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Who Works Where? Building Occupational Research Capacity in the B.C. Linked Health Database

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Who Works Where? Building Occupational Research Capacity in the BC Linked Health Database

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EXECUTIVE SUMMARY – Key Points

- ♦ The British Columbia Linked Health Database (BCLHD) is among the richest data resources in the world for population health and health services research;
- ♦ This project developed an industry of employment variable in the BCLHD to enhance the capacity of the database for future research projects on the relationships between work and health;
- ♦ For the 2001 BCLHD data file, we were able to assign an industry code to 13,578 employers (86% success rate at the employer-level) representing 908,430 workers (91% success rate at the employee-level). *(Note Approximately half of the BC workforce can be identified as actively employed via variables in the BCLHD. Overall, our success rate at the population level means there is an industry code available for 47% of the BC workforce in the 2001 BCLHD data file)*
- ♦ The industry of employment code is now available in the BCLHD data holdings for researchers to include in population and workforce studies.

EXECUTIVE SUMMARY

Introduction: The Centre for Health Services and Policy Research (CHSPR) at the University of British Columbia is home to the British Columbia Linked Health Database (BCLHD). The BCLHD is among the richest data resources in the world for population health and health services research. It includes longitudinal, person-specific, health data on the province's four million residents, covering the period 1985 forward. The data available includes a registration file of British Columbia (BC) residents, records of services from physicians and alternative providers, hospitalizations, vital statistics, cancer incidence, mental health services, pharmaceutical prescriptions, and workers' compensation claims. The purpose of this project was to create an industry of employment variable in the BCLHD to enhance the capacity of the database for future research projects on the relationships between work and health at a population workforce level.

Methods: A 'crosswalk' was developed between an employer field (representing the payer of the provincial health premium) in the BCLHD registration file and an industry-coded employer field in the Workers' Compensation Board (WCB) registry. Both computer programming (deterministic and probabilistic linkages) and manual searches (e.g. key words) were used to create the crosswalk. The crosswalk was then applied to the 2001 registration file of BC residents to assign an industry of employment code to workers. Overall, approximately 52% of the BC workforce can be identified in the BCLHD using the employer paid health premium field. Not all workers have an employer paid health premium and are therefore not 'identifiable' as a worker in the database.

Results: For 2001, there were 15,833 unique employers in the registration file providing health premiums for 1,000,130 workers. Of these, we were able to find a match with the WCB registry for 13,578 employers (86% success rate at the employer-level) and assign an industry code to 908,430 BC workers in the registration file (91% success rate at the employee-level for all employees with an employer paid health premium). In summary, we are able to identify 52% of the BC workforce in the 2001 BCLHD using employer-paid health premiums and assign an industry of employment code to 47% of the BC workforce at the population level.

Conclusion: With the addition of industry codes, the BCLHD provides enhanced capacity for investigating questions on the relationships between work and health and on labour market and workers' compensation experiences at the population level. In particular, it enables surveillance of disease and injury by industry of employment at the population workforce level using a variety of health and health services data. We recommend the use of the employment and industry variables in the BCLHD database for research purposes, recognizing that some employee groups may be underrepresented by these variables.

WHO WORKS WHERE?

1.0 Research Context

1.1 Rich Research Resource

The Centre for Health Services and Policy Research (CHSPR) at the University of British Columbia is home to the British Columbia Linked Health Database (BCLHD). The BCLHD is among the richest data resources in the world for population health and health services research. It includes longitudinal, person-specific, health data on the province's four million residents, covering the period from 1985 forward. The data available includes a registration file of British Columbia (BC) residents, records of service from physicians and alternative providers, hospitalizations, vital statistics, cancer incidence, mental health services, pharmaceutical prescriptions, and workers' compensation claims.

1.2 Centre for Health Services and Policy Research

CHSPR has over 30 years of experience in handling data from the BC Ministry of Health Services (MoHS) and other professional bodies, and now acts as the access point for researchers wishing to use these data for research in the public interest. CHSPR has comprehensive policies and procedures in place to protect the confidentiality and security of data holdings. The foremost priority is to respect the privacy of individual users and providers of health care and other care services, and to protect data against loss, destruction, or unauthorized use,

while making data available to researchers to answer questions on the health of British Columbians and the delivery of health services in the province.

CHSPR ensures data confidentiality and security in two main ways. The first is by limiting access to personal identifying information and ensuring that data is used for appropriate research purposes. The cornerstone of data protection at CHSPR is an Access Policy (1), which has been successfully used to facilitate research in the public interest using linkable data since 1996. The Access Policy was developed to conform to the BC Freedom of Information and Protection of Privacy Act. The second approach to ensuring data confidentiality and security is through best practices in data protection. All data at CHSPR are managed in a manner that is consistent with evolving international best practices. CHSPR's physical workspace is tightly controlled, and the security of data is further ensured with sophisticated technical safeguards. Please see CHSPR's web site for further details on policies regarding privacy and security (<http://www.chspr.ubc.ca/privacy.htm>).

1.3 Research Problem

Prior to this project, there was limited data in the BCLHD that indicated employment status, occupation or industry of employment of BC residents. This data was only available for BC residents who incurred a workers' compensation claim, a small subset of the population and one defined by disability. The lack of data on employment and employment characteristics limited the capacity of

the BCLHD for occupational and population workforce research and the ability to answer important questions on occupational injury and disease, and on work health programs and policies.

1.4 Study Purpose

The overall purpose of this development grant was to create an industry of employment variable in the registration file of the BCLHD for residents in the BC workforce by assigning an industry code to the employers who pay health premiums; and to tabulate the proportion of the workforce whose industry of employment is assigned using this technique.

The addition of an industry of employment variable to the BCLHD offers the potential of vastly improved methods of occupational health research, including: improved denominator data for calculating incidence and prevalence rates of injuries and diseases by industry, stratified by demographic, geographic and socioeconomic variables; enhanced capacity for surveillance of injury and disease by industry across numerous databases that capture multiple health outcomes; enhanced capacity for defining study and comparison populations for occupational health studies; and the opportunity to investigate questions about the relationship between work and health, labour market experiences and workers' compensation experiences at the population health level. Ultimately the enhancement of the BCLHD is expected to generate more opportunities for examining the health of British Columbia

workers, and in turn provide evidence for effective planning, implementation and evaluation of workplace policies, legislation and prevention strategies.

Population-based, health research databases such as the BCLHD are unique in the world, and are made possible because of Canada's comprehensive, public health care systems and research sensitive privacy legislation. Similar databases are available in Manitoba, Quebec and Nova Scotia. However, this will be the first database to add employment characteristics at a population workforce level.

2.0 Methodology

2.1 Overview

A 'crosswalk' was developed between the employer field (representing the payer of the provincial health premium) in the BCLHD registration file and an industry-coded employer field (a 'classification unit' or CU) in the Workers' Compensation Board (WCB) business registry. Approaches based on both computer programming and manual review were used to create the crosswalk between the two registries. Additional industry codes were added using employer coding from Statistics Canada. The protocol was approved by the Behavioural Research Ethics Committee of UBC (#B03-0579 03-1306).

The end product was a data matrix of unique codes for employers paying health premiums linked to WCB of BC industry code(s) that can be applied to individuals in the registration file whose employer pays their health premium via their specific employer-paid premium provider code.

2.2 Premium Provider Codes

In British Columbia, all residents, with a few exceptions (e.g. federal inmates, RCMP, foreign students) are covered by the provincial health care system and pay a health care premium for their universal health care benefits. The payer of the health premium is assigned a code (premium provider code or PPC) and recorded for everyone in the registration file of the BCLHD. For many residents this is their employer. In the remaining cases, premiums are self-paid,

paid by a spouse's or parent's employer, or paid by the government (e.g. federal employees, individuals on social assistance, and those with native status). The Ministry of Health Services provided a list of the health premium provider codes and corresponding employer names effective December 31st, 2001 to the research team for this project. This file contained a total of 15,833 unique employer-paid premium provider codes.

The employer-paid health premium provider code allows for the construction of an industry of employment code but not an occupation code. An initiative is underway between the Workers' Compensation Board of British Columbia and the BC Ministry of Health Services to investigate recording occupation data as part of medical services billing records, but this is not part of this development grant.

2.3 WCB of BC Industry Classification Codes

The WCB of BC industry classification and coding system is used to group employers into similar industries with similar work activities with similar levels of risk for occupational injury and disease. By grouping employers in this way, the WCB of BC is able to set equitable rates for workers' compensation insurance.

Industrial activities are organized into a hierarchical structure consisting of sectors (the greatest degree of aggregation), subsectors, and classification units or CUs (the least degree of aggregation). It includes seven sectors, 24 subsectors, and approximately 600 classification units. The classification unit is

identified by a six-digit classification unit code. For example, 'Residential Social Service Facility' is a unique classification unit (#766017) nested within the subsector 'Health Care and Social Assistance', nested with the 'Service Sector'. Typically, each employer is assigned to the CU that best describes its primary business activity. If an employer is engaged in two or more distinct activities, it is assigned to two or more CUs, although this represents a small proportion of employers (less than 3.5%). For more information and to view the industrial classification system please refer to:

http://www.worksafebc.com/for_employers/premiums/classification/default.asp

Permission was obtained from the WCB of BC to receive a copy of their registry of employer names and industry classification codes as of December 31st, 2001. This data file contained 181,085 records.

As a development grant, the work to create a crosswalk was limited to one year (2001) to investigate the feasibility of creating an industry code. Based on the results, the crosswalk can be used for the matched employers in other years of the BCLHD registration files and additional work undertaken to identify new (2004 forward) and in-active employers (1985 to 2000).

2.4 Linkage Strategy

2.4.1 Deterministic Programming

Several computer programming queries in Visual FoxPro 9.0 (2) and SAS (3) were used to match employer names in the Ministry of Health Services (MoHS)

data file with names in the WCB of BC data file. The first was a 'perfect' matching query requiring the name in one file to be identical to the name in the other file (Table 1) after removing 'low' weighted words such as 'The', 'Inc' or 'BC', and punctuation such as periods or hyphens from both lists.

Table 1: Examples of 'Perfect' Matches

MoHS Employer Name	WCB of BC Employer Name
Otis Canada Ltd	Otis Canada Ltd
The Landing Services Ltd	Landing Services
Nineties Sparerib House	Nineties Spare-rib House

2.4.2 FoxPro Programming

The second strategy employed a set of programming rules to identify matches (Table 2) between the two lists excluding the perfect matches identified in the first strategy. Removing low weighted words such as 'The' or 'Ltd', each word of an employer name in the MoHS list was compared with each word of a name in the WCB list and vice versa. A weight of '1' was assigned to a word in the WCB employer name if the whole word or the first 7 characters of the word matched a whole word or the first 7 characters of a word in an MoHS employer name, and vice versa. A weight of '2' was assigned to a word in the WCB employer name if the first 4 characters matched the first 4 characters of a word in a MoHS employer name, and vice versa. A '0' weight was given to words that did not match on at least the first four characters. In this manner a string of weights was generated for each name in the WCB list and the MoHS list (e.g. 1111 or 0210).

Based on visual inspection of a random sample of 200 programming matches, we excluded matches where **both** the WCB string and the MoHS string included at least one '0' weight. We also excluded matches where less than half of both strings were weighted with '1s' (i.e. excluded '1222' or '2' or '02112').

Table 2: Examples of Included Programming Matches

MoHS Employer Name (Weighted String)	WCB of BC Employer Name (Weighted String)
<i>Examples where all whole words, first 7 digits or first 4 digits in one list match in the other list</i>	
Aaronson's Pharmacy (11)	Aaronson's Pharmacy Cook Street (1100)
Lufthansa (1)	Deutsche Lufthansa Aktiengesellschaft (010)
Brenda Mines Noranda (110)	Brenda Mines (11)
Pontiac Buick GMC- Kallewski's (1112)	Kallawsky Pontiac Buick GMC (2111)
Canadian Sulzer Pumps/Pompes Sulzer (21100)	Sulzer Pumps Canada (112)
Chris Schenk MD (110)	Dr Christian Schenk (021)
Township of North Cowichin (211)	North Cowichan Town (111)
Kelowna Coop Assoc (111)	Kelowna Cooperative Association (122)

We investigated rerunning the programming strategy with the remaining unmatched names allowing for weights of '3' where only the first 3 characters of a word in the WCB employer name matched the first 3 characters of a word in the MoHS list and vice versa. However, a visual inspection of a random sample of 10% of matches indicated a high rate of error (more than 30% mismatches) and we eliminated this as a matching strategy.

2.4.3 SAS Programming

With the remaining unmatched list we used an alternative programming strategy to find matches. The SAS SPEDIS function computes a 'spelling distance' between characters in words. If the two words are identical, the spelling distance is 0. A higher scores indicates that words are more dissimilar.

For each type of spelling error, SPEDIS assigns penalty points. For example, if the first letters of the two words do not match, there is a relatively large penalty. If two letters are reversed (e.g. dr verses rd) there is a smaller penalty. The final spelling distance is also based on the length of the words being matched. A wrong letter in a long word results in a smaller score than a wrong letter in a shorter word. See Cody (5) for a list of SPEDIS operations and their penalties.

Table 3: Examples of SAS Programming Matches

MoHS Employer Name (SPEDIS Score)	WCB of BC Employer Name (SPEDIS SCORE)
<i>Examples of Included Matches</i>	
E Archie Strimbold (27)	E A Strimbold (19)
Dicks Lumber & Bldg (30)	Dicks Lumber And Building Supplies (19)
Hetherington & Hooper Stores (1969) (26)	Hetherington Hooper (12)
<i>Examples Of Excluded Matches</i>	
J Reid & Associates Ltd (25)	Dr J B Reid (22)
Checktech Services Ltd (26)	Caltech Tech Services (23)
Echo 8 Enterprises Inc (32).	Eh-Cho-Dene Enterprises (27)

Based on a review of a random 10% sample of matches, we included only those matches where the SPEDIS Score was 20 or less for either the MoHS name or the WCB of BC name.

2.4.3 Key Word Matching

Next, a 'key word' strategy was used to assign CUs to the remaining unmatched employer names in the MoHS list. Using the total list of employer names provided by the WCB of BC, frequencies of CUs were generated for 183 key words representing different types of work activities, such as 'chiropractor' or 'insurance'. The complete list of key words is provided in Appendix I. For each key word with at least 20 employers, we tabulated the frequency of employers with the identical CU. Where the same CU was assigned to 90% or more of the employers, all employers in the MoHS list with that key word in their name were assigned the same CU. For example, if 40 employers in the WCB of BC list had the key business word 'Chiropractor' and 95% of these had the same CU, this key word(s) was included in our matching strategy and the CU applied with confidence to all remaining unmatched employers with the word 'Chiropractor' in the MoHS list (Table 3). We selected 20 employers and 90% CU frequencies to try to minimize misclassification of industry coding in the matrix and subsequently in the BCLHD registration file.

A total of 24 key business words met the inclusion criteria for application of WCB CUs to the MoHS list (these are highlighted in bold in Appendix I).

Table 3: Example of Key Word Strategy

Key Business Word(s)	Distribution of CUs
<i>Key Words Included in Matching Strategy</i>	
Restaurant	1026 of 1084 employers with same CU (94.7%)
Day Care	96 of 96 employers with same CU (100%)
Taxi or Cabs	69 of 70 employers with same CU (98.6%)
Lawyers or Barristers	941 of 954 employers with the same CU (98.6%)
Pawn Broker	13 of 14 employers with the same CU (93%)
<i>Key Words Excluded from Matching Strategy</i>	
College	107 of 179 employers with the same CU (59.8%)
Forest Products	60 of 244 employers with the same CU (24%)
Beef Farm	2 of 8 employers with the same CU (25%)
Jewelry	7 of 10 employers with the same CU (70%)

2.4.4 Manual Matching

A manual search was completed by the principal investigator (Koehoorn) to identify any unresolved matches between the two lists based on general knowledge of changes in business names over time or similar names that did not meet the computer programming criteria but were deemed to be the same employer upon further inspection (Table 4). This was completed by searching the WCB list of employers for proper names such as 'Hudson Bay' or 'Norske', for example, for all remaining unmatched MoHS employer names.

Table 4: Examples of Manual Matches

MoHS Employer Name	WCB of BC Employer Name
The Bay	The Hudson Bay Company
BCHydro	BC Hydro and Power Corp
Fletcher Challenge	Norske Skog Canada
Majdanski Chartered Accountants	Majdanski, MacLean and Associates CAs
Dr Aindrias O'Breasil Inc	A OBreasil MD

2.4.5 Statistics Canada Matching

Approval was obtained from Statistics Canada (Dennis Wong, January 2004) to submit a sample of unmatched employer names from the MoHS list for linkage with their business registry, which includes a North American Industry Classification System (NAICS) code, in an effort to increase the number of employers with an industry code in the crosswalk and to confirm if this is a feasible alternative for future industry coding. NAICS is an industry classification system developed jointly by Statistics Canada, the US Economic Classification Policy Committee and Mexico's Instituto Nacional de Estadística Geografía e Informática. NAICS is designed to provide common definitions of the industrial structure of the three countries and a common statistical framework to facilitate the analysis and comparison of labour statistics in North America (4). NAICS-Canada coding is also hierarchical, with 20 sectors, 99 sub-sectors, and 921 national industries. The NAICS code in the Stats Can registry is assigned by

industrial activity and provides both a valid matching strategy and industry code for our sample of unmatched business names.

Employer names were selected for submission to Statistics Canada for industry coding on the basis of the number of residents by employer in the client registry. Almost 2,000 of the largest unmatched employers were selected to see if Statistics Canada could assign an industry code (NAICS) by matching with our employer name via their business registry.

Finally, the principal investigator reviewed all of the matches across all of the strategies and eliminated errors to arrive at the final list of approved matches.

The industry matrix is held solely under the auspices of the Centre for Health Services and Policy Research. Only the industry of employment code is released to researchers, under the same protocols that govern the use of all other variables in the BCLHD. The premium provider code and the employer name are not part of the data holdings available for research purposes and will not be released to researchers.

Figure 1 below provides an overview of the methodology.

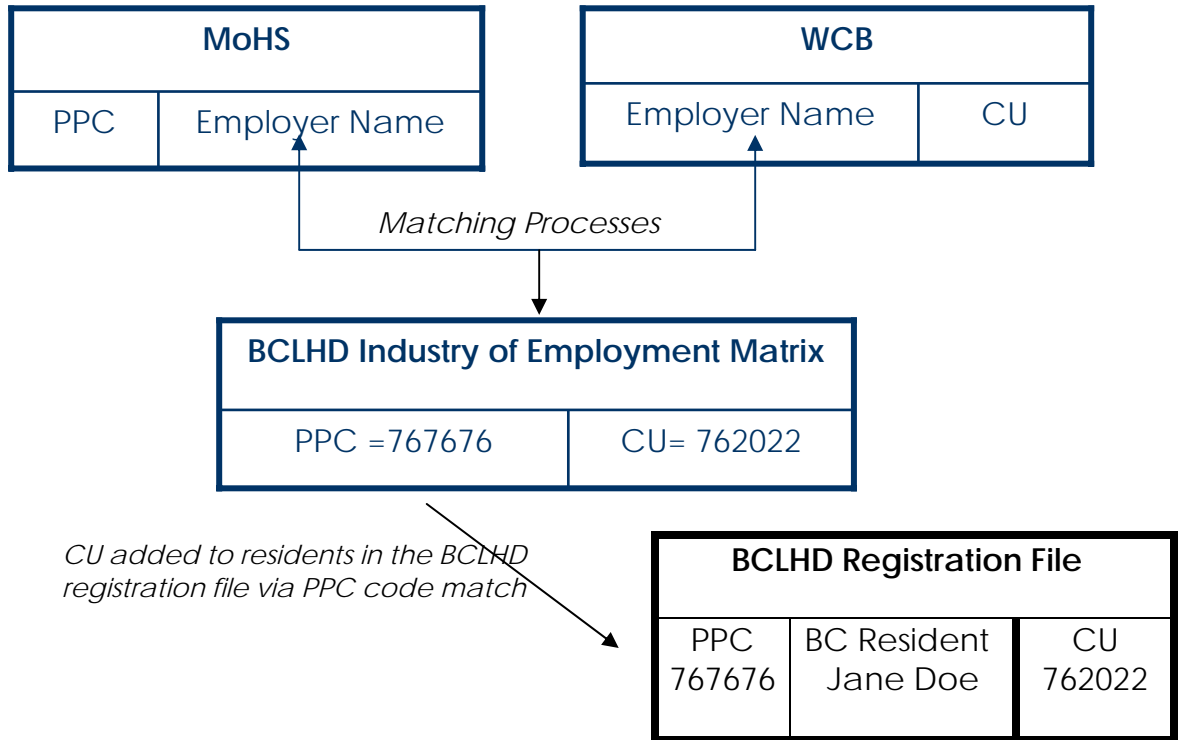


Figure 1: Overview of Study Methods

3.0 Results

3.1 Summary of Key Findings

Approximately half of all employer names in the MoHS registry were successfully assigned an industry code by a 'perfect' match with an employer name in the WCB of BC registry (Table 5). This was followed by programming matches (17.2%), key word matches (7.0%), manual matches (5.4%) and Statistics Canada matches (5.3%). Just over 14% of the MoHS employer list remained unmatched without an assigned industry code.

Table 5: Matching Results between MoHS and WCB of BC lists of employers

	Matching Strategy	Number of Matches (% of Total Employers or unique PPCs in the MoHS registration file)	
	Perfect Matches*	8,069 (50.96%)	
	FoxPro Programming Matches*	2,474 (15.57%)	2724 (17.21%)
	SAS Programming Matches*	250 (1.56%)	
	Key Word*	1,100 (6.95%)	
	Manual*	851 (5.38%)	
	Statistics Canada †	834 (5.27%)	
Total Matches (% Employers with an Assigned Industry Code)		13,578 (85.76%)	
Total Non Matches (% Employers without an Industry Code)		2,255 (14.24%)	
Total Unique Employers		15,833 (100%)	

* Assigned an WCB of BC Industry Classification Unit (CU) code

† Assigned a Statistics Canada North American Industry Classification System (NAICS) code only (No WCB of BC CU). Statistics Canada was able to find 1,630 of our sample of unmatched 1,928 employers (86%) and assign a NAICS code. After completing our key word and manual matching strategies, only 838 remained unmatched and we used the NAICS code as a valid industry code in lieu of the WCB of BC CU code for these employers.

In summary, a total of 13,578 of 15,833 (86%) unique employers (a.k.a. health premium providers) in the 2001 BCLHD registration file were assigned an industry code (i.e. WCB of BC industry classification unit or Statistics Canada NAICS code). A matrix of industry codes linkable to individuals via the employer premium provider codes is now available for research purposes as part of the BCLHD registration file, linkable to all other health data holdings.

3.3 Visual Inspection of Matches

A visual inspection of all perfect and programming matches by the principal investigator resulted in the exclusion of 43 'perfect' matches (0.5%), arriving at the 8,070 figure in Table 5; and 160 programming matches (5.5%) arriving at the final 2,728 figure in Table 5. Visual inspection was not appropriate for key word and Statistics Canada matches (i.e. no WCB name to compare with) or manual matches (i.e. already inspected by the PI).

4.0 Workforce Coverage

In order to assess the assignment of industry codes to BC workers, the matrix of industry codes was applied to BC residents in the 2001 BCLHD registration file by premium provider code. In order to eliminate misclassification, industry codes were only assigned to the person employed in the industry (the 'primary') and not to 'dependents' such as spouses and children, who can have their health benefits covered by a family member's

employer. In the 2001 registration file, a total of 1,000,130 individuals with primary status had an employer-paid premium provider code. Of these, 908,430 were assigned an industry of employment code (90.8% coverage).

According to Census statistics generated by BC Stats, there were a total of 1,922,100 BC residents employed in the workforce in 2001 (4); whereas we can identify as employed 1,000,130 individuals in the BCLHD registration file based on a combination of the employer premium provider code and 'primary' status (52.0% of the workforce). Industry of employment was assigned to 908,430 of these representing 47.3% of the BC workforce. We were able to identify only approximately 50% of the workforce in the BCLHD registration file for a few reasons. First, 'dependents' (according to a registration file based on responsibility for payment) were excluded from our analysis but may be in the workforce. Second, because identification of an employer is based on that employer paying for health care premiums, we will not capture employees of smaller firms. Third, self-employed individuals are responsible for paying their health premiums and are not identifiable in the registration by an employer-paid premium. For these reasons, we hypothesize that industry of employment coverage is lower for women, self employed individuals, and workers in small worksites (See Section 6.0 for future steps to assess workforce statistics). Of those we can identify as employed in the BC workforce, we are able to assign an industry code to the vast majority.

4.0 Implications for Future Research on Occupational Health

4.1 Operating Grants

Three research projects are either underway or proposed that will request access to the industry of employment variable and will serve as pilot tests for the new variable. In particular, the industry of employment variable is being used to identify a cohort of workers in heavy industry for a study of work-related back injury (Teschke & Koehoorn; WCB of BC funded project), and as a co-variate in a multi-factor environmental study of cardiovascular disease associated with air pollution in the Georgia Air Basin (Brauer, Demers and Koehoorn et al; Health Canada and BC Centre for Disease Control funded project). It will also be used in a study of asthma surveillance by industry of employment in British Columbia (Koehoorn, Kennedy, McLeod, Bogyo; AllerGen NCE – CIHR funded project). Pending recommendations from researchers on the refinement of the industry variable, it will be made available with documentation as part of the regular BCLHD holdings for Canadian researchers with approved research projects.

4.2 Population Health and Learning Observatory

Eventually, the BCLHD including the registration file with the industry codes will become a component of the Population Health and Learning Observatory (PHLO). PHLO is an umbrella organization funded by the Canada Foundation for Innovation to expand and develop data resources and create crosswalks between databases, to support population health research. PHLO will broaden

the array of variables available for research and integrate them in a way that will allow for innovative questions on occupational injury and disease, including multi-factor studies (e.g. occupational exposures), detailed health outcomes (combination of drug claims, outpatient visits, hospitalization, health registries, self-reported surveys and deaths) and life course trajectories (from school, to work to retirement). As such, the industry of employment variable will be a cornerstone of the occupational research component of the Observatory for the identification of study populations, the assignment of exposures, the surveillance of health over the life course, and as an explanatory variable in multi-factorial studies of health outcomes.

4.3 WCB-CHSPR Research Partnership

The industry variable will also be a focus for research projects under the Partnership recently formed between the Workers' Compensation Board of British Columbia (WCB) and the Centre for Health Services and Policy Research at UBC. The intent is to conduct research that maximizes the use of the BCLHD for evidence-based policies and prevention programs. The goal is to create safe and secure workplaces and to provide the best opportunity for recovery after injuries occur. For example, one project proposes to add health maps by industry of employment to the BC Health Atlas for surveillance of injuries and diseases (www.chspr.ubc.ca/cgi-bin/pub).

5.0 Dissemination/Knowledge Transfer and Policy Implications

5.1 Occupational and Population Health Researchers

The primary audiences for the industry variable in the BCLHD are researchers and those interested in research findings. To reach these audiences, several presentations have been completed and abstracts submitted to local, national and international conferences in an effort to communicate the findings from the *Who Works Where?* project and the potential of the industry variable in the BCLHD for occupational and population workforce research, as follows:

Koehoorn M. *Who Works Where?* Population Health and Learning Observatory Seminar Series. October 21st, 2004. University of British Columbia, Vancouver, BC.

Koehoorn M. Occupational Research using the BCLHD. OCCH 540 Research Seminar. School of Occupational and Environmental Hygiene. November, 2004. University of British Columbia, Vancouver BC.

Koehoorn M, McGrail K, Teschke K, Aghajanian A. *Who Works Where?* Occupational Injury and Disease Surveillance in British Columbia. 18th International Symposium on Epidemiology in Occupational Health (accepted). Bergen, Norway, September 11-14, 2005.

Koehoorn M, Aghajanian J, McGrail K, Teschke K, McLeod CB. Building Research Capacity to Investigate Questions on Place and Health. Canadian Public Health Association 96th Annual Conference (accepted). Ottawa, ON. September 18-21, 2005.

The project has also been highlighted as part of presentations to the Workers' Compensation Board on the partnership, including the Senior Executive Committee. The researchers will continue to present on the *Who Works Where?* project as requested.

5.1.1 BC Linked Health Database

Pending further pilot studies (as outlined above) and validation work (as outlined below under Future Steps), the industry variable will be incorporated into the regular BCLHD data holdings and application process, and available for research purposes, with plans to include information on the variable on the CSHPR, PHLO and WCB-CHSPR Research Partnership websites.

5.2 WCB of BC Interactions

Knowledge translation research has identified the development of partnerships, based on regular exchange and contact, as the most effective approach in facilitating the use of research evidence and in creating a research-attuned culture among decision makers. Consistent with this approach, the WCB-CHSPR Research Partnership meets every other month and, in this way, senior WCB decision makers are engaged in the research process from study design to implementation of findings. Surveillance projects using the industry variable in the BCLHD as part of a future BC Health Atlas have been identified as a priority for the WCB under this Partnership. Relationships with senior policy makers and leaders in the compensation field are well-established, and the 'receptor' capacity for the findings and mechanisms for interchange and policy/program development are underway.

Findings from this project will also be posted on a public website (www.chspr.ubc.ca/research/wcbpartnership.htm) that has been created to

profile the WCB-CHSPR partnership and to present the results of research projects to a broader audience. Knowledge translation will also be facilitated through our active collaboration with the UBC Centre for Health and Environment Research, which has dedicated research personnel and resources focusing specifically on knowledge translation in occupational health settings (www.cher.ubc.ca).

6.0 Future Steps

The research team is continuing to develop the industry variable in the BCLHD under the WCB-CHSPR Research Partnership. There are four key objectives for future work;

1. To generate descriptive statistics about the BC workforce in the 2001 registration file by demographic, socioeconomic, and geographic variables to assess the coverage of the industry variable relative to Census and Labour Force Survey statistics data. This step requires the submission of a Data Access Request to the Ministry of Health Services to access the registration file at the individual level, along with ethics approval at UBC (to be completed summer of 2005). Findings from this step will be incorporated into data documentation for researchers accessing the industry variable for approved projects to communicate the limitations of the variable (e.g. under representation of self-employed, certain industries and women)

2. To improve upon the success rate by continuing with manual matches between the MoHS and WCB of BC employer lists. We will also attempt to assign industry codes to individuals in the registration file without an employer-paid premium provider code or those with an unmatched employer name, by using industry information from the WCB of BC database in the BCLHD for the subset of the population with an accepted claim. This may help improve assignment of industry codes for female workers and workers in small workplaces.

3. To continue to update the industry variable for new employers on an ongoing basis and expand the coding beyond 2001. Employer paid premium provider codes are associated with start and end dates of coverage for the period 1985 to 2003 in BCLHD. It is therefore feasible to use our crosswalk to retrospectively assign industry codes to individuals by PPC using start and end dates.

4. To investigate funding and methodological opportunities to assign the NAICS code to employers and ultimately employees in the BCLHD via Statistics Canada registry. Based on our success rate with Statistics Canada and to improve comparability of research findings across jurisdictions, we have submitted an operating grant to the Canadian Institutes for Health Research (Koehoorn, June 2005) that proposes to link the entire MoHS employer list to the Statistics Canada registry for NAICS coding.

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APPENDIX 1

Bold indicates key words were included in the matching strategy based on the distribution of CUs associated with employers with the key words in their name (>90% of employers with the key word had the same CU)

1. ADVERTISING
2. **AFTER HOURS SCHOOL**
3. **ANIMAL OR VETERINARY OR PET HOSPITAL**
4. APPLIANCE(S)
5. AQUA TOWING
6. ARTS ASSOCIATION (E.G. DRAMA)
7. AUTO BROKER(S)
8. AUTO ELECTRIC
9. AUTO GLASS
10. AUTOBODY OR AUTO BODY
11. AUTOMOTIVE
12. AVIATION
13. BAKERY
14. BANK
15. BANK BROKER(S) OR LOAN BROKER(S)
16. **BARRISTERSOR LAWYER**
17. BROKER (NOT BANK, AUTO OR FOOD)
18. BUILDING MAINTENANCE
19. BUSINESS OR MERCHANT ASSOCIATION
20. CAB(S) OR TAXICAB(S) OR TAXI(S)
21. CARPET CLEANER(S)
22. CARPET CLEANING
23. CATERING
24. CATHOLIC OR CHRISTIAN OR INDEPENDENT SCHOOL
25. **CHIROPRACTIC OR CHIROPRACTOR(S)**
26. CHRISTIAN OR CHURCH ASSOCIATION
27. CHURCH
28. CLEANERS (NOT CARPET)
29. COLLEGE
30. COLLEGE AND HEALTH PROFESSIONAL (E.G. CHIROPRACTIC)
31. COMMUNICATIONS (NOT TELE)
32. COMMUNITY ASSOCIATION
33. COMMUNITY SCHOOL
34. COMPUTER(S)
35. CONSTRUCTION
36. CONSULTING OR CONSULTANT(S)
37. CONTRACTING
38. COURIER(S)
39. **CREDIT UNION**
40. CULINARY SCHOOL
41. **DAY CARE**
42. DDS
43. DELICATESSEN OR DELI
44. DENTAL
45. DENTAL ASSOCIATION
46. **DENTAL CLINIC**
47. DENTAL PRODUCTS OR DENTAL SERVICES
48. DEVELOPMENTS
49. DINER
50. DISTRIBUTOR OR DISTRIBUTING
51. DR OR DRS OR DOCTOR(S)
52. DRILLING
53. **DRIVING SCHOOL**
54. **DRYWALL**
55. ECLECTRONICS
56. ELECTRIC
57. ENGINEERING OR ENGINEER(S)
58. ENGINEERING MANAGEMENT
59. ENGLISH COLLEGE
60. ENTERPRISES
61. EXCAVATING
62. EXCAVATING OR EXCAVATION
63. FLOWERS
64. FOOD BROKER(S)

- 65. FOOD IMPORTERS
- 66. FOODS
- 67. FOREST OR FORESTRY
- 68. FOREST PRODUCTS
- 69. FURNITURE
- 70. FURNITURE DELIVERY
- 71. FURNITURE MANUFACTURING
- 72. GARAGE DOOR(S)
- 73. GARAGE OR SERVICE STATION
- 74. GARDENING
- 75. GLASS
- 76. GLASS BLOWING OR GLASS WORKS OR GLASS WARE
- 77. GOLF ASSOCIATION
- 78. GOLF COURSE OR GOLF LINKS OR GOLF CLUB
- 79. GOLF SALES OR GOLF SHOP
- 80. GRAPHICS
- 81. GYMNASTICS OR KARATE OR TAEKWONDO OR BIKING OR SOCCER OR HOCKEY OR KAYAKING OR SAILING OR BASKETBALL SCHOOL
- 82. HAIR OR HAIRDRESSING OR COSMETOLOGY OR BEAUTY**
- 83. HEALTH REGION OR HEALTH AUTHORITY
- 84. HELICOPTER OR AIRCRAFT MAINTENANCE
- 85. HELICOPTERS
- 86. HOLDINGS
- 87. HOSPITAL AUXILIARY
- 88. HOSPITAL LAUNDRY
- 89. HOSPITALITY
- 90. HOSPITAL FOUNDATION
- 91. HOSPITAL(S)
- 92. HOTEL**
- 93. HOTEL ASSOCIATION(S)
- 94. HOTEL SCHOOL
- 95. HOUSING ASSOCIATION OR CO-OP**
- 96. HYDRO
- 97. IMPORTERS
- 98. INN
- 99. INSURANCE**
- 100. INSURANCE BROKER**
- 101. INTERIOR DESIGN
- 102. INVESTMENTS
- 103. LANDSCAPING
- 104. LAW CORPORATION**
- 105. LAW JOURNAL
- 106. LIVESTOCK OR CATTLE ASSOCIATION
- 107. LODGE
- 108. LOGGING
- 109. LUMBER
- 110. MANAGEMENT
- 111. MARINE
- 112. MARINE INSURANCE
- 113. MARKETING
- 114. MEDICAL CLINIC(S)
- 115. MEDICAL SUPPLIES
- 116. MENTAL OR HANDICAPPED ASSOCIATION
- 117. MINERALS
- 118. MONTESSORI
- 119. MOTEL**
- 120. MOVING AND STORAGE
- 121. MUSEUM OR GALLERY OR ARCHIVES
- 122. MUSIC OR DANCE OR ART OR LANGUAGE SCHOOL
- 123. NATUROPATHIC
- 124. NEWS
- 125. NEWSPAPER
- 126. OPTOMETRIC
- 127. PENSION PLANS
- 128. PHARMACEUTICALS
- 129. PHARMACY OR DRUGS**
- 130. PLUMBING
- 131. PLUMBING AND ELECTRICAL
- 132. PLUMBING AND HEATING**
- 133. PODIATRIC
- 134. POOL MAINTENANCE
- 135. PRESCHOOL OR NURSERY SCHOOL OR PLAY SCHOOL**
- 136. PRINTING
- 137. PRIVATE HOSPITAL
- 138. PROPERTIES
- 139. PUB OR BAR
- 140. PUBLISHING
- 141. REAL ESTATE
- 142. REALTY
- 143. RECREATION ASSOCIATION (E.G. HOCKEY)
- 144. REFORESTATION
- 145. RESTAURANT
- 146. RESTAURANT ASSOCIATION
- 147. RESTAURANT SUPPLIES
- 148. RESTAURANT AND MARINA
- 149. ROAD OR HIGHWAY OR PAVEMENT MAINTENANCE
- 150. SCHOOL
- 151. SCHOOL ASSOCIATION
- 152. SCHOOL BOARD
- 153. SCHOOL DISTRICT**
- 154. SCHOOL SOCIETY
- 155. SCREEN PRINTING
- 156. SEAFOODS
- 157. SHIPYARD(S)
- 158. SOFTWARE
- 159. TECHNOLOGIES
- 160. TELECOMMUNICATIONS
- 161. TIRE
- 162. TOURISM OR TOURIST
- 163. TOWING
- 164. TRADING
- 165. TRANSPORT OR TRANSPORTATION
- 166. TRAVEL
- 167. TRUCKING
- 168. TRUCKING AND EXCAVATING
- 169. TRUST
- 170. UNION
- 171. UNION OR BROTHERHOOD
- 172. UNIVESTIY
- 173. WELDING
- 174. WOOD PRODUCT(S)
- 175. WOODWORKERS
- 176. WRECKING OR WRECKERS
- 177. GREENHOUSE**
- 178. MUSHROOM**
- 179. CRANBERRY**
- 180. VINEYARD OR WINERY**
- 181. JEWELRY
- 182. BEEF FARM
- 183. RANCH

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