

Mental health in Canada: Are there any risky occupations and industries?

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Abstract

This study examined the role of occupations and industries in explaining differences among workers reporting poorer mental health in the Canadian workforce. It used data coming from a large representative sample of 77,377 workers engaged in 139 occupations and 95 industries. Logistic regression analysis was used to identify differences in the odds of reporting poorer mental health, adjusting for gender, age, education, marital status, and household income. Results identify ten occupations and nine industries at higher risk for workers reporting poorer mental health. The article concludes by highlighting implications for actors and policymakers and by specifying potential targets for intervention.

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1. Introduction

Mental health problems in the workforce remain a major issue today because psychological distress, depression, and burnout afflict a significant proportion of workers. In Europe and the United States, the estimated prevalence of these problems among workers ranges from 15 to 20% (ILO, 2000). The Whitehall II study reported prevalence rates of 21% for men and 25% for women among London civil servants (Stansfeld, Fuhrer, Shipley, & Marmot, 1999). In Canada, nearly 43% of workers had experienced an episode of psychological distress between 1994–1995 and 2000–2001, and 19% had two episodes or more (Marchand, Demers, & Durand, 2005a). In the province of Québec, the prevalence of psychological distress among workers varies from 17 to 26% over the period 1987–1998 (Daveluy et al., 2000). Furthermore, mental health problems cost companies and society as a whole several billion dollars each year (ILO, 2000; Vézina, Cousineau, Mergler, & Vinet, 1992), mainly from workplace absenteeism, lost business productivity, income replacement outlays, and health services use.

Over the years, several studies have identified work organisation conditions that have contributed positively or negatively to workers' mental health problems. They have demonstrated the influence of skill utilization and decision authority (Andrea et al., 2004; de Jonge, Reuvers, Houtman, & Kompier, 2000; Mausner-Dorsch & Eaton, 2000; Niedhammer, Goldberg, Leclerc, Bugel, & David, 1998; Stansfeld, Head, Fuhrer, Wardle, & Cattell, 2003; Van der Doef, Maes, & Diekstra, 2000), psychological and physical demands (Andrea et al., 2004; Challenor & Wright, 2000; de Jonge, Mulder, & Nijhuis, 1999, 2000; Julien et al., 2000; Marchand et al., 2005a, Marchand, Demers, & Durand,

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2005b, Marchand, Demers, & Durand, 2006; Muntaner et al., 2004; Stansfeld et al., 1999; Van der Doef et al., 2000), long work hours and irregular schedules (Spurgeon, Harrington, & Cooper, 1997; van der Hulst, 2003; Voydanoff & Donnelly, 1999a,b), social support at work (Andrea et al., 2004; Karasek & Theorell, 1990; Marchand et al., 2005a; Stansfeld et al., 1999; Van der Doef et al., 2000; Vermeulen & Mustard, 2000), and gratifications (Feldt, Kinnunen, & Mauno, 2000; Marchand et al., 2005a, 2006; McDonough, 2000; Swaen, Bultmann, Kant, & van Amelsvoort, 2004; Turner, Wheaton, & Lloyd, 1995; Virtanen, Vahtera, Kivimaki, Pentti, & Ferrie, 2002).

Furthermore, three main theoretical models have been proposed to explain how work organisation conditions affect mental health. The Job Demand-Control Model (Karasek, 1979) hypothesised that decision latitude moderated psychological demands, and the Demand–Control–Support Model (Karasek & Theorell, 1990) added social support as a modifying effect of the interaction between decision latitude and psychological demands. The theoretical components of these two models are well supported (Bourbonnais, Malenfant, Vézina, Jauvin, & Brisson, 2005; Bourbonnais, Vézina, & Massé, 2005; Bourbonnais, Brisson, Malenfant, & Vézina, 2005; Calnan, Wadsworth, May, Smith, & Wainwright, 2004; D’Souza et al., 2005; Li, Yang, & Cho, 2006; Sanne, Mykletun, Dahl, Moen, & Tell, 2005; Van der Doef & Maes, 1999; Ylipaavalniemi et al., 2005). The Effort–Reward Imbalance Model (Siegrist, 1996) posited that the discrepancy between workplace demands and rewards led to distress. Distress levels intensified among individuals who were overcommitted to their work and a recent review of 19 studies using this model confirmed the effort–reward imbalance hypothesis for the most part (van Vegchel, de Jonge, Bosma, & Schaufeli, 2005).

Overall, the literature has placed considerable emphasis on work organisation conditions as a potentially key determinant of workplace mental health, but few studies have examined how occupations and industries have been associated with this outcome. This is an important gap because recent studies reported that occupation contributes to mental health even after accounting for work organisation conditions, family situation and social network outside work, as well as individual characteristics related to demography, physical health, personality traits, life habits and stressful life events (Marchand et al., 2005a,b, 2006). As such, current knowledge about how specific occupations and industries contribute to higher risks of psychic imbalance in workers is limited, and the paucity of research has impeded the development of targeted public health interventions and policies that might help resolve these problems. Studying variations in mental health across occupations and industries might help identify clusters in which working conditions need to be more closely investigated, on the basis that the identification of more risky groups could allow for the identification of still undiscovered risk factors in workplaces.

In order to shed some light on these issues, this article presents the results of a study carried out on a large sample of the Canadian workforce for which the risk of reporting poorer mental health was evaluated in 139 occupations and 95 industries.

1.1. Background

Quite a few longitudinal and cross-sectional studies have identified variations in mental health by occupation. In longitudinal designs, a French study (the GAZEL cohort) of more than 11,000 employees of two public service firms surveyed in 1989 and 1995–1996 reported significant psychological distress differences in five of nine occupational groups (Niedhammer et al., 1998). In Denmark, a study of 144,855 individuals and 26 occupations found that social workers and professionals caring for mentally and physically disabled persons faced a higher risk of affective disorders and stress related conditions (Wieclaw, Agerbo, Mortensen, & Bonde, 2005). In the Netherlands, analysis of baseline data from the Maastricht cohort study (Bultmann, Kant, van Amelsvoort, van der Brandt, & Kasl, 2001), composed of 8521 workers in 131 occupations at 45 companies, showed higher prevalences of psychological distress for 10 occupations. Overall, occupations accounted for 2.7% of the variance in psychological distress.

This latter result is consistent with recent Canadian studies that show significant occupational variation in the level and episodes of psychological distress in a sample of more than 6000 workers across 417 occupations. Overall, occupations accounted for 1 to 3% of the variance in psychological distress (Marchand et al., 2005a,b, 2006), but these studies did not identify specific occupations as being more at risk. Last, the Whitehall Study, which followed a large sample of London civil servants beginning in 1985, found an association between minor psychiatric disorders and employment grades (Fuhrer, Stansfeld, Chemali, & Shipley, 1999; Hemingway, Nicholson, Roberts, & Marmot, 1997; Stansfeld et al., 2003). Employees with higher grades or management positions were at lower risk for mental health problems, while greater risk was observed for occupation positions lower in the hierarchy. Similar results were obtained for the GAZEL cohort (Paterniti, Niedhammer, Lang, & Consoli, 2002).

In cross-sectional designs, a Norwegian study (Hordaland Health Study) of 17,384 workers located within a ten-group occupational classification reported higher frequencies of depressive symptoms in six specific groups (Sanne, Mykletun, Dahl, Moen, & Tell, 2003). In the USA, Grosch and Murphy (1998) found, on a sample of 8486 individuals interviewed in 1987, that 239 occupations within eleven occupational categories explained 9.3% of the total variance in depression. In Canada, a study carried out in the province of Quebec with 31,357 workers and a twelve-group occupational classification, reported higher levels of psychological distress in three occupation groups (Marchand, Durand, & Demers, 2005). Using data going back to 1987, another Canadian study reported higher psychological distress in nine occupations (Vezina & Gingras, 1996).

Fig. 1 summarizes occupations found to be at greater risk in previous studies. Overall, blue and white collars as well as supervisory occupations appear more vulnerable to mental health imbalance as compared to upper managerial occupations.

The association between occupation and mental health may vary according to gender, however, because there is an unequal distribution of occupations between genders, and females have a tendency to report more mental health problems (de Jonge et al., 2000; Marchand et al., 2005a,b, 2006; Marchand, Durand, et al., 2005; McDonough, 2000; Pugliesi, 1999; Shirom, Westman, & Melamed, 1999; Stansfeld et al., 1999). Wieclaw et al. (2005) found that females were experiencing more affective and stress related disorders than males among corporate managers; health, health associates, and teaching professionals; personal and protective services; other labourers; elementary (unskilled) sales, and service occupations (street or door-to-door sales or services, cleaning, property watching and caretaking, delivering goods and messages, carrying luggage). Sanne et al. (2003) found no between-occupation differences for male anxiety symptoms, whereas females displayed more anxiety in elementary (unskilled) sales and services occupations. Other results indicated that male clerks and shop/market sales and service workers reported more depressive symptoms than did females in the same occupations. In a Canadian study based on a six-group classification of occupations, male blue-collar workers experienced less psychological distress than all other occupations while differences among occupations were non-significant for females (Wilkins & Beaudet, 1998). In another Canadian study also based on a six-group classification of occupations, females holding professional and semi-professional jobs and qualified and semi-qualified female white-collar workers reported higher distress levels than did males in the same occupations (Vermeulen & Mustard, 2000).

Study	Mental health	Occupations at risk
Bultmann et al., (2001)	Psychological distress	controller/tester of electro-technical machinery; archivist and librarian; waiter/server; typist/data typist; manager of wholesale-retail trade/movie theatre; supply clerk; social-cultural worker/social welfare worker; assembler of cars and office machines; statistical analyst/statistician; machinist of glass, earthenware, paper, textile fabrics, food and luxury food processing industry
Grosch & Murphy (1998)	Depression	Machine operators, farming-forestry, transportation occupations
Marchand et al., (2005c)	Psychological distress	Supervisors, semi-qualified white collars, semi-qualified blue collars.
Niedhammer et al., (1998)	Psychological distress	Semi-professionals (administration and associate engineering), supervisors, office workers, blue-collar workers, craftsmen
Sanne et al., (2003)	Depression symptoms	Shop/market sales and service workers; agricultural/forestry/fishery workers; craft and related trades workers; plant/machine operators; assemblers; and elementary occupations
Vézina & Gingras, (1996)	Psychological distress	Road transportation (excluding truck drivers); workers in textile, leather, and fur manufacturing and repairing; housekeeping and maintenance workers; painters; tapestry-workers; insulation and waterproofing workers; food-and-beverage-sector workers; data processors; editors and university professors
Wieclaw et al., (2005)	Affective disorders and stress related conditions	Teaching associated professionals, Social workers, professionals caring for mentally and physically disabled

Fig. 1. Occupations at higher risk of mental health reported in previous studies.

When it comes to variations in mental health by industry, the literature is scarce and outdated. A literature search turned up one study by [Vézina and Gingras \(1996\)](#), which found higher risks for mental health problems in the following industries in the Canadian province of Quebec in 1987: the leather, chemical, and paint and varnish industries; urban bus transportation and taxi services; shoe, clothing, and textile retail stores; department stores; restaurant services; insurance; and public administration.

In summary, there is some evidence that certain occupations, and to a lesser extent certain industries, may contribute to mental health problems in individuals. Furthermore, gender may moderate the relationship between occupations and mental health. However, it is hard to reach definite conclusions based on existing studies because of potentially significant conceptual or design limitations. First, different studies have, for purposes of analysis, aggregated occupations in different ways or used different occupational classifications. For example, results from studies that use a given number of categories may not be easily compared with results from studies using more or fewer categories, nor can such results always be readily replicated. Moreover, the number of occupations in a given society is far larger than the number suggested by occupational classification systems, which often must group several occupations into a single category. In order to better identify which occupations pose greater mental health risks, the analysis requires finer levels of occupational measurement to adequately capture the diversity of occupational composition and position. Second, because occupations and industries have rarely been simultaneously taken into account, existing studies have presented a biased view of the influence on mental health of major factors structuring the labour market. Third, a number of studies have used large samples but have limited them to a few work settings, which makes generalizing results to the entire work force problematic. Finally, it seems that no currently available study has examined occupations and industries for the Canadian workforce as a whole.

This deficit signals the need for a large population study to help identify targets for intervention and orient research and public policies so as to reduce the prevalence of negative mental health outcomes in the working population.

2. Methods

2.1. Data

Cross-sectional data were derived from Cycle 2.1 (2003) of the Community Health Survey (CCHS) conducted by Statistics Canada. It contained a representative sample of the general population based on a complex sampling design of 134,072 individuals aged 12 years and older (response rate 92.6%) taken from 144,836 households (response rate 87.1%). The pool response rate was 80.7%. Data were weighted according to selection probability and response rate, as well as for demographic distribution by gender, age, and the 126 Canadian health regions. After cases with missing values on study variables were deleted (5.3%), the CCHS 2.1 allowed analyzing responses from 77,377 employed individuals aged 15 years and older and who had been employed during the last 12 months. Overall, 46.7% of the workers in this sub-sample were females, and the mean age was 38.5 years (SD=13.3 years).

2.2. Measures

Mental health was measured with a single-item five-point scale. Respondents were asked to answer the following question: “In general, would you say your mental health is: 1) excellent, 2) very good, 3) good, 4) fair, 5) poor.” Overall, 40.1% of workers answered excellent, 35.9% very good, 20.2% good, 3.3% fair, and 0.5% poor. To compute the prevalence of poorer mental health, the variable was further binary-recoded with 0 = excellent, very good, and 1 = other. Using this grouping, the prevalence of poorer mental health is estimated at 24.0% (95% CI=23.5%–24.5%) which is comparable to prevalence reported with multi-item instruments in Canada ([Daveluy et al., 2000](#); [Marchand et al., 2005a,b, 2006](#); [Marchand, Durand, et al., 2005](#)), as well as in Europe and the United States ([ILO, 2000](#); [Stansfeld et al., 1999](#)). The measure of poorer mental health encompassed a large range of mental health imbalance problems and symptoms that an individual may face, including depression, burnout and psychological distress. Like psychological distress – which is defined by a set of psychophysiological and behavioral symptoms that are not specific to a given pathology, ([Dohrenwend, Shrout, Egri, & Mendelsohn, 1980](#); [Ross, Mirowsky, & Goldsteen, 1990](#); [Vézina et al., 1992](#)) – the measure of poorer mental health used here gave a sign that something is going wrong in the individual psyche ([Marchand, Demers, Durand, & Simard, 2003](#)).

Occupation was measured according to the four-digit codes of the 1991 Standard Occupational Classification (SOC-1991) developed by [Statistics Canada \(1993\)](#). SOC-1991 defined occupations according to the nature of the work, the

tasks carried out, the responsibilities, and the sector of activity. SOC-1991 has a hierarchical structure containing more than 514 four-digit groups nested in 139 higher-level groups (three-digit), 47 two-digit groups, and 10 major groupings: management; business, finance and administrative; natural and applied sciences and related; health; social science, education, government service and religion; art, culture, recreation and sport; sales and service; trades, transportation, and equipment operators and related; primary industry; processing, manufacturing and utilities. It should be noted that direct comparison with American and certain European countries is difficult because occupation titles are not always the same between classifications. For this study, the grouping with 139 occupations was used.

Industry was measured using the four-digit codes of the 1997 North American Industry Classification System (NAICS) of *Statistics Canada* (2003). NAICS-1997 defines each industry based on a production-oriented, or supply-based, conceptual framework. Establishments are grouped into industries according to the similarity in the production processes used to produce goods and services. The classification has a hierarchical structure in which 321 four-digit small groups are nested in 99 sub-sectors that are further included in 20 larger industries: agriculture, forestry, fishing and hunting; mining and oil and gas extraction; utilities; construction; manufacturing; wholesale trade; retail trade; transportation and warehousing; information and cultural industries; finance and insurance; real estate and rental and leasing; professional, scientific and technical services; management of companies and enterprises; administrative and support, waste management and remediation services; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food services; other services (except public administration); and public administration. After deletion of cases with missing values, the present study examined 95 sub-sectors in which workers responses were available for analysis.

Gender, age, marital status, household income, and education were controlled for in the analysis, as these variables are routinely associated with mental health outcomes (Almeida & Kessler, 1998; Booth & Lloyd, 2000; de Jonge et al., 2000; Grzywacz, 2000; Marchand et al., 2005a,b, 2006; Marchand, Durand, et al., 2005; Mausner-Dorsch & Eaton, 2000; McDonough, 2000; Niedhammer et al., 1998; Pugliesi, 1999; Shirom et al., 1999; Stansfeld et al., 1999; Soderfeldt et al., 1997; Turner et al., 1995). Gender was a dichotomous variable coded 0 for men and 1 for women, and age was measured in years. Marital status distinguished between people living together as a couple (coded 1) and those with other marital situations (coded 0). Household income was determined using a five-point ordinal scale (low/high) from Statistics Canada, which measured the level of sufficiency of income in relation to household size. Last, education level was measured using a ten-point ordinal scale ranging from 1 (8 years and less) to 10 (graduate studies diploma/certificate).

2.3. Analysis

The prevalence of workers reporting poorer mental health was estimated for each occupation and each industry. Because of the complex sample design, standard errors were bootstrapped to obtain robust 95% confidence intervals. Bootstrap weights were provided by Statistics Canada. Further analyses using logistic regression models were carried out to estimate the significance and magnitude of differences, by occupation and industry, in the odds of reporting poorer mental health. Using SAS 9.1, all models were adjusted for gender, age, education, marital status, and household income. Bootstrapped standard errors were estimated to establish significance of difference, as well as to calculate 95% confidence intervals. Bootstrap weights used in the computation were also provided by Statistics Canada. Occupations and industries were analysed separately and jointly to evaluate their main effects and possible mediation-suppressive effects (Baron & Kenny, 1986; Cohen & Cohen, 1975). Analysis used deviation contrast because it allowed comparing occupations and industries with the average probability of workers reporting poorer mental health. Reference categories were legislators—senior management for occupations, and farming not elsewhere classified for industries. Last, gender interactions with occupations and industries were evaluated separately. Since chi-square tests are also affected by complex sample designs (Rao & Scott, 1992), chi-square tests for significance were corrected for the design effect using $\chi^2_c = \chi^2 / \text{DEFF}$, where DEFF is the CCHS 2.1 average design effect.

3. Results

Table 1 presents the prevalence of workers reporting poorer mental health in twenty selected occupations and industries by lowest and highest prevalence in the sample.

The lowest prevalence observed was for managers in art, culture, recreation, and sport occupations (8.3%), and the wholesale agents and brokers industry (9.2%). The highest prevalence obtained was for machine operators and related

Table 1
Prevalence of workers reporting poorer mental health in twenty selected occupations and industries

Codes	Occupations/industries	%	95% CI
SOC-1991 10 lowest-prevalence/occupations			
A34	Managers in art, culture, recreation and sport	8.3	1.0–15.5
A38	Managers in primary production (except agriculture)	8.6	1.0–16.3
G61	Police officers and fire-fighters	9.8	5.9–13.7
D02	Optometrists, chiropractors and other health diagnosing and treating professionals	11.0	1.1–18.9
A01	Legislators and senior management	11.6	3.7–19.6
A39	Managers in manufacturing and utilities	12.0	7.9–16.2
E11	University professors and assistants	12.4	8.1–16.7
B02	Human resources and business service professionals	14.4	11.2–17.5
E03	Policy and program officers, researchers and consultants	14.6	9.8–19.4
J01	Supervisors, processing occupations	14.7	8.1–21.3
SOC-1991 10 highest-prevalence/occupations			
H82	Trades helpers and labourers	32.7	27.4–38.0
G93	Cleaners	33.1	29.9–36.2
I15	Logging machinery operators	33.5	21.6–45.5
H72	Train crew operating occupations	33.9	17.2–56.0
J31	Labourers in processing, manufacturing and utilities	35.2	29.2–41.3
H83	Public works and other labourers, n.e.c.	37.7	24.4–51.0
H62	Crane operators, drillers and blasters	39.1	24.2–54.1
J15	Machine operators and related workers in textile processing	39.2	21.6–56.9
J22	Other assembly and related occupations	40.9	32.1–49.7
J16	Machine operators and related workers in fabric, fur and leather products manufacturing	43.1	32.2–53.9
NAICS-1997 10 lowest-prevalence/industries			
419	Wholesale agents and brokers	9.2	1.0–17.4
412	Petroleum product wholesaler–distributors	11.1	1.0–22.1
211	Mining and oil and gas extraction	13.0	7.8–18.2
487	Scenic and sightseeing transportation	13.8	0.1–27.7
411	Farm product wholesaler–distributors	14.8	3.4–26.2
414	Personal and household goods wholesaler–distributors	15.7	9.8–21.6
483	Water transportation	15.7	5.1–26.3
324	Petroleum and coal products manufacturing	16.9	8.3–25.5
312	Beverage and tobacco product manufacturing	17.4	8.6–26.3
911	Federal government public administration	17.7	14.9–25.0
NAICS-1997 10 highest-prevalence/industries			
314	Textile product mills	38.0	16.9–44.7
336	Transportation equipment manufacturing	31.1	27.4–34.7
335	Electrical equipment, appliance and component manufacturing	31.5	22.0–41.0
332	Fabricated metal product manufacturing	31.7	26.6–36.9
442	Furniture and home furnishings stores	31.8	2.0–43.6
110	Farming n.e.c.	32.8	25.4–41.0
413	Food, beverage and tobacco wholesaler–distributors	33.1	24.7–41.4
315	Clothing manufacturing	33.2	24.4–42.0
482	Rail transportation	33.9	24.1–43.7
484	Truck transportation	34.1	29.9–38.4

CCHS 2.1. $N=77,377$.

Notes: n.e.c. = not elsewhere classified.

workers in fabric, fur, and leather products manufacturing occupations (43.1%), and the truck transportation industry (34.1%).

Table 2 presents the results of logistic regression analyses of risk differences between occupations and industries adjusted for gender, age, education, marital status, household income, and education, and further fully adjusted for both occupations and industries.

Table 2

Results of logistic regression analysis of risk differences in workers reporting poorer mental health, by occupation and industry

Occupation/industry ^a		OR ^b	95% CI	OR ^c	95% CI
SOC 1991					
H83	Public works and other labourers, n.e.c.	1.91	1.08–3.37	2.07	1.15–3.73
J22	Other assembly and related occupations	1.98	1.33–2.93	1.66	1.09–2.51
H42	Motor vehicle mechanics	1.57	1.22–2.00	1.54	1.14–2.07
H81	Longshore workers and material handlers	1.47	1.16–1.86	1.39	1.10–1.75
G96	Food counter attendants and kitchen helpers	1.32	1.05–1.66	1.37	1.05–1.79
G93	Cleaners	1.31	1.13–1.53	1.35	1.14–1.60
D31	Assisting occupations in support of health services	1.25	1.02–1.53	1.34	1.06–1.70
G41	Chefs and cooks	1.23	1.01–1.50	1.29	1.00–1.65
H11	Plumbers, pipefitters and gas fitters	1.48	1.03–2.12	ns	
H22	Stationary engineers and power station and system operators	1.70	1.04–2.79	ns	
H31	Machinists and related occupations	1.43	1.01–2.01	ns	
H41	Machinery and transportation equipment mechanics (except motor vehicle)	1.27	1.02–1.58	ns	
H62	Crane operators, drillers and blasters	2.11	1.12–3.97	ns	
H71	Motor vehicle and transit drivers	1.23	1.06–1.42	ns	
H82	Trades helpers and labourers	1.48	1.15–1.91	ns	
J16	Machine operators and related workers in fabric, fur and leather products manufacturing	1.96	1.21–3.17	ns	
J19	Machining, metalworking, woodworking and related machine operators	1.42	1.12–1.81	ns	
J31	Labourers in processing, manufacturing and utilities	1.39	1.08–1.81	ns	
J16	Machine operators and related workers in fabric, fur and leather products manufacturing	ns		2.35	1.22–4.54
G31	Cashiers	ns		1.35	1.10–1.65
B02	Human resources and business service professionals	0.64	0.49–0.84	0.68	0.51–0.90
B41	Clerical supervisors	0.66	0.46–0.95	0.66	0.46–0.95
G11	Sales representatives, wholesale trade	0.73	0.57–0.93	0.64	0.49–0.83
E11	University professors and assistants	0.54	0.36–0.81	0.57	0.37–0.89
G61	Police officers and fire-fighters	0.46	0.29–0.72	0.50	0.31–0.82
A39	Managers in manufacturing and utilities	0.49	0.33–0.73	0.41	0.28–0.62
A38	Managers in primary production (except agriculture)	0.34	0.13–0.92	0.36	0.14–0.97
B21	Secretaries, recorders and transcriptionists	0.76	0.61–0.96	ns	
D11	Nurse supervisors and registered nurses	0.76	0.62–0.94	ns	
E13	Secondary and elementary school teachers and counsellors	0.75	0.63–0.89	ns	
F15	Athletes, coaches, referees and related occupations	0.71	0.52–0.97	ns	
J01	Supervisors, processing occupations	ns		0.51	0.30–0.86
NAICS 1997					
413	Food, beverage and tobacco wholesaler–distributors	1.63	1.11–2.39	1.92	1.31–2.82
335	Electrical equipment, appliance and component manufacturing	1.58	1.02–2.44	1.77	1.12–2.79
484	Truck transportation	1.57	1.28–1.93	1.64	1.29–2.10
336	Transportation equipment manufacturing	1.56	1.30–1.87	1.61	1.29–2.01
339	Miscellaneous manufacturing	1.47	1.02–2.13	1.46	1.01–2.11
332	Fabricated metal product manufacturing	1.40	1.11–1.78	1.42	1.08–1.86
482	Rail transportation	1.64	1.02–2.62	ns	ns
623	Nursing and residential care facilities	1.21	1.01–1.46	ns	ns
331	Primary metal manufacturing	ns		1.62	1.04–2.51
416	Building material and supplies wholesaler–distributors	ns		1.50	1.03–2.19
325	Chemical manufacturing	ns		1.47	1.03–2.10
444	Building material and garden equipment and supplies dealers	0.66	0.50–0.88	0.61	0.45–0.82
621	Ambulatory health care services	0.84	0.70–0.99	ns	ns
611	Educational services	0.82	0.72–0.93	ns	ns
414	Personal and household goods wholesaler–distributors	0.60	0.37–0.96	ns	ns

CCHS 2.1. $N=77,377$.

Notes: n.e.c. = not elsewhere classified; ns = non-significant.

References: legislators–senior management (occupation), farming n.e.c. (industry).

^a Only occupations with $p < .05$ are shown.^b Adjusted for gender, age, education, marital status, and household income.^c Adjusted for gender, age, education, marital status, household income, occupations and industries.

Without adjusting for industries and comparing the 139 occupations with the occupations' average probability risk of workers reporting poorer mental health, eleven occupations were found to be at lower risk and eighteen at higher risk. ORs ranged from 0.34 (95% CI=0.13–0.92) to 2.11 (95% CI=1.12–3.97). The overall contribution of occupation is $\chi^2_c=258.4$, $df=138$, $p=0.00$. Of the 10 major occupational groupings of SOC-1991, only natural and applied sciences and related occupations group, and occupations unique to the primary industry group did not have occupations with risks that were significantly different from the average risk of reporting poorer mental health. As for industries, the overall contribution is $\chi^2_c=186.5$, $df=94$, $p=0.00$ and thirteen industries were significantly associated with the outcome. ORs for the five lowest risk sectors ranged from 0.56 (95% CI=0.35–0.92) to 0.84 (95% CI=0.70–0.99); and ORs for the eight highest risk sectors range from 1.21 (95% CI=1.01–1.46) to 1.64 (95% CI=1.02–2.62).

When both occupations and industries were taken simultaneously into account in the analysis, eighteen occupations and ten industries were found to be significantly associated with reported poorer mental health. The contribution of occupations and industries jointly gave $\chi^2_c=401.4$, $df=233$, $p=0.00$. Moreover, the results highlight mediation and suppression effects (Baron & Kenny, 1986; Cohen & Cohen, 1975). At the occupation level, fourteen occupations in Table 2 were no longer significant and three new job titles appeared instead: human resources and business service professionals, cashiers, and supervisors of processing occupations. Overall, three major groupings of SOC-1991 did not have occupations with risks that differed significantly from the average risk of reporting poorer mental health: natural and applied sciences and related occupations; occupations in art, culture, recreation and sport; and occupations unique to primary industry. At the industry level, seven industries lost their significance and three new ones emerged: chemical manufacturing; primary metal manufacturing; and building material and supplies wholesaler–distributors. Of the twenty major groupings of NAICS-1997, higher risks of poorer mental health appeared to be concentrated in four industries: manufacturing; wholesale; retail trade; transportation and warehousing.

Last, gender interactions were tested and found not significant. Results give $\chi^2_c=73.69$ $df=138$ $p=0.99$ for occupations and $\chi^2_c=47.70$ $df=94$ $p=0.99$ for industries.

4. Discussion

This article presents the results of a research study that evaluated the risks of reporting poorer mental health for 139 occupations and 95 industries in the Canadian labour force. Data from 77,377 workers interviewed in Cycle 2.1 of the Canadian Community Health Survey were analysed using logistic regression and adjusted for gender, age, education, marital status, and household income.

With regard to the contribution of occupations, the results reported here help identify a group of higher-risk occupations. These results advance our knowledge in this field in tangible ways by providing a clearer picture of work-related mental health risks in Canada, particularly as compared with previous studies, which had used very limited occupation classifications (Vermeulen & Mustard, 2000; Wilkins & Beaudet, 1998) or were limited to one province, or both (Marchand, Durand, et al., 2005; Vezina & Gingras, 1996). Nevertheless, it appears that the extent of the specific contribution of occupations in explaining variations in worker reporting of poorer mental health is rather low, as can be observed by the magnitude of the odds ratios. This last observation is consistent with recent reports (Bultmann et al., 2001; Marchand et al., 2005a,b, 2006; Marchand, Durand, et al., 2005; Wieclaw et al., 2005) and suggests that mental health problems are widely distributed among members of the labour force.

Occupations still, however, show significant variations with prevalence estimates for workers reporting poorer mental health ranging from 8 to 43%. Of the occupations studied here, ten emerge as being at higher risk for workers reporting poorer mental health, and eight at lower risk. The risky occupations are concentrated in four of the ten major groupings of SOC-1991: 1) health; 2) sales and service; 3) trades, transportation and equipment operators, and related occupations; 4) occupations unique to processing, manufacturing, and utilities. When the analysis compares the average probabilities between occupations, higher-risk occupations have between 1.3 and 2.4 times the risk that workers will report poorer mental health. However, since the 95% confidence intervals for these estimates overlap for the most part, no significant differences in the risk of workers reporting poorer mental health are expected among the ten higher-risk occupations, which translates into an average odds ratio of 1.57 (57%).

In the health occupations, the risk of poorer mental health is most pronounced in a sub-group of occupations (assisting occupations that support health services) consisting of three specific jobs: dental assistants; nurse aides and orderlies; and other aides and assistants. In sales and service occupations, chefs and cooks, cashiers, and cleaners (light-duty cleaners, specialized cleaners, janitors, caretakers, and building superintendents) have a greater tendency to report

poorer mental health. For the trades and for transportation and equipment operators and related occupations, higher-risk occupations are found to include longshore workers and material handlers, motor vehicle mechanics, and public works and other labourers. Last, in the SOC-1991 major occupational groupings that cover processing, manufacturing, and utilities occupations, two sub-groups appear to be at greater risk for reporting poorer mental health: machine operators and related workers in fabric, fur and leather products, and other assembly and related occupations.

Each of these occupations may have, of course, its own work organisation conditions that may explain the higher prevalence of poorer mental health. For example, irregular work schedules and job insecurity may be determinants of poorer mental health outcomes for cashiers, whereas physical demands more strongly influence mental health outcomes in longshore workers and material handlers. Exposure to neurotoxic substances and repetitive movements might also be at play in cleaning and some manufacturing occupations. However, the results suggest that these blue- and white-collar occupations found to be riskier in this study require fewer qualifications while offering more stressful job conditions (Marchand, Durand, et al., 2005). The ten higher-risk occupations also appear to be lower in the occupational hierarchy operating within firms as well as in the larger labour market and some of them may be similar to the elementary (unskilled) sales and services occupations reported in the Hordaland Health Study (Sanne et al., 2003). The results thus give some support to the association between employment grade and mental health found in the Whitehall (Fuhrer et al., 1999; Hemingway et al., 1997; Stansfeld et al., 2003) and GAZEL cohort studies (Paterniti et al., 2002). Nevertheless, further research and interventions are needed to more closely analyse the nature of the work organisation conditions in these ten occupations that may be stressful for workers. Closer examination in these groups of the demand-control (Karasek, 1979; Karasek & Theorell, 1990) and effort-reward imbalance (Siegrist, 1996) models might help in identifying the mechanisms generating workers' self perception of poorer mental health.

Turning now to variations in workers' reports of poorer mental health by industry, the results of this study help bridge the gap in the research literature. Based on the data analysed here, however, it appears that the magnitude of the contribution of industries is, as was observed for occupations, also rather low, as can be seen from the values for the odds ratios in Table 2. Nevertheless, the results shed new light on the association between poorer mental health in workers and industries. Of the ninety-five industries analysed, nine of them appear to be at significantly higher risk for workers reporting poorer mental health; only one is at lower risk compared to the average industry effect. Higher-risk industries have between 1.4 and 1.9 times the risk that workers will report poorer mental health compared to the average probability. Here again, however, the 95% confidence intervals for these estimates overlap. No significant differences in risk are thus expected. The risk of workers reporting poorer mental health in these nine sectors is estimated to average 1.60 (60%) greater than the average. The prevalence of this outcome by industry ranges from 9 to 34%.

Higher-risk industries are mainly concentrated in three major groupings of NAICS-1997: 1) manufacturing; 2) wholesale trade; 3) transportation and warehousing. Together, these industries employed 35% of the Canadian workforce in 2003 (Statistics Canada, 2006). Higher-risk sub-sectors found in manufacturing are: fabricated metal product manufacturing; chemicals; transportation equipment; primary metals; electrical equipment, appliance, and component manufacturing; and miscellaneous manufacturing. For the wholesale trade industry, workers are at higher risk of reporting poorer mental health in building material and supplies wholesaler-distributors and in the food, beverage, and tobacco sub-sectors. Finally, truck transportation is the high-risk sub-sector in the transportation and warehousing major grouping of NAICS-1997. Overall, most of the industries found to be at higher risk of poorer mental health in this study are at variance with the ones reported by Vezina and Gingras (1996). These results suggest some shift in risk between 1987 and 2003, and may indicate the development of increasingly stressful work organisation conditions in these industries over the last 15 years. Greater attention might be devoted to these industries in order to closely investigate what is going wrong in workplaces operating in these groups.

The results of this study clearly indicate the need to analyse occupations and industries jointly, because mediation and suppressive effects were observed. When accounting simultaneously for both these factors, thirteen occupations and seven industries lose their significance (mediation effect), whereas three job titles and industries emerge as contributing to the risk that workers might report poorer mental health (suppressive effect). To gain a clearer picture of the occupations and industries at higher risk for poorer mental health outcomes among workers, it will be important for future studies to take these two factors into account together.

The present study nevertheless has limitations. First of all, the data are cross-sectional, which implies that the relationships observed cannot be interpreted causally and will need to be replicated longitudinally. A selection mechanism might be at play in which some jobs may attract individuals vulnerable to mental health problems (Wieclaw

et al., 2005). Second, mental health was measured with a single item that asked respondents to evaluate their own mental health. While multi-item instruments, like the General Health Questionnaire (Goldberg, 1972), may provide a better assessment of mental health imbalances, the prevalence estimate of 24.0% of workers reporting poorer mental health obtained here approximates the magnitude of prevalences reported in occupational mental health studies using multi-item scales (Daveluy et al., 2000; ILO, 2000; Marchand et al., 2005a,b, 2006; Marchand, Durand, et al., 2005; Stansfeld et al., 1999). Third, in order to provide a clearer picture of occupations and industries at risk, further research must incorporate explicitly the work organization conditions of individuals because they have been associated with mental health outcomes. They operate within organizational components like task design (ex: skill used, decision authority), demands (ex: psychological, physical, contractual), social relations (ex: social support of colleagues and supervisors) and gratifications (ex: professional income, prestige, career perspective). However, previous studies seem to indicate that beyond the contribution of these factors, mental health still varies between occupations (Marchand et al., 2005a,b, 2006) and the present study helps in identifying specific occupations and industries where workers are at greater risk. Last, this study was unable to find any significant gender interaction suggested in previous research (Sanne et al., 2003; Vermeulen & Mustard, 2000; Wieclaw et al., 2005; Wilkins & Beaudet, 1998). While it is important to correct chi-square tests for complex sampling design (Rao & Scott, 1992), the approximate method used here to adjust chi-square tests for the CCHS 2.1 design effect may offer a conservative test of the interaction effect. Without this correction, gender interactions would have been $p=0.01$ for occupations and $p=0.04$ for industries. This implies that further research is needed to better evaluate the moderating effect of gender on the relationship between occupations/industries and mental health. Stratification by gender (Messing, Tissot, Saurel-Cubizolles, Kaminski, & Bourguine, 1998) might help in conducting additional analysis to discover possible gender variations of the contributions of occupations and industries on this outcome.

In conclusion, this study demonstrates that certain occupations and industries in Canada favour conditions where workers are at higher risk of reporting poorer mental health independently of their individual characteristics (i.e., gender, age, education, marital status, household income). While the magnitude of the contribution of occupations and industries is relatively small, it could nevertheless be possible to envisage interventions and public health policies that target specific segments of the labour market where more workers have more mental health problems and where pathogenic work organisation conditions are no doubt at play. The prevention of mental health problems at work is surely one of the most important challenges ahead in the coming years. To this end, the present study identifies priority groups on which actors and policymakers in occupational health and safety would do well to focus. Further research is necessary as the ten occupations and the nine industries identified here might hide undiscovered risk factors for workers mental health that need to be better investigated.

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