respondents' reports of average hours worked per week and weeks worked in the past 12 months to calculate the proportion of a full-time equivalent (FTE) that they worked. An FTE was defined as 2000 hours in one year.

Job characteristics

Respondents completed an abbreviated version of Karasek's Job Content Questionnaire.²² The 10 JCQ items included created three subscales: job control, psychological demands and social support. In addition, one question about physical exertion on the job was included. A five-point Likert scale from Strongly Agree to Strongly Disagree was used. Higher scores represent poorer levels of the construct being measured. The inter-item reliability scores for the three JCQ subscales are modest.²³

All analyses used weights provided by Statistics Canada that take into account sampling probabilities and non-response.¹⁹ As recommended by Statistics Canada, we used a weighted bootstrap method with 500 replicates to estimate the variances for our analyses to account for the non-independence of respondents.²⁴

RESULTS

Table I shows the background characteristics and work injury rates for this sample of young workers. As would be expected, young adults tended to have a higher educational level than the teenagers and were less likely to be in school. Also, the majority of those not in school and having less than a high school education were male (66.2%). In terms of types of jobs, the highest proportion of manual and goods-producing jobs was found among youth not in school and with less than a high school education (51.1%). Irregular hours were most likely among those in school with or without a high school degree (30.3, 30.9, respectively), which is consistent with holding a part-time temporary job.

With regard to work injuries, those out of school and with less than a high school degree had rates threefold higher than young people in school with a high school degree. Those youth not in school who had graduated from high school had almost twice the injury rates of young people in school with a high school degree.

Table II presents the fully adjusted logistic regression on presence of a work injury. Being male (Adjusted odds ratio = 1.89, 95% confidence interval 1.4-2.55) was associated with increased injury risk. The type of job increased the risk of injury by 80% (AOR = 1.80, 95% CI 1.34-2.41).

In terms of education status variables, those out of school and with less than a high school degree and those out of school with a high school degree both retained their two- to threefold risk of a work injury, even with other demographic and work factors controlled. Age, type of shift, and hours of work were not statistically significant factors for injury risk.

To examine how the type of work may differ, Table III shows the means and 95% confidence intervals for several job characteristics. Of note, those young workers out of school with less than a high school degree reported significantly greater physical demands than other groups. Also, those out of school (with or without a high school degree) reported lower social support at work compared to those in school.

DISCUSSION

Consistent with previous young worker research,^{8-10,25} manual and goods-producing jobs increased the risk of work injuries. Also, being male was associated with a higher risk of work injury. Extending this literature, we found that those teenagers and young adults not attending school (whether or not they had completed a high school degree) had much higher work injury rates than those young people in school. The elevated risk of those out of school is *not* simply due to those out of school being younger, and thereby less ready physically or mentally for the challenges of the work environment than their counterparts in school. Even with age and job type controlled in the logistic regression, this elevated injury risk persisted.

There were indications that those out of school may be encountering a poorer fit between themselves and their work environment compared to their counterparts in school holding the same type of job. This possibility of variability within job category is in line with previous research showing that young workers with the same job title sometimes perform different tasks.⁸ In the present study for example, those not in school (regardless of high school completion) reported less social support at work. This reduced support could reflect

fewer peers as co-workers when working full-time and/or inadequate supervision than their counterparts in school. Inadequate supervision in particular could be associated with less safety communication/training and, in turn, an increased risk of injury.²⁶ Further, youth working full-time may have additional challenges such as encountering more unfamiliar equipment or tasks and/or receiving less safety training than their peers who work part-time.^{27,28} These are qualitative aspects of full-time work that are not fully accounted for when statistically controlling for work hours. Thus, the elevated work injury risk of those out of school may still be related to aspects of the person-job fit rather than to their educational status per se. However, these possible explanations are tentative because of the cross-sectional nature of the study.

A potential implication is that more effort is required to improve the fit between the young workers' experience/capabilities and their physical/social work environment, particularly among those young people out of school. Injury prevention principles such as engineering out hazards where possible, education and training, and enforcement of occupational health and safety regulation relevant to youth (i.e., the three E's) apply in this situation.²⁹ With regard to education efforts in particular, many young workers who stay in school receive relevant safety information both at school and at work. However, since teenage and young adult workers who are not in school have the highest injury rates and many youth apparently do not receive workplace safety training,²⁸ additional targeted workplace training/supervision initiatives or community-based social marketing programs on work safety for vulnerable subgroups should be considered.

REFERENCES

1. Usalcas J. Youth and the labour market. Ottawa, ON: Statistics Canada, 2005.
2. Statistics Canada. Youths and the labour market. Ottawa: Statistics Canada, 1999.
3. Statistics Canada. Canadian Labour Force Survey, public use files. Ottawa, ON: Statistics Canada, 2001.
4. Millar WJ. Accidents in Canada, 1988 and 1993. *Health Rep* 1995;7(2):7-16.
5. Conn J, Annett J, Gilchrist J. Sports and recreation related injury episodes in the US population, 1997-99. *Inj Prev* 2003;9(2):117-24.
6. Breslin FC, Smith P, Mustard CA, Zhao S. Young people and work injuries: An examination of jurisdictional variation within Canada. *Inj Prev* 2006;12:105-10.
7. Chapeskie K, Breslin FC. Securing a Safe and Healthy Future. Toronto, ON: Institute for Work & Health, 2004.
8. National Research Council. Protecting Youth at Work: Health, Safety, and Development of Working Children and Adolescents in the United States. Washington, DC: National Academy Press, 1998.
9. Runyan CW, Zakocs RC. Epidemiology and prevention of injuries among adolescent workers in the United States. *Annu Rev Public Health* 2000;21:247-69.
10. Breslin FC, Koehoorn M, Smith P, Manno M. Age-related differences in work injuries and permanent impairment: A comparison of workers' compensation claims among adolescents, young adults, and adults. *Occup Environ Med* 2003;60(9):1-6.
11. Parker DL, Carl WR, French LR, Martin FB. Characteristics of adolescent work injuries reported to the Minnesota Department of Labor and Industry. *Am J Public Health* 1994;84(4):606-11.
12. Parker DL, Carl WR, French LR, Martin FB. Nature and incidence of self-reported adolescent work injury in Minnesota. *Am J Ind Med* 1994;26:529-41.
13. Breslin FC, Tompa E, Zhao R, Amick B, Pole J, Smith P, et al. Work disability absence among young workers with respect to earnings losses in the following year. *Scand J Work Environ Health* 2007;33(3):192-97.
14. Boychuk S. 2005/06: National Government/WCB Young Worker Health and Safety Initiatives/Programs Inventory. Toronto, ON: Ontario Ministry of Labour, 2005.
15. Reed D, Kidd P, Westneat S, Rayens M. Agricultural disability awareness and risk education (AgDARE) for high school students. *Inj Prev* 2001;7:i59-i63.
16. Bowlby G. Provincial drop-out rates - Trends and consequences. Ottawa: Statistics Canada, 2006. Report No. 81-004-XIE.
17. Shaiens D, Eisl-Culkin J, Bussière P. Follow-up on education and labour market pathways of young Canadians aged 18 to 20 - Results from YITS Cycle 3. Ottawa: Statistics Canada, Culture, Tourism and the Centre for Education Statistics Division, 2006. Report No. 81-595-MIE - No. 045.
18. Organisation for Economic Co-operation and Development, Canadian Policy Research Networks. From education to work: A difficult transition for young adults with low levels of education. Paris, France: OECD Publications, 2005. ISBN 92-64-00918-3.
19. Statistics Canada. Canadian Community Health Survey Cycle 1.1 (2000-2001), Public use documentation. Ottawa: Statistics Canada, 2003.
20. Council of State and Territorial Epidemiologists. Putting Data to Work: Occupational Health Indicators from Thirteen Pilot States for 2000. Atlanta, Georgia: Centers for Disease Control, 2005.
21. Costa G. Shift work and occupational medicine: An overview. *Occup Med (Lond)* 2003;53(2):83-88.
22. Karasek R. Job Content Questionnaire and User's Guide. [1.1]. Los Angeles, CA: University of Southern California, 1985.
23. Shannon HS, Ibrahim SA, Robson LS, Zarinpoush F. Changes in job stressors in the Canadian working population. *Can J Public Health* 2006;97(3):225-29.
24. Yeo D, Mantel H, Liu T. Bootstrap Variance Estimation for the National Population Health Survey, 1999 Proceedings of the Survey, Research Methods Section, American Statistical Association. 1999;778-83.
25. Breslin FC, Day D, Tompa E, Irvin E, Bhattacharyya S, Clarke J, et al. Systematic Review of Risk Factors for Work Injury Among Youth. Toronto, ON: Institute for Work & Health, 2005.
26. Barling J, Loughlin C, Kelloway EK. Development and test of a model linking safety-specific transformational leadership and occupational safety. *J Appl Psychol* 2002;87(3):488-96.
27. Sorock G, Lombardi D, Hauser R, Eisen E, Herrick R, Mittleman M. A case-crossover study of transient risk factors for occupational acute hand injury. *Occup Environ Med* 2004;61:301-11.
28. Smith PM, Mustard CA. How many employees receive safety training during their first year of a new job? *Inj Prev* 2007;13(1):37-41.
29. Lonero L, Clinton K, Wilde G, Roach K, McKnight J, McKnight S, et al. The Roles of Legislation, Education, and Reinforcement in Changing Road User Behaviour. Toronto, ON: Safety Research Office, Safety Policy Branch, Ministry of Transportation, 1994. Report No. SRO-94-102.

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RÉSUMÉ

Objectif : Examiner le risque d'accidents du travail chez les jeunes travailleurs ne fréquentant plus l'école comparativement à ceux qui travaillent pendant leurs études.

Méthode : Les 12 506 travailleurs de 15 à 24 ans choisis pour cette étude faisaient partie d'une enquête nationale utilisant une méthode d'échantillonnage stratifié à plusieurs degrés. Les répondants ont été divisés en quatre groupes selon leur situation scolaire actuelle (ne fréquentant plus l'école ou allant à l'école) et leur niveau d'instruction (études secondaires terminées ou non). Nous avons mené une analyse de régression logistique multivariée selon une méthode d'autogénération mutuelle pondérée pour obtenir la variance estimée de la fréquence des accidents du travail ayant nécessité des soins médicaux.

Résultats : Les jeunes travailleurs ne fréquentant plus l'école et n'ayant pas terminé leurs études secondaires (8,2 p. 100 équivalents temps pleins [ETP]) et ceux ne fréquentant plus l'école, mais ayant un diplôme d'études secondaires (5,1 p. 100 ETP) présentaient des taux accidents du travail plus élevés (données avant ajustement) que les travailleurs qui allaient encore à l'école et n'avaient pas terminé leurs études secondaires (3,1 p. 100 ETP) ou que les diplômés du secondaire qui faisaient des études supérieures (2,7 p. 100 ETP). Ces écarts ont persisté avec une analyse de régression multivariée incluant des covariables démographiques et liées au travail. De plus, les jeunes ne fréquentant plus l'école évoluaient dans un milieu de travail différent du fait qu'ils recevaient moins de soutien social au travail.

Conclusion : Le risque de blessures accru chez les jeunes travailleurs ne fréquentant plus l'école semble indiquer que les programmes de sensibilisation à la sécurité enseignés dans les écoles gagnaient à être complétés par d'autres stratégies de prévention visant à réduire les écarts entre l'expérience et les capacités de ces jeunes travailleurs et la réalité de leur milieu de travail.

Mots clés : adolescent; enseignement; groupe professionnel; plaies et blessures