COMMENTARY

Research Opportunities Using Administrative Databases and Existing Surveys for New Knowledge in Occupational Health and Safety in Canada, Quebec, Ontario and British Columbia

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ABSTRACT

In Canada, many datasets are initially collected for purposes other than occupational health and safety (OHS) research. These include administrative health care billing records, pharmaceutical records, vital statistics, provincial cancer registries and workers' compensation claims data. In addition, many national and provincial health surveys, while not focused specifically on occupational health and safety, collect data on the health status and health determinants of populations, and such data can be used for investigating OHS issues among Canadian workers. This paper provides examples of the use of administrative and survey data for OHS research projects from the provinces of Quebec, Ontario and British Columbia to illustrate the potential of such data. These three provinces have a long history of using administrative and survey data for OHS research and have developed capacity in this regard for improving access to data, for linkage of records across databases and for developing methods to answer OHS questions. As research using these data sources expands, a consistent understanding within the work and health research community must be forged concerning the strengths and limitations of these data resources and their comparability.

Key words: Surveillance; work injury and illness; Quebec; Ontario; British Columbia

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

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The relation between working conditions and health outcomes is an important public health concern. In 2007, almost 1 million Canadians experienced non-fatal occupational injuries and diseases that required health care and/or time off work.[1] In 2006, nearly $7 billion (more than $450 per insured worker) was spent on wage loss, health care and rehabilitation of workers covered by workers' compensation boards in Canada (approximately 83% of the Canadian workforce).[2] Among Canadians between 15 and 64 years of age, 21% of all traumatic injuries occur at work, as do 52% of all repetitive movement injuries.[3]

Working conditions have important links to health status outside of work injury. The psychosocial work environment is at least as important as health behaviours in the development of cardiovascular disease.[4] Longitudinal research also suggests an association between stressful psychosocial work environments and poorer mental health.[5] Physical work demands and various psychosocial work exposures are also key determinants of musculoskeletal health.[6,7] Additionally, occupational morbidity and mortality related to workplace exposures contribute significantly to the total disease burden in Canada.[8]

The objective of this paper is to describe survey, administrative and linked data resources that are available nationally, with examples drawn from the provinces of Ontario, British Columbia and Quebec to highlight the potential of these data to generate occupational health and safety (OHS) knowledge over (relatively) short time periods in a cost-effective manner. Many of the administrative and secondary data described in this paper were originally collected for purposes other than OHS research. There are also numerous national and provincial health and labour force surveys that collect measures relevant to OHS within a broader examination of health determinants and health status that could be used to pursue research in this area.

In each of the following sections we have described these data sources, outlining the content available, coverage and types of policy-relevant research questions that can be, or have been, answered using the data source (examples of papers using each data source are available in Appendix 1). We conclude by highlighting lessons learned and some ongoing challenges for using the data described here. In each section we first describe national resources, followed by resources within the provinces of Quebec, Ontario and British Columbia. Our focus on only these provinces is related to our experience with these resources and, therefore, our ability to comment on the challenges and benefits associated with the data. Administrative data (e.g., workers' compensation claims) have been used for research in other provinces, such as Alberta and Manitoba,[9,10] and in some cases have been linked to other data resources, such as cancer registries,[11] provincial health plan data[12,13] and responses to

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the 1986 Canadian Census long form.[14] Despite restricting our focus to the three provinces, we do feel that the strengths and limitations pertaining to their resources as discussed in this paper are generalizable to other provincial settings.

Survey data

Statistics Canada conducts numerous national surveys that can be used for work and health research. Three datasets collect data on work injuries: the National Population Health Survey (NPHS), the Canadian Community Health Survey (CCHS) and the Survey of Labour and Income Dynamics (SLID). These datasets enable researchers to examine a broad array of factors not available in compensation claim reports (such as psychosocial work conditions and shift work) for work injury and allow comparisons between self-reported injury rates and rates of compensation claims within provinces.[15]

The NPHS collects data on health conditions, health behaviours and labour market conditions on a longitudinal, nationally representative cohort of Canadians every two years.[16,17] Seven cycles of the NPHS are available for analysis (1994, 1996, 1998, 2000, 2002, 2004 and 2006). The CCHS – initiated in 2000-01 – collects data similar to that of the NPHS from a cross-sectional sample of over 130,000 respondents every two years, with smaller samples interviewed on particular topics in the years in between. Both surveys ask respondents about injuries that occurred in the previous 12 months that have limited their normal activities, whether the most serious injury required medical attention and whether it occurred at work. Respondents are also asked to report repetitive strain injuries (RSI) that limited normal activities in the previous 12 months (although specific attribution to work is only available from 2000 onwards).

To date these surveys have been used to examine factors related to work injuries among youth[18,19] and recent immigrants.[20] The surveys have also been used to examine the contribution of psychosocial work conditions to risk of RSI,[21] occupational exposures to asthma[22] in combination with an externally developed exposure matrix,[23] and the associations of occupation and work organization conditions with mental health.[24-26] Unfortunately, in recent cycles of the CCHS the already limited amount of data on relevant labour market activity and psychosocial work exposure variables has been moved to optional content (i.e., the inclusion of this information is at the discretion of a particular health region), resulting in non-random, selective samples of participants and reducing the utility of this data source.[27] In addition, attribution to work is only enquired into for acute injuries and RSI, with no questions asked about attribution to work for causation or aggravation of chronic conditions that are captured in each survey. Finally, the already limited, and decreasing, occupation and industry information collected limits the ability of researchers using these data to categorize groups of workers according to exposures and working conditions using alternative sources (e.g., exposure matrices).

The SLID – an ongoing representative longitudinal survey of Canadians – contains data on labour activity, income and wealth, education and personal characteristics. It has longitudinal and cross-sectional components. Each longitudinal cohort contains approximately 40,000 respondents, followed for six years. Longitudinal cohorts were initiated in 1993, 1996, 1999, 2001 and 2003, providing a three-year overlap between contiguous panels, which allow cross-sectional samples of approximately 60,000 respondents each (from 1996 onwards). The SLID contains more detailed data on labour market participation, although it lacks detailed data on health conditions. Respondents report absences from work lasting at least one week in the previous 12 months and whether they were work related.[28,29] Data are also collected on compensation during each absence, allowing examination of the factors associated with the receipt of compensation after a work absence.[30] The longitudinal nature of the SLID also allows examination of future earnings after work absences.[31]

The above surveys have the advantages of rigorous sampling frames and high response rates, making them representative of the Canadian population, with sample sizes that often permit provincial-level analyses. Although these surveys are broad in their scope and coverage, the lack of detail on occupational and industrial classifications, particular working conditions, and attribution to work of some of the health outcomes collected limits their extensive use for OHS research.

Other pan-Canadian survey data worthy of brief mention include the Participation and Activity Limitation Survey, which is administered to all persons who were living in Canada at the time of the Census and responded positively to either of the Census questions on activity limitations. The 2005 National Survey on the Work and Health of Nurses, which covers a large sample of registered nurses, licensed practical nurses and registered psychiatric nurses, provides quite detailed data on the health and working conditions of nurses in Canada.[32] The Workplace and Employee Survey (WES), now discontinued, was a unique survey that administered questionnaires to both employees and employers, resulting in a linked employer-employee file.[33] Finally the Longitudinal Survey of Immigrants to Canada (LSIC) is a cohort of approximately 12,000 immigrants arriving in Canada in 2000-01 and followed for four years. Unfortunately, both the WES the LSIC, while capturing detailed labour market and workplace data, have limited data on health outcomes attributable to work or work injury. The addition of this information in both surveys (or the linking of these surveys with compensation claim data) would have allowed more detailed examinations of how workplace factors affect work injury rates (in the WES) and a better understanding of the risk of injury and factors associated with injury among recent immigrants to Canada.

At a provincial level, the Quebec Health and Social Survey (QHSS) is a cross-sectional health survey carried out in 1987, 1992 and 1998. Since 1998 the QHSS has been replaced by the Canadian Community Health Survey, although in 2008 a new Quebec population health survey was conducted to include health outcomes and determinants measured in previous QHSS but not included in the CCHS surveys. The QHSS was a household survey of a representative sample of the general population using a complex sampling design to ensure that there was adequate regional representation. The 1998 QHSS survey included approximately 12,000 households, providing data on over 30,000 individuals; a self-administrated questionnaire that included an extensive section on work and occupational health and safety was given to all household members aged 15 and over, and provided self-reported information on approximately 20,800 of the 30,000 respondents, including 11,735 workers. Thus, this survey has allowed examination of the association between a variety of health outcomes and work exposures while taking into account numerous personal fac-

tors.[34-37] The QHSS surveys have been used to study variation in workers' mental health and alcohol intake and to identify work-related and non-work exposures associated with musculoskeletal disorders.[38-41]

In 2004, legislation was introduced in Quebec that mandated regular surveys of working conditions in the Quebec population every five years. Thus, a new survey, the Quebec Survey of Working Conditions and Occupational Health and Safety, was designed and carried out collaboratively in 2007/08 by the Institut national de santé publique du Québec (Quebec's institute of public health), the Institut de recherche Robert-Sauvé en santé et sécurité du travail (Quebec's OHS research institute), the Institut de statistique du Québec (Quebec's statistics institute), as well as the Quebec ministries of health and social services and of labour. This household-based telephone survey of a representative sample of 5,000 workers includes exposure data on a wide range of working conditions and outcome data on mental health, musculoskeletal outcomes and work injuries. It will be possible to link these data to the Régie de l'assurance maladie du Québec (RAMQ) health services utilization data for the respondents who have consented to this linkage (see administrative section below for more details on this data resource). The survey is currently under analysis by the research team that developed it. Once their report is published in 2010, the data will be made available to other researchers.

Apart from the Ontario Child Health Survey, which has been used to examine the effects of early childhood experiences on working status and work-related outcomes,[42] there are no other provincial work and health surveys regularly conducted on representative samples in Ontario or British Columbia, making the ongoing active surveying of working conditions in Quebec unique in this context.

Administrative data

The majority of administrative data available for OHS research exists at the provincial level, partly as a result of workers' compensation and health falling under provincial jurisdiction.

The Commission de la santé et de la sécurité du travail (CSST), Quebec's OHS commission, is responsible for workers' compensation and prevention, covering approximately 85% of Quebec workers across 243,575 companies.[43] The CSST's annual database of occupational injuries and diseases (fichiers des lesions professionnelles) is a rich source of data on occupational injury and diseases, including injured worker and workplace data, the type and cause of the injury, and subsequent consequences (health and financial). Quebec researchers have used these data to study various types of injuries, disorders and fatalities, as well as to identify subgroups of workers at highest risk of compensation for various disorders (by industry, sex, type of occupation, age), allowing more targeted preventive efforts.[44-47]

Employees working for workplaces covered by the Ontario Workplace Safety & Insurance Board (WSIB) are required to submit claims for injuries sustained at work that result in health care and/or time off work. Coverage by workers' compensation in Ontario is one of the lowest in Canada,[1] yet approximately 65% of the Ontario workforce is covered by the WSIB.[48,49] Reports for lost-time claims contain data on demographic characteristics, occupation, industry and job tenure, allowing for the calculation of rates of lost-time claims across various labour force subgroups.[50-55] Information on health care and wage replacement associated with each injury is also available, allowing examination of injury consequences. Similar compensation claim data are available in British Columbia through WorkSafeBC, although the potential of this compensation data is enhanced by 93% workforce coverage and by the extensive linkages with other databases (see next section).

As with any data collected for purposes other than research, there are ongoing challenges in administrative data, such as workers' compensation claim data, related to missing fields of information, differences in legislation on claim reporting and differences in classification systems (in particular those related to industrial coding), which make provincial comparisons challenging. Compensation agencies have the mandate to store information electronically that is of relevance to the assessment of the claim and the provision of compensation benefits. This generally extends to the date of injury, the occupation, industry, age and sex of the claimant, as well as details about the injury (nature, event, part of body, source), which are coded to the Z795 Canadian Standards Association scheme in each province.[56] Information on other variables of interest to OHS research, such as pre-existing health conditions, information about the workplace (worksite) or other socio-demographic information (immigration status, education level) is not available in these data.

Linked data

Linked data available at the national level include CAREX Canada, a Canadian Workplace Exposure Database that is being created on the basis of exposure measurement data collected by both provincial and federal agencies, as well as by Canadian researchers and employers who are willing to share their exposure data information. This information is being combined with the Canadian Census and Census of Agriculture data to estimate the number of workers exposed to known carcinogens according to their reported occupation and industry of employment (see http://www.carex-canada.ca/ for more information). The Longitudinal Administrative Databank (LAD), a longitudinal sample of tax filers for the years 1982 to 2006 with data on income and demographic variables contained in tax file reports (e.g., marital status, income sources), has been linked to samples of workers' compensation claim reports in Ontario and British Columbia. The Census Mortality Database is a recent record linkage performed by Statistics Canada of a 15% sample from the 1991 Canadian Census linked to the Canadian Cohort Mortality File over a 10-year follow-up period. The linkage allows data on education, occupation and work schedules to be linked with causes of mortality over a 10-year period. In each of the above cases, the linkage of these databases has increased the utility of both sources for OHS research. In the case of the Canadian Mortality File and the LAD, in particular, data linkage has resulted in the ability to utilize data that, without linkage, could not have been used for OHS research.

In Quebec, data from the CSST and the various health and working condition surveys described previously have been analyzed to identify groups at high risk of occupational exposures or disease and to target preventive interventions carried out by occupational health professionals working in regional and/or local public health centres in collaboration with other occupational health prevention agencies.[57,58]

In Ontario, the Institute of Clinical and Evaluative Sciences has linked the 2000-01 and the 2003-04 CCHSs with the Ontario Health Insurance Plan and the Canadian Institute for Health Infor-

mation hospitalization database at the individual level. This allows data from the CCHS to be used to prospectively examine the impact of working conditions and health behaviours on the incidence of diseases such as diabetes, hypertension and cardiovascular disease.

The Institute for Work & Health has linked lost-time claims from motor vehicle accidents from the Ontario WSIB with vehicle driver records in the Accident Database System maintained by the Ontario Ministry of Transportation to examine differences in collision circumstances across occupations. Future possible data linkages worth pursuing in Ontario include the linkage of Ministry of Labour inspection data with WSIB claim data. This database could then be used to examine the relation between inspection activity within industry groups and changes in claim frequency.

British Columbia leads Canada in the number and scope of currently linked data resources. This capacity enables researchers across Canada to conduct a broad range of occupation health research in the British Columbia population that is simply not possible in other provinces. Population Data BC,* previously known as the British Columbia Linked Health Database, administers a growing set of linkable data applicable to research on the entire working age population over a 25-year period. Data include workers' compensation claims linked at the individual level with provincial health insurance registry records, hospital separation records, outpatient medical service records, cancer registry data, prescription data, vital statistics data and some Statistics Canada surveys (e.g., CCHS).

This extensive data resource has enabled a variety of novel applications relevant to OHS research. For example, data on asthma-related outpatient medical visits, hospital separations and accepted workers' compensation claims have allowed specific estimates of occupation-related asthma to be compared with the number of individuals receiving compensation for asthma.[59] Similarly, linkage of individuals with mesothelioma in the BC Cancer Agency registry with accepted mesothelioma workers' compensation claims was possible. This research found that less than half of all individuals with mesothelioma in British Columbia seek compensation from WorkSafeBC, despite most mesothelioma cases being attributed to occupational exposure.[60] This work prompted further research on the surveillance of other asbestosis-related diseases[61] and an intervention by letter to increase awareness of compensation benefits among mesothelioma cases in the cancer registry.

Linkages of external datasets, such as employment records or exposure assessments, with workers' compensation data and other health databases through Population Data BC, and formerly the British Columbia Health-Linked Database, have made it possible for researchers to conduct cohort and case-control studies on the relation between numerous health outcomes and working conditions among BC workers. An example, the BC Sawmill Cohort Study,[62] initially linked employment records for approximately 30,000 workers in 14 sawmills in BC with health outcome data (e.g., cancer registry, vital statistics) and further linked them with researcher-collected exposure data to examine the health effects of chlorophenate fungicides on cancer outcomes.[63,64] This cohort has led to numerous other occupational health-related studies and linkages with other health databases (e.g., medical services and hospitalization data) investigating the effects of noise exposures on cardiovascular outcomes,[65] cancer risks among the children of sawmill workers exposed to carcinogens[66] and the effects of economic downturns and psychosocial conditions on mental health,[67] including the role of parental psychosocial work conditions on the mental health outcomes among children of sawmill workers.[68] This model of linked data using a combination of health care, researcher and/or employer databases has also been frequently used to support master and doctoral thesis work in the field of occupational health.[65,69]

Other occupation-related research using Population Data BC data has looked at the effect of pre- and post-claim health care utilization in a cohort of injured health care workers,[70] the use of hospitalization records for the surveillance of serious work-related injuries[71] and the use of linked health databases (outpatient, inpatient, compensation claims) for the surveillance of occupational diseases such as asbestosis.[61] Current research is also using workers' compensation surgery data and medical records to examine the effect of workers' compensation policy on surgical wait time, return to work and complications among workers undergoing surgery in private clinics versus public hospitals.

Recently a research partnership* between WorkSafeBC and researchers at the University of British Columbia was formed to enhance occupational health research capacity using workers' compensation data through Population Data BC and to promote and support the use of this resource by other occupational health researchers. To this end, Population Data BC is in the process of enhancing research access to linked data, including expanding data holdings for occupational health and safety researchers to include environmental and occupational exposure data. Access to approved research data extracts will be available to researchers throughout Canada through a secure remote access.†

The data linkage capacity available in British Columbia is unique to Canada, the linkages in other provinces (such as Alberta) being project specific.[13] While the RAMQ, Quebec's public health insurance board, maintains databases on hospital stays and on doctor visits that could potentially be used for research, data linkage to date in Quebec has not extended to this area. Similarly, in Ontario there is no currently available capacity to enable linkage of data from the WSIB to the Ontario Health Insurance Plan, limiting the capacity in both these provinces to undertake work similar in scope to that currently being undertaken in British Columbia (and, to an extent, Alberta).

CONCLUSIONS

In this paper we have outlined administrative, survey and linked data sources in Canada, and in Quebec, Ontario and British Columbia. These datasets allow insights into OHS research that can be completed in a timely manner and can contribute to knowledge on how working conditions and various aspects of health are related (Appendix 1 provides examples of papers, by province, that have been produced using these data sources). However, using these data is not without its challenges; in particular, administrative datasets may use different occupational and industrial coding schemes that can make linkages and comparisons for occupational research difficult. Understanding the burden of work injury represented by workers' compensation data is hindered by difficulties in estimating accurate workforce denominator data, with researchers in each

* http://www.popdata.bc.ca

* http://www.chspr.ubc.ca/research/worksafebc

† Refer to http://www.popdata.bc.ca/dataacess/ for steps on how to access the data.

Appendix 1. Examples of papers using secondary data sources*

Canada

NPHS and CCHS

- Cole DC, Ibrahim S, Shannon HS. Predictors of work-related repetitive strain injuries in a population cohort. *AJPH* 2005;95(7):1233-37.
- Kennedy SM, Le Moual N, Choudat D, et al. Development of an asthma specific job exposure matrix and its application in the epidemiological study of genetics and environment in asthma (EGEA). *Occup Environ Med* 2000;57(9):635-41.
- Breslin FC, Smith PM. Age-related differences in work injuries: A multivariate, population-based study. *Am J Ind Med* 2005;48(1):50-56.
- Smith PM, Mustard CA. Comparing the risk of work-related injuries between immigrant and Canadian-born labour market participants. *Occup Environ Med* 2009;66(6):361-67.
- Garzia NA, Koehoorn M, Demers PA, et al. Asthma in relation to job among Canada's adult population: Comparison of surveillance information from two sources. *Occup Environ Med* 2007;64(12):e5.
- Marchand A, Demers A, Durand P. Do occupation and work conditions really matter? A longitudinal analysis of psychological distress experiences among Canadian workers. *Sociol Health Illn* 2005;27(5):602-27.
- Marchand A. Mental health in Canada: Are there any risky occupations and industries? *Int J Law Psychiatry* 2007;30:272-83.
- Marchand A, Demers A, Durand P. Social structures, agent personality and workers' mental health: A longitudinal analysis of the specific role of occupation and of workplace constraints-resources on psychological distress in the Canadian workforce. *Hum Relat* 2006;59:875-901.

SLID

- Breslin FC, Pole JD, Tompa E, et al. Antecedents of work disability absence among young people: a prospective study. *Ann Epidemiol* 2007;17(10):814-20.
- Breslin FC, Tompa E, Zhao R, et al. The relationship between job tenure and work disability absence among adults: A prospective study. *Accid Anal Prev* 2008;40(1):368-75.
- Smith PM, Kosny A, Mustard CA. Differences in access to wage replacement benefits for absences due to work-related injury or illness in Canada. *Am J Ind Med* 2009;52(4):341-49.
- Breslin FC, Tompa E, Zhao R, 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.

Other

- 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.
- Schellenberg G, Maheux H. Immigrants' perspectives on their first four years in Canada: Highlights from three waves of the Longitudinal Survey of Immigrants to Canada. *Canadian Social Trends* Special edition, 2007. Statistics Canada Catalogue no. 11-008. p. 1–34.

Quebec

- *Quebec has a wide range of administrative and survey data relevant to occupational health and safety (OHS). A complete list of available data and their relevance to OHS research can be found on the "Portail des bases de données et des instruments de mesure en santé et sécurité du travail" (Portal for Occupational Health and Safety Databases and Measurement Instruments) developed by Quebec's Réseau de recherche en santé et sécurité du travail du Québec (www. Portail-rrsstq.com)*

Administrative data

- De Guire L, Labreche F, Provencher S. Maladies reliées à l'exposition au béryllium au Québec - Étude des réclamations soumises à la Commission de la santé et de la sécurité du travail entre 1999 et 2002. Institut national de santé publique du Québec, 2006.
- Turcot A, Roy S, Simpson A. Lésions professionnelles reliées aux vibrations mainbras au Québec, 1993 à 2002 - Partie II : Analyse descriptive des dossiers d'indemnisation des travailleurs. Montréal: IRSST, 2007;1-165.
- Stock S, Funes A, Turcot A, Lippel K, Messing K, Asselin P, et al. Qui est à risque de troubles musculo-squelettiques? Une analyse différenciée selon le genre des cas de TMS indemnisés par la CSST. Québec : Institut national de santé publique du Québec (in press).
- Duguay P, Massicotte P. Compensated Fatalities Following a Work Injury: Comparison of Québec, Ontario and British Columbia, 1997-2003. Montreal: IRSST, 2007:1-61.

Secondary Survey data

- Marchand A, Demers A, Durand P. Work and mental health: The experience of the Quebec workforce between 1987 and 1998. *Work* 2005;25:135-42.
- Marchand A, Demers A, Durand P, et al. The moderating effect of alcohol intake on the relationship between work strain and psychological distress. *J Stud Alcohol* 2003;64:419-27.
- Marchand A. Alcohol use and misuse: What are the contributions of occupation and work organization conditions? *BMC Public Health* 2008;8:1-12.
- Marchand A, Demers A, Durand P, et al. Occupational variations in drinking and psychological distress: A multilevel analysis. *Work* 2003;21(2):153-63.
- Messing K, Stock SR, Tissot F. Should studies of risk factors for MSDs be stratified by gender? Lessons from analyses of musculoskeletal disorders among respondents to the 1998 Québec Health Survey. *Scand J Work Environ Health* 2009;35(2):96-112.
- Tissot F, Messing K, Stock SR. Distal lower extremity pain and working postures in the Quebec population. *AJPH* 2008;98:705-13.
- Vezina M, Bourbonnais R, Marchand A, et al. Stress au travail et santé mentale chez les adultes québécois. Enquête sur la santé dans les collectivités canadiennes, (cycle 1.2). Québec: Institut de la statistique du Québec, 2008.
- Stock SR, Vezina N, Seifert AM, et al. Les troubles musculo-squelettiques au Québec, la détresse psychologique et les conditions de travail: relations complexes dans un monde du travail en mutation. *Santé, Société et Solidarité de l'Observatoire franco-québécois de la santé et de la solidarité* 2006;2:45-58.
- Tissot F, Messing K. Standing, sitting and associated working conditions in the Quebec population in 1998. *Ergonomics* 2005;48(3):249-69.

Ontario

Administrative data

- Breslin FC, Smith PM. Trial by fire: The relationship between job tenure and lost-time claim rates among adolescent, young adult, and adult workers. *Occup Environ Med* 2006;63(1):27-32.
- Smith PM, Mustard CA. Examining the associations between physical work demands and work injury rates between men and women in Ontario, 1990–2000. *Occup Environ Med* 2004;61:750-56.
- Breslin FC, Koehoorn M, Smith PM, et al. 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):e10.
- Cote P, Kristman V, Vidmar M, Van Eerd D, Hogg-Johnson S, Beaton D, et al. The prevalence and incidence of work absenteeism involving neck pain: A cohort of Ontario lost-time claimants. *Spine* 2008;33(4S):S192-S198.
- McIntosh G, Frank J, Hogg-Johnson S, et al. Prognostic factors for time receiving workers' compensation benefits in a cohort of patients with low back pain. *Spine* 2000;25(2):147-57.
- Pole JD, Franche RL, Hogg-Johnson S, et al. Duration of work disability: A comparison of self-report and administrative data. *Am J Ind Med* 2006;49(5):394-401.

Secondary Survey Data

- Mustard CA, Kalcevich C, Frank JW, et al. Childhood and early adult predictors of risk of incident back pain: Ontario Child Health Study 2001 follow-up. *AJE* 2005;162(8):1-8.

Other linked data

- Mustard CA, Etches J. Work-related motor vehicle collision injury in Ontario. Toronto: Institute for Work & Health, 2007.

British Columbia

British Columbia Linked Health Database

- McLeod CB, Bogyo T, Demers PA, et al. Asthma in British Columbia. Vancouver, BC: Centre for Health Services and Policy Research, University of British Columbia, 2007.
- Kirkham T, Demers PA, McLeod CB, et al. Factors related to compensation of mesothelioma in British Columbia. *Occup Environ Med* 2007;64(12):e8.
- Koehoorn M, Cole DC, Hertzman C, et al. Health care use associated with work-related musculoskeletal disorders among hospital workers. *J Occup Rehabil* 2006;16(3):402-15.
- Alamgir H, Koehoorn M, Ostry A, et al. An evaluation of hospital discharge records as a tool for serious work related injury surveillance. *Occup Environ Med* 2006;63(4):290-96.
- Gan W (PhD Student), Demers PA, McLeod C, Koehoorn M. Population-based asbestosis surveillance in British Columbia. *Occup Environ Med* 2009;66(11):766-71.

BC Sawmill Cohort Study

- Hertzman C, Teschke K, Ostry A, et al. Mortality and cancer incidence among sawmill workers exposed to chlorophenate wood preservatives. *AJPH* 1997;87(1):71-79.
- Demers PA, Davies HW, Friesen MC, et al. Cancer and occupational exposure to pentachlorophenol and tetrachlorophenol (Canada). *Cancer Causes Control* 2006;17(6):749-58.
- Davies HW, Teschke K, Kennedy SM, et al. Occupational exposure to noise and increased risk of acute myocardial infarction death. *Epidemiology* 2005;16(1):25-32.
- Heacock H, Hertzman C, Demers PA, et al. Childhood cancer in the offspring of male sawmill workers occupationally exposed to chlorophenate fungicides. *Environ Health Perspect* 2000;108(6):499-503.
- Ostry A, Hershler R, Kelly S, et al. Effects of de-industrialization on unemployment, re-employment, and work conditions in a manufacturing workforce. *BMC Public Health* 2001;1(15).
- Alamgir H, Demers PA, Koehoorn M, et al. Epidemiology of work-related injuries requiring hospitalization among sawmill workers in British Columbia, 1989-1997. *Eur J Epidemiol* 2007;22(4):273-80.
- Friesen MC, Macnab YC, Marion SA, et al. Mixed models and empirical Bayes estimation for retrospective exposure assessment of dust exposures in Canadian sawmills. *Ann Occup Hyg* 2006;50(3):281-88.

* This is not designed as a comprehensive list, but merely to provide some examples.

province estimating the insured labour force using Statistics Canada census data, Labour Force Surveys and the Surveys of Employment Earnings and Hours.

Knowledge generated through the data sources in this paper has affected OHS practices outside of academia. For example, work on job tenure and work injury has been incorporated into the Ontario WSIB's 2006 young worker safety awareness campaign.[72] The work in British Columbia on mesothelioma and workers' compensation benefits prompted the BC Cancer Agency, with the support of WorkSafeBC, to send letters to physicians of patients with newly diagnosed cancer to encourage patients with mesothelioma to seek workers' compensation benefits. In addition, the surveillance research on occupation-related asthma in BC helped inform changes to compensation policy regarding work-aggravated asthma. In Quebec, as previously mentioned, analysis of compensation data on musculoskeletal disorders has informed public health priorities for prevention.

As outlined, there is diversity in the data resources among Canadian provinces, with British Columbia being the only province to allow an ongoing linkage of compensation claim data with other data sources for research purposes. Research procedures and protocols for data linkages with more jurisdictions would allow comparative research into differences in provincial policy, legislation and occupational exposures/working conditions and the role these play in the prevention and consequences of work injuries. As evidenced by the novel OHS research that can be conducted in British Columbia, national and provincial research funders and the OHS research community should support and promote the utility of research from such linkages, as well as the required infrastructure and optimal research methods for each of these data sources. By doing this, we can significantly increase the potential use of data that are already collected in Canada to better understand the relations between working conditions and health outcomes, improving the health of all Canadians.

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RÉSUMÉ

Au Canada, de nombreuses bases de données sont recueillies au départ dans d'autres buts que la recherche sur la santé et la sécurité du travail (SST) : les fichiers de facturation des services de santé, les fichiers pharmaceutiques, les registres d'état civil, les registres provinciaux du cancer et les fichiers d'indemnisation des lésions professionnelles. De plus, beaucoup d'enquêtes fédérales et provinciales sur la santé, bien qu'elles ne portent pas spécifiquement sur la SST, recueillent des données sur l'état de santé et les déterminants de la santé des populations, et ces données peuvent servir à étudier des questions de SST dans la main-d'œuvre canadienne. Dans cet article, nous donnons des exemples probants de l'utilisation de données administratives et de données d'enquête pour des projets de recherche en SST dans les provinces du Québec, de l'Ontario et de la Colombie-Britannique afin d'illustrer le potentiel de ces données. Ces trois provinces utilisent depuis longtemps des données administratives et des données d'enquête pour la recherche en SST et ont développé des capacités à cet égard pour améliorer l'accès aux données, jumeler les dossiers de différentes bases de données et élaborer des méthodes pour répondre aux questions de SST. Comme il se fait de plus en plus de recherche à l'aide de ces sources de données, la communauté des chercheurs en SST devrait développer la même compréhension des forces et faiblesses de ces sources de données et de leur comparabilité.

Mots clés : surveillance; accidents du travail; maladies professionnelles; Québec; Ontario; Colombie-Britannique