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Vol. 15 No. 1

• Obesity and arthritis

• Premature mortality

• Stress



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Parsons GF, Gentleman JF, Johnston KW. Gender differences in abdominal aortic aneurysm surgery. *Health Reports* (Statistics Canada, Catalogue 82-003) 1997; 9(1): 9-18.

Research Articles

Stress, health and the benefit of social support 9

While almost all Canadians reported stress in 1994/95, women were more likely than men to do so, and they reacted to a wider range of stressors. Stress was related to psychological distress and a number of health problems—both short- and long-term. The impact of stress on psychological well-being may be buffered by emotional support.

Margot Shields

Incident arthritis in relation to excess weight 39

In 2000/01, 19% of men and 31% of women aged 40 or older reported having been diagnosed with arthritis. For both sexes, the odds of developing arthritis were higher among those who were obese, compared with individuals of acceptable weight— independent of other factors such as age, household income, daily lifting, physician visits and psychological distress.

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Premature mortality in health regions with high Aboriginal populations 51

The rate of potential years of life lost—a measure used to quantify premature mortality—was considerably higher in health regions with large proportions of Aboriginal residents, compared with other health regions. Much of this difference was attributable to injuries in the high-Aboriginal regions; notably, suicides and motor vehicle accidents.

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Stress, health and the benefit of social support

Margot Shields

Abstract

Objectives

This article describes stress exposure among Canadians aged 18 or older and analyzes short- and long-term associations with psychological distress and chronic conditions. The buffering role of emotional support is also explored.

Data sources

Data are from the household cross-sectional (1994/95) and longitudinal (1994/95 to 2000/01) components of Statistics Canada's National Population Health Survey. Supplemental data are from the 2000/01 Canadian Community Health Survey.

Analytical techniques

Exposure rates to stress were calculated by sex, age group and socio-economic characteristics. Multivariate analyses were used to examine associations between stress and mental and physical health in 1994/95, and between stress and changes in health by 2000/01, controlling for other possible confounders.

Main results

Women reported more stress than did men. For both sexes, stress levels were higher among the less educated, less affluent, and previously married. The level of psychological distress in 1994/95 and the prevalence of chronic conditions were related to stress, as were increases in distress over the next six years and the likelihood of having been diagnosed with chronic conditions.

Key words

life change events, life stress, chronic disease, mental health, longitudinal studies, health surveys

Author

Margot Shields (613-951-4177; Margot.Shields@statcan.ca) is with the Health Statistics Division at Statistics Canada, Ottawa, Ontario, K1A 0T6.

Stress has become a common theme of modern life as individuals try to cope with incessant demands that, for many, are overwhelming. Pressures at home, at work and even during leisure time often seem relentless. At the same time, the decline in family size and increased geographic mobility have meant fewer support networks. Therefore, it is hardly surprising that most Canadians report at least some stress in their lives, and over a quarter describe their days as “quite,” if not “extremely,” stressful. For some, this stress may intensify until it poses a threat to mental health.¹⁻⁹ And, although the exact mechanisms are not fully understood, the emotions engendered by stress can alter the immune response and influence the onset and progression of physical illness.¹⁰⁻¹³ Another possibility is that stress may prompt negative changes in health behaviours as individuals attempt to cope.^{10,11,13}

But stress does not always lead to illness. An individual's reaction to a potentially stress-provoking situation determines its impact on health. Whether or not a stressor will help make someone sick depends on a complex set of factors that may include genetics, how the stress is perceived, and available resources.¹³⁻¹⁵ External resources such as

Measuring stress

This analysis considers three kinds of stress: recent negative life events, chronic strains, and childhood traumas.

To determine *recent negative life events*, the National Population Health Survey (NPHS) asked 10 “yes/no” questions: In the past 12 months,

- 1) . . . were you (or was anyone close to you—that is, your spouse or partner, children, relatives or close friends) beaten up or physically attacked?
- 2) . . . did you or someone in your family have an unwanted pregnancy?
- 3) . . . did you or someone in your family have an abortion or miscarriage?
- 4) . . . did you or someone in your family have a major financial crisis?
- 5) . . . did you or someone in your family fail school or a training program?
- 6) . . . did you (or your partner) experience a change of job for a worse one?
- 7) . . . were you (or your partner) demoted at work or did either of you take a cut in pay?
- 8) . . . did you have increased arguments with your partner?
- 9) Now, just you personally, did you go on welfare?
- 10) . . . did you have a child move back into the house?

A total score was calculated by summing the “yes” responses. Item 8 did not apply to respondents without a spouse/common-law partner, and item 10 did not apply to those without children. To have consistent ranges of scores for all sub-populations, scores were adjusted (prorated) so that all respondents had a potential maximum of 10. For example, if a single man without children answered “yes” to 4 of the 8 questions applicable to him, his initial score of 4 would be pro-rated by multiplying by 10 (the maximum) and dividing by 8 (the number of applicable items), resulting in a final score of 5.

Chronic strains were measured by asking respondents to reply “true” or “false” to 17 statements:

- 1) You are trying to take on too many things at once.
- 2) There is too much pressure on you to be like other people.
- 3) Too much is expected of you by others.
- 4) You don’t have enough money to buy the things you need.
- 5) Your partner doesn’t understand you.
- 6) Your partner doesn’t show enough affection.
- 7) Your partner is not committed enough to your relationship.
- 8) You find it is very difficult to find someone compatible with you.
- 9) One of your children seems very unhappy.
- 10) A child’s behaviour is a source of serious concern to you.
- 11) Your work around the home is not appreciated.
- 12) Your friends are a bad influence.

- 13) You would like to move but you cannot.
- 14) Your neighbourhood or community is too noisy or too polluted.
- 15) You have a parent, a child or partner who is in very bad health and may die.
- 16) Someone in your family has an alcohol or drug problem.
- 17) People are too critical of you or what you do.

Items 5 to 7 applied to those with a spouse/common-law partner; item 8, to single respondents; and items 9 and 10, to those with children. The maximum number of applicable items was 16. A total score was calculated by summing the “yes” responses and prorating the result (as described above) to be out of 16.

Childhood traumas were measured with 7 “yes/no” questions about events that happened when the respondent was a child or a teenager, before moving out of the house:

- 1) Did you spend two 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 that it caused problems for the family?
- 7) Were you ever physically abused by someone close to you?

The score for childhood traumas was calculated by summing the “yes” responses.

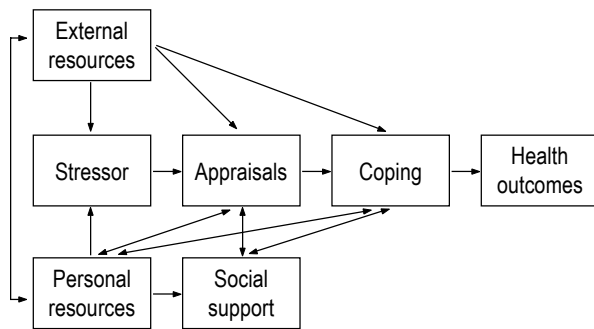
Total stress was calculated as the sum of the scores for recent negative life events, chronic strains, and childhood traumas.

To maximize the number of respondents for whom scores were calculated, some non-response was accepted. If no more than 25% of applicable items had missing values, a score was calculated and adjusted to compensate for the item non-response. For example, if the number of applicable items for a respondent’s stress score was 16, and this respondent had 4 “yes” responses, 8 “no” responses, and 4 items with non-response, the initial score of 4 would be adjusted by multiplying by 16 (the total number of applicable items) and dividing by 12 (the number of items for which there was a response), resulting in an overall score of 5.3. The adjustment for non-response was made before the adjustment for applicable items as described above.

To determine day-to-day stress, the 2000/01 Canadian Community Health Survey asked, “Thinking about the amount of stress in your life, would you say that most days are: not at all stressful? not very stressful? a bit stressful? quit a bit stressful? extremely stressful?”

money and education,¹⁶ personal resources such as a sense of control over one's life¹⁶⁻²¹ and emotional support,^{3,16-20} can mediate the impact of stress (Figure 1).^{15,16}

Figure 1
The stress process



Sources: References 15 and 16

Some resources may prevent an individual from experiencing stress in the first place. For example, highly educated people may never encounter the stress of job insecurity. Resources can also affect the perception of an event. A sense of mastery may help individuals place less importance on stressful situations. As well, resources can help in coping. People with a strong support network may receive advice that helps them resolve a situation before it can affect their health, or emotional reinforcement that mitigates its impact.

Using data from the National Population Health Survey (NPHS) and the Canadian Community Health Survey (CCHS), this article describes the stress levels of Canadian adults (see *Measuring stress*) and how stress levels vary by demographic and socio-economic characteristics (see *Definitions, Data sources, Analytical techniques and Limitations*). Based on 1994/95 cross-sectional data, associations between stress and psychological distress and chronic conditions are determined. With longitudinal data, stress in 1994/95 is studied in relation to changes in psychological distress and the incidence of chronic conditions by 2000/01. These relationships are examined using multivariate techniques to control for the influence of other variables that might affect the outcomes. The role emotional support plays in the relationship between

stress and mental and physical health is also considered. Because men and women report different levels and sources of stress, separate analyses are conducted for each sex.

Sources of stress

Stress can originate in a variety of situations, so to understand the full health impact, multiple sources must be considered²² (see *Stress leading to stress*). Three types of stress are examined in this analysis: recent negative life events, chronic strains and childhood traumas.

A life event is an acute change that requires a major adjustment in a short time.¹⁹ In the early days of stress research, all change was viewed as potentially stress-provoking. This has given way to the belief that negative changes, particularly unscheduled or uncontrolled events, are more predictive of health problems.^{18,23-26} Negative life events are usually measured over a fixed reference period; in the case of the NPHS, the period is one year.

Chronic strains, by contrast, are not discrete events. Often there is no clear beginning; these strains develop subtly and persist.^{19,27} Chronic strains may be related to social roles;^{18,26} for example, being in a relationship, being a parent, or working. They can also arise from not having a desired role, such as wanting a partner but not being able to find someone.²² Another class of chronic strains concerns ambient circumstances, such as time pressure, financial trouble and environmental problems.^{26,27}

Childhood traumas, such as parental divorce and parental substance abuse, may have occurred many years before, but can have a lingering impact.²⁸

A common experience

A substantial number of Canadians experience stress. In response to the 2000/01 CCHS, 26% of people aged 18 or older characterized their life as “quite stressful” or “extremely stressful,” and another 40% reported it to be “a bit stressful” (Chart 1).

In 1994/95, the NPHS found that the most common forms of stress were chronic strains, especially trying to do too many things at once,

Definitions

Four *age groups* were established for this analysis: 18 to 24, 25 to 44, 45 to 64, and 65 or older.

Household income was based on the number of people in the household and total household income from all sources in the 12 months before the 1994/95 interview.

| 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 |

National Population Health Survey (NPHS) respondents were grouped into four *education* categories based on the highest level attained: less than secondary graduation, secondary graduation, some postsecondary, and postsecondary graduation.

Respondents were asked their current *marital status*. Those who indicated "now married," "common-law" or "living with a partner" were grouped as "married." Individuals who answered "single" were classified as "never married," and responses of "widowed," "separated" or "divorced" were categorized as "previously married."

Daily smokers were defined as those who indicated that they smoked cigarettes every day.

Leisure-time *physical activity* was based on total accumulated energy expenditure (EE), calculated from the reported frequency and duration of all of a respondent's leisure-time physical activities in the three months before the 1994/95 NPHS interview and the metabolic energy demand (MET value) of each activity, which was independently established.^{29,30}

$$EE = \sum (N_i * D_i * MET_i / 365 \text{ days}), \text{ where}$$

N_i = number of occasions of activity i in a year,

D_i = average duration in hours of activity i , and

MET_i = a constant value for metabolic energy cost of activity i .

For each respondent, daily EE was the sum of energy expenditures of all leisure-time activities, expressed as total kilocalories expended per kilogram of body weight per day (K/K/D). An EE of 3 or more K/K/D was defined as active leisure time; 1.5 to 2.9, moderately active; and less than 1.5, inactive.²⁹

Heavy drinking was measured by asking respondents the number of times in the past year they had five or more alcoholic drinks on one occasion. Those who answered 12 or more times were classified as heavy drinkers.

Weight was defined in terms of body mass index (BMI), which was calculated by dividing weight in kilograms by the square of height in metres. BMI is not calculated for pregnant women. BMI was grouped into two categories: obese (BMI 30 or more) and not obese (less than 30).

To measure *mastery*, respondents were asked to react to 7 statements, ranked on a five-point scale ranging from "strongly agree" (score 0) to "strongly disagree" (score 4):

- You have little control over the things that happen to you.
- There is really no way you can solve 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 you are being pushed around in life.
- What happens in the future mostly depends on you. (Reverse scored.)
- You can do just about anything if you set your mind to it (Reverse scored.)

The responses were summed (ranging from 0 to 28), with higher scores indicating greater mastery (Cronbach's alpha = 0.76).

Four "yes/no" questions were used to measure perceived *emotional support*:

- Do you have someone you can talk to about your private feelings or concerns?
- Do you have someone you can really count on in a crisis situation?
- Do you have someone you can really count on to give you advice when you are making important personal decisions?
- Do you have someone who makes you feel loved and cared for?

The "yes" responses were summed (ranging from 0 to 4), with higher scores indicating greater perceived emotional support. Respondents were classified as having low emotional support if they answered "yes" to at least one of the four items.

Psychological distress was based on responses to the following questions: During the past month, about how often did you feel:

- ... so sad that nothing could cheer you up?
- ... nervous?
- ... restless or fidgety?
- ... hopeless?
- ... worthless?
- ... that everything was an effort?

Each question was answered on a five-point scale: all of the time (score 4), most of the time (3), some of the time (2), a little of the time (1) or none of the time (0). Responses were scored and summed; the possible range was 0 to 24, with a higher score indicating more distress (Cronbach's alpha = 0.77). For longitudinal analyses, the difference in distress scores was calculated as the score in 2000/01 minus the score in 1994/95.

To determine the presence of *chronic conditions*, respondents were asked if they had "any long-term health conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." The interviewer then read a checklist. Conditions considered in this analysis were: asthma, arthritis/rheumatism, back problems (excluding arthritis), high blood pressure, migraine, chronic bronchitis/emphysema, diabetes, heart disease, cancer, and stomach/intestinal ulcers. Respondents were classified as having "none" or "one or more" of these conditions in 1994/95. For longitudinal analyses, the incidence of each condition was determined over a six-year period. Respondents were classified as having one or more new chronic conditions if, in 2000/01, they reported at least one from the checklist that they had not reported in 1994/95.

which was cited by 44% of adults (Table 1, Chart 2). Financial problems affected 38%, and 31% felt that others expected too much of them. One person in five (21%) wanted to move, but felt that a move was not possible.

A third of previously married or never-married people reported difficulty finding someone compatible. And 30% of people with children were seriously concerned about a child's behaviour.

Stress leading to stress

Stress rarely occurs in isolation, and in some cases, stress in one milieu may create stressors in another.¹⁸ For instance, problems at work may cause tension at home, which may, in turn, exacerbate work problems. "Proliferation of stressors" refers to the development and spread of stress across all facets of a person's life.^{16,19,26}

Modest to sizeable correlations were observed between the various sources of stress measured by the National Population Health Survey in 1994/95. Women seemed to be especially vulnerable to "stress proliferation."

As well, stress in 1994/95 was associated with stress six years later. And for both sexes, childhood traumas were associated with chronic strains and recent negative life events, suggesting that stress that occurred decades earlier can have a long-lasting impact.

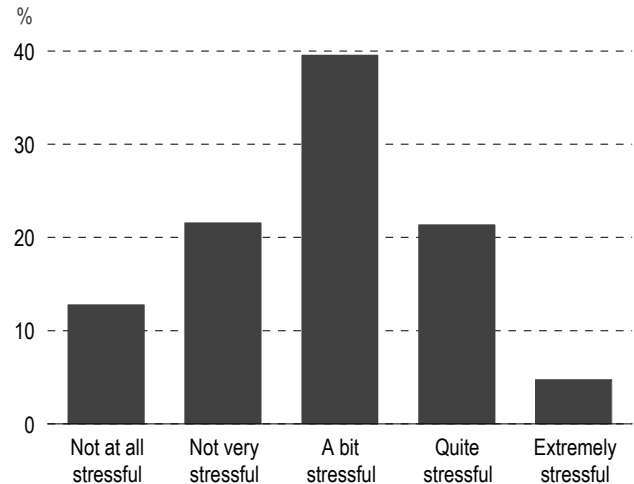
Correlations between sources of stress, by sex, household population aged 18 or older in 1994/95, Canada excluding territories

| | Men | Women |
|---|------|-------|
| Cross-sectional correlations, 1994/95 | | |
| Recent negative life events x chronic strains | 0.38 | 0.43 |
| Recent negative life events x childhood traumas | 0.31 | 0.34 |
| Chronic strains x childhood traumas | 0.30 | 0.37 |
| Longitudinal correlations, 1994/95 to 2000/01 | | |
| Recent negative life events 1994/95 x recent negative life events 2000/01 | 0.25 | 0.27 |
| x chronic strains 2000/01 | 0.25 | 0.26 |
| Chronic strains 1994/95 x recent negative life events 2000/01 | 0.22 | 0.27 |
| x chronic strains 2000/01 | 0.37 | 0.49 |
| Childhood traumas 1994/95 x recent negative life events 2000/01 | 0.20 | 0.25 |
| x chronic strains 2000/01 | 0.18 | 0.29 |

Data sources: 1994/95 National Population Health Survey, cross-sectional sample, Health file; 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

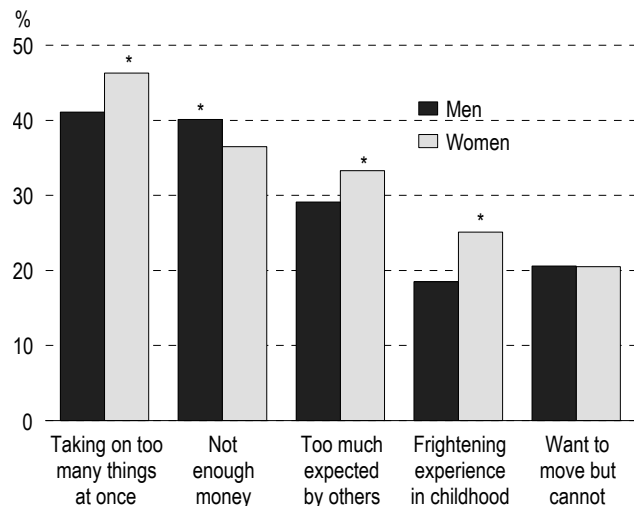
More dramatic stressors in the categories of recent negative life events and childhood traumas were less prevalent. Around 3% of adults reported that in the past year they or someone in their family had had an abortion or miscarriage, and 5% said

Chart 1
Percentage distribution of household population aged 18 or older, by day-to-day stress level, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Chart 2
Five most common sources of stress, by sex, household population aged 18 or older, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

* Significantly higher than estimate for other sex ($p < 0.05$)

that they or someone close to them had been beaten up or physically attacked. A larger number—over 7%—had been physically abused by someone close to them when they were children.

When the various stressors in an adult's life were added up, the average in 1994/95 was 4.6 (Table 2). The range, however, was wide: from individuals reporting no stressors at all to those citing 29.

Women more stressed

Whether it was recent negative life events, chronic strains or childhood traumas, women were generally more likely than men to report stress. Not surprisingly, then, women's average stress score was higher (4.8 versus 4.3 for men), and a larger percentage had 10 or more stressors (Chart 3).

Women were more likely than men to report chronic strains in the realms of personal stress,

Data sources

National Population Health Survey

Since 1994/95, Statistics Canada's biennial National Population Health Survey (NPHS) has collected information about the health of the Canadian population. The survey covers household and institutional residents in all provinces and territories, except persons on Indian reserves, on Canadian Forces bases, and in some remote areas. This analysis is based only on household residents in the 10 provinces.

In 1994/95 (cycle 1), data were collected using two questionnaires: General and Health. With the General questionnaire, socio-demographic and some basic health information was collected from one knowledgeable household member for all members of sampled households. Additional, in-depth health information about one randomly selected household member was collected using the Health questionnaire. Because of the detailed nature of the Health questionnaire, this information had to be provided by the selected respondent. Proxy response was accepted only in special circumstances (for example, if a health problem prevented the selected respondents from providing their own information).

In cycle 1, a total of 20,725 households participated, meaning that at least the General questionnaire was completed for the randomly selected respondent—a response rate of 88.7%. The response rate to the Health questionnaire for the randomly selected respondents was 96.1%. Numbering 17,276, they formed the basis for the longitudinal panel. The response rates for the longitudinal panel in subsequent cycles were 93.6% in 1996/97, 88.9% in 1998/99, and 84.8% in 2000/01. The first three cycles had both longitudinal and cross-sectional components, but starting in 2000/01 (cycle 4), the NPHS became strictly longitudinal, and one questionnaire was used to collect all information from the longitudinal panel.

In 1994/95, the majority of interviews were conducted in person. In subsequent cycles, as long as respondents were willing and able, the interviews were conducted by telephone. More detailed

descriptions of the design, sample and interview procedures can be found in published reports.^{31,32}

The cross-sectional sample analyzed for this article consists of 15,690 respondents (6,954 men and 8,736 women) aged 18 or older and is based on the 1994/95 NPHS. It was necessary to use 1994/95 data for the cross-sectional analysis because the stress questions were not asked in any of the subsequent cycles for which a cross-sectional file was produced. (The stress questions were repeated in 2000/01, the cycle at which the NPHS became strictly longitudinal.) Because of the subjective nature of the stress questions, it was felt that another household member could not accurately report this information. Consequently, 433 men and 168 women whose Health questionnaire data were provided by proxy were excluded from the analyses.

The longitudinal analysis is based on 10,151 respondents (4,370 men and 5,781 women) aged 18 or older in 1994/95, for whom complete data were available for cycles 1 and 4. Respondents whose 1994/95 Health questionnaire data were provided by proxy were excluded (261 men and 102 women). Also excluded were longitudinal panel members who had died or been institutionalized by the 2000/01 interview (506 men and 544 women). Consequently, weighted estimates based on the longitudinal file are lower than those based on the 1994/95 cross-sectional file.

Canadian Community Health Survey

Recent estimates of day-to-day stress levels are from Statistics Canada's 2000/01 Canadian Community Health Survey (CCHS). The CCHS covers the household population aged 12 or older in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas. The responding sample was 131,535, and the response rate was 84.7%. The CCHS data in this article pertain to 118,105 respondents aged 18 or older in the provinces and territories, who answered the question about daily stress.

relationships, children, and family health. Most of these stressors involve significant others. It has been suggested that women are socialized to be more

responsive to others' well-being, so their higher stress rates may partially stem from their nurturing roles—the “cost of caring.”^{33,34}

Table 1

Percentage of household population aged 18 or older reporting stress, by source of stress and sex, Canada excluding territories, 1994/95

| | Both sexes | Men | Women |
|--|------------|-------|-------|
| | % | | |
| Recent negative life events (past 12 months) | | | |
| You/Family member had major financial crisis | 13.3 | 12.0 | 14.6* |
| You/Partner demoted at work or took pay cut | 11.7 | 12.4* | 11.0 |
| Increased arguments with partner† | 8.7 | 7.1 | 10.1* |
| Went on welfare | 6.4 | 5.9 | 6.9 |
| Child moved back into house‡ | 5.3 | 4.9 | 5.6 |
| You/Partner changed job for worse one | 5.1 | 5.8* | 4.5 |
| You/Someone close physically attacked | 5.0 | 5.1 | 5.0 |
| You/Family member failed school/training program | 4.6 | 4.6 | 4.6 |
| You/Family member had abortion/miscarriage | 2.8 | 2.0 | 3.5* |
| You/Family member had unwanted pregnancy | 2.0 | 1.5 | 2.4* |
| Chronic strains | | | |
| Personal stress | | | |
| Trying to take on too much at once | 43.8 | 41.1 | 46.3* |
| Too much expected by others | 31.3 | 29.1 | 33.3* |
| Too much pressure to be like others | 16.0 | 15.0 | 16.9* |
| Work around home not appreciated | 12.7 | 8.7 | 16.3* |
| People too critical of you | 11.8 | 11.7 | 11.9 |
| Financial problems | | | |
| Not enough money to buy things needed | 38.2 | 40.1* | 36.5 |
| Relationship problems | | | |
| Very difficult to find someone compatible§ | 32.8 | 35.7* | 30.4 |
| Partner doesn't understand you† | 13.8 | 11.7 | 15.8* |
| Partner doesn't show enough affection† | 12.2 | 9.9 | 14.5* |
| Partner not committed enough to relationship† | 6.0 | 5.0 | 7.0* |
| Child problems‡ | | | |
| Child's behaviour is serious concern | 29.6 | 29.5 | 29.7 |
| Child seems very unhappy | 16.3 | 14.1 | 18.1* |
| Environmental problems | | | |
| Want to move but can't | 20.6 | 20.6 | 20.5 |
| Neighbourhood/Community too noisy/polluted | 9.8 | 9.6 | 10.1 |
| Friends are bad influence | 3.5 | 5.0* | 2.1 |
| Family health | | | |
| Family member has drinking/drug problem | 14.0 | 12.4 | 15.4* |
| Parent/Child/Partner in very bad health, may die | 11.4 | 10.3 | 12.3* |
| Childhood traumas | | | |
| Something scared you so much that you thought about it for years | 22.0 | 18.5 | 25.1* |
| Spent two or more weeks in hospital | 15.7 | 16.4 | 15.1 |
| Parental drinking/drug use caused family problems | 14.5 | 13.4 | 15.4* |
| Parent did not have job for long time | 13.4 | 13.2 | 13.6 |
| Parents divorced | 10.7 | 9.9 | 11.5* |
| Physically abused by someone close | 7.5 | 4.6 | 10.2* |
| Sent away from home because you did something wrong | 2.5 | 2.7 | 2.4 |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Note: Based on 6,954 male and 8,736 female respondents

† Married respondents

‡ Respondents with children

§ Previously married and never-married respondents

* Significantly higher than estimate for other sex ($p < 0.05$)

Table 2

Stress scores, by source of stress and sex, household population aged 18 or older, Canada excluding territories, 1994/95

| | Both sexes | Men | Women |
|------------------------------------|------------|------|-------|
| Total stress | | | |
| Average score | 4.6 | 4.3 | 4.8* |
| Observed minimum | 0 | 0 | 0 |
| Observed maximum | 28.7 | 25.7 | 28.7 |
| Recent negative life events | | | |
| Average score | 0.7 | 0.6 | 0.7* |
| Observed minimum | 0 | 0 | 0 |
| Observed maximum | 7.8 | 7.8 | 7.8 |
| Chronic strains | | | |
| Average score | 3.0 | 2.9 | 3.2* |
| Observed minimum | 0 | 0 | 0 |
| Observed maximum | 16.0 | 14.7 | 16.0 |
| Childhood traumas | | | |
| Average score | 0.9 | 0.8 | 0.9* |
| Observed minimum | 0 | 0 | 0 |
| Observed maximum | 7.0 | 7.0 | 7.0 |

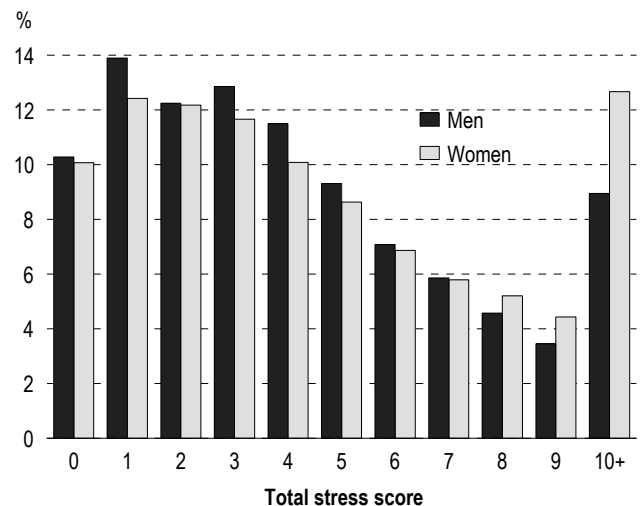
Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Note: Based on 6,954 male and 8,736 female respondents

* Significantly higher than estimates for men ($p < 0.05$)

Chart 3

Percentage distribution of household population aged 18 or older, by total stress scores and sex, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Women were also more likely than men to report four of the seven childhood traumas: an experience so frightening that they thought about it for years afterward, a parent with a drinking or drug problem, parental divorce, and physical abuse.

A few stressors affected a higher percentage of men than women. Men were more likely to report employment-related stress, such as a change of job for a worse one, a demotion or pay cut, and not having enough money. Larger proportions of previously married and never-married men than women found it difficult to find someone compatible. And although the numbers were small

for both sexes, men were more likely to report that their friends were a bad influence.

Decreases with age

Like many previous studies,^{28,34,37} analyses of 1994/95 NPHS data show that stress levels originating from each of the three sources—recent negative life events, chronic strains and childhood traumas—decline with age (Charts 4 to 6). It is possible that experience and maturity make people less likely to perceive events as stressful. While the inverse relationship between age and reporting childhood traumas could be due to recall problems,

Analytical techniques

The prevalence of day-to-day stress was determined based on the 2000/01 Canadian Community Health Survey. The data were weighted to represent the population of the provinces and the territories in 2000/01.

Descriptive statistics based on the 1994/95 National Population Health Survey (NPHS) cross-sectional file were used to profile stress levels by sex and age group. Relationships between stress and various health problems in 1994/95 were considered in a series of multivariate models that control for factors believed to play a role in the relationship between stress and health: demographic and socio-economic characteristics, health behaviours and psycho-social resources.^{10,11,16,18,20,21} Mental health was addressed by considering psychological distress levels. To study the relationship between stress and physical health, 10 chronic conditions were examined: asthma, arthritis, back problems, high blood pressure, migraine, chronic bronchitis/emphysema, diabetes, heart disease, cancer, and stomach/intestinal ulcers.

The NPHS longitudinal file was used to study changes in psychological distress and the incidence of chronic conditions between 1994/95 and 2000/01 in relation to stress in 1994/95. Each association was examined in multivariate regression models. Again, the factors believed to mediate the relationship between stress and health were accounted for in these models. In all the regression models, continuous measures were used for the stress, mastery, emotional support and psychological distress variables.^{35,36}

To test the emotional support buffering hypothesis, the regression models were of the following form:

$$H = \beta_0 + \beta_1(\text{str}) + \beta_2(\text{pes}) + \beta_3(\text{stress} \times \text{pes}) + (\text{other control variables})$$

where:

H = health outcome

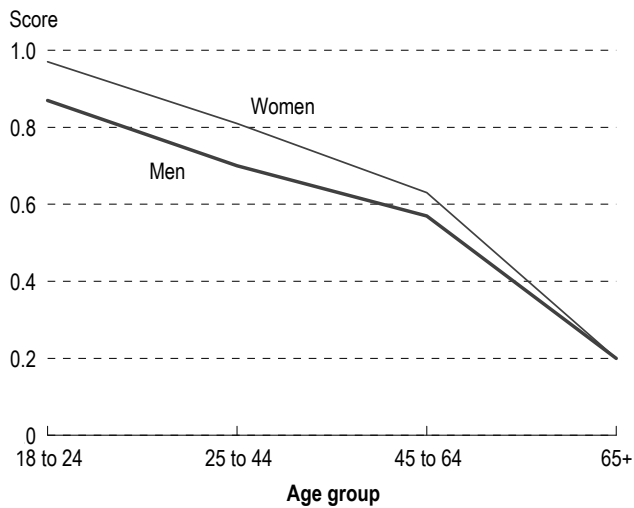
str = stress

pes = perceived emotional support

Evidence of buffering is indicated by a significant negative interaction between stress and emotional support. That is, if β_3 (the cross-product regression coefficient) is significantly less than zero, this indicates a benefit derived from emotional support (to the health outcome) for each increment in stress. The regression coefficients for the constituent variables (β_1 and β_2) estimate the effect of one of these variables when the other is zero. In this example, β_1 represents the effect of stress on the health outcome for people with zero emotional support, and β_2 represents the effect of emotional support for those with zero stress.³⁸ In reality, however, almost no one is totally devoid of emotional support or totally insulated from stress. Therefore, for this analysis, the stress and emotional support variables were centred. The mean for each variable was subtracted from the corresponding value on each individual record. In the revised data set, β_1 represents the effect of stress for those with an average amount of emotional support; β_2 represents the effect of emotional support for people with an average amount of stress.³⁹

The cross-sectional and longitudinal NPHS data were weighted to reflect the socio-demographic makeup of the population of the 10 provinces in 1994/95. Sample sizes and weighted distributions for all factors included in the regression models can be found in the Appendix (Tables A through E). To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique.⁴⁰⁻⁴³ All significance tests were conducted using a p-value of 0.05, which was deemed appropriate because the number of incident cases of chronic conditions, the main focus of the analyses, was relatively small (Appendix Table E). However, significance levels of 0.01 and 0.001 are also shown in the tables, indicating the relationships between stress and health outcomes.

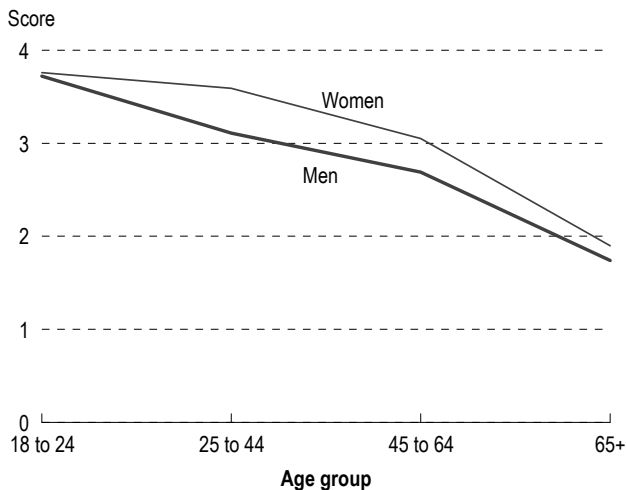
Chart 4
Average score for recent negative life events, by sex and age group, household population aged 18 or older, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: Score decreases significantly as age increases ($p < 0.05$ adjusted for multiple comparisons), except no significant difference between age groups 18 to 24 and 25 to 44 for women; women's score significantly higher than men's for age group 25 to 44.

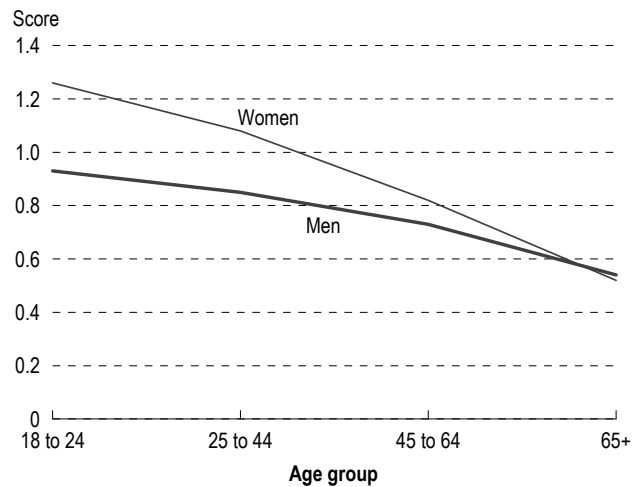
Chart 5
Average score for chronic strains, by sex and age group, household population aged 18 or older, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: Score decreases significantly as age increases ($p < 0.05$ adjusted for multiple comparisons), except no significant difference between age groups 18 to 24 and 25 to 44 for women; women's score significantly higher than men's for age groups 25 to 44 and 45 to 64.

Chart 6
Average score for childhood traumas, by sex and age group, household population aged 18 or older, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: Score decreases significantly as age increases ($p < 0.05$ adjusted for multiple comparisons), except no significant difference between age groups 18 to 24 and 25 to 44 for men; women's score significantly higher than men's for age groups 18 to 24, 25 to 44 and 45 to 64.

it might also signal a lessening of the impact of these events over time. Nonetheless, many of the situations that comprise the stress scales commonly occur in young and middle adulthood.³⁷

Inverse relationship with socio-economic status

Stress tends to be relatively high among people with low socio-economic status.^{34,44} The strength of this association, however, may be diluted by the low prevalence of stress at older ages, and the fact that a disproportionate percentage of the elderly have low incomes and relatively little formal education. When the effects of these potential confounders were taken into account, in 1994/95, men and women with lower household incomes generally reported higher levels of stress from each of the three sources (Table 3). The relationship between education and stress was less consistent. Postsecondary graduates tended to report less stress than did people with lower levels of education. However, men and women with some postsecondary schooling reported higher stress levels than did high school graduates (data not

shown). It has been suggested that starting but not completing college or university is itself a source of stress.⁴⁴

A number of studies have found that people who are not married are more likely than those who are to report negative life events and chronic strains.^{34,44} The results of analyses of NPHS data are similar for previously married individuals (widowed, separated, divorced), but not for the never-married. The chronic strain scores of never-married people were on a par with those of married people, and their scores for recent negative life events were actually lower. This may be because many items included among negative life events concern not only the respondents, but also their family. With fewer family members, never-married people may be less exposed to such stressors.

Response to stressors

The majority of people who experience stress continue to function effectively with no adverse health effects. But for some, stress is associated with mental health problems such as depression and psychological distress.¹⁻⁹ Stress has also been linked to the onset and progression of physical illnesses including infectious diseases such as colds and influenza; autoimmune diseases such as rheumatoid arthritis; and potentially fatal conditions such as coronary heart disease, insulin dependent diabetes, cancer, and HIV.^{10-12,45-47}

Previous studies have clearly established stress as a non-specific risk factor. It is important, therefore, to consider more than one health outcome. Stress can manifest itself in a variety of ways depending on the nature of the stress and the characteristics

Table 3

Regression coefficients relating selected characteristics to stress, by source of stress and sex, household population aged 18 or older, Canada excluding territories, 1994/95

| | Total stress | | | | Recent negative life events | | | | Chronic strains | | | | Childhood traumas | | | |
|-----------------------------------|--------------|-------|--------|-------|-----------------------------|-------|--------|-------|-----------------|-------|--------|-------|-------------------|-------|--------|-------|
| | Men | | Women | | Men | | Women | | Men | | Women | | Men | | Women | |
| | B | se | B | se | B | se | B | se | B | se | B | se | B | se | B | se |
| Age | -0.06* | 0.004 | -0.08* | 0.004 | -0.01* | 0.001 | -0.02* | 0.001 | -0.03* | 0.003 | -0.05* | 0.003 | -0.01* | 0.001 | -0.02* | 0.001 |
| Household income | | | | | | | | | | | | | | | | |
| Low/Lower-middle | 1.46* | 0.197 | 1.34* | 0.170 | 0.46* | 0.055 | 0.40* | 0.051 | 0.79* | 0.135 | 0.74* | 0.119 | 0.23* | 0.059 | 0.22* | 0.052 |
| Middle | 0.47* | 0.126 | 0.41* | 0.130 | 0.10* | 0.038 | 0.13* | 0.037 | 0.36* | 0.092 | 0.28* | 0.091 | 0.02 | 0.038 | 0.00 | 0.043 |
| Upper-middle/High† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Education | | | | | | | | | | | | | | | | |
| Less than secondary graduation | 0.36* | 0.145 | 0.88* | 0.159 | 0.01 | 0.040 | 0.03 | 0.047 | 0.26* | 0.108 | 0.57* | 0.110 | 0.11* | 0.044 | 0.27* | 0.049 |
| Secondary graduation | 0.33* | 0.158 | 0.43* | 0.170 | 0.05 | 0.047 | -0.03 | 0.047 | 0.22 | 0.119 | 0.38* | 0.121 | 0.07 | 0.050 | 0.08 | 0.050 |
| Some post-secondary | 0.64* | 0.150 | 0.63* | 0.148 | 0.15* | 0.045 | 0.05 | 0.039 | 0.39* | 0.104 | 0.36* | 0.101 | 0.11* | 0.043 | 0.21* | 0.046 |
| Postsecondary graduation† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Marital status | | | | | | | | | | | | | | | | |
| Married† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Previously married | 0.76* | 0.173 | 0.97* | 0.138 | 0.14* | 0.046 | 0.07* | 0.037 | 0.51* | 0.127 | 0.68* | 0.100 | 0.09 | 0.052 | 0.20* | 0.042 |
| Never married | 0.02 | 0.165 | -0.31 | 0.166 | -0.09* | 0.043 | -0.16* | 0.048 | 0.18 | 0.114 | -0.06 | 0.114 | -0.07 | 0.047 | -0.09 | 0.052 |
| Intercept | 6.03 | | 7.47 | | 1.06 | | 1.30 | | 3.87 | | 4.61 | | 1.09 | | 1.56 | |
| Model information | | | | | | | | | | | | | | | | |
| R ² | 0.10 | | 0.12 | | 0.07 | | 0.07 | | 0.08 | | 0.09 | | 0.02 | | 0.06 | |
| Sample size | 6,872 | | 8,669 | | 6,886 | | 8,687 | | 6,889 | | 8,684 | | 6,884 | | 8,680 | |
| Dropped because of missing values | 82 | | 67 | | 68 | | 49 | | 65 | | 52 | | 70 | | 56 | |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Note: "Missing" category for household income variable was included in each model to maximize sample size, but coefficients are not shown.

† Reference category

* $p < 0.05$

... Not applicable

of the person experiencing it.²³ In this analysis, various health outcomes are considered in a series of multivariate models that control for factors believed to play a pivotal role in the relationship between stress and health: demographic and socio-economic characteristics, health behaviours, and

psycho-social resources. The relationship between stress and mental health is addressed by examining psychological distress. To study associations with physical health, 10 chronic conditions are considered: asthma, arthritis/rheumatism, back problems, high blood pressure, migraine, chronic

Table 4

Regression coefficients relating selected characteristics in 1994/95 to psychological distress in 1994/95 and to change in psychological distress by 2000/01, by sex, household population aged 18 or older, Canada excluding territories

| | Psychological distress level in 1994/95 | | | | Change in psychological distress level between 1994/95 and 2000/01 | | | |
|---|---|-------|----------|-------|--|-------|----------|-------|
| | Men | | Women | | Men | | Women | |
| | B | se | B | se | B | se | B | se |
| Distress level in 1994/95 | ... | ... | ... | ... | -0.71*** | 0.033 | -0.73*** | 0.026 |
| Age | -0.02*** | 0.003 | -0.01*** | 0.003 | 0.00 | 0.005 | -0.01 | 0.005 |
| Household income | | | | | | | | |
| Low/Lower-middle | 0.22 | 0.154 | 0.29 | 0.149 | 0.39 | 0.211 | 0.46* | 0.199 |
| Middle | -0.01 | 0.099 | 0.08 | 0.098 | 0.11 | 0.145 | 0.08 | 0.142 |
| Upper-middle/High† | ... | ... | ... | ... | ... | ... | ... | ... |
| Education | | | | | | | | |
| Less than secondary graduation | -0.20 | 0.129 | 0.09 | 0.128 | 0.21 | 0.170 | 0.36 | 0.186 |
| Secondary graduation | -0.32** | 0.123 | -0.07 | 0.126 | -0.05 | 0.171 | 0.25 | 0.212 |
| Some postsecondary | -0.10 | 0.114 | 0.07 | 0.103 | 0.07 | 0.152 | -0.23* | 0.114 |
| Postsecondary graduation† | ... | ... | ... | ... | ... | ... | ... | ... |
| Marital status | | | | | | | | |
| Married† | ... | ... | ... | ... | ... | ... | ... | ... |
| Previously married | 0.10 | 0.143 | 0.32* | 0.134 | -0.01 | 0.171 | -0.18 | 0.151 |
| Never married | 0.38** | 0.130 | 0.52*** | 0.142 | 0.01 | 0.169 | 0.02 | 0.168 |
| Health behaviours | | | | | | | | |
| Daily smoker | 0.08 | 0.103 | 0.27* | 0.118 | 0.28 | 0.145 | 0.25 | 0.147 |
| Physically inactive | 0.19* | 0.093 | 0.26** | 0.080 | 0.05 | 0.108 | -0.12 | 0.125 |
| Heavy drinker | 0.10 | 0.096 | 0.14 | 0.211 | -0.27 | 0.142 | -0.18 | 0.245 |
| Obese | -0.14 | 0.128 | -0.16 | 0.126 | -0.34* | 0.146 | 0.23 | 0.208 |
| Psycho-social resources | | | | | | | | |
| Mastery | -0.20*** | 0.015 | -0.26*** | 0.012 | -0.04* | 0.018 | -0.04** | 0.015 |
| Emotional support | -0.06 | 0.073 | -0.29** | 0.100 | -0.14 | 0.138 | 0.20* | 0.094 |
| Stress and emotional support interactions‡ | | | | | | | | |
| Total stress | 0.29*** | 0.016 | 0.28*** | 0.014 | 0.06* | 0.024 | 0.10*** | 0.019 |
| x emotional support | -0.05** | 0.017 | -0.07*** | 0.017 | 0.01 | 0.031 | -0.05* | 0.019 |
| Intercept | 3.86 | | 3.63 | | 1.25 | | 1.71 | |
| Model information | | | | | | | | |
| R ² | 0.30 | | 0.34 | | 0.35 | | 0.35 | |
| Sample size | 6,644 | | 8,467 | | 3,960 | | 5,474 | |
| Dropped because of missing values | 310 | | 269 | | 410 | | 307 | |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file; 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but coefficients are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

‡ Beta coefficients are not presented because standardized regression coefficients for interaction terms and constituent variables are affected by changes in origin and so are not useful indicators of relative importance of variables in multiplicative regression model (see Analytical techniques) (Reference 39).

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

bronchitis/emphysema, diabetes, heart disease, cancer, and stomach/intestinal ulcers.

Stress and mental health

For some people, stress can be associated with emotional upset.¹⁻⁹ In fact, analysis of 1994/95 NPHS data showed that psychological distress among men and women was related to the total amount of stress they reported (Table 4). As well, each source of stress—negative life events, chronic

strains and childhood traumas—was independently associated with increased psychological distress, even when demographic and socio-economic characteristics, health behaviours, and psycho-social resources were taken into account (Appendix Tables F and G). Chronic strains were the most powerful in explaining differences in psychological distress, perhaps because they represent prolonged, unresolved difficulties.^{23,48}

Table 5
Adjusted odds ratios relating source of stress to selected chronic conditions, by sex, household population aged 18 or older, Canada excluding territories, 1994/95

| | Total stress | | Recent negative life events | | Chronic strains | | Childhood traumas | |
|--|---------------------|-------------------------|-----------------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Asthma | | | | | | | | |
| Men | 1.07** | 1.02, 1.12 | 1.19* | 1.03, 1.37 | 1.08* | 1.01, 1.15 | 1.11 | 0.97, 1.27 |
| Women | 1.09*** | 1.06, 1.13 | 1.19** | 1.06, 1.33 | 1.09*** | 1.04, 1.15 | 1.27*** | 1.17, 1.37 |
| Arthritis/Rheumatism | | | | | | | | |
| Men | 1.14*** | 1.10, 1.18 | 1.28*** | 1.16, 1.42 | 1.15*** | 1.09, 1.21 | 1.31*** | 1.19, 1.43 |
| Women | 1.09*** | 1.06, 1.11 | 1.17*** | 1.08, 1.27 | 1.09*** | 1.06, 1.13 | 1.24*** | 1.16, 1.32 |
| Back problems | | | | | | | | |
| Men | 1.11*** | 1.08, 1.14 | 1.30*** | 1.19, 1.41 | 1.10*** | 1.06, 1.15 | 1.23*** | 1.15, 1.33 |
| Women | 1.12*** | 1.09, 1.14 | 1.26*** | 1.18, 1.36 | 1.13*** | 1.09, 1.17 | 1.27*** | 1.19, 1.34 |
| High blood pressure | | | | | | | | |
| Men | 1.08*** | 1.04, 1.13 | 1.24*** | 1.10, 1.39 | 1.10*** | 1.04, 1.17 | 1.05 | 0.93, 1.18 |
| Women | 1.02 | 0.99, 1.05 | 1.02 | 0.91, 1.15 | 1.01 | 0.97, 1.06 | 1.09* | 1.00, 1.17 |
| Migraine | | | | | | | | |
| Men | 1.13*** | 1.08, 1.17 | 1.31*** | 1.14, 1.50 | 1.15*** | 1.08, 1.23 | 1.20** | 1.07, 1.35 |
| Women | 1.12*** | 1.09, 1.15 | 1.25*** | 1.16, 1.34 | 1.13*** | 1.10, 1.17 | 1.30*** | 1.21, 1.39 |
| Chronic bronchitis/ Emphysema | | | | | | | | |
| Men | 1.08** | 1.03, 1.14 | 1.23* | 1.02, 1.48 | 1.06 | 0.98, 1.14 | 1.29** | 1.10, 1.50 |
| Women | 1.15*** | 1.11, 1.20 | 1.29*** | 1.11, 1.49 | 1.16*** | 1.10, 1.21 | 1.48*** | 1.33, 1.64 |
| Diabetes | | | | | | | | |
| Men | 1.03 | 0.97, 1.10 | 1.05 | 0.82, 1.35 | 1.02 | 0.94, 1.10 | 1.12 | 0.94, 1.35 |
| Women | 1.10*** | 1.05, 1.15 | 1.41*** | 1.20, 1.66 | 1.09** | 1.03, 1.16 | 1.20** | 1.06, 1.37 |
| Heart disease | | | | | | | | |
| Men | 1.10*** | 1.04, 1.16 | 1.11 | 0.93, 1.33 | 1.09* | 1.01, 1.18 | 1.32*** | 1.13, 1.54 |
| Women | 1.07** | 1.03, 1.11 | 1.14 | 0.97, 1.34 | 1.06* | 1.00, 1.12 | 1.21** | 1.07, 1.37 |
| Cancer | | | | | | | | |
| Men | 0.97 | 0.86, 1.10 | 0.95 | 0.65, 1.39 | 0.88 | 0.72, 1.08 | 1.29* | 1.04, 1.60 |
| Women | 1.02 | 0.96, 1.07 | 1.12 | 0.97, 1.28 | 0.97 | 0.90, 1.05 | 1.21* | 1.01, 1.44 |
| Stomach/Intestinal ulcers | | | | | | | | |
| Men | 1.13*** | 1.08, 1.19 | 1.28*** | 1.12, 1.47 | 1.16*** | 1.08, 1.24 | 1.21** | 1.06, 1.39 |
| Women | 1.09*** | 1.05, 1.13 | 1.11 | 0.98, 1.26 | 1.10*** | 1.04, 1.16 | 1.28*** | 1.16, 1.41 |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: Presents results of 40 separate regression models for each sex (one for each chronic condition). Each regression includes same control variables as Appendix Tables J and K. Results for complete models are available on request. Because of rounding, some confidence intervals with 1.00 as lower limit are significant.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Not only was stress reported in 1994/95 associated with psychological distress at that time, but it was also related to increased distress by 2000/01. Even when their distress level at the beginning of the period was taken into account, for men, a negative life event reported in 1994/95 was significantly associated with an increase in psychological distress by 2000/01 (Appendix Table H). Among women, chronic strains and childhood traumas reported in 1994/95 had a similar

association with long-term psychological distress (Appendix Table I).

Stress and physical health

In 1994/95, people with elevated stress levels had high odds of reporting at least one of the 10 chronic conditions considered in this article (Appendix Tables J and K). For men, each additional stressor meant a 12% increase in the odds of reporting a chronic condition; for women, a 13% increase. Each

Table 6

Adjusted odds ratios relating source of stress in 1994/95 to incidence of selected chronic conditions by 2000/01, by sex, household population aged 18 or older in 1994/95, Canada excluding territories

| | Total stress | | Recent negative life events | | Chronic strains | | Childhood traumas | |
|--|---------------------|-------------------------|-----------------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Asthma | | | | | | | | |
| Men | 1.06 | 1.00, 1.13 | 1.05 | 0.80, 1.37 | 1.02 | 0.94, 1.11 | 1.40*** | 1.15, 1.71 |
| Women | 1.06** | 1.02, 1.11 | 1.02 | 0.88, 1.17 | 1.11** | 1.04, 1.19 | 1.11 | 0.98, 1.27 |
| Arthritis/Rheumatism | | | | | | | | |
| Men | 1.08** | 1.03, 1.13 | 1.21** | 1.05, 1.39 | 1.09* | 1.02, 1.17 | 1.14 | 1.00, 1.29 |
| Women | 1.10*** | 1.06, 1.13 | 1.10 | 0.99, 1.22 | 1.11*** | 1.06, 1.16 | 1.32*** | 1.19, 1.46 |
| Back problems | | | | | | | | |
| Men | 1.09*** | 1.04, 1.14 | 1.07 | 0.92, 1.24 | 1.11*** | 1.04, 1.18 | 1.23** | 1.09, 1.40 |
| Women | 1.08*** | 1.04, 1.12 | 1.10 | 0.97, 1.26 | 1.08** | 1.03, 1.14 | 1.24*** | 1.14, 1.36 |
| High blood pressure | | | | | | | | |
| Men | 1.00 | 0.94, 1.06 | 1.02 | 0.81, 1.30 | 1.00 | 0.92, 1.09 | 0.98 | 0.84, 1.14 |
| Women | 1.01 | 0.97, 1.05 | 1.04 | 0.92, 1.19 | 0.99 | 0.94, 1.05 | 1.06 | 0.94, 1.18 |
| Migraine | | | | | | | | |
| Men | 1.06 | 0.99, 1.14 | 1.01 | 0.77, 1.31 | 1.10 | 1.00, 1.21 | 1.10 | 0.92, 1.31 |
| Women | 1.10*** | 1.06, 1.13 | 1.22** | 1.08, 1.39 | 1.13*** | 1.07, 1.18 | 1.12 | 1.00, 1.25 |
| Chronic bronchitis/ Emphysema | | | | | | | | |
| Men | 1.12* | 1.00, 1.24 | 1.37* | 1.01, 1.86 | 1.16* | 1.00, 1.35 | 0.97 | 0.75, 1.24 |
| Women | 1.13*** | 1.05, 1.20 | 1.13 | 0.92, 1.37 | 1.19*** | 1.09, 1.30 | 1.21 | 0.96, 1.52 |
| Diabetes | | | | | | | | |
| Men | 1.05 | 0.97, 1.12 | 1.10 | 0.83, 1.44 | 1.01 | 0.91, 1.13 | 1.22 | 0.97, 1.54 |
| Women | 1.06 | 0.99, 1.14 | 1.43*** | 1.18, 1.74 | 1.03 | 0.94, 1.13 | 1.08 | 0.86, 1.35 |
| Heart disease | | | | | | | | |
| Men | 1.10* | 1.02, 1.19 | 1.26 | 0.99, 1.60 | 1.12* | 1.02, 1.24 | 1.07 | 0.87, 1.30 |
| Women | 1.07 | 0.99, 1.15 | 1.15 | 0.90, 1.48 | 1.06 | 0.96, 1.18 | 1.17* | 1.00, 1.37 |
| Cancer | | | | | | | | |
| Men | 1.07 | 0.93, 1.25 | 1.11 | 0.71, 1.71 | 1.11 | 0.90, 1.37 | 1.00 | 0.71, 1.41 |
| Women | 1.07 | 0.99, 1.15 | 1.20 | 0.92, 1.56 | 1.08 | 0.97, 1.19 | 1.10 | 0.86, 1.41 |
| Stomach/Intestinal ulcers | | | | | | | | |
| Men | 1.13** | 1.05, 1.22 | 1.26* | 1.00, 1.58 | 1.13* | 1.02, 1.26 | 1.39*** | 1.15, 1.67 |
| Women | 1.11*** | 1.05, 1.18 | 1.18 | 0.96, 1.45 | 1.15*** | 1.06, 1.25 | 1.24* | 1.04, 1.48 |

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

Notes: Presents results of 40 separate regression models for each sex (one for each chronic condition). Each regression includes same control variables as Appendix Tables L and M and is based on respondents who did not report the specific chronic condition in 1994/95. Results for complete models are available on request. Because of rounding, some confidence intervals with 1.00 as lower limit are significant.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

source of stress was independently associated with reporting at least one chronic condition. Stress was also associated with reporting specific conditions—in some instances, only among men, in others, only among women, but in other cases, for both (Table 5). For example, whether it was recent negative life events, chronic strains or childhood traumas, men and women who reported those stressors had elevated odds of also reporting arthritis/rheumatism, back problems and migraine. Men and women with higher levels of total stress had higher odds of reporting asthma, arthritis/rheumatism, back problems, migraine, chronic bronchitis/emphysema, heart disease, and stomach/intestinal ulcers.

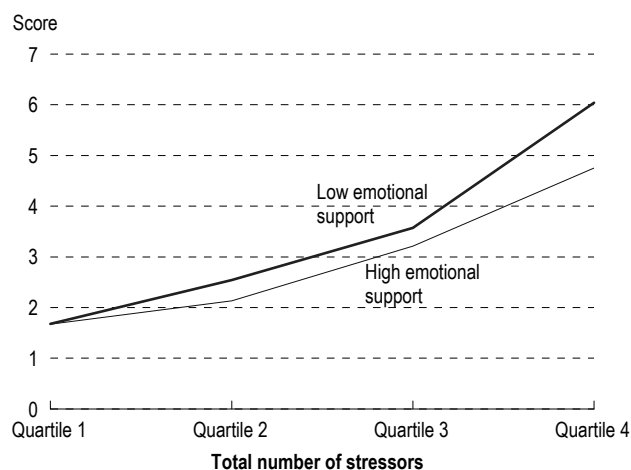
While these cross-sectional data suggest a link between exposure to stress in 1994/95 and health problems at that time, such data cannot indicate if the stress led to physical illness, or vice versa. However, longitudinal analyses indicate that, to some extent, stress precedes illness. For both sexes, total stress in 1994/95 was associated with developing at least 1 of the 10 conditions by 2000/01, even when the number of chronic conditions at the beginning of the period and other potentially influential factors were taken into account (Appendix Tables L and M).

As well, the various sources of stress reported in 1994/95 were associated with the incidence of specific chronic conditions over the next six years (Table 6). Chronic strains were associated with high odds of developing arthritis/rheumatism, back problems, chronic bronchitis/emphysema, and stomach/intestinal ulcers for both sexes, as well as heart disease for men, and asthma and migraine for women. Childhood traumas were related to new cases of back problems and stomach/intestinal ulcers among both sexes, to asthma among men, and to arthritis/rheumatism and heart disease among women. The long-term health effects of negative life events were less wide-ranging. For men, this type of stress increased the odds of arthritis/rheumatism, chronic bronchitis/emphysema, and stomach/intestinal ulcers by 2000/01; for women, such events increased the odds of migraine and diabetes.

Emotional support buffer

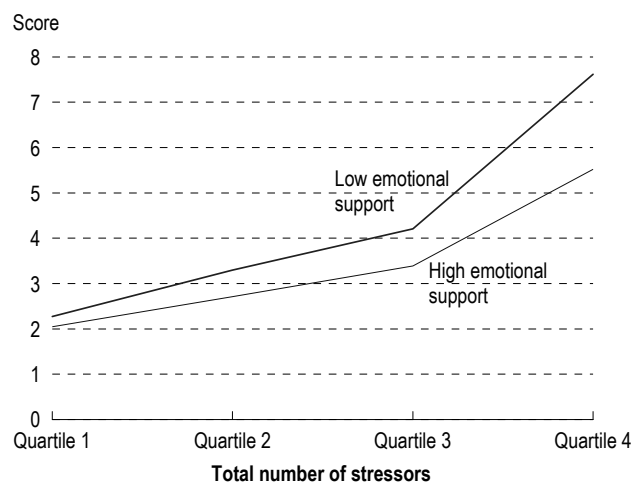
Emotional support is a feeling of being able to turn to others for affection, assistance and advice.^{19,21} The buffering hypothesis proposes that such support moderates the psychological effects of stress.^{35,36,49-51} In fact, perception of the availability

Chart 7
Psychological distress score, by emotional support and total number of stressors, men aged 18 or older, household population, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file
Note: For men in fourth quartile of stressors, psychological distress higher for those with low emotional support ($p < 0.05$).

Chart 8
Psychological distress score, by emotional support and total number of stressors, women aged 18 or older, household population, Canada excluding territories, 1994/95



Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file
Note: For women in third and fourth quartiles of stressors, psychological distress higher for those with low emotional support ($p < 0.05$).

of support may be more important than actual support received.^{19,49,52-56}

Consistent with previous studies,^{17,50,56-59} evidence of emotional support buffering against psychological distress emerged in 1994/95 NPHS data. People reporting few stressors had low levels of psychological distress, regardless of how much emotional support they believed they had (Charts 7 and 8). But among those exposed to a large number of stressors, levels of psychological distress in 1994/95 were lower if they had emotional support. And as stress rose, the protective effect of emotional support became stronger, as indicated by the negative interaction between stress and social support for both sexes (Table 4).

Longitudinal analysis showed no evidence of emotional support buffering against an increase in psychological distress by 2000/01 among men, although there was for women (Table 4). Previous longitudinal research has revealed scant evidence of emotional support buffering for mental health over time.^{1,8,9,49,57,59,64}

No indication of emotional support buffering against reporting at least one chronic condition, in either the short- or long-term (Appendix Tables J to M), emerged in the analysis of NPHS data, although for a few specific conditions there did seem to be a weak effect (data not shown).

Limitations

Although the National Population Health Survey (NPHS) measured stress in a variety of ways, the items that constituted these measures were not comprehensive. The lower stress exposure rates observed for the elderly may reflect stress inventory lists that over-represent situations likely to affect younger people and omit stressful events that typically occur later in life.^{25,37}

Apparent associations between stress and health may result from both stress and health being associated with another factor not included in this analysis. Self-reported data raise the risk of “negative affectivity bias,” meaning that individuals with a pessimistic or neurotic temperament may be predisposed to report both stress and poor health.^{25,60-63} Longitudinal analysis that controls for initial level of health (number of chronic conditions) reduces the possibility that a third factor is involved. But this, in turn, may yield overly conservative estimates of the associations between stress and health if the health problems observed at baseline were due to stress that had occurred previously.⁶⁰⁻⁶²

Some members selected for the longitudinal panel in 1994/95 did not respond in 2000/01, and so were excluded from the longitudinal analysis. Total stress scores in 1994/95 were higher for these dropouts than for continuers (5.0 versus 4.5). To compensate for dropouts, adjustments to survey weights were applied to the continuers, although some bias may still exist.³¹ Respondents who had died or were institutionalized by 2000/01 were necessarily excluded. Their 1994/95 stress scores were relatively low (3.0 for the institutionalized and 3.2 for those who died), which is in line with the lower stress observed among the elderly.

Respondents whose 1994/95 Health questionnaire data were provided by proxy were excluded (see *Methods*). This may have weakened some associations, because by definition, these people tended to be less healthy. The Health questionnaire could be answered by proxy only if the selected respondent could not answer because of special circumstances, often a medical problem.

Cases for which the 1994/95 General questionnaire had been answered by proxy were included in the analysis. However, the degree to which they are inaccurate because of reporting error is unknown. For example, the incidence of chronic conditions may have been affected.⁶⁵ In fact, even self-reported data about chronic conditions may be flawed, since no independent source verified whether respondents who reported a chronic condition had actually received a professional diagnosis.

Most 1994/95 interviews were conducted in person; in subsequent cycles, most were conducted by telephone. To some extent, differences in psychological distress levels between cycles may reflect this change in collection methodology. Obtaining information about psychiatric symptoms by telephone rather than face-to-face may result in fewer problems being reported,⁶⁶ although some studies have found no significant differences.^{67,68}

The measure of perceived emotional support was based on only four “yes/no” questions. The narrow range of possible scores may have reduced the likelihood of finding evidence of emotional support buffering.^{16,35,36,58,69,70}

Concluding remarks

Stress is an unavoidable part of life. Stress-provoking situations may be major upheavals that require rapid adjustment, or they may be daily hassles that cause frustration and tension. Stress may also stem from events that occurred years ago, but are still not resolved.

According to the 1994/95 National Population Health Survey, the most common stressors were chronic strains—trying to do too much at once, not having enough money, and ongoing problems in relationships and with children. Major life events were also frequent: over the course of a year, substantial numbers of people experienced a financial crisis, were demoted, received a pay cut or went on welfare. And a considerable number of adults reported childhood traumas such as parental divorce or having been abused by someone who was close to them.

While almost all Canadians reported stress, some were far more stressed than others. In general, women reported more stress and reacted to a wider range of stressors than did men. For both sexes, stress decreased with age. Stress tended to be relatively low among people with higher levels of income and education.

Stress was related to psychological distress and a number of health problems in the short-term, and even more importantly, in the long-term. High stress in 1994/95 was associated with an increase in psychological distress by 2000/01, and high odds of developing a number of chronic conditions: arthritis/rheumatism, back problems, chronic bronchitis/emphysema, and stomach/intestinal ulcers for both sexes, as well as heart disease for men, and asthma and migraine for women. These relationships suggest that, at least in some cases, stress is a precursor of poor health. And of the various sources of stress, chronic strains seemed to be the most potent. A stressful event in the preceding year had a less consistent effect on an individual's chances of eventually getting sick than did prolonged anxieties and frustrations.

Emotional support may moderate the association between stress and psychological upset, in the short-term for both sexes, and in the long-term for women. There was, however, little evidence of an emotional support buffer between stress and physical illness. ●

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Appendix

Table A

Distribution of selected characteristics, by sex, household population aged 18 or older in 1994/95, Canada excluding territories

| | 1994/95 cross-sectional file | | | | | | Longitudinal file | | | | | |
|--------------------------------|------------------------------|----------------------|-------------------|--------------|----------------------|--------------------|-------------------|----------------------|-------------------|--------------|----------------------|-------------------|
| | Men | | | Women | | | Men | | | Women | | |
| | Sample size | Estimated population | | Sample size | Estimated population | | Sample size | Estimated population | | Sample size | Estimated population | |
| | | '000 | % | | '000 | % | | '000 | % | | '000 | % |
| Total | 6,954 | 9,742 | 100.0 | 8,736 | 10,598 | 100.0 | 4,370 | 8,988 | 100.0 | 5,781 | 9,788 | 100.0 |
| Age group | | | | | | | | | | | | |
| 18-24 | 857 | 1,204 | 12.4 | 965 | 1,184 | 11.2 | 545 | 1,191 | 13.2 | 652 | 1,099 | 11.2 |
| 25-44 | 2,977 | 4,511 | 46.3 | 3,591 | 4,708 | 44.4 | 1,960 | 4,380 | 48.7 | 2,478 | 4,609 | 47.1 |
| 45-64 | 1,974 | 2,770 | 28.4 | 2,316 | 2,925 | 27.6 | 1,306 | 2,581 | 28.7 | 1,639 | 2,794 | 28.5 |
| 65+ | 1,146 | 1,258 | 12.9 | 1,864 | 1,782 | 16.8 | 559 | 837 | 9.3 | 1,012 | 1,285 | 13.1 |
| Household income | | | | | | | | | | | | |
| Low/Lower-middle | 1,229 | 1,401 | 14.4 | 2,246 | 2,119 | 20.0 | 674 | 1,146 | 12.8 | 1,343 | 1,775 | 18.1 |
| Middle | 2,003 | 2,643 | 27.1 | 2,547 | 3,068 | 29.0 | 1,227 | 2,358 | 26.2 | 1,681 | 2,779 | 28.4 |
| Upper-middle/High | 3,441 | 5,219 | 53.6 | 3,589 | 4,948 | 46.7 | 2,284 | 5,038 | 56.1 | 2,541 | 4,824 | 49.3 |
| Missing | 281 | 480 | 4.9 | 354 | 462 | 4.4 | 185 | 446 | 5.0 | 216 | 410 | 4.2 |
| Education | | | | | | | | | | | | |
| Less than secondary graduation | 2,063 | 2,419 | 24.8 | 2,561 | 2,765 | 26.1 | 1,165 | 2,054 | 22.9 | 1,523 | 2,306 | 23.6 |
| Secondary graduation | 1,034 | 1,475 | 15.1 | 1,387 | 1,812 | 17.1 | 653 | 1,374 | 15.3 | 906 | 1,715 | 17.5 |
| Some postsecondary | 1,713 | 2,472 | 25.4 | 2,230 | 2,728 | 25.7 | 1,107 | 2,357 | 26.2 | 1,527 | 2,617 | 26.7 |
| Postsecondary graduation | 2,130 | 3,350 | 34.4 | 2,549 | 3,282 | 31.0 | 1,436 | 3,183 | 35.4 | 1,818 | 3,136 | 32.0 |
| Missing | 14 | F | F | 9 | F | F | 9 | F | F | 7 | F | F |
| Marital status | | | | | | | | | | | | |
| Married | 4,246 | 6,604 | 67.8 | 4,824 | 6,734 | 63.5 | 2,785 | 6,200 | 69.0 | 3,296 | 6,427 | 65.7 |
| Previously married | 925 | 821 | 8.4 | 2,318 | 1,987 | 18.8 | 487 | 612 | 6.8 | 1,438 | 1,720 | 17.6 |
| Never married | 1,781 | 2,316 | 23.8 | 1,592 | 1,874 | 17.7 | 1,097 | 2,175 | 24.2 | 1,047 | 1,640 | 16.8 |
| Missing | 2 | F | F | 2 | F | F | 1 | F | F | 0 | F | F |
| Daily smoker | | | | | | | | | | | | |
| Yes | 2,105 | 2,766 | 28.4 | 2,254 | 2,564 | 24.2 | 1,281 | 2,469 | 27.5 | 1,460 | 2,318 | 23.7 |
| No | 4,846 | 6,968 | 71.5 | 6,478 | 8,025 | 75.7 | 3,086 | 6,508 | 72.4 | 4,318 | 7,458 | 76.2 |
| Missing | 3 | F | F | 4 | F | F | 3 | F | F | 3 | F | F |
| Physically inactive | | | | | | | | | | | | |
| Yes | 3,984 | 5,524 | 56.7 | 5,524 | 6,803 | 64.2 | 2,484 | 5,015 | 55.8 | 3,644 | 6,277 | 64.1 |
| No | 2,941 | 4,180 | 42.9 | 3,191 | 3,766 | 35.5 ^{E1} | 1,866 | 3,938 | 43.8 | 2,125 | 3,495 | 35.7 |
| Missing | 29 | 38 ^{E1} | 0.4 ^{E1} | 21 | 29 ^{E1} | 0.3 ^{E1} | 20 | 36 ^{E2} | 0.4 ^{E2} | 12 | F | F |
| Heavy drinker | | | | | | | | | | | | |
| Yes | 1,549 | 1,897 | 19.5 | 474 | 477 | 4.5 | 971 | 1,795 | 20.0 | 294 | 425 | 4.3 |
| No | 5,265 | 7,679 | 78.8 | 8,176 | 10,004 | 94.4 | 3,323 | 7,052 | 78.5 | 5,439 | 9,269 | 94.7 |
| Missing | 140 | 166 | 1.7 | 86 | 117 | 1.1 | 76 | 142 | 1.6 | 48 | 94 ^{E1} | 1.0 ^{E1} |
| Obese | | | | | | | | | | | | |
| Yes | 1,000 | 1,234 | 12.7 | 1,235 | 1,355 | 12.8 | 601 | 1,132 | 12.6 | 824 | 1,268 | 13.0 |
| No | 5,920 | 8,448 | 86.7 | 7,185 | 8,819 | 83.2 | 3,745 | 7,793 | 86.7 | 4,743 | 8,122 | 83.0 |
| Missing/Not applicable | 34 | 60 ^{E1} | 0.6 ^{E1} | 316 | 425 | 4.0 | 24 | 64 ^{E1} | 0.7 ^{E1} | 214 | 398 | 4.1 |

Data sources: 1994/95 National Population Health Survey, cross-sectional sample, Health file; 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

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

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

F Coefficient of variation greater than 33.3%

Table B

Average scores for stress and psycho-social variables, by sex, household population aged 18 or older in 1994/95, Canada excluding territories

| | 1994/95 cross-sectional file | | | | | | Longitudinal file | | | | | |
|----------------------------------|------------------------------|----------|------------------|-------------------|----------|------------------|-------------------|----------|------------------|-------------------|----------|------------------|
| | Men | | | Women | | | Men | | | Women | | |
| | Sample responding | Miss-ing | Weighted average | Sample responding | Miss-ing | Weighted average | Sample responding | Miss-ing | Weighted average | Sample responding | Miss-ing | Weighted average |
| Stress 1994/95 | | | | | | | | | | | | |
| Total stress | 6,883 | 71 | 4.3 | 8,675 | 61 | 4.8 | 4,330 | 40 | 4.4 | 5,754 | 27 | 4.8 |
| Recent negative life events | 6,898 | 56 | 0.6 | 8,696 | 40 | 0.7 | 4,335 | 35 | 0.6 | 5,762 | 19 | 0.7 |
| Chronic strains | 6,900 | 54 | 2.9 | 8,690 | 46 | 3.2 | 4,339 | 31 | 2.9 | 5,760 | 21 | 3.2 |
| Childhood traumas | 6,896 | 58 | 0.8 | 8,689 | 47 | 0.9 | 4,337 | 33 | 0.8 | 5,759 | 22 | 0.9 |
| Mastery 1994/95 | 6,851 | 103 | 19.9 | 8,622 | 114 | 19.4 | 4,319 | 51 | 20.1 | 5,720 | 61 | 19.5 |
| Emotional support 1994/95 | 6,849 | 105 | 3.7 | 8,654 | 82 | 3.8 | 4,311 | 59 | 3.7 | 5,740 | 41 | 3.8 |

Data sources: 1994/95 National Population Health Survey, cross-sectional sample, Health file; 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

Table C

Average psychological distress scores, by sex, household population aged 18 or older in 1994/95, Canada excluding territories

| | Men | | | Women | | |
|--|-------------------|---------|------------------|-------------------|---------|------------------|
| | Sample responding | Missing | Weighted average | Sample responding | Missing | Weighted average |
| Psychological distress 1994/95 | 6,859 | 95 | 3.1 | 8,648 | 88 | 3.7 |
| Change in psychological distress by 2000/01 | 4,063 | 307 | -0.9 | 5,566 | 215 | -1.0 |

Data sources: 1994/95 National Population Health Survey, cross-sectional sample, Health file; 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

Table D

Distribution of chronic condition prevalence, by sex, household population aged 18 or older, Canada excluding territories, 1994/95

| | Men | | | Women | | |
|---|--------------|----------------------|--------------|--------------|----------------------|--------------|
| | Sample size | Estimated population | | Sample size | Estimated population | |
| | | '000 | % | | '000 | % |
| Total - 1994/95 cross-sectional file | 6,954 | 9,742 | 100.0 | 8,736 | 10,598 | 100.0 |
| Total number of chronic conditions | | | | | | |
| None | 4,069 | 5,991 | 61.5 | 4,404 | 5,772 | 54.5 |
| One or more | 2,875 | 3,737 | 38.4 | 4,324 | 4,820 | 45.5 |
| Missing | 10 | F | F | 8 | F | F |
| Asthma | | | | | | |
| Yes | 337 | 512 | 5.3 | 580 | 638 | 6.0 |
| No | 6,607 | 9,216 | 94.6 | 8,148 | 9,953 | 93.9 |
| Missing | 10 | F | F | 8 | F | F |
| Arthritis/Rheumatism | | | | | | |
| Yes | 916 | 1,031 | 10.6 | 1,881 | 1,857 | 17.5 |
| No | 6,028 | 8,697 | 89.3 | 6,847 | 8,735 | 82.4 |
| Missing | 10 | F | F | 8 | F | F |
| Back problems | | | | | | |
| Yes | 1,141 | 1,484 | 15.2 | 1,422 | 1,611 | 15.2 |
| No | 5,803 | 8,245 | 84.6 | 7,306 | 8,981 | 84.7 |
| Missing | 10 | F | F | 8 | F | F |
| High blood pressure | | | | | | |
| Yes | 670 | 817 | 8.4 | 1,153 | 1,174 | 11.1 |
| No | 6,274 | 8,912 | 91.5 | 7,575 | 9,417 | 88.9 |
| Missing | 10 | F | F | 8 | F | F |
| Migraine | | | | | | |
| Yes | 298 | 417 | 4.3 | 967 | 1,142 | 10.8 |
| No | 6,646 | 9,311 | 95.6 | 7,761 | 9,449 | 89.2 |
| Missing | 10 | F | F | 8 | F | F |
| Chronic bronchitis/Emphysema | | | | | | |
| Yes | 227 | 265 | 2.7 | 371 | 411 | 3.9 |
| No | 6,717 | 9,463 | 97.1 | 8,357 | 10,180 | 96.1 |
| Missing | 10 | F | F | 8 | F | F |
| Diabetes | | | | | | |
| Yes | 249 | 340 | 3.5 | 335 | 341 | 3.2 |
| No | 6,695 | 9,389 | 96.4 | 8,393 | 10,250 | 96.7 |
| Missing | 10 | F | F | 8 | F | F |
| Heart disease | | | | | | |
| Yes | 365 | 421 | 4.3 | 458 | 413 | 3.9 |
| No | 6,579 | 9,307 | 95.5 | 8,270 | 10,179 | 96.0 |
| Missing | 10 | F | F | 8 | F | F |
| Cancer | | | | | | |
| Yes | 93 | 108 | 1.1 | 219 | 240 | 2.3 |
| No | 6,851 | 9,620 | 98.7 | 8,509 | 10,351 | 97.7 |
| Missing | 10 | F | F | 8 | F | F |
| Stomach/Intestinal ulcers | | | | | | |
| Yes | 289 | 336 | 3.4 | 369 | 407 | 3.8 |
| No | 6,655 | 9,393 | 96.4 | 8,359 | 10,184 | 96.1 |
| Missing | 10 | F | F | 8 | F | F |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

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

F Coefficient of variation greater than 33.3%

Table E
Distribution of chronic condition incidence, by sex, household population aged 18 or older, Canada excluding territories

| | Men | | | Women | | |
|---|--------------|----------------------|-------------------|--------------|----------------------|-------------------|
| | Sample size | Estimated population | | Sample size | Estimated population | |
| | | '000 | % | | '000 | % |
| Total - longitudinal file | 4,370 | 8,988 | 100.0 | 5,781 | 9,788 | 100.0 |
| Total number of chronic conditions diagnosed between 1994/95 and 2000/01 | | | | | | |
| None | 2,960 | 6,181 | 68.8 | 3,531 | 6,109 | 62.4 |
| One or more | 1,372 | 2,729 | 30.4 | 2,210 | 3,619 | 37.0 |
| Missing | 38 | 78 ^{E1} | 0.9 ^{E1} | 40 | 60 ^{E1} | 0.6 ^{E1} |
| Asthma[†] | | | | | | |
| Yes | 135 | 295 | 3.5 | 248 | 416 | 4.5 |
| No | 4,029 | 8,209 | 96.4 | 5,174 | 8,800 | 95.4 |
| Missing | 5 | F | F | 3 | F | F |
| Arthritis/Rheumatism[†] | | | | | | |
| Yes | 375 | 739 | 9.1 | 652 | 1,097 | 13.3 |
| No | 3,480 | 7,404 | 90.8 | 3,999 | 7,134 | 86.6 |
| Missing | 7 | F | F | 7 | F | F |
| Back problems[†] | | | | | | |
| Yes | 364 | 755 | 9.9 | 576 | 968 | 11.6 |
| No | 3,296 | 6,850 | 90.0 | 4,305 | 7,376 | 88.3 |
| Missing | 4 | F | F | 4 | F | F |
| High blood pressure[†] | | | | | | |
| Yes | 331 | 629 | 7.6 | 568 | 857 | 9.7 |
| No | 3,626 | 7,642 | 92.0 | 4,503 | 7,934 | 90.1 |
| Missing | 22 | 38 ^{E2} | 0.5 ^{E2} | 7 | F | F |
| Migraine[†] | | | | | | |
| Yes | 127 | 259 | 3.0 | 351 | 695 | 8.0 |
| No | 4,041 | 8,301 | 96.9 | 4,781 | 8,012 | 92.0 |
| Missing | 4 | F | F | 3 | F | F |
| Chronic bronchitis/Emphysema[†] | | | | | | |
| Yes | 67 | 131 | 1.5 | 129 | 195 | 2.1 |
| No | 4,188 | 8,649 | 98.4 | 5,436 | 9,256 | 97.9 |
| Missing | 6 | F | F | 3 | F | F |
| Diabetes[†] | | | | | | |
| Yes | 124 | 228 | 2.6 | 149 | 243 | 2.5 |
| No | 4,108 | 8,482 | 97.3 | 5,457 | 9,298 | 97.4 |
| Missing | 5 | F | F | 4 | F | F |
| Heart disease[†] | | | | | | |
| Yes | 174 | 375 | 4.3 | 196 | 302 | 3.2 |
| No | 4,010 | 8,321 | 95.6 | 5,354 | 9,186 | 96.7 |
| Missing | 5 | F | F | 7 | F | F |
| Cancer[†] | | | | | | |
| Yes | 86 | 141 | 1.6 | 107 | 178 | 1.9 |
| No | 4,235 | 8,767 | 98.3 | 5,548 | 9,414 | 98.0 |
| Missing | 7 | F | F | 7 | F | F |
| Stomach/Intestinal ulcers[†] | | | | | | |
| Yes | 94 | 181 | 2.1 | 159 | 261 | 2.8 |
| No | 4,091 | 8,506 | 97.7 | 5,381 | 9,167 | 97.1 |
| Missing | 9 | F | F | 7 | F | F |

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file (extreme)

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

[†] Incidence rates, population counts and sample counts for specific chronic conditions are based on those who did not report the condition in 1994/95.

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

F Coefficient of variation greater than 33.3%

Table F

Regression coefficients relating selected characteristics to psychological distress, men aged 18 or older, household population, Canada excluding territories, 1994/95

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|---|-----------------------------|-------|-----------------|-------|-------------------|-------|-------------------------|-------|--------------|-------|
| | B | se | B | se | B | se | B | se | B | se |
| Age | -0.03*** | 0.003 | -0.02*** | 0.003 | -0.03*** | 0.003 | -0.02*** | 0.003 | -0.02*** | 0.003 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 0.26 | 0.160 | 0.34* | 0.155 | 0.38* | 0.162 | 0.25 | 0.153 | 0.22 | 0.154 |
| Middle | 0.03 | 0.104 | -0.01 | 0.098 | 0.06 | 0.103 | -0.02 | 0.098 | -0.01 | 0.099 |
| Upper-middle/High† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | -0.19 | 0.134 | -0.22 | 0.134 | -0.24 | 0.132 | -0.20 | 0.131 | -0.20 | 0.129 |
| Secondary graduation | -0.31* | 0.130 | -0.32* | 0.126 | -0.32* | 0.131 | -0.31* | 0.123 | -0.32** | 0.123 |
| Some postsecondary | -0.02 | 0.119 | -0.08 | 0.117 | 0.00 | 0.119 | -0.10 | 0.114 | -0.10 | 0.114 |
| Postsecondary graduation† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Marital status | | | | | | | | | | |
| Married† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Previously married | 0.18 | 0.149 | 0.09 | 0.143 | 0.20 | 0.146 | 0.09 | 0.141 | 0.10 | 0.143 |
| Never married | 0.37** | 0.134 | 0.31* | 0.131 | 0.36** | 0.133 | 0.36** | 0.130 | 0.38** | 0.130 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 0.25* | 0.107 | 0.19 | 0.103 | 0.26* | 0.106 | 0.10 | 0.102 | 0.08 | 0.103 |
| Physically inactive | 0.11 | 0.092 | 0.12 | 0.096 | 0.13 | 0.092 | 0.17 | 0.094 | 0.19* | 0.093 |
| Heavy drinker | 0.16 | 0.103 | 0.16 | 0.098 | 0.18 | 0.100 | 0.11 | 0.097 | 0.10 | 0.096 |
| Obese | -0.08 | 0.134 | -0.12 | 0.125 | -0.11 | 0.133 | -0.14 | 0.126 | -0.14 | 0.128 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | -0.25*** | 0.015 | -0.20*** | 0.015 | -0.26*** | 0.016 | -0.19*** | 0.015 | -0.20*** | 0.015 |
| Emotional support | -0.29*** | 0.074 | -0.03 | 0.070 | -0.29*** | 0.077 | -0.03 | 0.068 | -0.06 | 0.073 |
| Stress and emotional support interactions‡ | | | | | | | | | | |
| Recent negative life events | 0.51*** | 0.048 | | | | | 0.25*** | 0.050 | | |
| x emotional support | -0.06 | 0.073 | | | | | 0.11 | 0.069 | | |
| Chronic strains | | | 0.38*** | 0.023 | | | 0.33*** | 0.023 | | |
| x emotional support | | | -0.09*** | 0.026 | | | -0.10** | 0.032 | | |
| Childhood traumas | | | | | 0.42*** | 0.043 | 0.22*** | 0.044 | | |
| x emotional support | | | | | -0.14* | 0.058 | -0.05 | 0.066 | | |
| Total stress | | | | | | | | | 0.29*** | 0.016 |
| x emotional support | | | | | | | | | -0.05** | 0.017 |
| Intercept | 4.25 | | 3.94 | | 4.34 | | 3.84 | | 3.86 | |
| Model information | | | | | | | | | | |
| R ² | 0.24 | | 0.29 | | 0.24 | | 0.31 | | 0.30 | |
| Sample size | 6,650 | | 6,650 | | 6,652 | | 6,644 | | 6,644 | |
| Dropped because of missing values | 304 | | 304 | | 302 | | 310 | | 310 | |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but coefficients are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

‡ Beta coefficients are not presented because standardized regression coefficients for interaction terms and constituent variables are affected by changes in origin and so are not useful indicators of relative importance of variables in multiplicative regression model (see Analytical techniques) (Reference 39).

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table G

Regression coefficients relating selected characteristics to psychological distress, women aged 18 or older, household population, Canada excluding territories, 1994/95

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|---|-----------------------------|-------|-----------------|-------|-------------------|-------|-------------------------|-------|--------------|-------|
| | B | se | B | se | B | se | B | se | B | se |
| Age | -0.03*** | 0.003 | -0.02*** | 0.003 | -0.03*** | 0.003 | -0.01*** | 0.003 | -0.01*** | 0.003 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 0.31* | 0.154 | 0.40** | 0.149 | 0.44** | 0.161 | 0.29* | 0.148 | 0.29 | 0.149 |
| Middle | 0.05 | 0.099 | 0.10 | 0.098 | 0.12 | 0.102 | 0.08 | 0.097 | 0.08 | 0.098 |
| Upper-middle/High† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 0.16 | 0.134 | 0.11 | 0.131 | 0.05 | 0.134 | 0.10 | 0.128 | 0.09 | 0.128 |
| Secondary graduation | -0.02 | 0.132 | -0.09 | 0.128 | -0.08 | 0.132 | -0.07 | 0.127 | -0.07 | 0.126 |
| Some postsecondary | 0.19 | 0.106 | 0.11 | 0.105 | 0.12 | 0.109 | 0.08 | 0.102 | 0.07 | 0.103 |
| Postsecondary graduation† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Marital status | | | | | | | | | | |
| Married† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Previously married | 0.49*** | 0.139 | 0.33* | 0.137 | 0.43** | 0.138 | 0.32* | 0.134 | 0.32* | 0.134 |
| Never married | 0.51*** | 0.147 | 0.45** | 0.143 | 0.45** | 0.145 | 0.52*** | 0.142 | 0.52*** | 0.142 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 0.54*** | 0.126 | 0.41*** | 0.120 | 0.52*** | 0.127 | 0.27* | 0.118 | 0.27* | 0.118 |
| Physically inactive | 0.25** | 0.085 | 0.21* | 0.082 | 0.26** | 0.084 | 0.26** | 0.081 | 0.26** | 0.080 |
| Heavy drinker | 0.27 | 0.219 | 0.31 | 0.216 | 0.33 | 0.223 | 0.14 | 0.211 | 0.14 | 0.211 |
| Obese | -0.07 | 0.130 | -0.13 | 0.127 | -0.04 | 0.129 | -0.16 | 0.126 | -0.16 | 0.126 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | -0.32*** | 0.013 | -0.27*** | 0.013 | -0.33*** | 0.013 | -0.26*** | 0.013 | -0.26*** | 0.012 |
| Emotional support | -0.59*** | 0.109 | -0.29*** | 0.099 | -0.54*** | 0.099 | -0.28** | 0.098 | -0.29** | 0.100 |
| Stress and emotional support interactions‡ | | | | | | | | | | |
| Recent negative life events | 0.59*** | 0.053 | | | | | 0.31*** | 0.053 | | |
| x emotional support | -0.14 | 0.078 | | | | | -0.01 | 0.086 | | |
| Chronic strains | | | 0.36*** | 0.021 | | | 0.29*** | 0.022 | | |
| x emotional support | | | -0.10*** | 0.028 | | | -0.07* | 0.032 | | |
| Childhood traumas | | | | | 0.46*** | 0.041 | 0.25*** | 0.041 | | |
| x emotional support | | | | | -0.26*** | 0.069 | -0.13 | 0.075 | | |
| Total stress | | | | | | | | | 0.28*** | 0.014 |
| x emotional support | | | | | | | | | -0.07* | 0.017 |
| Intercept | 4.12 | | 3.85 | | 4.15 | | 3.63 | | 3.63 | |
| Model information | | | | | | | | | | |
| R ² | 0.30 | | 0.33 | | 0.30 | | 0.34 | | 0.34 | |
| Sample size | 8,476 | | 8,473 | | 8,472 | | 8,467 | | 8,467 | |
| Dropped because of missing values | 260 | | 263 | | 264 | | 269 | | 269 | |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but coefficients are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

‡ Beta coefficients are not presented because standardized regression coefficients for interaction terms and constituent variables are affected by changes in origin and so are not useful indicators of relative importance of variables in multiplicative regression model (see Analytical techniques) (Reference 39).

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table H

Regression coefficients relating selected characteristics in 1994/95 to change in psychological distress by 2000/01, men aged 18 or older in 1994/95, household population, Canada excluding territories

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|---|-----------------------------|-------|-----------------|-------|-------------------|-------|-------------------------|-------|--------------|-------|
| | B | se | B | se | B | se | B | se | B | se |
| Distress level in 1994/95 | -0.69*** | 0.031 | -0.70*** | 0.032 | -0.69*** | 0.032 | -0.71*** | 0.032 | -0.71*** | 0.033 |
| Age | -0.01 | 0.005 | -0.01 | 0.005 | -0.01 | 0.005 | 0.00 | 0.005 | 0.00 | 0.005 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 0.38 | 0.210 | 0.40 | 0.213 | 0.39 | 0.209 | 0.38 | 0.210 | 0.39 | 0.211 |
| Middle | 0.12 | 0.146 | 0.11 | 0.144 | 0.13 | 0.147 | 0.12 | 0.145 | 0.11 | 0.145 |
| Upper-middle/High† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 0.23 | 0.168 | 0.21 | 0.170 | 0.21 | 0.170 | 0.21 | 0.170 | 0.21 | 0.170 |
| Secondary graduation | -0.04 | 0.170 | -0.04 | 0.171 | -0.04 | 0.170 | -0.05 | 0.171 | -0.05 | 0.171 |
| Some postsecondary | 0.07 | 0.153 | 0.08 | 0.153 | 0.09 | 0.153 | 0.06 | 0.152 | 0.07 | 0.152 |
| Postsecondary graduation† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Marital status | | | | | | | | | | |
| Married† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Previously married | 0.00 | 0.171 | 0.00 | 0.170 | 0.02 | 0.172 | 0.00 | 0.172 | -0.01 | 0.171 |
| Never married | 0.02 | 0.165 | 0.00 | 0.168 | 0.01 | 0.164 | 0.02 | 0.168 | 0.01 | 0.169 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 0.30* | 0.143 | 0.31* | 0.142 | 0.31* | 0.143 | 0.28 | 0.145 | 0.28 | 0.145 |
| Physically inactive | 0.03 | 0.108 | 0.03 | 0.108 | 0.05 | 0.109 | 0.05 | 0.109 | 0.05 | 0.108 |
| Heavy drinker | -0.27 | 0.142 | -0.27 | 0.142 | -0.27 | 0.142 | -0.28* | 0.140 | -0.27 | 0.142 |
| Obese | -0.33* | 0.147 | -0.33* | 0.147 | -0.33* | 0.146 | -0.33* | 0.144 | -0.34* | 0.146 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | -0.05** | 0.017 | -0.04* | 0.018 | -0.05** | 0.017 | -0.04* | 0.018 | -0.04* | 0.018 |
| Emotional support | -0.16 | 0.115 | -0.13 | 0.140 | -0.15 | 0.114 | -0.13 | 0.139 | -0.14 | 0.138 |
| Stress and emotional support interactions‡ | | | | | | | | | | |
| Recent negative life events | 0.15* | 0.062 | | | | | 0.11 | 0.063 | | |
| x emotional support | 0.09 | 0.085 | | | | | 0.11 | 0.080 | | |
| Chronic strains | | | 0.06 | 0.033 | | | 0.04 | 0.032 | | |
| x emotional support | | | 0.01 | 0.042 | | | 0.00 | 0.038 | | |
| Childhood traumas | | | | | 0.11 | 0.059 | 0.07 | 0.059 | | |
| x emotional support | | | | | 0.00 | 0.078 | -0.03 | 0.066 | | |
| Total stress | | | | | | | | | 0.06* | 0.024 |
| x emotional support | | | | | | | | | 0.01 | 0.031 |
| Intercept | 1.23 | | 1.25 | | 1.24 | | 1.23 | | 1.25 | |
| Model information | | | | | | | | | | |
| R ² | 0.35 | | 0.35 | | 0.35 | | 0.35 | | 0.35 | |
| Sample size | 3,961 | | 3,965 | | 3,964 | | 3,960 | | 3,960 | |
| Dropped because of missing values | 409 | | 405 | | 406 | | 410 | | 410 | |

Data source: 1994/95 National Population Health Survey, longitudinal sample, Health file (extreme)

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but coefficients are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

‡ Beta coefficients are not presented because standardized regression coefficients for interaction terms and constituent variables are affected by changes in origin and so are not useful indicators of relative importance of variables in multiplicative regression model (see Analytical techniques) (Reference 39).

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table 1

Regression coefficients relating selected characteristics in 1994/95 to change in psychological distress by 2000/01, women aged 18 or older in 1994/95, household population, Canada excluding territories

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|---|-----------------------------|-------|-----------------|-------|-------------------|-------|-------------------------|-------|--------------|-------|
| | B | se | B | se | B | se | B | se | B | se |
| Distress level in 1994/95 | -0.70*** | 0.025 | -0.72*** | 0.025 | -0.71*** | 0.025 | -0.73*** | 0.025 | -0.73*** | 0.026 |
| Age | -0.01* | 0.005 | -0.01 | 0.005 | -0.01 | 0.005 | -0.01 | 0.005 | -0.01 | 0.005 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 0.47* | 0.203 | 0.49* | 0.200 | 0.50* | 0.198 | 0.49* | 0.199 | 0.46* | 0.199 |
| Middle | 0.07 | 0.143 | 0.08 | 0.142 | 0.10 | 0.143 | 0.10 | 0.142 | 0.08 | 0.142 |
| Upper-middle/High† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 0.38* | 0.186 | 0.37* | 0.186 | 0.32 | 0.182 | 0.32 | 0.183 | 0.36 | 0.186 |
| Secondary graduation | 0.27 | 0.216 | 0.24 | 0.213 | 0.24 | 0.213 | 0.24 | 0.214 | 0.25 | 0.212 |
| Some postsecondary | -0.18 | 0.115 | -0.21 | 0.114 | -0.24* | 0.114 | -0.25* | 0.114 | -0.23* | 0.114 |
| Postsecondary graduation† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Marital status | | | | | | | | | | |
| Married† | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Previously married | -0.14 | 0.151 | -0.17 | 0.151 | -0.19 | 0.151 | -0.20 | 0.152 | -0.18 | 0.151 |
| Never married | -0.02 | 0.169 | -0.01 | 0.170 | 0.01 | 0.164 | 0.03 | 0.165 | 0.02 | 0.168 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 0.35* | 0.148 | 0.31* | 0.145 | 0.28 | 0.149 | 0.24 | 0.147 | 0.25 | 0.147 |
| Physically inactive | -0.13 | 0.127 | -0.13 | 0.126 | -0.11 | 0.124 | -0.11 | 0.124 | -0.12 | 0.125 |
| Heavy drinker | -0.10 | 0.245 | -0.11 | 0.241 | -0.16 | 0.250 | -0.18 | 0.249 | -0.18 | 0.245 |
| Obese | 0.28 | 0.211 | 0.24 | 0.209 | 0.27 | 0.206 | 0.24 | 0.206 | 0.23 | 0.208 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | -0.06*** | 0.015 | -0.04** | 0.015 | -0.05*** | 0.015 | -0.05** | 0.015 | -0.04** | 0.015 |
| Emotional support | 0.04 | 0.106 | 0.20* | 0.093 | 0.07 | 0.107 | 0.19* | 0.093 | 0.20* | 0.094 |
| Stress and emotional support interactions‡ | | | | | | | | | | |
| Recent negative life events | 0.11 | 0.057 | | | | | 0.00 | 0.061 | | |
| x emotional support | -0.09 | 0.087 | | | | | -0.01 | 0.096 | | |
| Chronic strains | | | 0.11*** | 0.026 | | | 0.09** | 0.028 | | |
| x emotional support | | | -0.07* | 0.028 | | | -0.05 | 0.038 | | |
| Childhood traumas | | | | | 0.28*** | 0.064 | 0.23*** | 0.068 | | |
| x emotional support | | | | | -0.13 | 0.079 | -0.06 | 0.097 | | |
| Total stress | | | | | | | | | 0.10*** | 0.019 |
| x emotional support | | | | | | | | | -0.05* | 0.019 |
| Intercept | 1.78 | | 1.76 | | 1.74 | | 1.71 | | 1.71 | |
| Model information | | | | | | | | | | |
| R ² | 0.35 | | 0.35 | | 0.35 | | 0.36 | | 0.35 | |
| Sample size | 5,478 | | 5,477 | | 5,476 | | 5,474 | | 5,474 | |
| Dropped because of missing values | 303 | | 304 | | 305 | | 307 | | 307 | |

Data source: 1994/95 National Population Health Survey, longitudinal sample, Health file (extreme)

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but coefficients are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

‡ Beta coefficients are not presented because standardized regression coefficients for interaction terms and constituent variables are affected by changes in origin and so are not useful indicators of relative importance of variables in multiplicative regression model (see Analytical techniques) (Reference 39).

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table J

Adjusted odds ratios relating selected characteristics to one or more chronic conditions, men aged 18 or older, household population, Canada excluding territories, 1994/95

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|--|-----------------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|-------------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Age | 1.05*** | 1.04, 1.06 | 1.05*** | 1.05, 1.06 | 1.05*** | 1.04, 1.06 | 1.05*** | 1.05, 1.06 | 1.05*** | 1.05, 1.06 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 1.18 | 0.95, 1.48 | 1.24 | 0.99, 1.55 | 1.24 | 0.99, 1.55 | 1.17 | 0.94, 1.47 | 1.19 | 0.95, 1.49 |
| Middle | 0.95 | 0.80, 1.13 | 0.95 | 0.80, 1.13 | 0.97 | 0.82, 1.15 | 0.94 | 0.79, 1.12 | 0.94 | 0.79, 1.12 |
| Upper-middle/High† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 1.22* | 1.02, 1.46 | 1.19* | 1.00, 1.42 | 1.18 | 0.99, 1.41 | 1.21* | 1.02, 1.44 | 1.21* | 1.01, 1.44 |
| Secondary graduation | 1.09 | 0.86, 1.37 | 1.07 | 0.84, 1.36 | 1.08 | 0.85, 1.36 | 1.08 | 0.85, 1.37 | 1.07 | 0.85, 1.36 |
| Some postsecondary | 1.44*** | 1.18, 1.75 | 1.43*** | 1.18, 1.74 | 1.46*** | 1.20, 1.77 | 1.41*** | 1.16, 1.71 | 1.41*** | 1.16, 1.71 |
| Postsecondary graduation† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Marital status | | | | | | | | | | |
| Married† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Previously married | 0.86 | 0.69, 1.07 | 0.84 | 0.68, 1.04 | 0.86 | 0.70, 1.07 | 0.83 | 0.67, 1.03 | 0.83 | 0.66, 1.03 |
| Never married | 0.85 | 0.71, 1.02 | 0.83* | 0.69, 1.00 | 0.85 | 0.71, 1.02 | 0.85 | 0.71, 1.01 | 0.84 | 0.70, 1.01 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 1.10 | 0.93, 1.30 | 1.11 | 0.94, 1.32 | 1.11 | 0.94, 1.32 | 1.04 | 0.88, 1.24 | 1.05 | 0.89, 1.25 |
| Physically inactive | 0.92 | 0.79, 1.07 | 0.90 | 0.78, 1.05 | 0.93 | 0.80, 1.08 | 0.94 | 0.81, 1.09 | 0.93 | 0.81, 1.08 |
| Heavy drinker | 1.14 | 0.94, 1.38 | 1.15 | 0.95, 1.40 | 1.14 | 0.94, 1.39 | 1.12 | 0.92, 1.37 | 1.13 | 0.93, 1.38 |
| Obese | 1.39** | 1.14, 1.68 | 1.37** | 1.13, 1.67 | 1.37** | 1.13, 1.66 | 1.36** | 1.12, 1.65 | 1.36** | 1.12, 1.65 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | 0.97** | 0.96, 0.99 | 0.98 | 0.96, 1.00 | 0.97*** | 0.95, 0.99 | 0.99 | 0.97, 1.01 | 0.99 | 0.97, 1.01 |
| Emotional support | 1.01 | 0.92, 1.11 | 1.05 | 0.95, 1.16 | 1.01 | 0.93, 1.11 | 1.05 | 0.95, 1.16 | 1.06 | 0.96, 1.17 |
| Stress and emotional support interactions | | | | | | | | | | |
| Recent negative life events | 1.28*** | 1.19, 1.38 | | | | | 1.18*** | 1.09, 1.28 | | |
| x emotional support | 1.00 | 0.93, 1.07 | | | | | 1.01 | 0.93, 1.10 | | |
| Chronic strains | | | 1.12*** | 1.09, 1.16 | | | 1.09*** | 1.05, 1.12 | | |
| x emotional support | | | 1.00 | 0.97, 1.03 | | | 1.01 | 0.97, 1.04 | | |
| Childhood traumas | | | | | 1.23*** | 1.15, 1.32 | 1.15*** | 1.07, 1.23 | | |
| x emotional support | | | | | 0.98 | 0.92, 1.04 | 0.98 | 0.91, 1.05 | | |
| Total stress | | | | | | | | | 1.12*** | 1.09, 1.14 |
| x emotional support | | | | | | | | | 1.00 | 0.98, 1.02 |
| Model information | | | | | | | | | | |
| Sample size | 6,654 | | 6,654 | | 6,655 | | 6,647 | | 6,647 | |
| With one or more chronic conditions | 2,745 | | 2,742 | | 2,742 | | 2,739 | | 2,739 | |
| Dropped because of missing values | 300 | | 300 | | 299 | | 307 | | 307 | |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but odds ratios are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker." Because of rounding, some confidence intervals with 1.00 as lower/upper limit are significant.

† Reference category

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table K

Adjusted odds ratios relating selected characteristics to one or more chronic conditions, women aged 18 or older, household population, Canada excluding territories, 1994/95

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|--|-----------------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|-------------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Age | 1.04*** | 1.04, 1.05 | 1.05*** | 1.04, 1.05 | 1.05*** | 1.04, 1.05 | 1.05*** | 1.05, 1.06 | 1.05*** | 1.05, 1.06 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 1.02 | 0.85, 1.22 | 1.09 | 0.91, 1.31 | 1.08 | 0.90, 1.30 | 1.01 | 0.84, 1.22 | 1.03 | 0.85, 1.24 |
| Middle | 0.98 | 0.84, 1.14 | 1.00 | 0.86, 1.16 | 1.01 | 0.87, 1.17 | 0.99 | 0.85, 1.16 | 0.99 | 0.85, 1.15 |
| Upper-middle/High† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 1.18 | 0.98, 1.43 | 1.14 | 0.94, 1.38 | 1.11 | 0.92, 1.34 | 1.13 | 0.93, 1.37 | 1.14 | 0.94, 1.38 |
| Secondary graduation | 0.81* | 0.67, 0.98 | 0.78* | 0.65, 0.94 | 0.79* | 0.65, 0.96 | 0.80* | 0.66, 0.97 | 0.79* | 0.66, 0.96 |
| Some postsecondary | 1.10 | 0.94, 1.29 | 1.07 | 0.91, 1.25 | 1.05 | 0.89, 1.23 | 1.04 | 0.88, 1.23 | 1.05 | 0.89, 1.23 |
| Postsecondary graduation† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Marital status | | | | | | | | | | |
| Married† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Previously married | 1.21* | 1.03, 1.41 | 1.14 | 0.98, 1.33 | 1.17* | 1.00, 1.36 | 1.13 | 0.96, 1.32 | 1.12 | 0.96, 1.31 |
| Never married | 1.04 | 0.85, 1.26 | 1.00 | 0.82, 1.22 | 1.02 | 0.84, 1.24 | 1.04 | 0.86, 1.28 | 1.03 | 0.85, 1.26 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 1.19* | 1.03, 1.38 | 1.17* | 1.02, 1.36 | 1.14 | 0.98, 1.32 | 1.05 | 0.90, 1.21 | 1.07 | 0.92, 1.24 |
| Physically inactive | 0.97 | 0.85, 1.11 | 0.95 | 0.83, 1.08 | 0.98 | 0.86, 1.12 | 0.98 | 0.86, 1.13 | 0.97 | 0.85, 1.11 |
| Heavy drinker | 1.05 | 0.80, 1.38 | 1.09 | 0.83, 1.44 | 1.05 | 0.79, 1.39 | 0.97 | 0.73, 1.29 | 1.00 | 0.76, 1.33 |
| Obese | 1.53*** | 1.27, 1.83 | 1.51*** | 1.26, 1.82 | 1.55*** | 1.29, 1.86 | 1.50*** | 1.25, 1.80 | 1.49*** | 1.24, 1.80 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | 0.95*** | 0.94, 0.97 | 0.96*** | 0.95, 0.98 | 0.95*** | 0.94, 0.97 | 0.97*** | 0.95, 0.99 | 0.97* | 0.96, 0.99 |
| Emotional support | 0.95 | 0.86, 1.05 | 1.00 | 0.89, 1.13 | 0.96 | 0.86, 1.07 | 1.01 | 0.90, 1.13 | 1.03 | 0.91, 1.15 |
| Stress and emotional support interactions | | | | | | | | | | |
| Recent negative life events | 1.33*** | 1.24, 1.42 | | | | | 1.19*** | 1.11, 1.27 | | |
| x emotional support | 0.97 | 0.89, 1.04 | | | | | 0.99 | 0.91, 1.09 | | |
| Chronic strains | | | 1.13*** | 1.10, 1.16 | | | 1.07*** | 1.04, 1.10 | | |
| x emotional support | | | 0.99 | 0.96, 1.02 | | | 1.00 | 0.96, 1.03 | | |
| Childhood traumas | | | | | 1.35*** | 1.28, 1.42 | 1.26*** | 1.20, 1.33 | | |
| x emotional support | | | | | 0.95 | 0.89, 1.02 | 0.97 | 0.89, 1.06 | | |
| Total stress | | | | | | | | | 1.13*** | 1.11, 1.15 |
| x emotional support | | | | | | | | | 0.99 | 0.97, 1.01 |
| Model information | | | | | | | | | | |
| Sample size | 8,484 | | 8,481 | | 8,480 | | 8,475 | | 8,475 | |
| With one or more chronic conditions | 4,187 | | 4,184 | | 4,184 | | 4,180 | | 4,180 | |
| Dropped because of missing values | 252 | | 255 | | 256 | | 261 | | 261 | |

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but odds ratios are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table L

Adjusted odds ratios relating selected characteristics in 1994/95 to incidence of one or more chronic conditions by 2000/01, men aged 18 or older in 1994/95, household population, Canada excluding territories

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|--|-----------------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|-------------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Number of chronic conditions in 1994/95 | 1.08 | 0.98, 1.19 | 1.07 | 0.96, 1.18 | 1.07 | 0.97, 1.18 | 1.04 | 0.95, 1.15 | 1.05 | 0.95, 1.16 |
| Age | 1.03*** | 1.02, 1.04 | 1.03*** | 1.03, 1.04 | 1.03*** | 1.02, 1.04 | 1.03*** | 1.03, 1.04 | 1.03*** | 1.03, 1.04 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 1.09 | 0.82, 1.44 | 1.11 | 0.84, 1.47 | 1.10 | 0.83, 1.45 | 1.09 | 0.82, 1.45 | 1.09 | 0.82, 1.44 |
| Middle | 0.96 | 0.76, 1.22 | 0.95 | 0.75, 1.20 | 0.97 | 0.77, 1.23 | 0.95 | 0.75, 1.21 | 0.95 | 0.75, 1.21 |
| Upper-middle/High† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 1.12 | 0.87, 1.44 | 1.10 | 0.85, 1.43 | 1.09 | 0.84, 1.42 | 1.10 | 0.85, 1.42 | 1.10 | 0.85, 1.43 |
| Secondary graduation | 0.99 | 0.75, 1.32 | 0.99 | 0.75, 1.32 | 0.98 | 0.74, 1.31 | 0.99 | 0.75, 1.32 | 0.99 | 0.75, 1.32 |
| Some postsecondary | 1.07 | 0.85, 1.35 | 1.07 | 0.85, 1.35 | 1.07 | 0.85, 1.35 | 1.05 | 0.84, 1.33 | 1.06 | 0.84, 1.33 |
| Postsecondary graduation† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Marital status | | | | | | | | | | |
| Married† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Previously married | 0.78 | 0.59, 1.02 | 0.77 | 0.58, 1.00 | 0.77 | 0.58, 1.01 | 0.76* | 0.58, 1.00 | 0.76* | 0.58, 1.00 |
| Never married | 0.83 | 0.64, 1.07 | 0.83 | 0.64, 1.07 | 0.83 | 0.64, 1.07 | 0.84 | 0.65, 1.08 | 0.83 | 0.64, 1.07 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 1.06 | 0.87, 1.30 | 1.07 | 0.88, 1.31 | 1.07 | 0.87, 1.30 | 1.03 | 0.84, 1.26 | 1.04 | 0.85, 1.27 |
| Physically inactive | 1.04 | 0.86, 1.26 | 1.04 | 0.86, 1.26 | 1.06 | 0.87, 1.28 | 1.07 | 0.88, 1.29 | 1.06 | 0.87, 1.28 |
| Heavy drinker | 1.03 | 0.81, 1.32 | 1.02 | 0.80, 1.30 | 1.02 | 0.80, 1.30 | 1.02 | 0.80, 1.31 | 1.02 | 0.80, 1.30 |
| Obese | 1.72*** | 1.32, 2.22 | 1.72*** | 1.33, 2.23 | 1.71*** | 1.32, 2.22 | 1.70*** | 1.31, 2.21 | 1.72*** | 1.32, 2.22 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | 0.99 | 0.97, 1.02 | 1.00 | 0.98, 1.03 | 0.99 | 0.97, 1.02 | 1.00 | 0.98, 1.03 | 1.00 | 0.98, 1.03 |
| Emotional support | 1.01 | 0.90, 1.15 | 1.06 | 0.92, 1.21 | 1.01 | 0.89, 1.14 | 1.06 | 0.92, 1.21 | 1.05 | 0.92, 1.21 |
| Stress and emotional support interactions | | | | | | | | | | |
| Recent negative life events | 1.11* | 1.00, 1.22 | | | | | 1.05 | 0.94, 1.16 | | |
| x emotional support | 0.96 | 0.87, 1.05 | | | | | 0.96 | 0.86, 1.06 | | |
| Chronic strains | | | 1.07* | 1.02, 1.11 | | | 1.05* | 1.01, 1.10 | | |
| x emotional support | | | 0.98 | 0.95, 1.02 | | | 0.98 | 0.94, 1.03 | | |
| Childhood traumas | | | | | 1.15*** | 1.06, 1.25 | 1.12* | 1.02, 1.22 | | |
| x emotional support | | | | | 1.02 | 0.93, 1.12 | 1.06 | 0.95, 1.17 | | |
| Total stress | | | | | | | | | 1.06*** | 1.03, 1.10 |
| x emotional support | | | | | | | | | 0.99 | 0.97, 1.02 |
| Model information | | | | | | | | | | |
| Sample size | 4,186 | | 4,190 | | 4,188 | | 4,184 | | 4,184 | |
| With one or more new chronic conditions | 1,325 | | 1,326 | | 1,325 | | 1,324 | | 1,324 | |
| Dropped because of missing values | 184 | | 180 | | 182 | | 186 | | 186 | |

Data source: 1994/95 National Population Health Survey, longitudinal sample, Health file (extreme)

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but odds ratios are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker." Because of rounding, some confidence intervals with 1.00 as lower/upper limit are significant.

† Reference category

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Table M

Adjusted odds ratios relating selected characteristics in 1994/95 to incidence of one or more chronic conditions by 2000/01, women aged 18 or older in 1994/95, household population, Canada excluding territories

| | Recent negative life events | | Chronic strains | | Childhood traumas | | All three stress scales | | Total stress | |
|--|-----------------------------|-------------------------|---------------------|-------------------------|---------------------|-------------------------|-------------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Number of chronic conditions in 1994/95 | 0.97 | 0.90, 1.04 | 0.96 | 0.89, 1.03 | 0.95 | 0.88, 1.02 | 0.94 | 0.87, 1.01 | 0.94 | 0.87, 1.01 |
| Age | 1.03*** | 1.02, 1.03 | 1.03*** | 1.02, 1.04 | 1.03*** | 1.02, 1.04 | 1.03*** | 1.03, 1.04 | 1.03*** | 1.03, 1.04 |
| Household income | | | | | | | | | | |
| Low/Lower-middle | 1.13 | 0.91, 1.40 | 1.15 | 0.93, 1.42 | 1.17 | 0.94, 1.44 | 1.13 | 0.91, 1.40 | 1.13 | 0.91, 1.40 |
| Middle | 0.91 | 0.76, 1.09 | 0.91 | 0.76, 1.09 | 0.93 | 0.78, 1.11 | 0.92 | 0.77, 1.10 | 0.91 | 0.76, 1.09 |
| Upper-middle/High† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Education | | | | | | | | | | |
| Less than secondary graduation | 1.27 | 0.99, 1.63 | 1.24 | 0.96, 1.59 | 1.21 | 0.95, 1.55 | 1.21 | 0.94, 1.56 | 1.23 | 0.96, 1.58 |
| Secondary graduation | 1.01 | 0.80, 1.27 | 0.98 | 0.78, 1.24 | 0.99 | 0.78, 1.24 | 0.98 | 0.78, 1.24 | 0.98 | 0.78, 1.24 |
| Some postsecondary | 1.17 | 0.95, 1.44 | 1.14 | 0.93, 1.41 | 1.13 | 0.92, 1.39 | 1.11 | 0.91, 1.37 | 1.12 | 0.91, 1.38 |
| Postsecondary graduation† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Marital status | | | | | | | | | | |
| Married† | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... | 1.00 | ... |
| Previously married | 1.05 | 0.86, 1.29 | 1.02 | 0.83, 1.25 | 1.02 | 0.83, 1.26 | 1.00 | 0.81, 1.23 | 1.01 | 0.82, 1.24 |
| Never married | 1.07 | 0.85, 1.34 | 1.06 | 0.84, 1.33 | 1.07 | 0.86, 1.34 | 1.09 | 0.86, 1.37 | 1.08 | 0.86, 1.36 |
| Health behaviours | | | | | | | | | | |
| Daily smoker | 1.19 | 1.00, 1.42 | 1.16 | 0.97, 1.39 | 1.15 | 0.96, 1.38 | 1.10 | 0.91, 1.31 | 1.10 | 0.92, 1.32 |
| Physically inactive | 0.89 | 0.77, 1.03 | 0.88 | 0.76, 1.02 | 0.90 | 0.77, 1.04 | 0.89 | 0.77, 1.03 | 0.89 | 0.77, 1.03 |
| Heavy drinker | 0.86 | 0.59, 1.27 | 0.86 | 0.59, 1.27 | 0.85 | 0.58, 1.26 | 0.82 | 0.55, 1.22 | 0.83 | 0.56, 1.23 |
| Obese | 1.27* | 1.04, 1.55 | 1.26* | 1.03, 1.54 | 1.28* | 1.05, 1.56 | 1.26* | 1.03, 1.54 | 1.25* | 1.02, 1.53 |
| Psycho-social resources | | | | | | | | | | |
| Mastery | 0.98 | 0.96, 1.00 | 0.99 | 0.97, 1.01 | 0.98 | 0.97, 1.00 | 0.99 | 0.98, 1.01 | 1.00 | 0.98, 1.02 |
| Emotional support | 1.06 | 0.93, 1.20 | 1.10 | 0.94, 1.28 | 1.05 | 0.92, 1.20 | 1.10 | 0.94, 1.28 | 1.11 | 0.95, 1.29 |
| Stress and emotional support interactions | | | | | | | | | | |
| Recent negative life events | 1.13*** | 1.05, 1.22 | | | | | 1.05 | 0.97, 1.14 | | |
| x emotional support | 0.96 | 0.88, 1.05 | | | | | 0.96 | 0.85, 1.07 | | |
| Chronic strains | | | 1.08*** | 1.05, 1.12 | | | 1.06** | 1.02, 1.10 | | |
| x emotional support | | | 0.99 | 0.95, 1.02 | | | 1.00 | 0.96, 1.04 | | |
| Childhood traumas | | | | | 1.20*** | 1.13, 1.28 | 1.16*** | 1.08, 1.24 | | |
| x emotional support | | | | | 0.98 | 0.90, 1.06 | 1.01 | 0.91, 1.11 | | |
| Total stress | | | | | | | | | 1.08*** | 1.05, 1.10 |
| x emotional support | | | | | | | | | 0.99 | 0.97, 1.02 |
| Model information | | | | | | | | | | |
| Sample size | 5,612 | | 5,611 | | 5,610 | | 5,608 | | 5,608 | |
| With one or more new chronic conditions | 2,152 | | 2,152 | | 2,152 | | 2,151 | | 2,151 | |
| Dropped because of missing values | 169 | | 170 | | 171 | | 173 | | 173 | |

Data source: 1994/95 National Population Health Survey, longitudinal sample, Health file (extreme)

Notes: "Missing" categories for household income and obese variables were included in models to maximize sample size, but odds ratios are not shown. When not noted, reference category is absence of characteristic; for example, reference category for "daily smoker" is "not daily smoker."

† Reference category

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

... Not applicable

Incident arthritis in relation to excess weight

Kathryn Wilkins

Abstract

Objectives

This article reports incidence rates of arthritis, based on data for people aged 40 or older who were followed over six years. The association between excess weight and arthritis, controlled for possible confounders, is also studied.

Data sources

Data are from the household components of cycle 1.1 of Statistics Canada's Canadian Community Health Survey (2000/01) and from the first four cycles of the National Population Health Survey (1994/95 to 2000/01).

Analytical techniques

The prevalence of arthritis in 2000/01 was estimated using cross-sectional data; 1994/95-to-2000/01 incidence density is based on longitudinal data. Logistic regression was used to study the association between excess weight and arthritis (respondent-reported, doctor-diagnosed), while controlling for age, household income, smoking, number of physician consultations, strenuous daily activity, and other factors.

Main results

In 2000/01, 19% of men and 31% of women aged 40 or older reported having been diagnosed with arthritis. Incidence rates of arthritis were 31 and 48 cases per 1,000 person-years for men and women, respectively. For both sexes, the odds ratio for obesity (based on self-reported height and weight) in association with subsequent arthritis was significantly elevated, at 1.6.

Key words

incidence, prevalence, predisposing factors, body mass index, longitudinal studies

Author

Kathryn Wilkins (613-951-1769; Kathryn.Wilkins@statcan.ca) is with the Health Statistics Division at Statistics Canada in Ottawa, Ontario, K1A 0T6.

Arthritis is a major public health problem in Canada. It is a leading cause of chronic pain and mobility limitation, especially in older people.^{1,2} And, as Canadians age, the rapid increase in the number with arthritis is imposing a growing burden on the health care system. Joint replacement, performed chiefly on people with arthritis, already accounts for sharply rising numbers of surgical procedures and hospital days of care.³

Various factors appear to give rise to arthritis, although the specific causal mechanisms are not yet fully understood. Research suggests that genetic, hormonal, and biomechanical or “wear and tear” influences are important.⁴⁻¹⁵ Certain inherent factors that cannot be altered predispose some people to arthritis; for example, being female and having certain genetic traits. But other characteristics can be controlled. A better understanding of the role of currently recognized modifiable risk factors—the most important of which is obesity—offers the best potential for arthritis prevention.

This article presents estimates of the prevalence and incidence of respondent-reported, physician-diagnosed

Definitions

Data from cycle 1.1 of the Canadian Community Health Survey (CCHS) were used to calculate prevalence estimates of respondent-reported, diagnosed *arthritis* (see *What is arthritis?*). CCHS respondents were asked about “long-term health problems that have lasted or are expected to last six months or more and that have been diagnosed by a health professional.” Specifically, the CCHS asked, “Do you have arthritis or rheumatism, excluding fibromyalgia?”

Incidence density estimates of arthritis, as well as relationships between selected characteristics and incident arthritis, were based on data from the National Population Health Survey (NPHS). The NPHS question, “Do you have arthritis or rheumatism?”, did not explicitly exclude fibromyalgia; therefore, more people may have reported arthritis in the NPHS than in the CCHS.

For prevalence and incidence estimates of arthritis, *age* was grouped into five categories: 40 to 49, 50 to 59, 60 to 69, 70 to 79, and 80 or older. Age was used as a continuous variable in multivariate analysis.

Body mass index (BMI) is a measure of weight adjusted for height. In this analysis, BMI was derived from self-reports of weight and height. BMI is calculated by dividing weight in kilograms by the square of height in metres. Three categories were defined, based on the World Health Organization’s standards:¹⁶ acceptable (BMI less than 25.0), overweight (25.0 to 29.9) and obese (30.0 or more). BMI was not calculated for pregnant women.

Four *household income* groups, based on household size and total household income from all sources in the 12 months before the interview, were derived; these groups were not adjusted for regional differences in the cost of living.

| Household income group | People in household | Total household income |
|------------------------|---------------------|------------------------|
| Lowest | 1 or 2 | Less than \$15,000 |
| | 3 or 4 | Less than \$20,000 |
| | 5 or more | Less than \$30,000 |
| Lower-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 |

Respondents were asked about their past and current cigarette consumption to establish *smoking status* as current (daily or occasional), former, or never smokers.

Level of physical activity during *leisure time* was based on total accumulated energy expenditure (EE). EE was calculated using the reported frequency and duration of a respondent’s leisure-time

physical activities in the three months before the cycle 1 interview and the metabolic energy demand of each activity.^{17,18} Leisure time was classified as active (3.0 or more kilocalories per kilogram per day), moderately active (a value between 1.5 and 2.9 kcal/kg/day) or inactive (below 1.5 kcal/kg/day).

Daily lifting was assessed by asking, “Thinking back over the past three months, what best describes your usual daily activities or work habits?” A “yes” response to either “Usually lift or carry light loads” or “Do heavy work or carry very heavy loads” was defined as daily lifting.

Number of *physician visits* in the past year was assessed by asking respondents how many times they had consulted a physician; that is, a general practitioner, a family doctor, or other specialist. Two categories were established: 0 to 6, and 7 or more (upper 20% of the weighted distribution in 1994/95).

Psychological distress was based on a five-point scale response (all of the time = 4, most of the time = 3, some of the time = 2, a little of the time = 1, none of the time = 0) to the following: “During the past month, about how often did you feel:

- so sad that nothing could cheer you up?”
- nervous?”
- restless or fidgety?”
- hopeless?”
- worthless?”
- that everything was an effort?”

The range of possible scores was 0 to 24, with higher scores indicating more distress. For bivariate tabulations, scores for psychological distress were dichotomized: values of 0 through 5 indicated a low level of distress; scores of 6 or higher (the upper decile of the weighted distribution in 1994/95) indicated a high level. Psychological distress was used as a continuous variable in multivariate analysis.

Hormone replacement use was determined by the following questions, asked of all women aged 30 or older: “In the past month, did you take hormones for menopause or aging symptoms?” and “When did you start this hormone therapy?” Three categories were used for bivariate analysis: none, less than five years, and five years or more. For multivariate analysis, responses were grouped as none or less than five years; and five years or more.

Respondents were designated as proxies by convenience if, in cycle 1, 2 or 3, the NPHS General questionnaire (which contained the questions on chronic conditions) was answered by someone other than the selected respondent, but the Health questionnaire was answered by the selected respondent. This response pattern indicated that proxy reporting for the General section probably arose from the interviewer’s convenience rather than from the selected respondent’s unavailability.

arthritis among the Canadian household population aged 40 or older (see *Definitions*). Prevalence was estimated using cross-sectional, population-based data from the 2000/01 Canadian Community Health Survey (CCHS). The availability of longitudinal data on a panel of individuals followed over time in the biennial National Population Health Survey

permitted estimates of incidence density over the 1994/95-to-2000/01 period. The analysis also quantifies the contribution of overweight and obesity to the risk of developing arthritis (see *Analytical techniques, Data sources and Limitations*). Because some research suggests that the relationship of excess weight to arthritis differs somewhat by

Analytical techniques

Incidence density—a measure of accumulated cases per person-years at risk—was calculated to estimate the incidence of arthritis.^{19,20} This accounts for the reported disease status of respondents in each survey cycle. The numerator for the incidence density of arthritis was the number of new cases that accumulated; the denominator was the number of person-years contributed by the population at risk over the follow-up period. Rates were expressed as cases per 1,000 person-years at risk.

For calculation of incidence density, up to three records were produced for each respondent—one for each two-year interval (1994/95-to-1996/97, 1996/97-to-1998/99 and 1998/99-to-2000/01). For each period, a record was generated if the respondent was at least 40 years old and without arthritis at the beginning of the period, and if information on arthritis at the end of the two years was also available.

For the numerator, an incident case of arthritis was defined as a report of a diagnosis of the disease at the cycle 2, 3, or 4 National Population Health Survey (NPHS) interview from a respondent who had not reported having the disease in the previous cycle (see Table). Based on the assumption that arthritis is a lifelong condition, each respondent could contribute a maximum of one incident case. Over cycles 2, 3, and 4, the number of respondents who reported a newly diagnosed case of arthritis totaled 1,162.

Respondents without arthritis at beginning of interval who reported diagnosed arthritis at the end of interval, by two-year interval, National Population Health Survey, 1994/95 to 2000/01

| | Cycles 1 to 2 (1994/95 to 1995/97) | Cycles 2 to 3 (1996/97 to 1998/99) | Cycles 3 to 4 (1998/99 to 2000/01) |
|--|--|--|--|
| No arthritis at beginning of interval | 4,787 | 4,696 | 4,521 |
| Arthritis at end of interval | 356 | 317 | 489 |

For the denominator, in cycles 2, 3 and 4, respondents contributed two person-years "at risk" each time they reported that they did not have arthritis. Thus, over the three two-year intervals, the maximum total time at-risk that a respondent could accumulate was six person-years. Based on the assumption that new cases were evenly distributed throughout the two years between interviews, each respondent reporting

a new case contributed one person-year to the denominator for that cycle. For example, a respondent who reported in cycles 1 and 2 that she did not have arthritis, and then in cycle 3 that she did, would contribute one case to the numerator, and three person-years of follow-up time to the denominator—two years from cycle 1 to 2, and one year between cycles 2 and 3.

To calculate incidence density, the weighted number of cases reported over the six-year period was divided by the weighted total person-years of follow-up time (that is, years "at risk") and multiplied by 1,000.

For the bivariate and multivariate analyses of incident arthritis in relation to respondent characteristics, the values of respondent characteristics (such as body mass index) were those reported at the beginning of each two-year period; the characteristics were assumed to have remained constant over the two years. For example, the body mass index used for the 1994/95-to-1996/97 interval was that reported in 1994/95, regardless of any change by 1996/97. The analysis thus examined risk factors in association with incident arthritis in each two-year period; the units of analysis were records, rather than individual respondents.

Logistic regression was used to examine the influence of overweight and obesity on incident arthritis, while taking into account the effects of other risk factors. Odds ratios and 95% confidence intervals were estimated using multiple logistic regression analysis. The primary independent variables reflected levels of BMI. Additional independent variables entered into multivariate models were selected based on findings from the literature, as well as their availability in the NPHS; these variables controlled for age, household income, smoking status, daily lifting, number of physician visits in the past year, psychological distress, and hormone replacement use (women). Although physical activity has been identified as a risk factor for osteoarthritis, to avoid multicollinearity, it was not included in models containing daily lifting. For both men and women, the incidence rate was slightly, but significantly, higher among those for whom information on diagnosed arthritis was provided by self-report, rather than by proxy (data not shown). Therefore, a variable to reflect proxy- or self-report was included in multivariate models.²¹ However, including this variable did not affect the values of the odds ratios for the independent variables reflecting body mass index.

Variance on prevalence and incidence rate estimates, on differences between rates, and on odds ratios, was calculated using the bootstrap technique, which accounts for survey design effects.²²⁻²⁴

sex, perhaps because of differences in hormonal influences or in tolerance of biomechanical stressors,²⁵ men and women are considered separately.

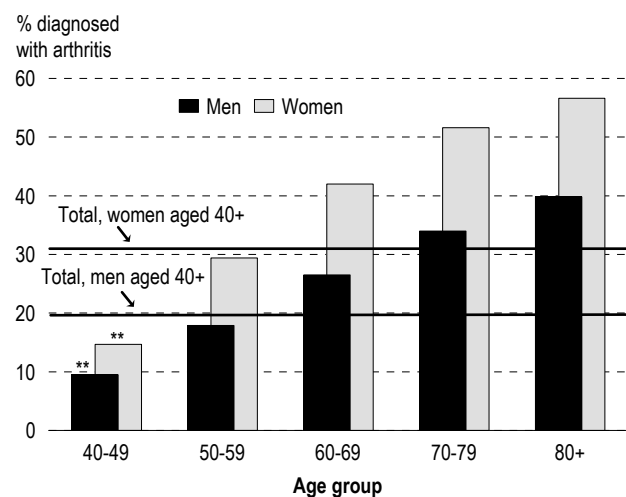
More common among women

In 2000/01, 19% of men and 31% of women aged 40 or older reported that they had been diagnosed with arthritis. The prevalence of the condition increased steadily with age; by age 80 or older, 40% of men and 57% of women were affected (Chart 1). These prevalence rates are consistent with, but slightly lower than, overall age-specific estimates of self-reported arthritis estimates for the United States.²⁶

Similar to the pattern for prevalence, incident arthritis affected more women than men, and was strongly related to age (Chart 2). Incidence density rates were estimated at 31 and 48 new cases of arthritis per 1,000 person-years for men and women, respectively (Table 1).

Authors of a study in the United States have speculated that higher rates of arthritis in women are linked to their higher prevalence of obesity.²⁷

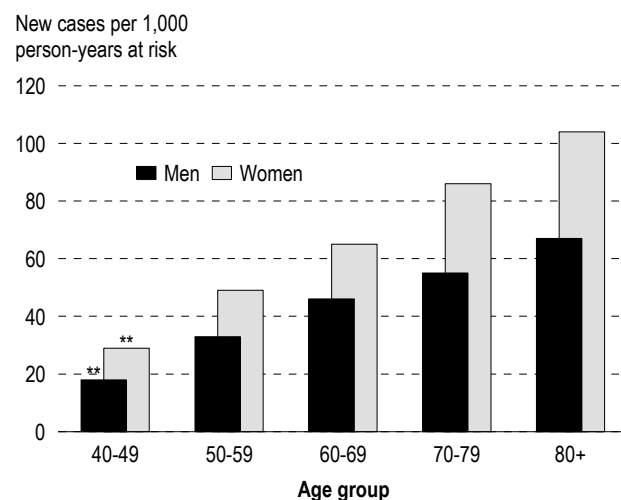
Chart 1
Prevalence of respondent-reported diagnosed arthritis, by sex and age group, household population aged 40 or older, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1
Note: Within each age group, estimates for men and women differ significantly ($p < 0.01$).
 ** Significantly different from other age group estimates within same sex ($p < 0.01$).

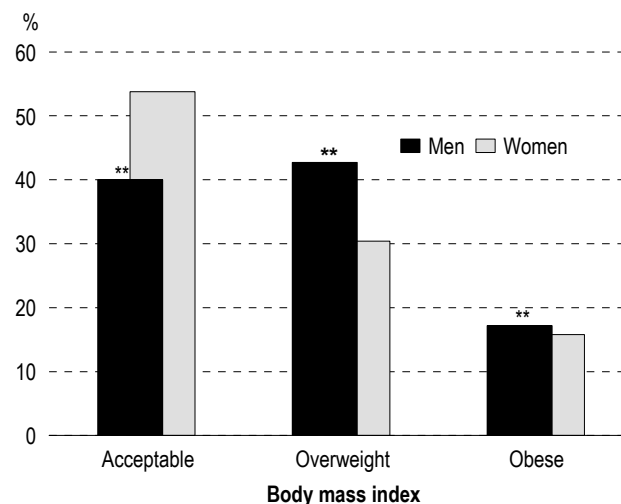
But this explanation does not apply in Canada, where overweight or obesity is more prevalent among men (Chart 3).

Chart 2
Incidence density of respondent-reported diagnosed arthritis, by sex and age group, household population aged 40 or older, Canada excluding territories, 1994/95 to 2000/01



Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file
Note: Within each age group except 80+, estimates for men and women differ significantly ($p < 0.01$).
 ** Significantly different from other age group estimates within same sex ($p < 0.01$).

Chart 3
Percentage distribution of body mass index, by sex, household population aged 40 or older, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1
 ** Significantly different from value for women ($p < 0.01$)

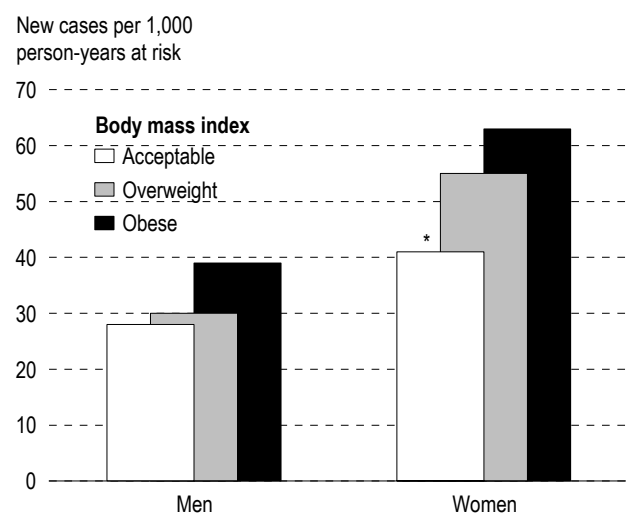
Linked with obesity

Women who were overweight or obese had higher rates of subsequently diagnosed arthritis than did women of acceptable weight (Chart 4). For men, differences in arthritis incidence rates according to BMI showed the same pattern, but were not statistically significant.

However, when the effects of other influences were controlled, associations between excess body weight and incident arthritis emerged for both sexes. For both men and women who were obese, the odds of being diagnosed with arthritis were nearly 60% higher than the corresponding odds for those in the acceptable weight range (Table 2). For women who were overweight, the odds of developing arthritis were 30% higher, compared with women of acceptable weight. The elevation in the odds ratio for men who were overweight was not statistically significant.

The finding that obesity confers a similar risk of subsequent arthritis in men and women is consistent with some previous research.^{27,28} Other studies, however, have reported that obese women are at greater risk of arthritis than are obese men.^{25,29}

Chart 4
Incidence density of respondent-reported diagnosed arthritis, by sex and body mass index, household population aged 40 or older, Canada excluding territories, 1994/95 to 2000/01



Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

* Significantly different from estimates for other BMI categories ($p < 0.05$)

Table 1
Incidence density of respondent-reported diagnosed arthritis, by sex and selected characteristics, household population aged 40 or older, Canada excluding territories, 1994/95 to 2000/01

| | Incidence density rates | |
|---|--|------------------|
| | Men | Women |
| | New cases per 1,000 person-years at risk | |
| Total | 31[†] | 48 |
| Body mass index (BMI) | | |
| Acceptable (< 25.0) [‡] | 28 | 41 |
| Overweight (25.0 to 29.9) | 30 | 55* |
| Obese (≥ 30.0) | 39 | 63* |
| Age group | | |
| 40-49 [‡] | 18 | 29 |
| 50-59 | 33* | 49* |
| 60-69 | 46* | 65* |
| 70-79 | 55* | 86* |
| 80+ | 67*E2 | 104*E1 |
| Household income | | |
| Lowest | 34 | 78* |
| Lower-middle | 44* | 49* |
| Upper-middle | 29 | 45* |
| Highest [‡] | 23 ^{E1} | 31 |
| Smoking status | | |
| Current/Former | 33* | 51 |
| Never smoked [‡] | 23 | 46 |
| Leisure time | | |
| Active | 26 | 46 |
| Moderately active | 29 | 43 |
| Inactive [‡] | 31 | 51 |
| Daily lifting | | |
| No [‡] | 30 | 48 |
| Yes | 29 | 48 |
| Physician visits in past year | | |
| 0 to 6 [‡] | 27 | 43 |
| 7 or more | 63* | 80* |
| Psychological distress | | |
| Low [‡] | 27 | 46 |
| High | 53* | 62* |
| Years of hormone replacement use | | |
| None [‡] | ... | 47 |
| Less than 5 | ... | 52 ^{E1} |
| 5 or more | ... | 65 ^{E1} |

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

[†] Significantly different from estimate for women ($p < 0.05$)

[‡] Reference category

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

* Significantly different from sex-specific estimate for reference category ($p < 0.05$)

... Not applicable

Other factors influential

Independent of the association with obesity, incident arthritis was associated with other characteristics. Increasing age conferred higher odds of arthritis;

Data sources

Canadian Community Health Survey: Estimates of arthritis prevalence are based on self-reports of diagnosed disease from cycle 1.1 of Statistics Canada's Canadian Community Health Survey (CCHS). Data collection for cycle 1.1 began in September 2000 and was conducted over 14 months. The CCHS covers the household population aged 12 or older in all provinces and territories, except persons on Indian reserves, on Canadian Forces bases, and in some remote areas.

The CCHS uses the area frame designed for the Labour Force Survey as its primary sampling frame. A multistage stratified cluster design was used to sample dwellings within the area frame. A list of the dwellings was prepared, and a sample was selected from the list. The majority (83%) of the sampled households came from the area frame, and face-to-face interviews were held with respondents randomly selected from these households. In some health regions, a random digit dialing (RDD) and/or list frame of telephone numbers was also used. Respondents in the telephone frames, who accounted for the remaining 17% of the targeted sample, were interviewed by telephone.

In approximately 82% of the households selected from the area frame, one person was randomly selected; two people were randomly chosen in the remaining households. For households selected from the RDD frame, one person was randomly chosen. The response rate was 84.7%. The responding sample size for cycle 1.1 was 131,535. The sample used for this article consists of 74,602 respondents aged 40 or older in the 10 provinces. More detail about the sample design of the CCHS is available in a previously published report.³⁰

National Population Health Survey: The analysis related to the incidence of arthritis is based on longitudinal data from the National Population Health Survey (NPHS), which is conducted every two years. The NPHS covers household and institutional residents in all provinces and territories, except persons on Indian reserves, on Canadian Forces bases, and in some remote areas. The NPHS has both longitudinal and cross-sectional components.

For household residents in the NPHS, individual data are organized into two files: General and Health. The General file contains socio-

demographic and some health information for each member of participating households. The Health file contains additional, in-depth health information for one randomly selected household member, as well as the information from the General file pertaining to that individual.

Among individuals in the longitudinal component, the person providing in-depth health information about himself/herself for the Health file was the randomly selected person for the household in cycle 1 and was usually the person who provided information on all household members for the General file in subsequent cycles.

In 1994/95, the NPHS collected information from a sample of 20,725 households. 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. Beginning with cycle 4 in 2000/01, the NPHS became strictly longitudinal. More detailed descriptions of the NPHS design, sample and interview procedures can be found in published reports.^{31,32}

The 2000/01 NPHS cycle 4 longitudinal square master file was used for this analysis. This file contains records for all longitudinal respondents in the household component ($n = 17,276$), whether or not they provided information for all four cycles (that is, those individuals selected for the longitudinal sample for whom information is available on the General file of cycle 1). This analysis is based on data for respondents who: were aged 40 or older in cycle 1, 2 or 3; reported in cycle 1 that they had not received a diagnosis of arthritis; and responded in consecutive cycles in a logically consistent pattern to the question on arthritis.

In cycle 1, a total of 5,746 respondents were aged 40 or older and reported that they had not been diagnosed with arthritis. From this file, 435 records with inconsistent responses over the four cycles regarding diagnosed arthritis (no, yes, yes, no, for example) were deleted. An additional 524 records were not usable because of missing data on arthritis; in most cases, because of refusal to participate in the survey or because of the respondent's death before cycle 2.

in both men and women, each additional year of age was associated with a 4% increase in odds (data not shown).

For women, income was also associated with a subsequent diagnosis of arthritis. Women living in households in the lowest income category had odds of developing arthritis over the six-year period that

were 60% higher than the odds for women in the highest income category. No association with income emerged for men. The finding for women is consistent with results of an Australian study of both sexes together that reported an inverse relationship between income and arthritis prevalence.³³

Table 2
Adjusted odds ratios relating selected characteristics to two-year incidence of respondent-reported diagnosed arthritis, by sex, household population aged 40 or older, Canada excluding territories, 1994/95 to 2000/01

| | Men | | Women | |
|---|---------------------|-------------------------|---------------------|-------------------------|
| | Adjusted odds ratio | 95% confidence interval | Adjusted odds ratio | 95% confidence interval |
| Body mass index (BMI) | | | | |
| Acceptable (< 25.0) [†] | 1.0 | ... | 1.0 | ... |
| Overweight (25.0 to 29.9) | 1.3 | 1.0, 1.7 | 1.3* | 1.0, 1.7 |
| Obese (≥ 30.0) | 1.6* | 1.1, 2.3 | 1.6* | 1.2, 2.1 |
| Age in years[‡] | 1.0* | 1.0, 1.0 | 1.0* | 1.0, 1.0 |
| Household income | | | | |
| Lowest | 1.0 | 0.6, 1.6 | 1.6* | 1.1, 2.4 |
| Lower-middle | 1.3 | 0.9, 2.0 | 1.2 | 0.8, 1.6 |
| Upper-middle | 1.1 | 0.7, 1.7 | 1.3 | 0.9, 1.8 |
| Highest [†] | 1.0 | ... | 1.0 | ... |
| Smoking status | | | | |
| Current | 1.2 | 0.8, 1.8 | 1.2 | 0.9, 1.6 |
| Former | 1.3 | 0.9, 1.8 | 1.2 | 0.9, 1.5 |
| Never [†] | 1.0 | ... | 1.0 | ... |
| Daily lifting | | | | |
| No [†] | 1.0 | ... | 1.0 | ... |
| Yes | 1.2 | 0.9, 1.7 | 1.1 | 0.9, 1.5 |
| Physician visits in past year | | | | |
| 0 to 6 [†] | 1.0 | ... | 1.0 | ... |
| 7 or more | 1.8* | 1.2, 2.5 | 1.7* | 1.3, 2.2 |
| Psychological distress | | | | |
| Score (low to high) [‡] | 1.1* | 1.0, 1.1 | 1.0* | 1.0, 1.1 |
| Years of hormone replacement use | | | | |
| None/Less than 5 [†] | ... | ... | 1.0 | ... |
| 5 or more | ... | ... | 1.3 | 0.9, 1.9 |

Data source: 1994/95 to 2000/01 National Population Health Survey, household component, longitudinal Health file

Notes: Models are based on records for 6,479 men and 6,792 women. Because of rounding, some odds ratios having confidence intervals with 1.0 as the upper/lower limit are statistically significant. Variables for missing body mass index, household income, daily lifting and psychological distress were entered into the models; the odds ratios are not shown. The models also contain a variable to control for proxy response for arthritis information; the odds ratios are not shown.

[†] Reference category

[‡] Treated as a continuous variable

* $p < 0.05$

... Not applicable

The relationship between stress and physical disease in general is a growing area of study. It has been postulated that the negative effects of stress may alter the immune response and increase susceptibility to disease.³⁴ However, longitudinal research focusing on the relationship between stress

What is arthritis?

Arthritis is one of the most common chronic conditions of middle and old age. The term "arthritis" refers to several different diseases affecting the musculoskeletal system (see *Definitions and Limitations*).

Osteoarthritis, or degenerative joint disease, is the most common type, affecting an estimated 12% of Americans aged 25 or older.²⁶ By age 70, arthritic joint changes as shown by x-ray are nearly universal, although osteoarthritis can appear as early as the second or third decade of life. At these younger ages, symptoms are not usually present, but from age 40, changes in the weight-bearing joints occur and symptoms—chiefly pain and stiffness—may begin to appear. Osteoarthritis most commonly affects the knee, hip, spine and hand. It is thought to have a combination of causes, including mechanical stress and biochemical, genetic and hormonal factors.

Rheumatoid arthritis is an autoimmune disorder that involves inflammation and tenderness of the joints; progressive disease can result in joint destruction. It has been estimated that rheumatoid arthritis affects about 1% of people in the United States.²⁶

Other arthritic diseases include juvenile rheumatoid arthritis, spondylarthropathies, systemic lupus erythematosus, scleroderma, polymyalgia and gout.^{26,35}

and arthritis is scarce. One previous study reported a cross-sectional association between arthritis and psychiatric disorders including depression, which is perhaps an indicator of psychological distress.³⁶ Results of the analysis of longitudinal data from the NPHS show that respondent-reported incident arthritis was significantly related to psychological distress for both sexes. For men, each 1-point increase in the 24-point scale used to measure psychological distress raised the odds of being diagnosed with arthritis by 8%; for women, by 3% (data not shown). This relationship emerged even though the number of physician consultations within the past year was taken into account. Therefore, the results suggesting that stress may be a precursor to arthritis were not simply attributable to more frequent medical contact and thus more opportunity for diagnosis.

Limitations

A total of 435 records with inconsistent response patterns to the National Population Health Survey (NPHS) question on self-reports of diagnosed arthritis were excluded from the analysis. Reasons for inconsistent responses are unknown, but some may be explained by fluctuations in respondents' symptoms. An additional 524 records could not be used because of missing data. Excluding records from the analysis might result in inaccurate or biased results. For example, records removed because of inconsistent patterns for the question on diagnosed arthritis all contained at least one "yes" response; the degree to which deletion of these records might deflate incidence estimates depends on the proportion reflecting true new diagnoses of arthritis. To examine the possibility of bias as a result of removing records with inconsistent responses or missing data, selected characteristics of respondents were compared (see table). Although the mean age of the group of deleted respondents was older than the corresponding mean for the group that was included, distribution by sex and mean BMI did not differ significantly.

Respondents' characteristics in cycle 1 (1994/95):

| | Included (n = 4,787) | Deleted (n = 959) |
|------------------------|-------------------------|----------------------|
| Age (mean) | 54.0 | 58.1** |
| Female (%) | 48.4 | 49.8 |
| Body mass index (mean) | 25.6 | 25.7 |

**Significantly different from value for included respondents ($p < 0.01$)

To maximize sample size and increase precision, the sample that was used comprised all respondents eligible for the study in cycle 1, and the survey weights used were those for this population. However, because the weights were not adjusted for attrition or other deletions, their use may lead to bias in estimates.³¹

The definition of arthritis used for this analysis is based on a respondent's report of a diagnosis (see *Definitions*); reports were not validated against clinical records, and no radiological information was available. Not all people with the disease have symptoms, however, so not all are diagnosed.³⁷ Under-ascertainment of arthritis would result in prevalence estimates that are lower than their true proportion in the population.

Inflated estimates of incidence would result from a false negative response (erroneous response of no diagnosed disease) in one cycle, followed by a positive response in the subsequent cycle. This would likely have the largest effect on data from NPHS cycles 1 and 2 because of the relatively high proportion of responses that were accepted from proxy respondents in cycle 1; compared with self-response, proxy response has been shown to underestimate disease prevalence.²¹ A variable for proxy report of diagnosed arthritis was used in multivariate analysis to control for any such effects.

"Arthritis" was considered a single entity, although the term applies to a variety of clinically distinct conditions (see *What is arthritis?*). Osteoarthritis is the most prevalent, and its onset is age-related.²⁶ Thus, most respondents who reported arthritis probably had osteoarthritis, especially since age was restricted to 40 or older. Although excess weight is a known risk factor for osteoarthritis,^{6,38} there is little evidence of its relationship to other arthritic disorders. Therefore, the observed values of the odds ratios for overweight and obesity in relation to "arthritis" are likely lower than they would be in association with osteoarthritis alone.

Information about the specific part of the body affected by arthritis was not available for this analysis. The literature indicates that the association between obesity and osteoarthritis is not consistent for all joints: a stronger relationship with the knees, and an unclear relationship with the hips.³⁹ If the analysis could have been restricted to people with diagnosed knee osteoarthritis, the relationships observed with overweight/obesity would likely have been more pronounced.

Because data are not available for some arthritis risk factors, such as family history, congenital and developmental diseases, and previous damage to the joints,^{10,40,41} they could not be included in the analysis.

Although the longitudinal data establish a temporal relationship between the dependent and independent variables, causality cannot be inferred. The findings do not rule out the possibility of an unknown factor that might cause both arthritis and obesity.

The sample used for this analysis was drawn from the household population, and does not include residents of institutions. An earlier report indicated a lower prevalence of arthritis among institutionalized seniors (35%) than among those living in households (40%).⁴²

The follow-up period for this analysis was relatively short. Previous research suggests that cumulative exposure to excess weight over several decades confers a greater risk of subsequent arthritis than exposure over a shorter period.⁴³

Information about the actual date of diagnosis is also not available from the National Population Health Survey, so time-dependent analytical techniques could not be used.

The survey data are self- or proxy-reported and the degree to which they are biased because of reporting error is unknown. For example, body mass index was based on self-reported weight and height. Other research has shown that error in self-reported weight and height is more pronounced among certain groups—the overweight, women, and older people—resulting in greater underestimates of the prevalence of overweight and obesity in these groups.^{44,45} The resulting bias would weaken the observed association between overweight/obesity and arthritis.

Although the findings of the analysis of NPHS data suggest a positive association between hormone replacement therapy and incident arthritis in women, the estimate failed to attain statistical significance. This may have been because of small numbers, as has been the case in other research.⁴⁶ As well, the variety of formulations used for hormone replacement therapy may have diluted any relationship with arthritis. The relationship between hormone replacement use and arthritis remains unclear, and the results of previous studies have been inconsistent.⁴⁷⁻⁴⁹

Concluding remarks

The results of this prospective study, based on a sample representative of the adult household population, show a strong relationship between excess weight and subsequent arthritis. For both men and women, the odds of developing arthritis were 60% higher among people who were considered obese, compared with those of acceptable weight—independent of other influences including age, household income, daily lifting, physician visits, and psychological distress. Being overweight was also associated with developing arthritis, but for women only.

The longitudinal data used to measure incidence in relation to excess weight support the hypothesis that obesity and overweight lead to arthritis (rather than the reverse), possibly by increasing stress on

the joints. Clearly, though, additional factors influence the likelihood of developing the disease: prevalence and incidence rates of arthritis are consistently higher for women than for men, even though greater proportions of men are overweight or obese.

Despite widespread attitudes that tend to stigmatize excess weight, as well as public initiatives promoting healthy weight, the majority of middle-aged and older Canadians are overweight. In addition to the more well-known dangers to health (for instance, diabetes and heart disease), excess weight is an important modifiable risk factor for arthritis, a major cause of disability. In 2000/01, 1 in 4 Canadians aged 40 or older reported that they had been diagnosed with arthritis; an estimated 3% of men and nearly 5% of women these ages develop arthritis each year. By age 70, one-third of men and half of women have arthritis. Measures taken to lower the prevalence of excess weight may, in turn, lower the risk of arthritis, not to mention numerous other chronic conditions linked with excess weight. ●

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Premature mortality in health regions with high Aboriginal populations

Yvon E. Allard, Russell Wilkins and Jean-Marie Berthelot

Abstract

Objectives

Potential years of life lost (PYLL) before age 75 in health regions with a relatively high proportion of Aboriginal residents is compared, by cause of death, with all other health regions.

Data sources

The findings are based on mortality data for 1995 through 1997 from the Canadian Vital Statistics Database, and on population estimates for 1995, 1996 and 1997 at the health region level.

Analytical techniques

PYLL was calculated by age and sex for two groups of health regions: the 18 with a high proportion (19% or more) of Aboriginal residents and the remaining 120, which had smaller proportions of Aboriginal residents. PYLL rate differences and rate ratios were used to compare the two groups.

Main results

The PYLL rate per 1,000 person-years at risk for all causes of death was about 50% greater in the high-Aboriginal health regions than in the other group. Almost 40% of total PYLL in high-Aboriginal health regions was attributable to injuries, notably, suicide and motor vehicles accidents.

Key words

death rate, accidents, regional health planning, rural health, databases

Authors

Yvon E. Allard is a private Aboriginal health consultant; Russell Wilkins (613-951-5305; Russell.Wilkins@statcan.ca) and Jean-Marie Berthelot (613-951-3760; jean-marie.berthelot@statcan.ca) are with the Health Analysis and Measurement Group at Statistics Canada.

Aboriginal populations worldwide have undergone major social, economic and cultural changes in the past several decades, some of which may have negatively affected their health status.^{1,2} In Canada, as in other countries, Aboriginal peoples bear a disproportionate burden of disease and die younger and at higher rates than do members of the non-Aboriginal population.²⁻⁸

The three leading causes of death in Canada are diseases of the circulatory system, cancer and respiratory diseases; injuries rank fourth.^{2,6,9,10} By contrast, for Aboriginal peoples, injuries are the leading cause of death, followed by diseases of the circulatory system and cancer.^{2,4-6,9} In 1996 and 1997, compared with the total Canadian population, Aboriginal people were over six times as likely to die of injuries.^{5,6,9,10}

In Canada, provincial authorities have established administrative areas known as health regions for the delivery of local health and social services. A 1999 study found that in 9 of the 12 health regions with the shortest life expectancy, at least 20% of residents were of Aboriginal origin.¹¹

In such regions, therefore, the racial and ethnic composition of the population, and how that may influence the region's health status, are among the factors that policy makers may wish to consider.

Methods

Data sources

Mortality data for 1995 through 1997 are from the Canadian Vital Statistics Database, which is based on information collected on death registrations by the provincial and territorial registries of vital statistics.

Population estimates for 1995, 1996 and 1997 at the health region level¹² were adjusted for net census undercount and incomplete enumeration of some Indian reserves (see *Limitations*).

Analytical techniques

This analysis presents potential years of life lost (PYLL) before age 75 for two groups of health regions: 18 designated "high-Aboriginal" because 19% or more of residents self-identified as Aboriginal in the 1996 Census, and the other 120 designated "low-Aboriginal," with fewer than 19% of residents claiming Aboriginal identity (see *Definitions*). The 19% cut-off represents a natural gap between health regions in their percentage of Aboriginal residents. Among the 18 regions selected for this analysis, the lowest Aboriginal component was 19.3% (Appendix Table A). Overall, in the 18 high-Aboriginal regions, 35% of residents claimed Aboriginal origins; the overall figure in the other regions was 2%.

With a modified version of the methods described by Romeder and McWhinnie,¹³ PYLL before age 75 was calculated, by sex and for both sexes together, by multiplying the number of deaths in each age group by the difference between 75 and the age at the mid-point of each age group, then summing that product over all age groups.^{14,15} Age 75 was chosen because it is the conventional limit for premature death in Canada, and because deaths before 75 are less likely than those at older ages to have more than one contributing cause. It was also close to the average life expectancy for the 18 high-Aboriginal health regions.

For each sex and cause of death, the variance of PYLL was calculated as the sum over the 16 age groups of the quantity ($C^2 \times N \times P \times Q$), where C is the number of potential years of life lost per death in the age group, N is the number of person-years at risk in the age group, P is the age-specific death rate (deaths in the age group / N), and Q is 1-P. The results were used in tests for the significance of the PYLL rate differences and PYLL rate ratios, comparing high- and low-Aboriginal health regions.

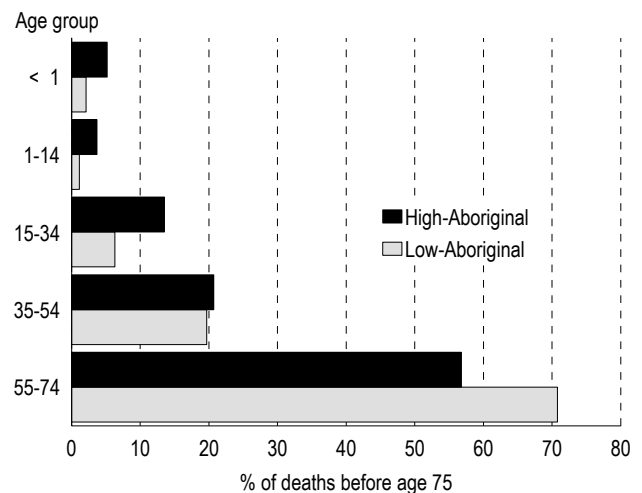
Quantifying health status has long been a concern of epidemiologists and public health authorities. While cause-deleted life expectancy and cause-specific mortality rates are useful in assessing the relative impact of clinical diseases, these measures tend to be dominated by deaths at older ages. To a considerable extent, Aboriginal peoples' life expectancy is shorter because of high mortality rates for many causes that tend to occur early in life.^{1,2,4-8} This phenomenon is best revealed by another measure—potential years of life lost or PYLL—which gives more weight to deaths that occur at younger ages.

This article compares health regions with a relatively high proportion (19% or more) of Aboriginal residents with other health regions in terms of potential years of life lost. It focuses on causes of death that place residents of high-Aboriginal regions at greater risk of premature mortality (see *Methods*, *Definitions* and *Limitations*).

Young age distribution of deaths

Residents of high-Aboriginal health regions tend to die at a comparatively young age. Over the 1995-to-1997 period, 54% of all deaths in such regions occurred before age 75, compared with 45% of deaths in the other health regions. Moreover, in the

Chart 1
Age distribution of deaths before age 75, high- and low-Aboriginal health regions, Canada, 1995 to 1997



Data sources: 1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997

high-Aboriginal regions, young people accounted for a much larger share of deaths before age 75 than was the case in the other group of regions (Chart 1). For instance, infants younger than age 1 made up 5% of such deaths in the high-Aboriginal regions, and 2% in the other group. Children aged 1 to 14 accounted for 4% and 1% of deaths, respectively. For 15- to 34-year-olds, the corresponding figures were 14% and 6%.

Potential years of life lost

Potential years of life lost, which highlights the loss resulting from early death, is suited to evaluating the impact of various causes of death on populations characterized by premature mortality. The PYLL rate is the number of potential years of

life lost divided by the person-years at risk (see *Methods*).

For the 1995-to-1997 period, the PYLL rate in the high-Aboriginal health regions was 84 potential years of life lost per 1,000 person-years at risk, compared with 56 in the low-Aboriginal regions (Table 1). In both groups of regions, PYLL rates for males were well above those of females, but the high-/low-Aboriginal disparity persisted. For males, the respective PYLL rates were 104 versus 72; for females, 62 versus 41.

Leading causes

In the high-Aboriginal health regions, injuries accounted for the greatest loss of potential years of life, followed by cancer, diseases of the circulatory

Table 1

Rates of potential years of life lost (PYLL) before age 75 per 1,000 person-years at risk, by cause of death and sex, high- and low-Aboriginal health regions, Canada, 1995 to 1997

| Cause of death | Both sexes | | | | Males | | | | Females | | | |
|-------------------------|-------------------------|------------------------|-----------------|--------------|-------------------------|------------------------|-----------------|--------------|-------------------------|------------------------|-----------------|--------------|
| | PYLL rate | | Rate difference | Rate ratio | PYLL rate | | Rate difference | Rate ratio | PYLL rate | | Rate difference | Rate ratio |
| | High-Aboriginal regions | Low-Aboriginal regions | | | High-Aboriginal regions | Low-Aboriginal regions | | | High-Aboriginal regions | Low-Aboriginal regions | | |
| All causes | 83.8 | 56.3 | 27.4* | 1.49* | 104.4 | 71.5 | 32.9* | 1.46* | 61.6 | 41.0 | 20.6* | 1.50* |
| Injuries | 32.3 | 12.4 | 20.0* | 2.61* | 46.7 | 18.7 | 27.7* | 2.49* | 17.0 | 6.0 | 11.0* | 2.84* |
| Suicide | 9.1 | 4.4 | 4.7* | 2.06* | 14.3 | 7.0 | 7.3* | 2.04* | 3.5 | 1.8 | 1.7* | 1.95* |
| Motor vehicle accidents | 9.0 | 3.8 | 5.2* | 2.35* | 12.2 | 5.4 | 6.7* | 2.24* | 5.6 | 2.2 | 3.4* | 2.54* |
| Drowning | 2.3 | 0.4 | 1.9* | 5.69* | 3.3 | 0.7 | 2.7* | 5.07* | 1.3 | 0.2 | 1.1* | 7.84* |
| Homicide | 2.0 | 0.6 | 1.4* | 3.14* | 2.4 | 0.9 | 1.5* | 2.75* | 1.6 | 0.4 | 1.2* | 3.92* |
| Fire | 1.5 | 0.3 | 1.2* | 5.72* | 2.0 | 0.4 | 1.6* | 5.60* | 2.0 | 0.2 | 1.8* | 5.78* |
| Other | 8.5 | 2.9 | 5.6* | 2.96* | 12.5 | 4.4 | 8.1* | 2.83* | 4.1 | 1.3 | 2.9* | 3.23* |
| Cancer | 13.7 | 16.4 | -2.7* | 0.84* | 14.3 | 17.0 | -2.7* | 0.84* | 13.0 | 15.8 | -2.7* | 0.83* |
| Lung | 3.5 | 4.1 | -0.6* | 0.86* | 4.1 | 4.9 | -0.8* | 0.83* | 3.0 | 3.3 | -0.4 | 0.89 |
| Other | 10.2 | 12.3 | -2.1* | 0.83* | 10.3 | 12.1 | -1.9* | 0.85* | 10.1 | 12.5 | -2.4* | 0.81* |
| Circulatory | 10.7 | 10.2 | 0.5 | 1.05 | 14.4 | 14.2 | 0.3 | 1.02 | 6.7 | 6.2 | 0.5 | 1.08 |
| Ischemic heart disease | 5.6 | 6.1 | -0.5* | 0.92* | 8.6 | 9.3 | -0.7 | 0.93 | 2.4 | 2.9 | -0.5* | 0.82* |
| Stroke | 1.8 | 1.5 | 0.3* | 1.19* | 1.9 | 1.7 | 0.2 | 1.11 | 1.8 | 1.4 | 0.4 | 1.29 |
| Other circulatory | 3.3 | 2.6 | 0.7* | 1.28* | 4.0 | 3.2 | 0.8* | 1.24* | 2.6 | 1.9 | 0.6* | 1.32* |
| Congenital/Perinatal | 8.1 | 4.6 | 3.5* | 1.77* | 9.0 | 5.1 | 3.9* | 1.76* | 7.2 | 4.1 | 3.1* | 1.76* |
| Congenital | 3.8 | 2.1 | 1.7* | 1.78* | 3.6 | 2.2 | 1.2* | 1.53* | 4.0 | 1.9 | 2.1* | 2.10* |
| Perinatal | 4.4 | 2.5 | 1.9* | 1.75* | 5.5 | 2.8 | 2.7* | 1.95* | 3.2 | 2.2 | 1.0* | 1.46* |
| Respiratory | 3.1 | 1.9 | 1.2* | 1.60* | 3.2 | 2.3 | 0.9* | 1.41* | 3.0 | 1.6 | 1.4* | 1.87* |
| Digestive | 2.2 | 1.8 | 0.5* | 1.26* | 2.0 | 2.3 | -0.2 | 0.89 | 2.4 | 1.2 | 1.2* | 1.95* |
| Nervous system | 2.1 | 1.4 | 0.7* | 1.47* | 2.2 | 1.6 | 0.6* | 1.40* | 2.0 | 1.3 | 0.7* | 1.56* |
| Metabolic | 1.7 | 1.5 | 0.2 | 1.14 | 1.6 | 1.8 | -0.2 | 0.92 | 1.7 | 1.2 | 0.6* | 1.49* |
| Infectious | 1.4 | 2.1 | -0.7* | 0.66* | 1.6 | 3.5 | -1.8* | 0.47* | 1.1 | 0.8 | 0.4 | 1.47 |
| Mental disorders | 1.2 | 0.6 | 0.6* | 2.13* | 1.3 | 0.8 | 0.6* | 1.71* | 1.0 | 0.3 | 0.7* | 3.06* |
| All other causes | 7.3 | 3.7 | 3.2* | 2.06* | 8.0 | 4.4 | 3.6* | 1.81* | 6.4 | 2.6 | 3.8* | 2.48* |

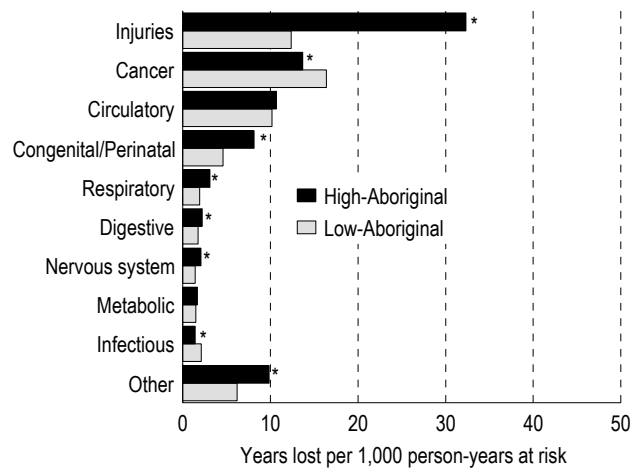
Data sources: 1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997

Note: Figures shown are rounded, but calculations were based on unrounded data. For ICD codes, see Definitions.

* $p < 0.05$

Chart 2

Rates of potential years of life lost (PYLL) before age 75, by major causes of death,[†] high- and low- Aboriginal health regions, Canada, 1995 to 1997



Data sources: 1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997

[†] ICD chapters

* Significantly different from low-Aboriginal ($p < 0.05$)

system, and congenital and perinatal causes (Chart 2). In the low-Aboriginal regions, the four leading causes of PYLL were the same, but cancer ranked first and injuries second. The PYLL rate for injuries in the high-Aboriginal regions was 2.6 times that in the other group, and the rate for perinatal and congenital causes was 1.8 times higher. The PYLL rates for diseases of the circulatory system were about the same in the two groups of regions, and the rate for cancer was actually lower in the high-Aboriginal regions.

In the high-Aboriginal regions, males had considerably higher PYLL rates than did females for injuries except for those caused by fires. As well, PYLL rates among males in these regions surpassed rates among females for ischemic heart disease, other circulatory diseases (except stroke), perinatal conditions (but not congenital anomalies), and infectious diseases.

Injuries play major role

The toll in potential years of life lost due to injuries in high-Aboriginal health regions was considerable: 32 per 1,000 person-years at risk, compared with 12 in the low-Aboriginal regions. Injuries accounted for 39% of PYLL in high-Aboriginal region versus

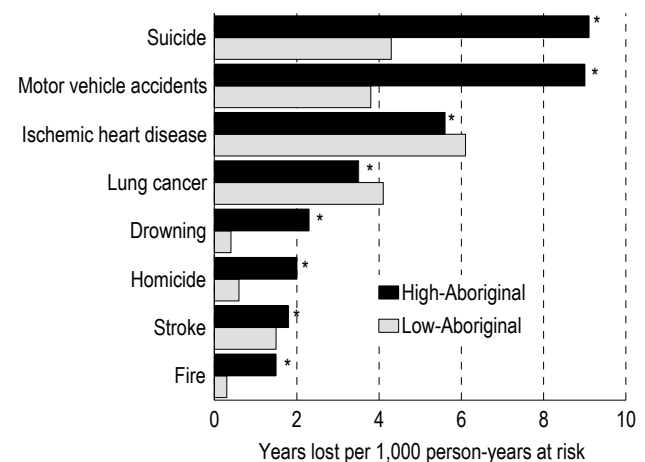
22% in low-Aboriginal regions. In fact, nearly three-quarters (73%) of the PYLL rate difference between the two groups of regions was attributable to injuries.

Among deaths due to injuries, suicide and those involving motor vehicles were the most common causes of PYLL in the high-Aboriginal regions (Chart 3). The PYLL rates for suicide and motor vehicle accidents were each about 9 per 1,000 person-years at risk, more than twice the rates in the low-Aboriginal regions. According to a number of observers, some deaths classified as motor vehicle accidents may be intentional; that is, suicides.^{5,16} Injury deaths may also be related to substance abuse, especially among young people.¹⁷ Recent studies have found that, in the general population, short bouts of drinking to intoxication tend to be associated with violent assaults, road injuries and drownings.^{17,18}

PYLL rates for drowning, fire, homicide, and other injuries in high-Aboriginal health regions far exceeded those in the other group of regions: rates for drowning and fire were more than five times higher; for homicide and other injuries, three times higher.

Chart 3

Rates of potential years of life lost (PYLL) before age 75, by specific causes of death, high- and low- Aboriginal health regions, Canada, 1995 to 1997



Data sources: 1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997

* Significantly different from low-Aboriginal ($p < 0.05$)

Cancer and circulatory system diseases

After injuries, cancer and diseases of the circulatory system, which typically occur at older ages, were the leading causes of PYLL in the high-Aboriginal health regions. However, these rates were not elevated compared with the other health regions,

Definitions

Aboriginal refers to people who identified themselves as belonging to an Aboriginal group—First Nations, Inuit or Métis—on the 1996 Census (see *Limitations*). This definition includes registered First Nations individuals and those having Aboriginal identity or band membership. No distinction was made between on- and off-reserve Aboriginal people in this analysis.

Health regions are defined by provincial governments as the administrative areas of responsibility for regional health boards or areas of interest to health care authorities.

The proportion of Aboriginal residents in a health region is the number claiming Aboriginal identity divided by the region's total population. Health regions in which 19% or more of the population was Aboriginal were categorized as "*high-Aboriginal*"; those with less than 19%, "*low-Aboriginal*."

Potential years of life lost (PYLL) is a measure of premature mortality that gives greater weight to deaths at younger ages, compared with other summary indices of mortality, which are dominated by deaths of the elderly. Premature deaths are defined here as those occurring before age 75.

The following *causes of death*, coded according to the *International Classification of Diseases, Ninth Revision (ICD-9)*,¹⁹ were used for this analysis:

- Injuries (E800-E999), including suicide (E950-E959); motor vehicle accidents (traffic and non-traffic) (E810-E825); drowning (E910); homicide (E960-E978); accidents caused by fire (E890-D899); and other injuries (E816-889; E900-E909; E911-E949; E979-E999)
- Neoplasms (cancer), including lung cancer (162) and other cancers (140-161; 163-239)
- Circulatory (390-459): ischemic heart disease (410-414); cerebrovascular disease (stroke) (430-438); other circulatory (390-405; 415-429; 440-459)
- Congenital (740-759) and perinatal (excluding stillbirths) (760-779)
- Respiratory (460-519)
- Digestive (520-579)
- Nervous system (320-389)
- Metabolic (240-279)
- Infectious (001-139)
- Mental disorders (290-319)

The final category, "all other causes," groups all causes of death not listed above.

and in the case of cancer, the high-Aboriginal region PYLL rate was actually lower. Even the rate for lung cancer was lower in the high-Aboriginal regions, despite a much greater prevalence of smoking among Aboriginal peoples.^{5,6,9}

Among diseases of the circulatory system, deaths due to ischemic heart disease predominated, especially for males. Although the PYLL rates in the high- and low-Aboriginal regions did not differ substantially, recent studies have found that Aboriginal peoples have a higher prevalence of cardiovascular diseases compared with the general population, and that rates of cardiovascular disease are increasing among Aboriginals.^{2,20,21}

Congenital/Perinatal

Congenital and perinatal conditions were a major cause of PYLL in the high-Aboriginal health regions. The rate for congenital/perinatal causes, excluding stillbirths, in the high-Aboriginal regions was 8 potential years of life lost per 1,000 person-years at risk, compared with 5 in the low-Aboriginal regions. To some extent, this may reflect the age of the mother: births to teenage mothers have high rates of infant mortality,²² and teen pregnancies are common among Aboriginal peoples.^{5,9} Pneumonia and influenza, sudden infant death syndrome (SIDS) and fetal alcohol syndrome, which are causes of premature death in infants generally, are of particular concern in the Aboriginal community, because of their high prevalence and because they are preventable with proper health care intervention.^{2,5,6,9}

Male–female differences

In both high- and low-Aboriginal health regions, PYLL rates for males exceeded rates for females. This indicates a higher risk of early death for males than for females, regardless of where they live. In the high-Aboriginal regions, the PYLL rate for males was 104 years per 1,000 person-years at risk, compared with 62 for females, or 1.7 times greater. In the low-Aboriginal health regions, although rates were lower, the male/female rate ratio was similar (1.7).

In the high-Aboriginal health regions, males had particularly elevated PYLL rates for suicides and for

Table 2

Rates of potential years of life lost (PYLL) before age 75 per 1,000 person-years at risk, all causes of death, by sex and age group, high- and low- Aboriginal health regions, Canada, 1995 to 1997

| | PYLL rate | | Rate difference | Rate ratio |
|-------------------|-------------------------|------------------------|-----------------|--------------|
| | High-Aboriginal regions | Low-Aboriginal regions | | |
| Both sexes | 84 | 56 | 28* | 1.49* |
| <1 | 730 | 410 | 320* | 1.78* |
| 1- 4 | 54 | 19 | 34* | 2.77* |
| 5- 9 | 22 | 10 | 12* | 2.24* |
| 10-14 | 27 | 11 | 16* | 2.38* |
| 15-19 | 71 | 31 | 41* | 2.32* |
| 20-24 | 85 | 34 | 51* | 2.50* |
| 25-29 | 75 | 32 | 43* | 2.35* |
| 30-34 | 62 | 37 | 25* | 1.67* |
| 35-39 | 64 | 43 | 21* | 1.48* |
| 40-44 | 64 | 54 | 9* | 1.17* |
| 45-49 | 84 | 68 | 16* | 1.23* |
| 50-54 | 115 | 89 | 26* | 1.29* |
| 55-59 | 142 | 115 | 27* | 1.24* |
| 60-64 | 159 | 133 | 25* | 1.19* |
| 65-69 | 161 | 130 | 31* | 1.24* |
| 70-74 | 71 | 69 | 3 | 1.04 |
| Males | 104 | 72 | 33* | 1.46* |
| <1 | 785 | 449 | 336* | 1.75* |
| 1- 4 | 55 | 21 | 34* | 2.63* |
| 5- 9 | 25 | 11 | 14* | 2.34* |
| 10-14 | 35 | 13 | 22* | 2.69* |
| 15-19 | 97 | 42 | 55* | 2.29* |
| 20-24 | 131 | 51 | 81* | 2.59* |
| 25-29 | 107 | 46 | 61* | 2.32* |
| 30-34 | 86 | 52 | 34* | 1.64* |
| 35-39 | 79 | 59 | 21* | 1.35* |
| 40-44 | 79 | 69 | 10 | 1.14 |
| 45-49 | 99 | 83 | 16* | 1.19* |
| 50-54 | 137 | 112 | 25* | 1.23* |
| 55-59 | 168 | 143 | 25* | 1.17* |
| 60-64 | 197 | 172 | 25* | 1.15* |
| 65-69 | 201 | 171 | 30* | 1.18* |
| 70-74 | 87 | 92 | -5 | 0.94 |
| Females | 62 | 41 | 21* | 1.50* |
| <1 | 672 | 370 | 303* | 1.82* |
| 1- 4 | 52 | 18 | 34* | 2.95* |
| 5- 9 | 20 | 9 | 10* | 2.13* |
| 10-14 | 19 | 10 | 9* | 1.95* |
| 15-19 | 44 | 18 | 25* | 2.38* |
| 20-24 | 35 | 16 | 19* | 2.12* |
| 25-29 | 43 | 18 | 25* | 2.41* |
| 30-34 | 36 | 21 | 15* | 1.70* |
| 35-39 | 48 | 28 | 20* | 1.71* |
| 40-44 | 47 | 39 | 8 | 1.19 |
| 45-49 | 66 | 53 | 14* | 1.26* |
| 50-54 | 90 | 67 | 23* | 1.34* |
| 55-59 | 113 | 87 | 26* | 1.30* |
| 60-64 | 116 | 97 | 20* | 1.20* |
| 65-69 | 119 | 93 | 25* | 1.27* |
| 70-74 | 56 | 50 | 6* | 1.12* |

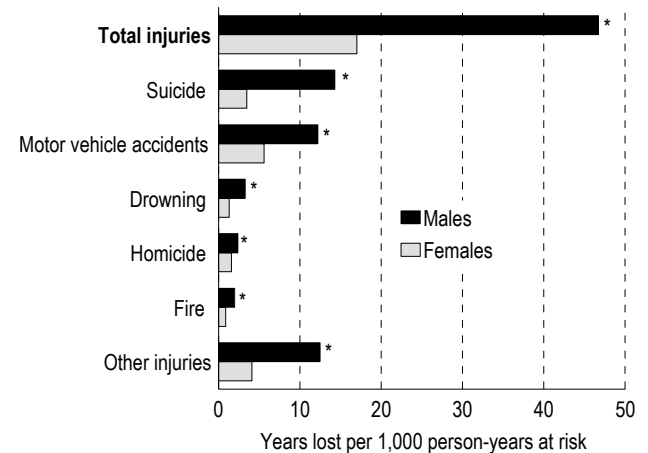
Data sources: 1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997

Note: Figures shown are rounded, but calculations were based on unrounded data.

* $p < 0.05$

Chart 4

Rates of potential years of life lost (PYLL) before age 75 from injuries in high-Aboriginal health regions, by sex, Canada, 1995 to 1997



Data sources: 1995-1997 Canadian Vital Statistics Database; population estimates for 1995, 1996, 1997

* Significantly higher than females ($p < 0.05$)

deaths resulting from motor vehicle accidents (Chart 4). For suicide, the PYLL rate among males was 14 per 1,000 person-years at risk, compared with 4 for females; rates for motor vehicle accidents were 12 and 6, respectively.

However, PYLL rates among females in the high-Aboriginal group of health regions often matched or exceeded those of males in the low-Aboriginal group. This was true for deaths attributed to motor vehicle accidents, drowning, homicide, fire, stroke, congenital/perinatal diseases, diseases of the respiratory system, diseases of the digestive system, diseases of the nervous system, and mental disorders.

Importance of age structure

In contrast to typical mortality statistics, which are dominated by deaths of the elderly, potential years of life lost emphasizes deaths of younger people. In any population, deaths of children, teenagers and young adults will mean more potential years of life lost than deaths of older people. And in the high-Aboriginal regions, young people make up a larger share of the population than is the case in the other group of health regions. Consequently, to some degree, the elevated PYLL rates in the high-

Limitations

Although the population estimates for 1995, 1996 and 1997 were adjusted for net census undercount, 1996 Census undercoverage was greater among Aboriginal peoples than among other segments of the population. Enumeration was not permitted, or was interrupted before it could be completed, on 77 Indian reserves and settlements, representing an estimated 44,000 individuals.²³ As well, counts of Aboriginal peoples have varied from one census to the next, thus affecting estimates of the Aboriginal population.^{5,23} There may also be deficiencies in the quality of data on Aboriginal births, deaths and migration, all of which are needed for accurate population estimates.

The registration of cause of death is subject to misclassification; therefore, data quality problems may affect PYLL values for certain causes. But such misclassification should not be more common in one group of health regions than in another.

Analyses based on a single underlying cause of death may underestimate the importance of other causes that contributed to the death. For example, Type II diabetes, which is prevalent among Aboriginal peoples,^{5,6} is a frequent contributor to subsequent death due to circulatory diseases or renal failure. The potential impacts of such “competing” causes should be considered when interpreting the results of this analysis.

While it is possible that deaths in outlying areas may be somewhat underreported, the extent of such underreporting is thought to be small.

The high-/low-Aboriginal dichotomy used to characterize health regions does not permit discussion of PYLL specifically among Aboriginal populations. Overall, in the high-Aboriginal group, only 35% of the population was Aboriginal, so potential years of life lost in these regions is not synonymous with PYLL among Aboriginal peoples. Unlike countries such as Australia and the United States, Canada does not include Aboriginal identity on death registrations,^{7,24,25} although in British Columbia²⁶ and Manitoba,²⁷ vital statistics data are linked to status verification files of Indian and Northern Affairs Canada. However, there is no way of determining Aboriginal identity for Canada as a whole from Statistics Canada’s Vital Statistics Database.

PYLL is a descriptive indicator of population health that places more “weight” on deaths of young people. It may be argued that the loss of an elder (which contributes less to PYLL) is of equal importance, in that it represents shrinkage of a community’s cultural repository. However, the value of PYLL is that it highlights the causes of premature, and therefore often preventable, deaths, whereas deaths among the elderly are a normal part of the life course.

Aboriginal regions reflect the young age structure of their populations.

Yet even when calculated for each age group, PYLL rates were much higher in the high-Aboriginal regions than in the others (Table 2). The PYLL rate for infants younger than age 1 in the high-Aboriginal regions was 730 years per 1,000 person-years at risk, compared with 410 in the low-Aboriginal regions. PYLL rates for children aged 1 to 14 and young adults aged 15 to 29 in the high-Aboriginal regions were well over twice those in the other group of regions. Although the disparity in PYLL rates between high- and low-Aboriginal regions diminished somewhat with advancing age, it persisted for almost all age/sex groups.

Concluding remarks

In this analysis, potential years of life lost was used to quantify premature mortality—by age, sex and cause of death—in two sets of health regions. The

results underscore the preventable nature of much loss of life in regions with a high proportion of Aboriginal residents.

Overall, the PYLL rate was about 50% higher in the high-Aboriginal regions, compared with the low-Aboriginal regions. And particularly for injuries (notably, suicides and motor vehicles accidents), high-Aboriginal health regions had elevated PYLL rates, especially among males.

The second- and third-ranking PYLL rates in the high-Aboriginal regions were for cancer and diseases of the circulatory system. This reflects a decrease among Aboriginal peoples in the proportion of deaths from most infectious diseases (such as tuberculosis) and an increase in the proportion from chronic diseases over the last 50 years.^{2,5,6,8}

However, the Aboriginal component of the population is not the only factor that might have had a bearing on PYLL. Links between premature mortality, population health and health determinants

such as socio-economic status cannot be discounted. The majority of the 18 health regions in the high-Aboriginal group were identified in three recent reports as having Canada's lowest life expectancies and/or lowest disability-free life expectancies.^{11,28,29} Not only do these regions have substantial proportions of Aboriginal residents, but they are also sparsely populated, far from major metropolitan areas, and are characterized by high unemployment, low educational attainment, low household income, and above-average reliance on government transfer payments. Thus, the elevated PYLL rates in high-Aboriginal health regions may not be due solely to higher mortality among the Aboriginal component of the population. The other factors at work in these regions—remoteness, rurality and low socio-economic status—could contribute to premature mortality and would be expected to affect both Aboriginal and non-Aboriginal residents alike.

However, a 2001 Australian study,³⁰ which accounted for remoteness and socio-economic deprivation in that country's statistical divisions, showed that while both were correlated with mortality rates, the strongest correlation was with the proportion of residents who self-identified as Indigenous. Therefore, although geographic and socio-economic factors (unmeasured in this analysis) probably contributed to the disparity in PYLL rates between the two groups of health regions, some part of it was almost certainly due to the difference in Aboriginal composition. Further study is needed

to determine if a shorter life with more years lived in poor health is a defining attribute of Aboriginal peoples, or whether this applies to everyone, regardless of ethnicity, who lives in a health region with a high proportion of Aboriginal residents. Record linkage³¹ is one of the methods that is technically feasible and could provide valuable information on the relationship between health status, mortality and being Aboriginal.^{2,30} However, databases that include Aboriginal identity are currently not linked to the Canadian Vital Statistics Database.

In Canada, health regions are increasingly assuming responsibility for health and social services.³² An analysis of the causes of potential years of life lost at the health region level has implications for the delivery of those services. This examination of premature death demonstrates the toll taken by injuries in high-Aboriginal health regions, and reinforces an observation made in a 2003 Health Canada report that “even a partial reduction in injury death rates would have a profound effect on premature death rates and the health of the population in general.”²² This is especially the case in northern, remote and isolated communities that have high Aboriginal populations where the the societal burden^{1,2} imposed by premature—and mostly preventable—death seems to suggest that effective public health or other strategies might reduce the harm associated with injury. ●

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Appendix

Table A

Population and life expectancy, health regions with a high proportion ($\geq 19\%$) of Aboriginal[†] residents, Canada, 1995 to 1997

| Number | Health region | | 1996 population | | Life expectancy (years) |
|--------------|--|-----------------------|-------------------|------------------------------------|-------------------------|
| | Name | Province/Territory | Number | Proportion Aboriginal [†] | |
| | | | | % | |
| 1006 | Health Labrador Corporation [‡] | Newfoundland | 25,693 | 28.7 | 74.9 |
| 2417 | Nunavik [‡] | Québec | 8,905 | 87.6 | 65.4 |
| 2418 | Terres-Cries-de-la-Baie-James [‡] | Québec | 11,597 | 92.1 | 73.9 |
| 3549 | Northwestern [‡] | Ontario | 84,450 | 22.2 | 74.3 |
| 4620 | North Eastman [‡] | Manitoba | 38,182 | 19.7 | 77.6 |
| 4660 | Parkland [‡] | Manitoba | 43,558 | 21.1 | 77.4 |
| 4670 | Norman [‡] | Manitoba | 23,621 | 36.9 | 74.6 |
| 4680 | Burntwood ^{‡§} | Manitoba | 45,167 | 65.0 | 72.9 |
| 4690 | Churchill ^{‡§} | Manitoba | 1,111 | 45.0 | 72.9 |
| 4709 | Prince Albert (Region I) | Saskatchewan | 75,632 | 24.9 | 78.4 |
| 4710 | North Battleford (Region J) [‡] | Saskatchewan | 67,728 | 23.4 | 77.3 |
| 4711 | Northern Health Services [‡] | Saskatchewan | 32,172 | 78.1 | 73.3 |
| 4815 | Keeweenok Lakes [‡] | Alberta | 23,563 | 45.5 | 74.8 |
| 4817 | Northwestern | Alberta | 17,639 | 35.1 | 80.0 |
| 5913 | North West [‡] | British Columbia | 90,212 | 21.5 | 77.9 |
| 6001 | Yukon [‡] | Yukon | 31,938 | 19.3 | 75.7 |
| 6101 | Northwest Territories [‡] | Northwest Territories | 41,829 | 45.4 | 76.8 |
| 6201 | Nunavut [‡] | Nunavut | 25,947 | 80.4 | 69.8 |
| | Total health regions with $\geq 19\%$ Aboriginal residents | | 688,944 | 35.1 | 75.9 |
| | Other health regions | | 28,982,948 | 2.1 | 78.4 |
| Total | Canada | | 29,671,892 | 2.9 | 78.3 |

Data sources: References 10 and 12

[†] Self-identified on 1996 Census

[‡] Among health regions where life expectancy and disability-free life expectancy are lowest (Reference 25)

[§] Life expectancies for Burntwood and Churchill are combined.



Data Releases

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Canadian Community Health Survey: Mental health and well-being, 2002

According to new data from the 2002 Canadian Community Health Survey, 1 out of 10 Canadians aged 15 or older—around 2.6 million people—reported having had symptoms of mental disorders or substance dependence in the previous 12 months. The survey covered five mental health disorders (major depression, mania disorder, panic disorder, social phobia and agoraphobia), as well as alcohol and illicit drug dependence.

The overall prevalence rates were about the same for both sexes: 11% for women and 10% for men. Major depression was more common among women: 6% versus 4% for men. A similar pattern emerged for anxiety disorders, but substance dependence was more common among men (4%) than women (2%).

Teens and young adults were more likely than older people to report mental disorders or substance dependence. About 18% of 15- to 24-year-olds reported having experienced feeling or symptoms consistent with the conditions surveyed. With increasing age, the percentage reporting such feelings or symptoms declined from 12% at ages 25 to 44 to 8% at ages 45 to 64 and to less than 3% at age 65 or older.

Only 32% of respondents who reported mental disorders or substance dependencies had seen or talked to a health care professional (psychiatrist, family physician, medical specialist, psychologist or nurse) during the year before the survey. Those who sought help most often consulted family physicians. Despite their higher prevalence of mental health problems, only about a quarter teenagers and young adults had used mental health resources. Adults aged 25 to 64 were the most likely to report consultations to help them with such problems, although fewer than half did so (45%). Among seniors, one-third had used mental health care resources.

About 21% of individuals with any of the mental disorders or substance dependencies covered by the survey reported feeling that they needed help but did not receive it during the previous 12 months. The reasons most frequently cited for not getting

help were: they preferred to manage their problems themselves (31%); they did not get around it or did not bother (19%); or they were afraid to ask for help or were afraid of what others would think (18%). Women were slightly more likely than men to reported unmet mental health care needs, and seniors reported far fewer unmet needs than the other age groups. When people did receive help, though, the vast majority (over 82%) were satisfied or very satisfied with the care they received.

The publication *Canadian Community Health Survey: Mental health and well-being, 2002* (82-617-XIE, free) is now available on Statistics Canada's Web site at www.statcan.ca. Select "Our products and services," "Browse our Internet publications," then select "Free," followed by "Health." For more information about the CCHS survey on mental health, or to enquire about the concepts, methods or data quality, contact Lorna Bailie (613-951-0837; lorna.bailie@statcan.ca), Health Statistics Division, Statistics Canada.

Canadian Community Health Survey: Canadian Forces supplement on mental health, 2002

Results from the Canadian Forces Mental Health Survey, a special supplement to the 2002 Canadian Community Health Survey (CCHS), are now available. The CCHS target population does not include full-time members of the Canadian Forces; therefore, the Department of National Defence commissioned Statistics Canada to conduct a supplemental survey of armed forces personnel, including those on reserve status. The survey measured the prevalence of five mental disorders: major depression, social phobia, post-traumatic stress disorder, panic disorder, and general anxiety disorder. It also measured the prevalence of alcohol dependence.

In 2002, about 15% of the Canadian regular military forces reported symptoms consistent with one or more of the five mental disorders or alcohol dependence at some time during the year before the survey interview. Among the reserves, the prevalence of such problems was lower (13%).

The prevalence of various disorders differed between regular and reserve personnel, and also by rank and sex. For example, depression was the most common disorder among those in the regular forces, reported by 7.6%. Depression was the second-most common problem among reservists, with a prevalence of 4.1%. Alcohol dependence was the most common problem for reservists (6.2%) and the second-most common for those in the regular forces (4.2%). Post-traumatic stress disorder affected 2.8% of regular forces personnel versus 1.2% of reservists.

The findings suggest a relationship between a higher number of deployments and post-traumatic stress disorder. Among regular forces members who had served on three or more deployments, 4.7% reported symptoms of post-traumatic stress disorder; prevalence of this disorder was lower among those with one or two deployments (2.7%) and for those with none (1.7%). The same pattern emerged for those in the reserves.

The rate of reporting symptoms was generally higher in the lower ranks, and for women. Alcohol dependence was the exception—its prevalence was higher among men. When compared with the general civilian population, two differences emerged: the rates of major depression and anxiety were higher among the regular forces.

For more information on the survey content and analyses, contact Colonel Randy Boddam (613-945-6308), Department of National Defence. For more information on the methodology, data collection or additional information from the survey database, contact Client Services (1-800-9050; 613-951-3321; ssd@statcan.ca) or Edward Praught (613-951-5386; edward.praught@statcan.ca), Special Surveys Division, Statistics Canada.

Births, 2001

In 2001, live births increased for the first time in a decade, allowing Canada's fertility rate to recover slightly from the record low set in 2000. In total, 333,744 babies were born in 2001, up 1.8% from 2000. The fertility rate—an estimate of the average number of children women aged 15 to 49 will have in their lifetime—rose from 1.49 in 2000 to 1.51 in

2001. Live births rose in only four provinces: Ontario, Québec, Saskatchewan and Alberta.

Although the reasons behind the increase in births cannot be determined from the birth registration, the rise coincides with the extension of parental benefits under Employment Insurance. It is possible that increasing the maximum from 10 weeks to 35 weeks as of December 31, 2000 may have encouraged some Canadians to start or add to their families.

Fertility rates for women aged 25 or older rose in 2001, and fell for women younger than 25. The fertility rate for teenagers reached a new low, with 16.3 births for every 1,000 aged 15 to 19—continuing an annual trend that began in 1992. By contrast, fertility rates for women aged 25 to 29 rose for the first time in a decade, to 97.9 births for every 1,000 women this age.

The publication *Births—shelf tables, 2001* (84F0210XPB, \$20), which contains tables on live births and stillbirths, is now available. For general information or to order custom tabulations, contact Client Services (613-951-1746; hd-ds@statcan.ca). For questions about the concepts, methods or data quality, contact Patricia Tully (613-951-1759; patricia.tully@statcan.ca) or Leslie Geran (613-951-5243; leslie.geran@statcan.ca), Health Statistics Division, Statistics Canada.

Stillbirths, 2001

Canada registered 1,097 stillbirths with a gestational age of 28 weeks or more in 2001—a 3.5% increase from the previous year and the third consecutive annual increase.

In 2001, there were 3.3 late fetal deaths for every 1,000 total births (live births plus stillbirths of 28 weeks or longer gestation). This compares with 3.2 such deaths for every 1,000 total births in 2000. Late fetal death rates have remained below 4 deaths for every 1,000 total births since 1990.

The publication *Births—shelf tables, 2001* (84F0210XPB, \$20), which contains tables on live births and stillbirths, is now available. Definitions, data sources and methods: survey number 3234. For general information or to order custom tabulations, contact Client Services (613-951-1746;

hd-ds@statcan.ca). For information about the concepts, methods or data quality, contact Patricia Tully (613-951-1759; patricia.tully@statcan.ca) or Leslie Geran (613-951-5243; leslie.geran@statcan.ca), Health Statistics Division, Statistics Canada. ●

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POPULATION HEALTH SURVEYS

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Cycle 1.1: CCHS was conducted by Statistics Canada to provide cross-sectional estimates of health determinants, health status and health system utilization for 133 health regions across Canada, plus the territories.

Cycle 1.2: CCHS-Mental Health and Well-being is being conducted by Statistics Canada to provide provincial cross-sectional estimates of mental health determinants, mental health status and mental health system utilization.

Cycle 2.1: CCHS will be conducted by Statistics Canada to provide cross-sectional estimates of health determinants, health status and health system utilization for 134 health regions across Canada.

National Population Health Survey (NPHS)

Household - The household component includes household residents in all provinces, with the principal exclusion of populations on Indian Reserves, Canadian Forces Bases and some remote areas in Québec and Ontario.

Institutions - The institutional component includes long-term residents (expected to stay longer than six months) in health care facilities with four or more beds in all provinces with the principal exclusion of the Yukon and the Northwest Territories.

North - The northern component includes household residents in both the Yukon and the Northwest Territories with the principal exclusion of populations on Indian Reserves, Canadian Forces Bases and some of the most northerly remote areas of the Territories.

Joint Canada - United States Health Survey (JCUHS)

The Joint Canada - United States Health Survey (JCUHS) will collect information from both Canadian and U.S. residents, about their health, their use of health care and their functional limitations.

For more information about these surveys, visit our web site at
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Statistical Research Data Centres

Statistics Canada, in collaboration with the Social Sciences and Humanities Research Council (SSHRC), has launched an initiative that will help strengthen the country's social research capacity, support policy-relevant research, and provide insights on important issues to the Canadian public. The initiative involves the creation of nine research data centres at McMaster University in Hamilton, the Université de Montréal, Dalhousie University, and the Universities of Toronto, Waterloo, Calgary, Alberta, New Brunswick (Fredericton), and British Columbia. Prospective researchers who wish to work with data from the surveys must submit project proposals to an adjudicating committee operating under the auspices of the SSHRC and Statistics Canada. Approval of proposals will be based on the merit of the research project and on the need to access detailed data. The centres and research projects will be evaluated periodically to assess security standards and the success of analysis resulting from the projects. Researchers will conduct the work under the terms of the *Statistics Act*, as would any other Statistics Canada employee. This means that the centres are protected by a secure access system; that computers containing data will not be linked to external networks; that researchers must swear a legally binding oath to keep all identifiable information confidential; and that the results of their research will be published by Statistics Canada. For more information, contact Garnett Picot (613-951-8214), Business and Labour Market Analysis Division.