

Prevalence of Musculoskeletal Activity Limitation and Associated Factors Among Adults in the General Population in the 1998 Quebec Health Survey

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ABSTRACT. Objective. To estimate the prevalence of short term and longterm musculoskeletal activity limitation among the general adult population of the province of Quebec, and to identify which factors are associated with these limitations.

Methods. We analyzed cross-sectional data from the 1998 Quebec Health Survey. Logarithmic binomial regression models were used to estimate prevalence ratios of (1) short term activity limitation related to musculoskeletal disorders (MSD); and (2) longterm activity limitation related to MSD in relation to demographic and behavioral variables and comorbidity factors.

Results. About one-fifth of participants reporting short term activity limitation and one-third of participants reporting longterm activity limitation mentioned MSD as a cause. Multivariate analyses showed that higher age, lower income, being overweight, ill defined nervousness, and the number of traumatic events that occurred before age 18 years were significantly associated with short term and longterm activity limitation related to MSD, whereas being in the minority ethnic group was protective for both outcomes. Female sex, physical inactivity, being a former alcohol drinker, and mental disorders were also associated with longterm activity limitation.

Conclusion. MSD are a major cause of activity limitation among adults from Quebec. With the aging population and the increasing prevalence of obesity, increasing prevalence of activity limitation related to MSD is to be expected. (J Rheumatol 2005;32:1794–804)

Key Indexing Terms:

ACTIVITIES OF DAILY LIVING ADULT EPIDEMIOLOGY HEALTH SURVEYS
MUSCULOSKELETAL DISEASE PREVALENCE

Musculoskeletal disorders (MSD) are reaching epidemic proportions throughout the world and put a major burden on individuals and society. MSD are the most common cause of activity limitation in the adult population¹. The prevalence of musculoskeletal activity limitation is expected to increase rapidly due to the aging of the population.

Because MSD are highly prevalent and present an important public health burden, they should be routinely assessed in health surveys, for surveillance purposes². Nevertheless, the impact of MSD in terms of activity limitation is still

understudied; for instance, the prevalence of musculoskeletal activity limitation has never been investigated in the general population of Quebec and only a few studies have been conducted on these problems in other parts of Canada, mostly in Ontario. Most studies on MSD conducted in the Quebec population have focused on compensated workers. Data from the 1990 Ontario Health Survey (OHS) show that MSD rank first or second among major body systems for 6 morbidity indicators (reason for consultation with a health professional, 2-week restricted activity days, use of prescription and nonprescription drugs, longterm activity limitation, and chronic conditions) among the population aged 16 years and older³.

Studies conducted in the general adult population have reported an increased prevalence of musculoskeletal activity limitation among older people^{4,5}, those with lower socioeconomic status^{4,6,7}, and among obese people^{7,8}. Moreover, higher prevalence of arthritis and chronic musculoskeletal pain have been found among women^{4,9-11}, separated or divorced people¹⁰, and cigarette smokers^{9,10}. Variables potentially associated with musculoskeletal activity limitation may also include psychological distress¹²⁻¹⁴, depressive symptoms^{15,16}, psychological trauma in childhood¹⁷, diabetes^{18,19}, and ethnicity^{9,10,20}.

Our study was conducted to fill the information gap on

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musculoskeletal activity limitation among the general adult population of the province of Quebec, in a public health perspective of surveillance. Our objectives were (1) to estimate the prevalence of short term and longterm musculoskeletal activity limitation among the general adult population of Quebec; and (2) to identify which factors are generally associated with these limitations.

MATERIALS AND METHODS

Study design. This was a population based cross-sectional study. We used data from the 1998 Quebec Health Survey (QHS) conducted by Santé Québec²¹. The population consisted of 7,246,896 inhabitants in 1996, which represented about one-quarter of the Canadian population according to the 1996 Canada Census²². The target population of the QHS consisted of all persons who lived in private households in Quebec in 1998, except those living on Cree and Inuit territories and First Nations reserves (0.4%) and the permanent residents of collective institutions or noninstitutional collective households (1.8%). This population, in 1998, consisted of more than 7 million inhabitants living in private households, of whom more than 5 million were aged 18 years and older. The QHS was based on a 3 stage stratified sampling design. Primary and secondary sampling units corresponded to geographical areas defined from the 1991 Canada Census data. Dwelling lists within selected secondary sampling units were prepared and households were randomly selected from these lists²³.

Data collection. Information was mainly collected by 2 questionnaires^{24,25} administered between January and December 1998. The first questionnaire was completed during a face to face interview with one individual within a selected household and focused on the health of all household members. A total of 11,986 households (participation rate 82.1%), representing 30,386 individuals, were covered by this interview. The second questionnaire (response rate 84.0%) was self-administered and completed by each member of the participating household aged 15 years and older, and provided information on health perceptions, lifestyle, jobs characteristics, and sociodemographic variables. Sixty-nine percent (69.0%) of respondents answered both questionnaires (82.1% × 84.0%); 19,576 of them were aged 18 years and over and thus composed our study population. Access to data was provided by the Quebec Institute of Statistics. The study was approved by the Human Subjects Committee of the Laval University Affiliated Hospital (CHAUQ).

The 1998 QHS was designed to allow comparisons with the OHS and Canada's Health and Activity Limitation Survey (HALS). Further, the sampling strategy was designed to provide a representative sample of the Quebec adult population that would allow generalization of results to this population²³.

Definition of study subgroups. People were considered to have a *short term activity limitation* if they had stayed at least one day in bed all or most of the time or were unable to perform their main daily activity or had to reduce their usual activities because of health problems within a 2 week period prior to the survey. *Longterm activity limitation* was defined as limitation in the kind or amount of activity the person could engage in because of a longterm physical or mental condition or health problems, compared to other people of the same age in good health. If indicated "yes," the respondent was asked in an open question, "What is the main health problem which limits [name] in his/her activities?" These 2 definitions are similar to those used in the 1990 OHS³. "Longterm" was not defined for the respondents. Respondents could be included in both the short and longterm activity limitation groups.

Underlying health conditions were coded by medical archivists using the International Classification of Diseases – 9th revision (ICD-9)²⁶. Codes related to MSD were identified; these codes include: disorders of the peripheral nervous system, arthropathies (including rheumatoid arthritis and osteoarthritis), back disorders, rheumatism, chondropathies and acquired musculoskeletal deformities, fractures, dislocations, sprains, and

strains (Table 1). Back disorders and arthropathies were by far the most frequent MSD reported in both the short term and longterm activity limitation groups.

To identify characteristics associated with short term activity limitation related to MSD, the sample was divided into 3 groups: short term activity limitation mainly related to MSD (n = 486); short term activity limitation mainly related to health problems other than MSD (n = 1613); and no short term activity limitation (n = 17,477).

We proceeded the same way to identify factors associated with longterm activity limitation related to MSD, and therefore 3 groups were created: longterm activity limitation mainly related to MSD (n = 811); longterm activity limitation mainly related to other health problems (n = 1386); and no longterm activity limitation (n = 17,379). This approach is similar to the one used by Badley, *et al* in analyzing the 1986 HALS⁴ and the 1990 OHS data³.

No respondents were excluded because they had health problems other than MSD. Therefore, some individuals in the musculoskeletal activity limitation groups could also have reported other health problems (as a cause of activity limitation), but these problems were not considered by the respondents as the main reason of their activity limitation.

Independent variables. We examined the possible associations between several demographic variables, behavioral variables, and comorbidity factors and the prevalence of musculoskeletal short term or longterm activity limitation. These variables were: age, sex, marital status, formal education, household income, ethnic group, physical activity, cigarette smoking, alcohol consumption, body mass index (BMI), mental disorders, ill defined nervousness, diabetes, hypertension, spiritual life, social support, and the number of traumatic events that occurred before the age of 18 years.

Age. Respondents were grouped into 4 age categories: 18–24, 25–44, 45–64, and 65+ years.

Socioeconomic factors. Marital status was considered in 4 categories: married, common law, single, and widowed or divorced. Formal education was measured with a 5-category index that took into account age and sex^{21,27}. Household income was grouped in 5 categories: high, medium-high, medium-low, poor, and very poor. This index classified households according to the number of people living in a given household and their total annual gross income.

Ethnic group. Respondents were grouped in 2 ethnic groups, majority and minority, as defined by the Canadian Ministry of Citizenship and Immigration^{21,27}. The majority group included people of French, British, or aboriginal descent whose maternal language was French or English, who were born in Canada, in France, in the United Kingdom, or in the United States, and who had at least one parent born in one of these countries. Other people were considered to be part of the minority group.

Lifestyle. Participants had to report the number of times per week they had engaged in physical activity (20–30 minutes) during the last 3 months; 5 categories of response, based on previous QHS, were considered: ≥ 3 times per week, 2 times per week, 1 time per week, 1–3 times per month, never. Smoking status was treated in 4 categories: nonsmoker, ex-smoker, occasional smoker (not every day), and current smoker (smoking every day). Alcohol consumption was considered in 3 categories: nondrinker, current drinker (whatever the number of drinks), and former drinker (no drink for the previous 12 months).

Body mass index. The participants' body mass index (BMI; weight in kg divided by height in m²) was calculated from their self-reported height and weight and thresholds to define categories (underweight / normal / overweight) were determined from 3 sources^{21,28–30}. Underweight was defined as BMI < 20 kg/m² for individuals aged < 65 years and as BMI < 24 kg/m² for those aged ≥ 65 years. BMI ≥ 27 kg/m² was considered as overweight for individuals aged 20–80 years.

Comorbidity. For each respondent, health problems recorded within 6 sections of the questionnaire completed by an interviewer were grouped²¹. These sections focused on short and longterm activity limitation, health

Table 1. Distribution of different types of musculoskeletal disorder (MSD) in the overall MSD category for both short term and longterm activity limitation related to MSD. The International Classification of Diseases, 9th revision (ICD-9)²⁶, was employed to code and classify conditions involving musculoskeletal disorders (MSD).

ICD-9 Codes	Specific Conditions	Short Term Activity Limitation (%)*	Longterm Activity Limitation (%)*
353.0 to 355.9	Disorders of the peripheral nervous system (e.g., carpal tunnel syndrome, lesion of sciatic nerve)	1.0	1.0
710.0 to 719.9	Arthropathies and related disorders, excluding disorders of the spine	24.4	29.2
720.0 to 724.0	Back disorders	31.5	29.1
725.0 to 729.9	Rheumatism, excluding the back	20.1	17.6
730.0 to 739.9	Osteopathies, chondropathies, and acquired musculoskeletal deformities	2.7	8.5
805.0 to 829.1	Fractures	8.6	7.4
831.0 to 839.9	Dislocation	1.8	2.6
840.0 to 847.9	Sprains and strains	10.0	4.7

* Prevalence estimates have been weighted to be representative of the Quebec population.

professional consultation, use of medication, accidents with injuries, and a list of chronic health problems, measured among all respondents. Health problems were coded using the ICD-9²⁶. Then an index was constructed to identify 31 health problems such as mental disorders, ill defined nervousness, diabetes, and hypertension. Some of these health problems were considered in our analyses because of a potential association with the outcomes suggested in the literature^{13,15,18,19}. These variables were treated as binary variables (yes/no): mental disorders (codes 290.0–316.9), ill defined nervousness (code 799.2), diabetes (codes 250.0–250.9), and hypertension (codes 401.0–405.9).

Social support. Social support (high/low) included 7 questions related to 3 distinct dimensions: social integration, social satisfaction, and the number of contacts^{21,27}. This index was dichotomized: low social support corresponded to the lowest quintile.

Spiritual life. Spiritual life was assessed with one question: “For you, spiritual life (i.e., beliefs or practices that concern spirit or soul) is very important, fairly important, not very important, or not important”; and was classified in 2 categories: (1) very or fairly important, (2) not very or not important.

Traumatic events. The index of traumatic events that occurred before the age of 18 years^{25,31} consisted of 7 yes/no questions documenting hospitalization, parental divorce, prolonged parental unemployment, fearful experiences, parental alcohol or drug abuse, being sent away from home, and childhood physical abuse (Appendix 1); respondents were grouped into 4 categories: none, 1, 2, and ≥ 3 events.

Statistical analyses. Prevalence figures for musculoskeletal short term and longterm activity limitation were generated. In order to be representative of the general population, weighting factors taking into account the distribution of respondents according to age, sex, and living area were used in the analyses²³.

Logarithmic binomial regression models³² were used to evaluate the bivariate association between each independent variable studied and the 2 outcomes, short term and longterm activity limitation related to MSD. Then multivariate models were built to identify and quantify the relation between each variable and the outcome, independently of other variables³³. Variables significantly associated ($p < 0.05$) in bivariate analyses were then introduced in multivariate models. A priori, the threshold of significance was fixed at $\alpha \leq 0.05$ as a criterion to enter a variable in a model and at $\alpha \geq 0.10$ as a criterion to exit multivariate models (similar to a stepwise procedure). However, age and sex were forced in the multivariate models.

The influence of potential confounders was evaluated in multivariate models. A variable was considered to be a confounder and was retained for the multivariate analyses if, after its inclusion, the prevalence ratio of any

independent variable in the multivariate model changed by at least 10%³⁴. Individuals with missing values on variables considered were excluded from the analyses (12% of participants for short term and 13% of participants for longterm limitation). Comparison of the characteristics of the group excluding those with missing values to the group of all respondents showed very similar frequencies for sex, age, income, and ethnic group according to their activity limitation status. All statistical analyses were performed using SAS, version 8.1³⁵.

RESULTS

Table 2 presents the prevalence of short term and/or longterm activity limitation related to MSD and other health problems. Within the previous 2 weeks, 2.3% of the population age ≥ 18 years had short term activity limitation related to MSD. Overall, 11.3% of the population reported longterm activity limitation. One-third of those (3.8%) mentioned that their limitation was due to MSD. In general, the prevalence of short term and longterm activity limitation from MSD and other health problems was higher among women than among men. The prevalence of short and longterm activity limitation related to MSD tended to increase with age. This increase of prevalence with age was steeper for women than for men, for both consequences of MSD.

Table 3 shows selected characteristics of respondents according to their activity limitation status. Respondents with short term or longterm activity limitation related to MSD were more often women, age ≥ 45 years, widowed or divorced, and in the lowest income and education groups than those without limitation.

Bivariate analyses. In bivariate analyses, several factors were associated with short term and longterm activity limitation related to MSD, although in general the associations were more marked for longterm activity limitation. Age and ill defined nervousness, in particular, were strongly associated with both outcomes (Table 4).

Multivariate analyses. Among the potential determinants of short term musculoskeletal activity limitation, the preva-

Table 2. Prevalence of short term and/or longterm activity limitation related to musculoskeletal disorder (MSD) and other health problems among adult participants aged 18 years and older, by age and sex.

Morbidity Indicator	Prevalence of MSD by Age, %				Total	All Other Causes Total
	18–24 yrs	25–44yrs	45–64 yrs	65 + yrs		
Short term activity limitation*						
All	0.9	2.0	2.7	3.3	2.3	8.8
Men	1.0	2.0	2.2	2.3	2.0	6.9
Women	0.8	2.0	3.2	4.0	2.6	10.5
Longterm activity limitation**						
All	1.0	2.7	5.1	6.3	3.8	7.5
Men	0.5	2.3	4.5	4.2	3.0	6.8
Women	1.4	3.1	5.8	7.8	4.5	8.2
Short term or longterm activity limitation						
All	1.7	3.9	6.4	7.9	5.0	13.4
Men	1.4	3.6	5.5	5.7	4.2	11.3
Women	2.0	4.1	7.2	9.5	5.7	15.4

* Proportion of respondents who stayed at least one day in bed all or most of the time and/or were unable to do their main activity and/or had to reduce their usual activities within a 2-week period because of health problems. ** Proportion of respondents who were limited in the amount of activity they could do because of “longterm” physical or mental conditions or health problems.

Table 3. Selected characteristics of respondents according to their activity limitation status.

Characteristics	MSD Short Term Activity Limitation, % (n = 486*)	No Short Term Activity Limitation, % (n = 17,477*)	MSD Longterm Activity Limitation, % (n = 811*)	No Longterm Activity Limitation, % (n = 17,379*)
Sex				
Men	40.5	50.1	37.6	49.9
Women	59.5	49.9	62.4	50.1
Age, yrs				
18–24	5.6	12.2	3.5	12.8
25–44	35.7	42.2	29.9	44.0
45–64	36.9	31.0	42.3	30.0
65+	21.8	14.6	24.3	13.2
Marital status				
Married	40.4	48.3	42.0	47.8
Common law	17.0	17.7	18.0	18.4
Single	19.6	21.8	14.3	22.2
Widowed, divorced	23.0	12.2	25.8	11.6
Income				
High	8.1	12.0	6.8	12.3
Medium high	32.5	38.6	33.0	39.2
Medium low	32.0	32.7	31.5	32.5
Poor	17.3	10.5	16.3	10.0
Very poor	10.0	6.2	12.4	6.0
Education				
Highest	18.8	21.5	16.3	22.1
High	16.4	20.0	18.4	20.2
Average	21.9	19.8	17.5	20.1
Low	17.5	19.9	22.1	19.6
Lowest	25.5	18.8	25.7	18.1
Ethnic group				
Minority	5.3	11.8	7.4	11.9
Majority	94.7	88.2	92.6	88.1

* Unweighted number of respondents included in each category of activity limitation status. However, the proportions of selected characteristics of respondents are weighted. MSD: musculoskeletal disorder.

Table 4. Unadjusted and adjusted prevalence ratios (PR), and 95% confidence intervals (95% CI) for potential determinants of (1) musculoskeletal short term activity limitation vs no short term activity limitation; and (2) musculoskeletal longterm activity limitation vs no longterm activity limitation. Results in bold type are statistically significant.

Variables	MSD Short Term Limitation vs No Short Term Limitation		MSD Longterm Limitation vs No Longterm Limitation	
	Bivariate Analysis, PR (95% CI) (n = 17,963*)	Multivariate Analysis [†] , PR (95% CI) (n = 15,814*)	Bivariate Analysis, PR (95% CI) (n = 18,190*)	Multivariate Analysis [†] , PR (95% CI) (n = 15,831*)
Sociodemographic				
Sex				
Men	1.0	1.0	1.0	1.0
Women	1.5 (1.1–1.9)	1.2 (0.9–1.7)	1.6 (1.3–2.0)	1.4 (1.1–1.7)
Age, yrs				
18–24	1.0	1.0	1.0	1.0
25–44	1.8 (1.0–3.3)	1.6 (0.9–3.1)	2.5 (1.4–4.4)	1.9 (1.1–3.4)
45–64	2.5 (1.4–4.6)	2.2 (1.1–4.2)	5.0 (2.8–8.8)	3.6 (2.0–6.4)
65+	3.2 (1.7–5.9)	2.6 (1.2–5.5)	6.4 (3.6–11.4)	4.2 (2.3–7.8)
Marital status				
Married	1.0	1.0	1.0	NS
Common law	1.2 (0.8–1.7)	1.3 (0.9–2.0)	1.1 (0.8–1.5)	
Single	1.1 (0.8–1.5)	1.3 (0.9–2.1)	0.7 (0.5–1.0)	
Widowed, divorced	2.2 (1.6–3.1)	1.4 (0.95–2.2)	2.4 (1.9–3.1)	
Income				
High	1.0	1.0	1.0	1.0
Medium high	1.2 (0.7–2.1)	1.2 (0.7–2.1)	1.5 (1.0–2.3)	1.4 (0.9–2.1)
Medium low	1.4 (0.9–2.4)	1.2 (0.7–2.1)	1.7 (1.1–2.6)	1.4 (0.9–2.2)
Poor	2.4 (1.4–4.1)	2.0 (1.1–3.6)	2.8 (1.8–4.4)	1.8 (1.1–3.0)
Very poor	2.3 (1.3–4.3)	1.4 (0.7–2.8)	3.5 (2.2–5.6)	2.3 (1.3–3.8)
Education				
Highest	1.0	NS	1.0	NS
High	0.9 (0.6–1.5)		1.2 (0.9–1.7)	
Average	1.3 (0.8–1.9)		1.2 (0.8–1.7)	
Low	1.0 (0.7–1.6)		1.5 (1.1–2.1)	
Lowest	1.5 (1.0–2.3)		1.9 (1.4–2.6)	
Ethnic group				
Majority	1.0	1.0	1.0	1.0
Minority	0.4 (0.2–0.8)	0.4 (0.2–0.8)	0.6 (0.4–0.9)	0.5 (0.3–0.8)
Lifestyle				
Spiritual life				
Very important	1.0	NS	1.0	NS
Not very/not important	0.7 (0.5–0.9)		0.6 (0.5–0.8)	
Physical activity				
≥ 3×/week	1.0	1.0	1.0	1.0
2×/week	0.7 (0.4–1.1)	0.7 (0.4–1.2)	0.8 (0.5–1.2)	0.9 (0.6–1.3)
1×/week	0.9 (0.5–1.5)	0.9 (0.6–1.6)	0.9 (0.6–1.3)	1.0 (0.6–1.5)
1–3×/month	0.8 (0.5–1.3)	0.8 (0.5–1.3)	0.9 (0.6–1.3)	1.0 (0.7–1.4)
Never	1.7 (1.2–2.4)	1.3 (0.9–1.9)	2.0 (1.5–2.6)	1.6 (1.2–2.1)
Smoking				
Nonsmoker	1.0	NS	1.0	NS
Former smoker	1.2 (0.9–1.7)		1.0 (0.8–1.3)	
Occasional smoker	0.6 (0.2–1.8)		0.6 (0.3–1.3)	
Current smoker	1.6 (1.1–2.2)		1.5 (1.2–2.0)	
Alcohol consumption				
Nondrinker	1.0	NS	1.0	1.0
Current drinker	0.6 (0.4–0.9)		0.6 (0.5–0.8)	0.9 (0.7–1.3)
Former drinker	1.2 (0.7–2.0)		1.8 (1.2–2.6)	1.8 (1.2–2.6)
Comorbidity				
BMI				
Normal	1.0	1.0	1.0	1.0
Underweight	1.0 (0.7–1.6)	0.8 (0.5–1.3)	1.3 (0.96–1.8)	0.9 (0.7–1.4)
Overweight	1.7 (1.3–2.3)	1.4 (1.1–1.9)	1.6 (1.3–2.0)	1.4 (1.1–1.8)
Mental disorders				
No	1.0	1.0	1.0	1.0
Yes	3.0 (2.0–4.4)	1.5 (0.9–2.4)	3.8 (2.8–5.0)	1.4 (1.0–2.0)

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Table 4. Continued.

Variables	MSD Short Term Limitation vs No Short Term Limitation		MSD Longterm Limitation vs No Longterm Limitation	
	Bivariate Analysis, PR (95% CI) (n = 17,963*)	Multivariate Analysis [†] , PR (95% CI) (n = 15,814*)	Bivariate Analysis, PR (95% CI) (n = 18,190*)	Multivariate Analysis [†] , PR (95% CI) (n = 15,831*)
Ill defined nervousness				
No	1.0	1.0	1.0	1.0
Yes	3.8 (2.6–5.4)	2.2 (1.4–3.5)	4.5 (3.5–5.9)	2.4 (1.7–3.4)
Diabetes		NS		
No	1.0		1.0	—**
Yes	1.6 (0.9–2.8)		3.1 (2.2–4.4)	—
Hypertension		NS		NS
No	1.0		1.0	
Yes	1.7 (1.2–2.4)		2.4 (1.9–3.0)	
Other				
Social support		NS		NS
High	1.0		1.0	
Low	1.1 (0.8–1.5)		1.6 (1.2–2.0)	
Traumatic events < 18 yrs [#]				
None	1.0	1.0	1.0	1.0
1	1.4 (1.0–1.9)	1.4 (1.0–2.0)	1.4 (1.1–1.8)	1.6 (1.2–2.1)
2	1.5 (1.0–2.2)	1.4 (0.9–2.2)	1.5 (1.1–2.0)	1.6 (1.1–2.3)
≥ 3	2.0 (1.3–2.9)	1.9 (1.3–3.0)	2.2 (1.6–3.0)	2.1 (1.5–3.0)

[†] Each prevalence ratio is adjusted for other variables present in the model. * Unweighted number of respondents included in the analyses. However, prevalence ratios are weighted. ** Variable not included in the final model even if significantly associated because the convergence of the model was questionable.

[#] Traumatic events included 7 items: hospitalization ≥ 2 weeks, parental divorce, prolonged parental unemployment, fearful experiences, being sent away from home, mother or father with problems of alcohol or drugs, or was physically abused by one parent or other relatives²¹. NS: not significant, not included in final model. BMI: body mass index.

lence ratios were significantly increased by having a higher age, having a low income, being overweight, having ill defined nervousness, and by the number of traumatic events that occurred before age 18 years. Being in the minority group had a protective effect on this outcome (Table 4).

For longterm musculoskeletal activity limitation, significant associations were identified in the multivariate model with female sex, higher age, lower income, physical inactivity, being a former drinker, being overweight, mental disorders, ill defined nervousness, and the number of traumatic events that occurred before age 18 years. Being in the minority group also had a protective effect here.

DISCUSSION

Our study provides information on the prevalence of musculoskeletal activity limitation in the general adult population of the province of Quebec. Some factors associated with these prevalence figures were also identified. The results indicate that MSD represent an important cause of activity limitation: about one-fifth of those reporting short term activity limitation and one-third of those reporting longterm activity limitation indicated MSD as a cause.

Multivariate analyses showed that higher age, lower income, being overweight, ill defined nervousness, and the number of traumatic events that occurred before age 18 years were significantly associated with short term and longterm activity limitation related to MSD. People within the ethnic minority group were less likely to report either outcome. Female sex, physical inactivity, being a former drinker, and mental disorders were also associated with longterm activity limitation.

The prevalence estimates of musculoskeletal short term activity limitation (2.3%) and longterm activity limitation (3.8%) found here are lower than those reported from the 1990 Ontario Health Survey data³. The latter study, based on similar questions, reported a population prevalence of 3.2% for 2-week activity limitation related to MSD and a prevalence of 4.6% for longterm activity limitation related to MSD³. Analyses based on several Canadian population health surveys have shown consistently low prevalence of arthritis in Quebec compared to the rest of Canada, even after adjustment for confounding factors³⁶. Our results are thus consistent with existing knowledge.

In our study, multivariate analyses identified several factors associated with short term and longterm activity limita-

tion. Overall, the associations were more frequent and stronger with longterm than with short term limitation. For both outcomes, the prevalence ratios increased with increasing age. Older age has been related to chronic musculoskeletal pain and functional limitation^{4,5,9-11}.

In one study, Badley and Ibañez explored the associations between socioeconomic factors and musculoskeletal activity limitation in the Canadian Health and Activity Limitation Survey (HALS)⁴. A definition similar to that used in our study was retained to identify people with longterm musculoskeletal activity limitation. Badley and Ibañez found that both musculoskeletal and nonmusculoskeletal activity limitation were independently associated with increasing age, being unmarried, being less educated, having lower income, and being unemployed⁴. As in our study, age and lower socioeconomic status were found in the HALS to be associated with longterm activity limitation. Unlike our study, however, multivariate analyses showed no significant increase in risk of musculoskeletal activity limitation for female sex⁴.

The protective effect of the minority ethnic group observed in our study could be explained by a selective “healthy immigrant effect”; 73% of the minority group in this study consisted of immigrants (respondents born outside Canada, except those of French or English maternal language). One study conducted in Quebec in 1998–99 measured the health status of recent immigrants from the Arabic-speaking countries in the Maghreb and the Middle East, Haiti, the Republic of China, Hong Kong, Taiwan and Macau, and the Spanish-speaking countries in the Americas. Overall, immigrants were less likely than the Quebec-born population to have any longterm activity limitation. Moreover, the prevalence of MSD (arthritis, rheumatism, back pain, etc.) was lower among immigrants compared to the Quebec-born population²⁰. Self-reported data from the 1994–95 National Population Health Survey also showed such an effect in Canada, especially among immigrants from non-European countries, who constitute the majority of recent immigrants to Canada³⁷.

In our study, the prevalence ratios of musculoskeletal short term and longterm activity limitation increased with being overweight. This is consistent with the results of other studies^{7,8,10}. Obesity has been identified as a risk factor for knee osteoarthritis³⁸, and it may well be a risk factor for activity limitation related to impairments of the knee. Obesity is assumed to cause osteoarthritis by increasing the mechanical stress on the joints^{8,38,39}. A metabolic explanation has also been proposed⁸. Besides being a risk factor for knee osteoarthritis, obesity may also increase the risk of back pain, especially among women. A longitudinal study has found that women who were obese at the age of 23 years had a relative risk of 1.5 of back pain onset in the following 10 years, and a relative risk of 1.8 for onset several years

later (ages 32–33)⁴⁰. Obesity is also an important risk factor in the onset of type II diabetes⁸. Moreover, diabetes has been associated with some activity limitation related to MSD (e.g., shoulder capsulitis, Dupuytren’s disease)¹⁹. In bivariate analyses, diabetes was strongly associated with longterm activity limitation related to MSD. Thus, diabetes was suspected to play an intermediate role in the relation between obesity and longterm activity limitation related to MSD, and was not included in the multivariate analyses.

We found that mental disorders, ill defined nervousness, and number of traumatic events before age 18 years were all associated in multivariate analyses with short term and/or longterm activity limitation related to MSD. Previous studies have indicated that psychological factors are important to consider when studying musculoskeletal activity limitation^{12,13,15}. Some prospective studies have shown that psychological distress is a strong predictor of MSD^{14,16,41}; psychological distress has also been found to be predictive of longterm back-related functional limitations^{12,13} and neck-shoulder disability¹³. A longitudinal study has shown that depressive disorder increased the risk of activity limitation in older people, even when controlling for confounders¹⁵. Further, a recent study using longitudinal data from the Canadian National Population Health Survey found that psychological trauma in childhood or adolescence was a significant predictor of chronic back pain among women¹⁷.

Methodological considerations. Our study is based on a large sample representative of the general population from the province of Quebec. It is the first study to focus on the prevalence of musculoskeletal activity limitation and associated factors in the general population of Quebec. All estimates here have been weighted to be representative of the Quebec population. Moreover, adjustments were made for several confounding factors.

Information about health problems reported as a cause of activity limitation was collected in a household interview with one respondent who reported health problems for all household members. Therefore, it is likely that MSD have been underreported and prevalence figures could have been underestimated. As well, the 1998 QHS did not include the population living in collective institutions and collective households, such as healthcare establishments. Considering that these individuals are generally more often affected by functional limitations, this probably led to underestimation of the prevalence of musculoskeletal activity limitation in the overall population of Quebec. However, several population studies on MSD^{3,4,10,42}, such as the OHS, excluded institutionalized people. Hence our results are comparable to other investigators’ findings. Simulating the worst-case scenario, where everybody excluded from the survey would have reported some activity limitation and without adjust-

ment for age and sex, and not taking into account the design effect, the prevalence would have been 4.8% (instead of 2.3%) for short term activity limitation and 6.3% (instead of 3.8%) for longterm activity limitation.

The 2 outcomes studied were somewhat different. Because it focused only on the previous 2 weeks, the definition of short term activity limitation we used included some respondents with longterm activity limitation. Since no reference period was given to define "longterm limitation," nondifferential misclassification is possible. Studies on previous Quebec Health Survey data reported that in at least 90% of cases, these limitations persisted for 6 months or more²¹, which thus limits considerably the importance of such a bias, if it existed.

As in other population studies^{3,4}, MSD were considered as a broad group because we were unable to accurately distinguish which body region was affected, given the coding system used in the QHS.

Although we identified factors associated with short and longterm activity limitations related to MSD, the cross-sectional design of this study did not allow us to make causal interpretations. Also, it is important to note that variables we found to be associated with musculoskeletal activity limitation, if they are determinants, are not necessarily unique to musculoskeletal activity limitation. Indeed, determinants of activity limitation seem to be quite nonspecific to health problems⁴. By choosing individuals with no activity limitation at all as the reference group in our analyses (instead of those with activity limitation associated with other health problems than MSD), we intended to identify potential risk factors of musculoskeletal activity limitation, not only those that are specific to musculoskeletal activity limitation. This choice was made because, in a public health perspective, all the factors that contribute to an adverse health outcome are important. Thus, it is possible that the benefits of modifying some possible risk factors identified here go beyond a decrease in musculoskeletal activity limitation to an effect

on activity limitation resulting from other health problems. Complementary analyses using as a comparison group all the participants with no activity limitation due to MSD were conducted to verify this assumption. The results of bivariate analyses were very similar to those presented in Table 4, although the strength of associations with comorbidity factors decreased slightly (Appendix 2). The final results of multivariate analyses were somewhat different for short and longterm activity limitation due to MSD versus no activity limitation due to MSD: with the modified comparison group, the variable "Mental disorders" was not retained further in the final models (short and longterm activity limitation) and marital status became associated with longterm activity limitation due to MSD. In both cases, however, these associations were on the edge of statistical significance.

Since the data we used are based on a large sample representative of the noninstitutionalized adult population of Quebec, our results are generalizable to the population surveyed and can therefore provide useful information on activity limitations related to MSD, in a public health perspective of surveillance. Characteristics associated with the prevalence of MSD among the Quebec working population, including psychosocial factors at work, are presented elsewhere⁴³.

Our findings show that MSD are a major cause of activity limitation among adults in Quebec. Several sociodemographic and comorbidity factors are associated with musculoskeletal short and longterm activity limitation, especially age, low household income, overweight, and ill defined nervousness. With the aging of the population and the increasing prevalence of obesity, increasing prevalence of activity limitation related to MSD is to be expected.

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Appendix 1. Index of traumatic events that occurred before the age of 18 years.

The following questions describe events that may have happened while you were a child or adolescent. Before you were 18 years old:

1. Did you spend 2 weeks or more in the hospital?
2. Did your parents get a divorce?
3. Did your father or mother not have a job for a long time when they wanted to be working?
4. Did something happen that scared you so much you thought about it for years after?
5. Were you sent away from home because you did something wrong?
6. Did either of your parents drink or use drugs so often or so regularly that it caused problems for the family?
7. Were you ever physically abused by someone close to you?

Appendix 2. Unadjusted and adjusted prevalence ratios and 95% CI for potential determinants of (1) musculoskeletal short term activity limitation vs no musculoskeletal short term activity limitation; and (2) musculoskeletal longterm activity limitation vs no musculoskeletal longterm activity limitation. Results in bold type are statistically significant.

Variables	MSD Short Term Limitation vs No MSD Short Term Limitation		MSD Longterm Limitation vs No MSD Longterm Limitation	
	Bivariate Analysis, PR (95% CI) (n = 19,576*)	Multivariate Analysis [†] , PR (95% CI) (n = 17,199*)	Bivariate Analysis, PR (95% CI) (n = 19,576*)	Multivariate Analysis [†] , PR (95% CI) (n = 16,896*)
Sociodemographic				
Sex				
Men	1.0	1.0	1.0	1.0
Women	1.4 (1.1–1.8)	1.2 (0.9–1.7)	1.6 (1.3–2.0)	1.4 (1.1–1.7)
Age, yrs				
18–24	1.0	1.0	1.0	1.0
25–44	1.8 (1.0–3.2)	1.6 (0.9–3.1)	2.4 (1.4–4.3)	1.9 (1.0–3.4)
45–64	2.5 (1.4–4.5)	2.2 (1.1–4.2)	4.7 (2.7–8.2)	3.3 (1.8–6.1)
65+	3.1 (1.7–5.8)	2.7 (1.3–5.7)	5.6 (3.1–10.1)	4.0 (2.0–7.9)
Marital status				
Married	1.0	1.0	1.0	1.0
Common law	1.1 (0.8–1.6)	1.3 (0.9–1.9)	1.1 (0.9–1.5)	1.4 (1.0–1.9)
Single	1.1 (0.7–1.5)	1.4 (0.9–2.1)	0.7 (0.5–1.0)	1.0 (0.7–1.5)
Widowed, divorced	2.1 (1.5–2.9)	1.4 (0.9–2.1)	2.3 (1.8–2.9)	1.3 (0.9–1.7)
Income				
High	1.0	1.0	1.0	1.0
Medium high	1.2 (0.8–2.1)	1.2 (0.7–2.1)	1.5 (1.0–2.3)	1.4 (0.9–2.2)
Medium low	1.4 (0.9–2.4)	1.2 (0.7–2.1)	1.7 (1.1–2.5)	1.4 (0.9–2.2)
Poor	2.3 (1.3–4.0)	1.9 (1.0–3.4)	2.5 (1.6–4.0)	1.6 (1.0–2.7)
Very poor	2.1 (1.1–3.9)	1.2 (0.6–2.6)	3.1 (1.9–5.0)	1.9 (1.1–3.3)
Education				
Highest	1.0	NS	1.0	NS
High	0.9 (0.6–1.4)		1.2 (0.9–1.7)	
Average	1.2 (0.8–1.9)		1.1 (0.8–1.6)	
Low	1.0 (0.7–1.6)		1.5 (1.1–2.1)	
Lowest	1.5 (1.0–2.3)		1.8 (1.3–2.4)	
Ethnic group				
Majority	1.0	1.0	1.0	1.0
Minority	0.4 (0.2–0.8)	0.4 (0.2–0.8)	0.6 (0.4–0.9)	0.5 (0.3–0.8)
Lifestyle				
Spiritual life				
Very important	1.0	NS	1.0	NS
Not very/not important	0.7 (0.5–0.95)		0.7 (0.5–0.8)	
Physical Activity				
≥ 3 ×/week	1.0	1.0	1.0	1.0
2 ×/week	0.7 (0.4–1.1)	0.7 (0.4–1.2)	0.8 (0.5–1.2)	0.9 (0.6–1.4)
1 ×/week	0.9 (0.5–1.5)	0.9 (0.5–1.5)	0.9 (0.6–1.3)	0.9 (0.6–1.4)
1–3 ×/month	0.8 (0.5–1.3)	0.8 (0.5–1.3)	0.9 (0.6–1.3)	1.0 (0.7–1.4)
Never	1.6 (1.1–2.2)	1.3 (0.9–1.8)	1.8 (1.4–2.4)	1.5 (1.1–2.0)
Smoking				
Nonsmoker	1.0	NS	1.0	NS
Former smoker	1.2 (0.8–1.7)		1.0 (0.7–1.3)	
Occasional smoker	0.6 (0.2–1.8)		0.6 (0.3–1.3)	
Current smoker	1.5 (1.1–2.1)		1.5 (1.2–1.9)	
Alcohol consumption				
Nondrinker	1.0	NS	1.0	1.0
Current drinker	0.6 (0.4–0.9)		0.7 (0.5–0.9)	1.0 (0.7–1.4)
Former drinker	1.1 (0.6–1.8)		1.7 (1.1–2.4)	1.7 (1.1–2.6)
Comorbidity				
BMI				
Normal	1.0	1.0	1.0	1.0
Underweight	1.0 (0.7–1.6)	0.7 (0.5–1.2)	1.3 (0.9–1.7)	0.9 (0.6–1.3)
Overweight	1.7 (1.3–2.3)	1.4 (1.1–1.9)	1.6 (1.3–2.0)	1.4 (1.1–1.7)

Variables	MSD Short Term Limitation vs No MSD Short Term Limitation		MSD Longterm Limitation vs No MSD Longterm Limitation	
	Bivariate Analysis, PR (95% CI) (n = 19,576*)	Multivariate Analysis [†] , PR (95% CI) (n = 17,199*)	Bivariate Analysis, PR (95% CI) (n = 19,576*)	Multivariate Analysis [†] , PR (95% CI) (n = 16,896*)
Mental disorders		NS		NS
No	1.0		1.0	
Yes	2.4 (1.6–3.5)		2.8 (2.1–3.7)	
Ill defined nervousness				
No	1.0	1.0	1.0	1.0
Yes	2.9 (2.0–4.2)	2.0 (1.3–3.0)	3.4 (2.6–4.5)	2.1 (1.5–2.8)
Diabetes		NS		NS
No	1.0		1.0	
Yes	1.4 (0.8–2.5)		2.4 (1.7–3.4)	
Hypertension		NS		NS
No	1.0		1.0	
Yes	1.6 (1.2–2.3)		2.0 (1.6–2.6)	
Other				
Social support		NS		NS
High	1.0		1.0	
Low	1.0 (0.7–1.4)		1.5 (1.2–1.9)	
Traumatic events < 18 yrs				
None	1.0	1.0	1.0	1.0
1	1.3 (1.0–1.9)	1.4 (1.0–2.0)	1.4 (1.1–1.8)	1.6 (1.2–2.1)
2	1.5 (1.0–2.2)	1.4 (0.9–2.2)	1.5 (1.1–2.0)	1.5 (1.1–2.1)
≥ 3	1.8 (1.2–2.7)	1.9 (1.2–2.9)	2.2 (1.6–3.0)	2.2 (1.5–3.0)

[†] Each prevalence ratio is adjusted for other variables present in the model. * Unweighted number of respondents included in the analyses. However, prevalence ratios are weighted.

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