

# Chronic back problems among workers

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## Abstract

### Objectives

This article examines associations between selected work- and non-work-related factors and the incidence of chronic back problems over the next two years.

### Data source

The data are from the longitudinal household component of the National Population Health Survey, conducted by Statistics Canada. The analysis is based on 3,234 male and 3,129 female respondents who, in 1994/95, were aged 16 or older, employed, rated their health as good, very good or excellent, and reported no diagnosed chronic back problems.

### Analytical techniques

All analyses were weighted to represent the Canadian population in 1994/95. Unadjusted cross-tabulations and multiple logistic regression were used to examine the associations between respondents' characteristics in 1994/95 and newly diagnosed chronic back problems in 1996/97.

### Main results

More than 1 million (9%) Canadian workers aged 16 or older developed chronic back problems between 1994/95 and 1996/97. Back injury, chronic stress, depression, and being aged 40 to 49 were significantly associated with subsequent chronic back problems.

### Key words

back pain, disability, stress, depression, psychological stress, occupational health

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Back problems are a major health concern in Canada and other industrialized nations.<sup>1,2</sup> It has been estimated that between 70% and 85% of the population will have a back problem of some kind in their lifetime, and while many of these problems may be short-term, those that develop into a chronic condition can have serious ramifications (see *Living with chronic back problems*).<sup>3</sup>

In addition to pain and possible disability, chronic back problems can have negative financial consequences for individuals, their employers, and insurance providers. A work-related back injury is, in fact, a frequently compensated disability claim, and a major cause of lost work time.<sup>1</sup> A chronic back problem may also have psychological consequences, not only for the individuals affected, but also for their families.<sup>4-6</sup>

Work-related back problems have been studied extensively. In addition to physical factors such as exertion on the job and the amount of time spent sitting, research has examined psychosocial conditions and stress. However, the results are far from consistent. Much of this inconsistency stems from differences in the outcomes studied: new and repeated, acute and chronic problems;

## Methods

### Data source

This article is based on Statistics Canada's National Population Health Survey (NPHS). The NPHS, which began in 1994/95, collects information about the health of the Canadian population every two years. It covers household and institutional residents in all provinces and territories, except persons living on Indian reserves, Canadian Forces bases, and in some remote areas. The NPHS has both a longitudinal and a cross-sectional component. Respondents who are part of the longitudinal component will be followed for up to 20 years.

Individual data are organized into two files: General and Health. Socio-demographic and some health information was obtained for each member of participating households. These data are found in the General file. Additional, in-depth health information was collected for one randomly selected household member. The in-depth health information, as well as the information in the General file pertaining to that individual, is found in the Health file.

Among individuals in the longitudinal component in 1996/97, the person providing in-depth health information about himself or herself for the Health file was the randomly selected person for the household in cycle 1 (1994/95) and was usually the person who provided information on all household members for the General file in cycle 2.

The 1994/95 provincial, non-institutional sample consisted of 27,263 households, of which 88.7% agreed to participate in the survey. After the application of a screening rule (to avoid over-representation of people in small households—typically, single or elderly people), 20,725 households remained in scope. In 18,342 of these households, the selected person was aged 12 or older. Their response rate to the in-depth health questions was 96.1%, or 17,626 respondents. Of these 17,626 randomly selected respondents, 14,786 were eligible members of the NPHS longitudinal panel, along with 468 persons for whom only general information was collected. And 2,022 of the 2,383 randomly selected respondents under age 12 were also eligible. Thus, 17,276 respondents were eligible for re-interview in 1996/97.

A response rate of 93.6% was achieved for the longitudinal panel in 1996/97. Of these 16,168 respondents, 15,670 provided full information; that is, general and in-depth health information for both cycles of the survey.

A more detailed description of the NPHS design, sample, and interview procedures can be found in published reports.<sup>7,8</sup>

The analysis in this article is primarily based on longitudinal data

from the household component of the first (1994/95) and second (1996/97) cycles of the NPHS for the 10 provinces. Of the 15,670 people providing full information, 6,363 (3,234 men and 3,129 women) were retained for the analyses in Tables 1 and 2 because, in 1994/95, they had reported no chronic back problems, reported good, very good or excellent overall health, were working, and were aged 16 or older.

### Analytical techniques

The factors that precede a diagnosis of chronic back problems, the independent variables, refer to responses provided in 1994/95, while the presence or absence of a chronic back problem, the dependent variable, refers to responses provided in 1996/97 (Appendix Tables A and B). To reduce the possibility that negative psychological indicators resulted from poor health status in general or from chronic back problems existing in 1994/95, only respondents who had reported that their overall health was good, very good or excellent and who did not report a chronic back problem in 1994/95 were included in the analysis (see *Limitations*). (Including respondents with any response for self-perceived health in the multivariate model did not change the significance of the results—data not shown). The analysis was restricted to respondents who were working in 1994/95; they may or may not have been working in 1996/97.

With data from the longitudinal file, cross-tabulations were used to estimate the percentage of healthy Canadian workers aged 16 or older who had been diagnosed with a chronic back problem in the two years between 1994/95 and 1996/97, by selected work- and non-work-related characteristics (see *Definitions* in *Appendix*). Multiple logistic regression was used to model associations between these characteristics and the diagnosis of a new chronic back problem. To maximize sample size, data for men and women were combined. For the same reason, "missing value" categories were included for most independent variables, but their odds ratios are not shown in the tables.

A number of psychosocial variables (for instance, job strain, chronic stress, mastery) were measured with scales. To determine cut-off points in these scales, weighted distributions of the cross-sectional file (1994/95 or 1996/97, depending on the variable) were used because the sample size is larger than that of the longitudinal file.

All estimates were weighted to represent the 1994/95 Canadian population.

To account for complex survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique.<sup>9</sup> Results at the 0.05 level were considered statistically significant.

upper back, lower back, and general musculoskeletal disorders; pain; and disability.

Some research has focussed on only one industry or occupation,<sup>2,10-18</sup> or on one sex.<sup>10,19</sup> Other studies have restricted the age of participants<sup>11,20</sup> or recruited subjects from clinic populations.<sup>20-23</sup> Several reports have not controlled for the level of physical demand on the job.<sup>4,24</sup> And a substantial

number of studies have used cross-sectional data.<sup>10,12,13,22,25-27</sup> Because the sequence of events in these studies is unknown, the nature of associations (cause, effect or concomitant back problems) is even more difficult to determine.

Consequently, it is difficult to generalize results and identify individuals at higher risk of developing chronic back problems.<sup>3</sup>

### Living with chronic back problems

A chronic back problem is a relatively common condition. According to the 1996/97 National Population Health Survey (NPHS), an estimated 3.1 million Canadian adults, or 13.6% of the population aged 16 or older, reported that they had such a problem. In a variety of ways, the health of people with a chronic back problem differed substantially from that of people not afflicted. (However, it is not possible to determine if these differences resulted from the presence of the back problem.)

An activity restriction is a limitation (due to a long-term physical or mental condition or health problem) on the kind or amount of activity in which an individual can engage. Almost 4 in 10 people (39%) with a diagnosed chronic back problem reported that they had an activity restriction, compared with 13% of people without such a problem. As well, a relatively low percentage of those with a chronic back problem reported that they were usually free of pain or discomfort.

In the two weeks before their NPHS interview, significantly higher proportions of people with a chronic back problem than without had cut down on their activities or spent days in bed. They also reported more disability days for that two-week period.

In the month before their interview, people with a chronic back problem were more likely than those without such a problem to have used pain relievers and codeine, Demerol or morphine. There was also a significant difference between the two groups in the proportion who had used antidepressants.

People with a chronic back problem also tended to be relatively frequent users of health care services. They averaged more consultations with physicians, physiotherapists and chiropractors than did people without a chronic back problem. And compared with the latter group, they were more likely to have consulted an alternative health care provider, to have consulted a health professional about their mental or emotional health, or to have had massage therapy. On the other hand, the average number of days that the two groups had spent in hospital in the previous year did not differ significantly.

#### Health status, health care utilization and drug use, by diagnosis of a chronic back problem, household population aged 16 or older, Canada excluding territories, 1996/97

	Diagnosed chronic back problem	
	Yes	No
<b>Activity restriction (%)</b>	38.9*	13.1
<b>Usually free of pain or discomfort (%)</b>	63.3*	90.1
<b>In last two weeks:</b>		
Cut down on activities (%)	19.8*	8.2
Stayed in bed (%)	9.8*	5.0
Mean number of disability days	1.7*	0.6
<b>In last month:</b>		
Used pain relievers (%)	75.3*	62.2
Used codeine/Demerol/morphine (%)	9.9*	3.8
Used antidepressants (%)	7.1*	3.1
<b>In last year:</b>		
Mean number of physician consultations	6.4*	3.8
Mean number of physiotherapist visits	2.8*	0.6
Mean number of chiropractor visits	3.5*	0.6
Had massage therapy (%)	8.1*	2.5
Consulted health professional about mental/emotional health (%)	10.5*	5.9
Consulted alternative health care provider† (%)	14.2*	5.6
Mean number of hospital days	1.1	0.7

**Data source:** 1996/97 National Population Health Survey, cross-sectional sample, Health file

**Note:** Non-respondents included in denominators of proportions  
†Includes massage therapy.

\* Significantly different from no diagnosed chronic back problem

Table 1

Percentage of population aged 16 or older and employed in 1994/95 who reported a new diagnosis of a chronic back problem in 1996/97, by selected characteristics in 1994/95, Canada excluding territories

	Newly diagnosed chronic back problem in 1996/97		Newly diagnosed chronic back problem in 1996/97
	%		%
<b>Total</b>	8.9	<b>High job insecurity<sup>§</sup></b>	
		Yes	9.8
		No	8.5
<b>Back injury in 1994/95</b>		<b>Low emotional support at work<sup>§</sup></b>	
Yes	23.9 <sup>†</sup>	Yes	10.2
No	8.3	No	8.3
<b>Back injury in 1996/97</b>		<b>Low job satisfaction<sup>§</sup></b>	
Yes	43.3 <sup>†</sup>	Yes	9.7
No	8.3	No	8.7
<b>Socio-demographic characteristics</b>		<b>Non-work psychosocial factors</b>	
<b>Sex</b>		<b>High personal stress<sup>§</sup></b>	
Men	8.6	Yes	10.3 <sup>†</sup>
Women	9.2	No	8.1
<b>Age group</b>		<b>High chronic stress<sup>§</sup></b>	
16-29	7.8	Yes	11.6 <sup>†</sup>
30-39	8.1	No	7.9
40-49	10.1 <sup>†</sup>	<b>High family stress<sup>§</sup></b>	
50-59	9.9	Yes	10.0 <sup>†</sup>
60+	9.9	No	8.1
<b>Education</b>		<b>Low emotional support<sup>§</sup></b>	
Secondary graduation or less	9.8	Yes	10.5
Some postsecondary	8.7	No	8.5
Postsecondary graduation	7.4	<b>Low mastery<sup>§</sup></b>	
<b>Household income<sup>§</sup></b>		Yes	10.0
Middle or less	9.0	No	8.5
Upper-middle	9.0	<b>Symptoms of depression<sup>§</sup></b>	
Highest	9.1	Yes	14.1 <sup>†</sup>
<b>Employment characteristics</b>		No	8.5
<b>Physical exertion at work<sup>§</sup></b>		<b>Health behaviour</b>	
High	9.9 <sup>††</sup>	<b>Smoking</b>	
Neutral	10.7 <sup>††</sup>	Non-smoker	8.3
Low	7.1	Occasional	9.0
<b>Occupation</b>		Daily	10.5 <sup>§§</sup>
Administrative	9.3	<b>Alcohol consumption</b>	
Professional	9.0	Non-drinker	9.0
Sales	7.4	Occasional	8.8
Service	7.8	Regular	8.9
Blue-collar	10.4 <sup>††</sup>	<b>Active in leisure time<sup>§</sup></b>	
Clerical	7.5	Yes	8.8
<b>High job strain<sup>§</sup></b>		No	8.8
Yes	9.1		
No	8.5		

**Data source:** 1994/95 and 1996/97 National Population Health Survey, longitudinal sample, Health file

**Note:** Except for "back injury in 1996/97," characteristics refer to 1994/95. Analysis is based on 3,234 men and 3,129 women who, in 1994/95, had been working, had reported good, very good or excellent overall health and had not reported chronic back problems. Data were weighted to represent the 1994/95 population.

<sup>†</sup> Significantly higher than absence of characteristic ( $p \leq 0.05$ )

<sup>‡</sup> Significantly higher than ages 16 to 29 ( $0.05 < p \leq 0.06$ )

<sup>§</sup> The logistic regression model used to determine statistical significance included a "missing" category.

<sup>††</sup> Significantly higher than low physical exertion at work ( $p \leq 0.05$ )

<sup>††</sup> Significantly higher than clerical occupations ( $p \leq 0.05$ )

<sup>§§</sup> Significantly higher than non-smoker ( $p \leq 0.05$ )

Based on data from the first and second cycles of the National Population Health Survey (NPHS), this analysis estimates the incidence of chronic back problems between 1994/95 and 1996/97 among people who, in 1994/95, were aged 16 or older; were employed; rated their health as good, very good or excellent; and did not report diagnosed chronic back problems (see *Methods* and *Limitations*). To identify individuals at risk, factors such as back injury, occupation, physical exertion on the job, psychosocial conditions at and outside of work, demographic characteristics, and health behaviours are examined for associations with newly diagnosed chronic back problems.

### One million new cases

An estimated 8.9% of people aged 16 or older who had been working in 1994/95 had developed chronic back problems by 1996/97 (see *Definitions* in *Appendix*). This amounted to over 1 million new cases. Contrary to the findings of a recent British study,<sup>28</sup> in Canada, the two-year incidence was similar among male and female workers: 9.2% and 8.6%, respectively (Table 1). Chronic back problems tended to be somewhat more common in middle age: workers aged 40 to 49 had an incidence rate of over 10%, compared with less than 8% for 16- to 29-year-olds. Two-year incidence did not differ significantly by education or household income.

### Physical dimension important

Any examination of factors associated with back problems cannot ignore the physical dimension.<sup>17,19,29</sup> The initial episode that eventually develops into a chronic problem may stem from or be complicated by an injury. In fact, 43% of people who had been working in 1994/95 and who had suffered an acute back injury in 1996/97 also reported a newly diagnosed chronic back problem. The proportion was lower, but at 24% still significant, among workers who had sustained a back injury in 1994/95.

Heavy exertion may increase the chances of some type of back problem, which may, in turn, become chronic.<sup>4</sup> Among workers reporting that their jobs in 1994/95 had entailed high or neutral physical exertion, an estimated 10% and 11%, respectively,

had developed a chronic back problem by 1996/97. The comparable figure for those in positions requiring low exertion was 7%. However, as with most NPHS data, physical exertion is self-reported, and perceptions may vary among individuals performing similar tasks. People who perceive greater physical exertion may be prone to developing a chronic back problem. It has also been suggested that those who are already experiencing pain may overestimate physical exertion,<sup>10</sup> or may exert themselves more than their pain-free counterparts.

Some occupations, of course, are quite physically demanding.<sup>1,2,11</sup> The NPHS data show that over 10% of people who had been in blue-collar jobs in 1994/95 went on to develop a chronic back problem by 1996/97, significantly higher than the corresponding figure for clerical workers (8%).

### Work stressors

Back problems may be linked to factors other than injury and physical exertion.<sup>4,5,30,31</sup> Various associations with psychosocial variables have been studied widely over the last 20 years, with the conceptual models generally falling into four categories:<sup>6</sup>

- Psychological demands may increase muscle tension and exacerbate task-related strain.
- Psychosocial demands may affect awareness and reporting of musculoskeletal symptoms and/or perceptions of their cause. This explanation includes the “perverse incentive” view, in which individuals are provided with “incentives” such as Workers’ Compensation that may lead to overreporting musculoskeletal symptoms.
- Initial episodes of pain based on a physical injury may trigger a chronic nervous system dysfunction, psychological as well as physiological, which perpetuates chronic pain.
- In some work situations, changes in physical demands may be associated with changes in psychological demands, and the direction of the associations may vary.

But while work-related psychosocial factors have been said to play a role in musculoskeletal problems,<sup>9,32</sup> the results of research have been

inconclusive.<sup>6</sup> Several reports have found low emotional support at work to be associated with back problems,<sup>4,6,12,13,25</sup> but another study found no association.<sup>10</sup> One study observed such a relationship for factory workers, but not for office workers.<sup>14</sup> Other research has noted associations between job strain<sup>25</sup> or its individual components (low skill discretion,<sup>33</sup> low decision authority,<sup>6,12</sup> or high psychological demands<sup>10,12,13,25</sup>) and low back pain or musculoskeletal disease. One of these,<sup>25</sup> however, detected no significant association between decision latitude and musculoskeletal disease. The findings relating low job satisfaction and back problems have also been mixed.<sup>6,13,25,28,32</sup>

According to the NPHS, the two-year incidence rate of chronic back problems among workers who had been experiencing various forms of work stress in 1994/95 were not significantly different from the rates among workers who had not experienced such stress.

### **Personal stress, depression precede problems**

Non-work psychological and social factors can also play a role in back trouble.<sup>3,12,20,24,34</sup> Indeed, the NPHS data show several psychosocial factors to be related to a new diagnosis of a chronic back problem among people who had been working in 1994/95. Two years later, at least 10% of those who had been experiencing high personal, chronic or family stress had developed a chronic back problem. These rates were significantly above those for workers whose stress levels had not been high. On the other hand, the percentages of workers with low emotional support and a low sense of mastery who had developed a chronic back problem were not significantly different from those for workers whose emotional support and sense of mastery had not been low.

Depression has been reported to be a predictor of first-time lower back pain,<sup>35</sup> and a significant but weak predictor of musculoskeletal pain.<sup>36</sup> One study observed that roughly half the depression associated with chronic lower back pain precedes the pain, while the other half follows it.<sup>21</sup> Yet another analysis,

of male subjects only, suggested that depression followed but did not precede chronic lower back pain.<sup>37</sup>

NPHS data indicate a relationship between depression and a subsequent chronic back problem. About 14% of workers who reported symptoms of depression in 1994/95 had developed a chronic back problem two years later. This was significantly above the percentage for workers who had not experienced such symptoms (9%).

### **Lifestyle**

The only lifestyle factor explored in this analysis that seems to be related to the appearance of a chronic back problem was smoking. The percentage of daily smokers who developed a chronic back problem was 11%, compared with 8% of non-smokers. This echoes the findings of other studies.<sup>22,25</sup> However, unlike some other research,<sup>3</sup> the two-year incidence rate for chronic back problems was not significantly associated with alcohol consumption or physical activity in leisure time.

### **Injury, stress, depression remain significant**

Of course, many of the factors related to back problems are interrelated. For example, it is likely that blue-collar occupations entail relatively high physical exertion, and that high physical exertion might result in a back injury. As well, people experiencing various forms of stress might be particularly susceptible to depression. They might also be more likely to smoke.

When such possible confounding relationships were taken into account, a newly diagnosed chronic back problem was significantly associated with back injury (Table 2). For workers who had been injured in 1994/95, the odds of a new chronic back problem were over three times as high as those for workers who had not sustained such an injury, and more than eight times as high as for those who had been injured in 1996/97.

And even while controlling for back injury, along with the other selected variables, the odds of a newly diagnosed chronic back problem among workers in

jobs that required high physical exertion, compared with those in jobs requiring low exertion, almost reached statistical significance.

Also notable is that workers aged 40 to 49 had significantly high odds of developing a chronic back problem, compared with those aged 16 to 29.

None of the selected job-related stressors was significantly related to having a new chronic back

problem. However, the odds for two non-work psychosocial factors—chronic stress and depression—were significant. Workers who reported high chronic stress had 1.5 times the odds of developing such a problem, compared with workers not exposed to high chronic stress. Similarly, workers who had experienced depressive symptoms in the 12 months before their 1994/95

Table 2  
Adjusted odds ratios for reporting a new chronic back problem in 1996/97, population aged 16 or older and employed in 1994/95, by selected characteristics in 1994/95, Canada excluding territories

	Odds ratio	95% confidence interval		Odds ratio	95% confidence interval
<b>Back injury</b>					
In 1994/95	3.22*	2.05, 5.04	<b>High job strain††</b>	1.08	0.79, 1.47
In 1996/97	8.57*	4.74, 15.47	<b>High job insecurity††</b>	1.12	0.80, 1.56
<b>Socio-demographic characteristics</b>			<b>Low emotional support at work††</b>	1.15	0.78, 1.69
<b>Sex</b>			<b>Low job satisfaction††</b>	0.97	0.59, 1.58
Men†	0.83	0.61, 1.13	<b>Non-work psychosocial factors</b>		
Women	1.00	...	<b>High personal stress††</b>	1.10	0.83, 1.46
<b>Age group</b>			<b>High chronic stress††</b>	1.49*	1.13, 1.98
16-29§	1.00	...	<b>High family stress††</b>	1.00	0.78, 1.29
30-39	1.11	0.79, 1.55	<b>Low emotional support††</b>	1.16	0.82, 1.64
40-49	1.44*	1.01, 2.04	<b>Low mastery††</b>	0.97	0.71, 1.33
50-59	1.45	0.98, 2.16	<b>Symptoms of depression††</b>	1.66*	1.08, 2.54
60+	1.77 <sup>a</sup>	0.98, 3.18	<b>Health behaviour</b>		
<b>Education</b>			<b>Smoking</b>		
Secondary graduation or less	1.32	0.83, 2.10	Non-smoker§	1.00	...
Some postsecondary	1.17	0.78, 1.76	Occasional	1.21	0.71, 2.07
Postsecondary graduation§	1.00	...	Daily	1.15	0.88, 1.50
<b>Household income‡</b>			<b>Alcohol consumption</b>		
Lowest, lower-middle or middle	0.88	0.61, 1.26	Non-drinker§	1.00	...
Upper-middle	0.96	0.68, 1.34	Occasional	0.93	0.64, 1.35
Highest§	1.00	...	Regular	0.98	0.69, 1.38
<b>Employment-related factors</b>			<b>Active in leisure time††</b>	1.01	0.76, 1.34
<b>Physical exertion at work‡</b>					
High	1.39 <sup>a</sup>	0.99, 1.94			
Neutral	1.54	0.95, 2.48			
Low§	1.00	...			
<b>Occupation</b>					
Administrative	1.34	0.90, 1.99			
Professional	1.25	0.78, 1.98			
Sales	0.99	0.59, 1.66			
Service	0.96	0.60, 1.55			
Blue-collar	1.26	0.82, 1.94			
Clerical§	1.00	...			

**Data source:** 1994/95 and 1996/97 National Population Health Survey, longitudinal sample, Health file

**Note:** Except for "back injury in 1996/97," characteristics refer to 1994/95. Analysis is based on 6,369 respondents (24 were dropped because of missing values in explanatory variables) who, in 1994/95, had been working, had reported good, very good or excellent overall health, and had not reported chronic back problems. Data were weighted to represent the 1994/95 population.

† Reference category is absence of characteristic.

‡ To maximize sample size, a missing category was created for this variable, but the odds ratio is not shown.

§ Reference category

... Not applicable

\*  $p < 0.05$

<sup>a</sup>  $0.05 < p \leq 0.06$

interview had 1.7 times the odds of a subsequent chronic back problem, compared with those who had not had depression.

By contrast, when the confounding effects of other variables were considered, personal and family stress were not significantly associated with the diagnosis of a chronic back problem. These forms of stress may be correlated with chronic stress, and therefore, may not add much explanatory power to the model. And because it is a measure of dissatisfaction with oneself, personal stress may also be associated with depression.

The odds that workers in blue-collar occupations would develop a chronic back problem were not significantly higher than those for clerical workers. Nor was there any association with smoking. And although heavy drinking has been associated with back trouble in men,<sup>37</sup> this analysis found no association with alcohol consumption.

### **Concluding remarks**

In this analysis of data from the National Population Health Survey, as in much of the literature, there were many unadjusted associations with newly

### **Limitations**

The National Population Health Survey (NPHS) defined a chronic back problem as one that had lasted or was expected to last more than six months, that was not due to arthritis, and that had been diagnosed by a health professional. This definition has not been tested for reproducibility or accuracy. Moreover, as with all self-reported data, it is not possible to determine if the problem reported satisfied all the criteria. (Self-reporting may also affect the accuracy of other variables, such as physical exertion at work.<sup>6</sup>) Under-reporting of the conditions (for example, if it is present but not yet diagnosed) may also dilute relationships observed. As well, the work conditions measured in 1994/95 may have changed by 1996/97.

Although a history of back problems (not chronic) is an important risk factor for developing a chronic back problem, such information is not available from the NPHS.

A back problem is normally considered "chronic" after a certain amount of time has passed without recovery from an initial episode. A back problem from which recovery is relatively quick or that has not become chronic is considered "acute." Factors associated with experiencing an acute back problem (primary risk factors) may differ from factors associated with an acute problem becoming chronic (secondary risk factors).<sup>3,26,34,38,39</sup>

Consequently, observing risk factors at the pre-morbidity stage (in 1994/95) and measuring the outcome at the chronic stage (in 1996/97) may weaken some associations and completely obscure others. This may partially explain why none of the work-related psychosocial variables was significantly associated with the development of a chronic back problem. Risk factors for which statistical associations do prevail may be primary, secondary or both. For example, symptoms of depression were associated with both a future chronic back problem and, univariately, with a future back

injury, which, in some cases, may initiate chronic back problems. (The lack of a statistical association between a chronic back problem and work-related psychosocial variables may also reflect a lack of sensitivity in the scales used to measure these variables.)

It is expected that, given the selection criteria, the majority of respondents in this analysis did not have a chronic back problem in 1994/95. However, it is possible that in 1994/95 a small proportion of them had experienced a back episode that would ultimately become chronic, although it had not yet been diagnosed as such (they would have been kept in the sample as long as they reported their overall health as good, very good or excellent). For such respondents, the risk factors observed may or may not have preceded the initial back episode that later evolved into a chronic condition.

Back injury, one of the risk factors for chronic back problems, may be under-reported. Such an injury was reported only if the respondent considered it to be the most serious injury suffered in the 12 months before the interview.

A number of other variables that might be relevant were not available from the NPHS: disability insurance, a measure of severity, and clinical information, such as the presence of sciatica or a slipped disc. A distinction between problems affecting the upper and lower back would also have been useful, because they may have different etiologies.<sup>6,38</sup>

Causality cannot be inferred from survey data analysis, even when temporal relationships are known. Any mention of "risk factor" or "predictor" is meant in the statistical sense only.

A problem with the computer-assisted interview in the third-quarter 1994/95 data collection resulted in French-language respondents being bypassed for questions about work-related stress. This yielded an unusually high non-response rate for these items.



diagnosed chronic back problems among workers. Variables related in this way to new back problems included back injury, physical exertion on the job, occupation, age, various types of stress, depression and smoking. Even when the confounding effects of multiple factors were taken into account, several of these associations remained statistically significant; most notably, back injury. Although physical exertion at work did not quite attain statistical significance, it, too, must be considered in any attempt to link psychosocial variables with the development of chronic back problems.

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## Appendix

### Definitions

National Population Health Survey (NPHS) respondents were asked about specific long-term conditions that had lasted or were expected to last six months or more and that had been diagnosed by a health professional. If respondents answered “yes” to “back problems, excluding arthritis” in 1996/97, they were considered to have a *chronic back problem*.

Respondents were considered to have had a *back injury in 1994/95* or *1996/97* if they reported a back injury as the most serious injury suffered in the 12 months before the respective interviews.

Respondents were considered *employed* in 1994/95 if they had worked in the year before their 1994/95 interview. By the time of their 1996/97 interview, they may have been working in the same job, in a different job, or not at all.

To measure work-related psychosocial factors,<sup>40-42</sup> the NPHS asked participants to rank their responses to the following 12 statements using a five-point scale ranging from “strongly agree” (score 0) to “strongly disagree” (score 4).

- a) Your job requires that you learn new things (reverse scored).
- b) Your job requires a high level of skill (reverse scored).
- c) Your job allows you freedom to decide how you do your job (reverse scored).
- d) Your job requires that you do things over and over.
- e) Your job is very hectic (reverse scored).
- f) You are free from conflicting demands that others make.
- g) Your job security is good.
- h) Your job requires a lot of physical effort.
- i) You have a lot to say about what happens in your job (reverse scored).
- j) You are exposed to hostility or conflict from the people you work with (reverse scored).
- k) Your supervisor is helpful in getting the job done.
- l) The people you work with are helpful in getting the job done.

Four components of work stress were assessed:

1) *Job strain*, measured as a ratio of psychological demands (items e and f) to decision latitude. Items pertaining to decision latitude include skill discretion (a, b and d) and decision authority (c and i). So that decision latitude and psychological demands contributed equally, the summed item scores pertaining to each were divided by 5 and 2, respectively. The score for job strain was then obtained by dividing the new score for psychological demands by the new score for decision latitude. High job strain refers to scores of 2.5 or greater (value closest to the 75th percentile of the weighted distribution of the 1994/95 cross-sectional file).

2) *Job insecurity*, measured by item g. Respondents who answered “disagree” or “strongly disagree” were categorized as experiencing job insecurity.

3) *Physical exertion*, measured by item h. Respondents who

answered “strongly agree” or “agree” were categorized as experiencing high physical exertion. Those who answered “neither agree nor disagree” were considered to have neutral physical exertion.

4) A lack of emotional support at work was measured by items j, k, and l (higher scores indicate lower support). *Low emotional support at work* was defined as a total score of 6 or more (value closest to the 75th percentile of the weighted distribution of the 1994/95 cross-sectional file).

*Occupation* in 1994/95 was categorized as: administrative, professional, sales, service, blue-collar, or clerical.

*Education* in 1994/95 was grouped into three categories: secondary graduation or less, some postsecondary, and postsecondary graduation.

*Household income* in 1994/95 was based on total household income and household size:

Household income group	People in household	Total household income
Lowest	1 to 4	Less than \$10,000
	5 or more	Less than \$15,000
Lower-middle	1 or 2	\$10,000 to \$14,999
	3 or 4	\$10,000 to \$19,999
	5 or more	\$15,000 to \$29,999
Middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

The first three categories were combined for this analysis.

To measure *personal stress*, respondents were asked if the following statements were true (score 1) or false (score 0):

- You are trying to take on too many things at once.
- There is too much pressure on you to be like other people.
- Too much is expected of you by others.
- Your work around the home is not appreciated.
- People are too critical of you or what you do.

Scores of 2 or more were defined as high personal stress. Such scores were in the upper 67th percentile of the weighted distribution of the 1994/95 cross-sectional file. This variable had an internal consistency estimate (Cronbach's alpha) of 0.59.

To measure *chronic stress*, respondents were asked if the following statements were true (score 1) or false (score 0):

- You don't have enough money to buy the things you need.
- Your friends are a bad influence.
- You would like to move but you cannot.
- Your neighbourhood or community is too noisy or too polluted.
- You have a parent, a child or partner who is in very bad health and may die.
- Someone in your family has an alcohol or drug problem.

Scores of 2 or more were defined as high chronic stress. Such scores

were in the upper 74th percentile of the weighted distribution of the 1994/95 cross-sectional file.

To measure *family stress* respondents were asked if the following statements were true (score 1) or false (score 0):

- Your partner doesn't understand you.
- Your partner doesn't show enough affection.
- Your partner is not committed enough to your relationship.
- You find it is very difficult to find someone compatible with you.
- One of your children seems very unhappy.
- A child's behaviour is a source of serious concern to you.

Scores ranged from 0 to 5 (not all questions were applicable to all respondents.) Respondents scoring at least 1 were considered to have high family stress. Such scores were in the upper 64th percentile of the weighted distribution of the 1994/95 cross-sectional file.

The *perceived emotional support* index is composed of four items that reflect whether respondents feel that they have someone they can confide in, someone they can count on, someone who can give them advice, and someone who makes them feel loved. Scores can range from 0 to 4, with higher scores indicating greater perceived social support. Low emotional support was defined as a score of 3 or less. Scores of 0 to 3 accounted for 13% of the weighted distribution of the 1996/97 cross-sectional file. This variable had an internal consistency estimate (Cronbach's alpha) of 0.73.

A *mastery* score was derived as the sum of scores for each of the items below, based on five possible answers, ranging from "strongly agree" (score 0) to "strongly disagree" (score 4). Possible scores ranged from 0 to 28.

- You have little control over the things that happen to you.
- There is really no way you can solve some of the problems you have.
- There is little you can do to change many of the important things in your life.
- You often feel helpless in dealing with problems of life.
- Sometimes you feel that you are being pushed around in life.
- What happens to you in the future mostly depends on you (reverse scored).
- You can do just about anything you really set your mind to (reverse scored).

A low mastery score was 16 or less. Low mastery scores made up 21% of the weighted distribution of the 1994/95 cross-sectional distribution. This variable had an internal consistency estimate (Cronbach's alpha) of 0.76.

The NPHS measures a major depressive episode (MDE) with a subset of questions from the Composite International Diagnostic Interview.<sup>43</sup> These questions cover a cluster of symptoms for a depressive disorder, which are listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R).<sup>44</sup>

The question numbers refer to the NPHS questionnaire. There are three possible paths through these questions: "yes" to 2, then 3 to 13; "no" to 2, "yes" to 16, then 17 to 26; and "no" to 2 and "no" to 16.

2. During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row? (Yes - go to 3; No - go to 16)
16. During the past 12 months, was there ever a time lasting two weeks or more when you lost interest in most things like hobbies, work, or activities that usually give you pleasure? (Yes - go to 17; No - end)
- 3./17. For the next few questions, please think of the two-week period during the past 12 months when: 3. these feelings were worst/ 17. you had the most complete loss of interest in things. During that time how long did these feelings usually last? (All day long; Most of the day; About half of the day; Less than half the day)
- 4./18. How often did you feel this way during those two weeks? (Every day; Almost every day; Less often)
5. During those two weeks, did you lose interest in most things? (Yes; No)
- 6./19. Did you feel tired out or low on energy all of the time? (Yes; No)
- 7./20. Did you gain weight, lose weight, or stay about the same? (Gained weight; Lost weight; Stayed about the same; Was on a diet)
- 8./21. About how much did you gain/lose?
- 9./22. Did you have more trouble falling asleep than you usually do? (Yes; No),
- 10./23. How often did that happen? (Every night; Nearly every night; Less often)
- 11./24. Did you have a lot more trouble concentrating than usual? (Yes; No)
- 12./25. At these times, people sometimes feel down on themselves, no good, or worthless. Did you feel this way? (Yes; No)
- 13./26. Did you think a lot about death—either your own, someone else's or death in general? (Yes; No)

A value of 1 was assigned to any "yes" answer to the yes/no questions. For questions 8 and 21, a score of 1 was assigned if the change in weight was at least 10 pounds (4.5 kilograms). For questions 10 and 23, a score of 1 was given to respondents who reported having trouble falling asleep every night or nearly every night. Those who replied "yes" to question 2, and whose symptoms lasted all day or most of the day, and had occurred every day or almost every day, had a maximum possible score of 8. For those who responded "yes" to question 16, and whose symptoms lasted all day or most of the day, and had occurred every day or almost every day, the maximum possible was 7. Respondents who replied "no" to questions 2 and 16 scored 0.

Responses were scored, and the results were transformed into a probability estimate of a diagnosis of MDE. For this article, if the estimate was 0.5 or more, that is, 50% or greater likelihood of a positive diagnosis of MDE, the respondent was considered to have experienced symptoms of depression. To obtain a probability of 0.5

or more, respondents had to score 3 or more. Scores of 3 or more account for 5% of the weighted 1996/97 NPHS cross-sectional distribution.

*Smoking* in 1994/95 was categorized as: non-smoker, occasional smoker or daily smoker.

*Alcohol consumption* in 1994/95 was classified as: non-drinker, occasional (less than one drink a month) or regular (a drink at least once a month). An alternative definition of regular drinker (daily) did not change the statistical significance of the results.

A leisure-time energy expenditure score for 1994/95 was derived based on reported leisure-time physical activities. Respondents were read a list of 20 activities that included sports such as bowling and basketball and activities such as gardening and walking. Scores were derived using the frequency and time per session of the activity as well as a fixed metabolic energy cost value for the activity. *Active in leisure time* refers to scores of 2.3 or more.

Respondents were asked about health limitations that affect daily activities. If they indicated that, because of a long-term physical or mental condition or a health problem (one that had lasted or was expected to last six months or more), they were limited in the kind or amount of activity they could do at home, at school, at work or in other activities such as transportation to or from work or leisure time activities, or if they indicated having any long-term disabilities or handicaps, they were considered to have an activity restriction.

A number of questions probed respondents' health "during the past 14 days." They were asked if they "stayed in bed at all because of illness or injury, including any nights spent as a patient in a hospital." Another question asked if the respondent "cut down on things he/she normally does because of illness or injury." To determine the number of disability days in the last two weeks, the responses to the following

questions were combined: "How many days [in the last 2 weeks] did you stay in bed for all or most of the day?" and "How many days [in the last 2 weeks] did you cut down on things for all or most of the day?"

Respondents were asked, "In the past month, did you take any of the following medications," followed by a list read aloud that included pain relievers such as aspirin or Tylenol (including arthritis medicine and anti-inflammatories), anti-depressants, and codeine, Demerol or morphine.

To ascertain contact with health care professionals, respondents were asked, "Not counting when you were an overnight patient, in the past 12 months, how many times have you seen or talked on the telephone with [fill category] about your physical, emotional or mental health?" As well as family doctor or general practitioner and other doctor (such as surgeon, allergist, gynecologist or psychiatrist), categories read aloud included chiropractor and physiotherapist. To determine the number of physician consultations, the answers for family doctor or general practitioner and other medical doctor (such as a surgeon, allergist, gynecologist or psychiatrist) were combined.

Respondents were also asked, "In the past 12 months, have you seen or talked to an alternative health care provider such as an acupuncturist, homeopath or massage therapist about your physical, emotional or mental health?" If they answered "yes," they were asked, "Who did you see or talk to?" Interviewers did not read the list of categories aloud, but were asked to mark all that applied. The list included massage therapist.

As well, respondents were asked, "In the past 12 months, have you seen or talked on the telephone to a health professional about your emotional or mental health?"

Table A  
**Distribution of selected characteristics of employed population aged 16 or older who reported no chronic back problem and good, very good or excellent health in 1994/95, Canada excluding territories**

	Sample size	Estimated population			Sample size	Estimated population	
		'000	%			'000	%
<b>Total</b>	6,363	11,831.2	100.0				
<b>New chronic back problem in 1996/97</b>	566	1,052.8	8.9				
<b>Back injury in 1994/95</b>							
Yes	216	438.2	3.7				
No	6,146	11,391.2	96.3				
Missing	1	1.8	--				
<b>Sex</b>							
Men	3,234	6,499.1	54.9				
Women	3,129	5,332.1	45.1				
<b>Age</b>							
16-29	1,601	3,041.4	25.7				
30-39	1,892	3,577.3	30.2				
40-49	1,510	2,866.9	24.2				
50-59	948	1,708.4	14.4				
60+	412	637.2	5.4				
<b>Education</b>							
Secondary graduation or less	2,335	4,213.5	35.7				
Some postsecondary	2,940	5,449.2	46.1				
Postsecondary graduation	1,080	2,153.5	18.2				
Missing	8	15.0	0.1				
<b>Household income</b>							
Middle or less	2,486	4,202.7	35.5				
Upper-middle	2,614	4,774.5	40.4				
High	1,028	2,312.5	19.5				
Missing	235	541.4	4.6				
<b>Physical exertion at work</b>							
High	2,379	4,224.5	35.7				
Neutral	470	865.1	7.3				
Low	2,299	4,298.1	36.3				
Missing†	1,215	2,443.5	20.7				
<b>Occupation</b>							
Administration	805	1,585.7	13.4				
Professional	1,202	2,186.7	18.5				
Sales	542	1,037.5	8.8				
Service	983	1,777.4	15.0				
Blue-collar	1,814	3,424.9	28.9				
Clerical	980	1,758.4	14.9				
<b>High job strain</b>							
Yes	1,375	2,566.6	21.7				
No	3,742	6,745.5	57.0				
Missing†	1,246	2,519.1	21.3				
<b>High job insecurity</b>							
Yes	982	1,805.2	15.3				
No	4,166	7,582.5	64.1				
Missing†	1,215	2,443.5	20.7				
				<b>Low social support at work</b>			
				Yes	971	1,827.0	15.4
				No	4,177	7,560.7	63.9
				Missing†	1,215	2,443.5	20.7
				<b>Low job satisfaction</b>			
				Yes	414	811.8	6.9
				No	4,764	8,694.7	73.5
				Missing†	1,185	2,324.8	19.6
				<b>High personal stress</b>			
				Yes	1,946	3,673.9	31.1
				No	3,931	7,051.0	59.6
				Missing	486	1,106.3	9.4
				<b>High chronic stress</b>			
				Yes	1,480	2,687.6	22.7
				No	4,397	8,037.3	67.9
				Missing	486	1,106.3	9.4
				<b>High family stress</b>			
				Yes	2,267	4,089.0	34.6
				No	3,846	7,160.1	60.5
				Missing	250	582.2	4.9
				<b>Low emotional support</b>			
				Yes	839	1,634.9	13.8
				No	5,236	9,555.7	80.8
				Missing	288	640.6	5.4
				<b>Low mastery</b>			
				Yes	998	1,818.9	15.4
				No	5,087	9,366.2	79.2
				Missing	278	646.1	5.5
				<b>Symptoms of depression</b>			
				Yes	402	666.6	5.6
				No	5,680	10,517.0	88.9
				Missing	281	647.6	5.5
				<b>Smoking</b>			
				Non-smoker	4,367	8,222.4	69.6
				Occasional	245	532.8	4.5
				Daily	1,740	3,058.2	25.9
				Missing	11	17.8	0.2
				<b>Alcohol consumption</b>			
				Non-drinker	951	1,776.8	15.0
				Occasional	4,116	2,247.7	19.0
				Regular	1,290	7,795.2	66.0
				Missing	6	11.4	0.1
				<b>Active in leisure time</b>			
				Yes	1,568	2,936.8	24.8
				No	4,544	8,317.3	70.3
				Missing	251	577.1	4.9

**Data source:** 1994/95 and 1996/97 National Population Health Survey, longitudinal sample, Health file

**Note:** Except for "new chronic back problem in 1996/97," characteristics refer to 1994/95. Because of rounding, detail may not add to totals.

† A problem with the computer-assisted interview in the third-quarter 1994/95 data collection resulted in French-language respondents being bypassed for questions about work-related stress. This yielded an unusually high non-response rate for these items.

-- Amount too small to be expressed

Table B

Distribution of selected characteristics in 1994/95, by newly diagnosed chronic back problem in 1996/97, employed population aged 16 or older who reported good, very good or excellent health in 1994/95, Canada excluding territories

	Diagnosis of a chronic back problem in 1996/97		Diagnosis of a chronic back problem in 1996/97	
	Yes	No	Yes	No
	%	%	%	%
<b>Back injury in 1994/95</b>				
Yes	10.0	3.1		
No	90.0	96.9		
<b>Sex</b>				
Men	53.3	55.1		
Women	46.7	44.9		
<b>Age</b>				
16-29	22.6	26.0		
30-39	27.7	30.5		
40-49	27.6	23.9		
50-59	16.1	14.3		
60+	6.0	5.3		
<b>Education</b>				
Secondary graduation or less	39.3	35.3		
Some postsecondary	45.4	46.2		
Postsecondary graduation	15.2	18.5		
Missing	0.6	0.1		
<b>Household income</b>				
Middle or less	36.0	35.5		
Upper-middle	40.9	40.3		
High	19.9	19.5		
Missing	3.3	4.7		
<b>Physical exertion at work</b>				
High	39.9	35.3		
Neutral	8.8	7.2		
Low	29.0	37.0		
Missing†	22.3	20.5		
<b>Occupation</b>				
Administrative	14.1	13.3		
Professional	18.8	18.5		
Sales	7.3	8.9		
Service	13.1	15.2		
Blue-collar	33.8	28.5		
Clerical	12.5	15.1		
<b>High job strain</b>				
Yes	22.3	21.6		
No	54.7	57.2		
Missing†	23.0	21.1		
<b>High job insecurity</b>				
Yes	16.8	15.1		
No	61.0	64.4		
Missing†	22.3	20.5		
<b>Low emotional support at work</b>				
Yes	17.8	15.2		
No	59.9	64.3		
Missing†	22.3	20.5		
<b>Low job satisfaction</b>				
Yes			7.5	6.8
No			72.2	73.6
Missing†			20.3	19.6
<b>High personal stress</b>				
Yes			35.9	30.6
No			54.1	60.1
Missing			10.0	9.3
<b>High chronic stress</b>				
Yes			29.7	22.0
No			60.3	68.7
Missing			10.0	9.3
<b>High family stress</b>				
Yes			38.8	34.2
No			55.3	61.0
Missing			5.9	4.8
<b>Low emotional support</b>				
Yes			16.3	13.6
No			77.0	81.1
Missing			6.7	5.3
<b>Low mastery</b>				
Yes			17.4	15.2
No			75.4	79.5
Missing			7.2	5.3
<b>Symptoms of depression</b>				
Yes			8.9	5.3
No			84.7	89.3
Missing			6.4	5.4
<b>Smoking</b>				
Non-smoker			64.8	70.1
Occasional			4.6	4.5
Daily			30.6	25.4
Missing			0.2	0.1
<b>Alcohol consumption</b>				
Non-drinker			15.2	15.0
Occasional			18.9	19.0
Regular			65.9	66.0
Missing			0.5	0.1
<b>Active in leisure time</b>				
Yes			24.7	24.8
No			69.7	70.4
Missing			5.6	4.8

Data source: 1994/95 and 1996/97 National Population Health Survey, longitudinal sample, Health file

Note: Because of rounding, detail may not add to totals.

† A problem with the computer-assisted interview in the third-quarter 1994/95 data collection resulted in French-language respondents being bypassed for questions about work-related stress. This yielded an unusually high non-response rate for these items.