

Research brief: Young workers' exposure to carcinogens on the job

October 2021

Background

While limited data exist to assess young workers' exposure to carcinogens, the unique characteristics of this demographic suggest that young workers may be at an increased risk of hazardous exposures. We know that young workers have significantly higher injury rates compared to older workers (1,2). The work and demographic characteristics that lead to higher injury rates in young workers may also lead to higher levels of hazardous exposures.

This research brief documents why exposure at a young age is a concern and what factors may cause young workers to be at an increased risk. We also identify known and suspected carcinogens within industries and occupations that employ a large proportion of young workers and identify common high risk groups of young workers.

Characteristics of young workers

Young workers' limited experience and lower ability to recognize or address hazards places them at risk. Brain development is incomplete until the mid-twenties (3), which means that many young workers lack key decision making skills. They may not be able to assess hazards correctly or comprehend the long term implications of injury and disease (4,5). Even if they correctly identify hazards, young workers are less likely to ask questions, voice concerns, or take action. For example, one study found that nearly 1/3 of young workers would not refuse unsafe work, which is their right (6,7). Reluctance to refuse unsafe work could put

young workers at an increased risk of exposure. Young workers may not speak up about workplace hazards due to fear of losing their job or having their hours reduced, worries about how co-workers view them, and the belief that they cannot influence safety improvements (8).

Types of jobs young workers do

Young workers typically obtain entry-level jobs with minimal skill requirements. These jobs are more likely to involve a variety of potentially hazardous exposures and exposure situations due to the use of cleaning compounds, solvents, pesticides, and other chemicals (9). These jobs are often also part-time or seasonal, which can contribute to a weak safety culture and decrease workers' ability to gain job-specific skills (3). This results in an extended "new on the job" label and the increased risk that comes with being a new worker. Young workers are also often given tasks that their older coworkers do not want to perform (3,10), and this may expose them to hazards.

Safety training and PPE

Young workers often receive inadequate orientation and safety training. Although they report being more likely to receive safety training than their older counterparts (11), the majority still do not receive proper training. One Canadian study found that only about 21% of young workers reported receiving *any* safety orientation within the first year (11). The use of personal protective equipment (PPE) among young workers is also a concern. Many young workers state that they simply have not yet developed safe working habits, or that they did

not realize the task they were performing required safety equipment (12). Furthermore, PPE is not always properly suited for younger workers, as fit and style may not be appropriate. This has caused young workers, especially young women, not to use PPE as it seemed bothersome and redundant (12).

What we did

CAREX Canada data can be used to identify occupational carcinogens within the industries and occupations that employ proportionally more young workers. CAREX Canada has developed occupational prevalence estimates for 45 known or suspected carcinogens (13). These estimates were created for select carcinogens classified by the International Agency for Research on Cancer (IARC) as Group 1 (*carcinogenic to humans*), Group 2A (*probably carcinogenic to humans*), and Group 2B (*possibly carcinogenic to humans*). CAREX Canada created an exposures-per-worker metric for each industry and occupation as an indicator of the overall presence of occupational carcinogens and work situations where multiple exposures are expected to occur. This metric was calculated by dividing the number of exposures in each industry or occupation by the number of workers in the same industry or occupation (14). Since data were not directly available to produce separate estimates of the prevalence and level of exposure to occupational carcinogens for young workers, we aimed to highlight industries and occupations where young workers are employed and examine their potential for exposure to one or more carcinogens.

The Experienced Labour Force Population from the 2006 and 2016 Censuses of Population were used to determine the number of young workers by industry and occupation. In 2006,

16% (n= 2,662,490) of Canada's workforce was made up of young workers, and this number decreased to 14% (n=2,472,540) in 2016. Data were available by age strata and two-digit North American Industry Classification System (NAICS) and National Occupational Classification Statistics (NOC-S). Industries and occupations with proportionally more young workers were identified by comparing the percentage of young workers to the national percentage of young workers in all of Canada.

The CAREX Canada data and young worker data is summarized jointly for the five industries and occupations with the greatest proportion of young workers in Table 1 and Table 2, respectively. Both tables show the percentage of young workers, the top three exposures, and the exposures-per-worker metric for each industry and occupation.

Key considerations of our methods

Young workers often hold temporary or seasonal jobs and some of these jobs may not be accounted for using census data. The census asks about an individual's job during a certain week of the year, and if the individual did not work that week they are to answer questions based on their job of longest duration in the past year (15,16). Furthermore, the census only asks about workers over the age of 15, meaning any employee under this age restriction would not be included in the dataset. Since the 2016 census used a different job classification system than in 2006, CAREX Canada occupation prevalence estimates and exposure per-worker-metric could not be compared to the 2016 young worker population. For this reason, Table 2 (occupation-based) uses 2006 young worker census data. The 2016 census used a similar NAICS system as the 2006 census, therefore Table 1 (industry-based) presents CAREX data in relation to the 2016 young worker data.

What we found

Table 1: Proportion of young workers by industry and CAREX Canada exposure data, 2016

Industry	Proportion of industry made up of young workers	Most prevalent known or suspected carcinogen exposures	Exposures-per-worker metric
Accommodation and food services	39%	Night shift work Polycyclic aromatic hydrocarbons (PAHs) Solar radiation	0.35
Retail Trade	28%	Night shift work PAHs Benzene	0.29
Arts entertainment and recreation	28%	Solar radiation Night shift work Chloroform	0.34
Administrative and support, waste management and remediation services	14%	Solar radiation Night shift work Diesel engine exhaust	0.37
Agriculture, forestry, fishing and hunting	14%	Solar radiation Diesel engine exhaust Wood dust	1.07

Table 2: Proportion of young workers by occupation and CAREX Canada exposure data, 2006

Occupation	Proportion of occupation made up of young workers	Most prevalent known or suspected carcinogen exposures	Exposures-per-worker metric
Retail salespersons, sales clerks, cashiers	42%	Night shift work Polycyclic aromatic hydrocarbons (PAHs) Solar radiation	0.24
Chefs and cooks, and servers	41%	Night shift work PAHs Formaldehyde	0.52
Sales and service occupations	32%	Night shift work PAHs Solar radiation	0.21
Trades helpers, construction and transportation labourers	28%	Solar radiation Silica Night shift work	1.20
Occupations unique to primary industry	21%	Solar radiation Diesel engine exhaust Night shift work	1.09

Key job groups at high risk

Construction workers

Although only 11% of the construction industry is made up of young workers, this still accounts for over 150,000 young Canadians employed in both 2006 and 2016. This is especially true for young male workers; in 2016, 11% of *all* young Canadian male workers were employed in the construction industry.

The construction industry has long been known as a hazardous industry for young workers (1), and combined with the large number of associated carcinogenic exposures, it is a vulnerable setting. WorkSafeBC identified construction as the only common job for young and new workers that has the potential for exposure to asbestos, silica dust, lead, and other chemicals (17).



Due to the large number of young workers and hazards within the construction industry, several provinces have age-restricted tasks. For example, Manitoba prohibits workers under 16 from removing asbestos, and Newfoundland and Labrador prohibits those under 18 from performing tasks that are likely to cause exposure to silica (with the exception of those in

apprenticeship programs) (18). While these regulations provide occupational health and safety benefits for young workers, it is unknown to what extent the regulations are enforced and followed.

Farm workers

According to the 2016 census, 81% (n= 48,595) of young workers in the agriculture, forestry, fishing, and hunting industry work in farming (19). The censuses may not completely capture all the young farm workers, due to the considerations mentioned above.



The most prevalent carcinogen exposures in the farming industry are solar radiation, diesel engine exhaust, and pentachlorophenol. Pesticide exposure at a young age may increase the risk of childhood leukemia and can cause neurological development issues (20–22). Although it is unclear if young workers are at an increased risk of exposure to pesticides, it is known that young workers rarely receive training about the dangers of pesticides (5). One survey found adolescents had lower pesticide knowledge scores compared to adult agriculture workers. The same survey found that only 14% of the teens reported receiving any pesticide safety training, despite the fact that 86% of them reported being exposed to pesticides (5).

Outdoor workers

Many jobs that require working for extended periods outdoors are often filled by young workers. Examples include ground maintenance labourers, painters, tree planters, lifeguards, construction workers, and general farm workers. Such jobs expose workers to solar radiation. Using CAREX Canada population proportions for solar radiation, we estimated that approximately 11% (n=284,000) of all young workers are exposed to solar radiation on the job, and 7.5% (n=200,000) are exposed at a high level (spending six or more hours outdoors per day). The occupations with the largest number of young workers exposed to a high level of solar radiation include landscaping and grounds maintenance labourers (n= 49,000), construction trades helpers and labourers (n= 39,000), and general farm workers (n= 26,000).



A 2006 study investigated the work-time sun behaviors of outdoor workers (23). The authors found that young workers were more likely to spend four or more hours in the sun compared to older outdoor workers. The study also found that young workers are less likely to use sun protection, such as protective clothing, sunglasses, or sunscreen. This is concerning as getting sunburns at a young age is more strongly

correlated to skin cancer when compared to getting sunburns at an older age (20).

Synthesis

Young workers may be at an increased risk of exposure to carcinogens and other chemical and dust-related hazards at work, but the evidence is lacking. The occupational health and safety challenges faced by young workers include inexperience, low risk perception, and poor training, among others. These challenges contribute to the higher risk of occupational injury among young workers, and may also increase the risk of exposures. Although concrete evidence on young workers' exposure to carcinogens is lacking, we have demonstrated that it is plausible and there is sufficient evidence to encourage further research on protecting young workers' from workplace hazards.

Young workers represent approximately 14% of all workers in Canada and more than 40% of workers in specific occupations, including retail and restaurant staff. Our results show that young workers in construction, farming, and other outdoor jobs are at higher risk for occupational exposure to carcinogens due to the large proportion of young workers employed in those industries and the higher number of potential exposures.

There are many factors that influence a worker's attitude and behaviour towards safe work practices and compliance. It is important to understand these factors in order to develop relevant policies and programs. We outline some key recommendations for moving forward in the next section.

Recommendations

- Focus initial efforts on occupations and industries with higher proportions of young workers, including construction, farming, and other outdoor jobs.
- Enhance research capacity to explore the potential increased risk of exposure to carcinogens and other hazards among young workers.
- Enhance research capacity to explore strategies to improve young workers' compliance with safety practices.
- Encourage employers to stock PPE suited for young workers.
- Foster discussions with young workers and youth groups on workplace health and safety, focusing on empowering young workers' and developing strategies to improve understanding of risks and compliance with safety controls.
- Create a policy or program that encourages employers, recruitment firms, and educational institutions to provide occupational health and safety training tailored to young workers, since they often lack this type of training. The training should be interactive and include information on hazards specific to the job/job site, young workers' rights and responsibilities, speaking up about hazards, and asking questions about safety when beginning a new job.
- Foster discussions on young workers' occupational health and safety among the Ministries of Labour of all provinces and territories and create a national repository of resources.
- Incentivize employers to conduct hazard risk assessments and create training materials that are tailored to specific tasks or worksites for young workers.



References

1. WorkSafeBC. Young and New Workers. 2018. Available from: <https://www.worksafebc.com/en/health-safety/education-training-certification/young-new-worker>
2. CCOHS: Canadian Centre for Occupational Health and Safety. Young Worker Zone. 2018.
3. WorkSafeBC. Protecting Young Workers: Focus Report. 2011. p. 1–56. Available from: <https://www.worksafebc.com/en/resources/about-us/reports/protecting-young-workers-focus-report?lang=en>
4. Lavack AM, Magnuson SL, Deshpande S, Basil DZ, Basil MD, Mintz JH. Enhancing Occupational Health and Safety in Young Workers: The Role of Social Marketing. *Int J Nonprofit Volunt Sect Mark.* 2008;13(3):193–204.
5. Rohlman D, Nuwayhid I, Ismail A, Saddik B. Using epidemiology and neurotoxicology to reduce risks to young workers. *Neurotoxicology.* 2012;33(4):817–22.
6. SAFE Work Manitoba. Young Worker Injury Prevention Strategy. 2018.
7. Safe Workers of Tomorrow. General Presentation Evaluation. 2018;
8. Tucker S, Turner N. Waiting for safety: Responses by young Canadian workers to unsafe work. *J Safety Res.* 2013;45:103–10.
9. Woolf AD, Flynn E. Workplace Toxic Exposures Involving Adolescents Aged 14 to 19 Years: One Poison Center’s Experience. *Arch Pediatr Adolesc Med.* 2000;154(3):234–9.
10. Breslin FC, Smith P. Trial by fire: A multivariate examination of the relation between job tenure and work injuries. *Occup Environ Med.* 2006;63(1):27–32.
11. 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.
12. Lombardi DA, Verma SK, Brennan MJ, Perry MJ. Factors influencing worker use of personal protective eyewear. *Accid Anal Prev.* 2009;41(4):755–62.
13. Peters CE, Ge CB, Hall AL, Davies HW, Demers PA. CAREX Canada: An enhanced model for assessing occupational carcinogen exposure. *Occup Environ Med.* 2015;72(1).
14. Peters C, Ge C, Hall A, Davies H, Demers P. CAREX Canada: An enhanced model for assessing occupational carcinogen exposure. Vol. 72, *Occup Environ Med.* 2015. p. 64–71.
15. Statistics Canada. 2016 Census of Population questions, long form (National Household Survey).
16. Canada S. 2006 Census of Population. Ottawa, ON: Special dataset produced for CAREX Canada; 2006. Available from: <http://www12.statcan.ca/census-recensement/index-eng.cfm>
17. WorkSafeBC. Hidden Hazards in the Workplace: A Young Worker’s Guide. 2018.
18. Lewko J, Hall K, Egeh G, Volpe R, Fuhringer C, Tremblay C-L. Current Health & Safety Policies Protecting Young Workers in Canada. 2011.
19. CAREX Canada, data outputs from eWORK tool [1.0, 2014-11-24].
20. Mann M, Landrigan P. Occupational Carcinogens and Cancer in Children. Springer, London. 2014. 551–564 p.
21. Infante-Rivard C, Labuda D, Krajcinovic M, Sinnott D. Risk of childhood leukemia associated with exposure to pesticides and gene polymorphisms. *Epidemiology.* 1999;10(5):481–7.
22. Liu J, Schelar E. Pesticide exposure and child neurodevelopment: summary and implications. *Work Heal Saf.* 2012;60(5):235–42.
23. Marrett LD, Pichora EC, Costa ML. Work-time sun behaviours among Canadian outdoor workers: results from the 2006 National Sun Survey. Vol. 101, *Can.J Public Health.* 2010. p. 19–22.