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Vol. 12 No. 1

- Teenage pregnancy
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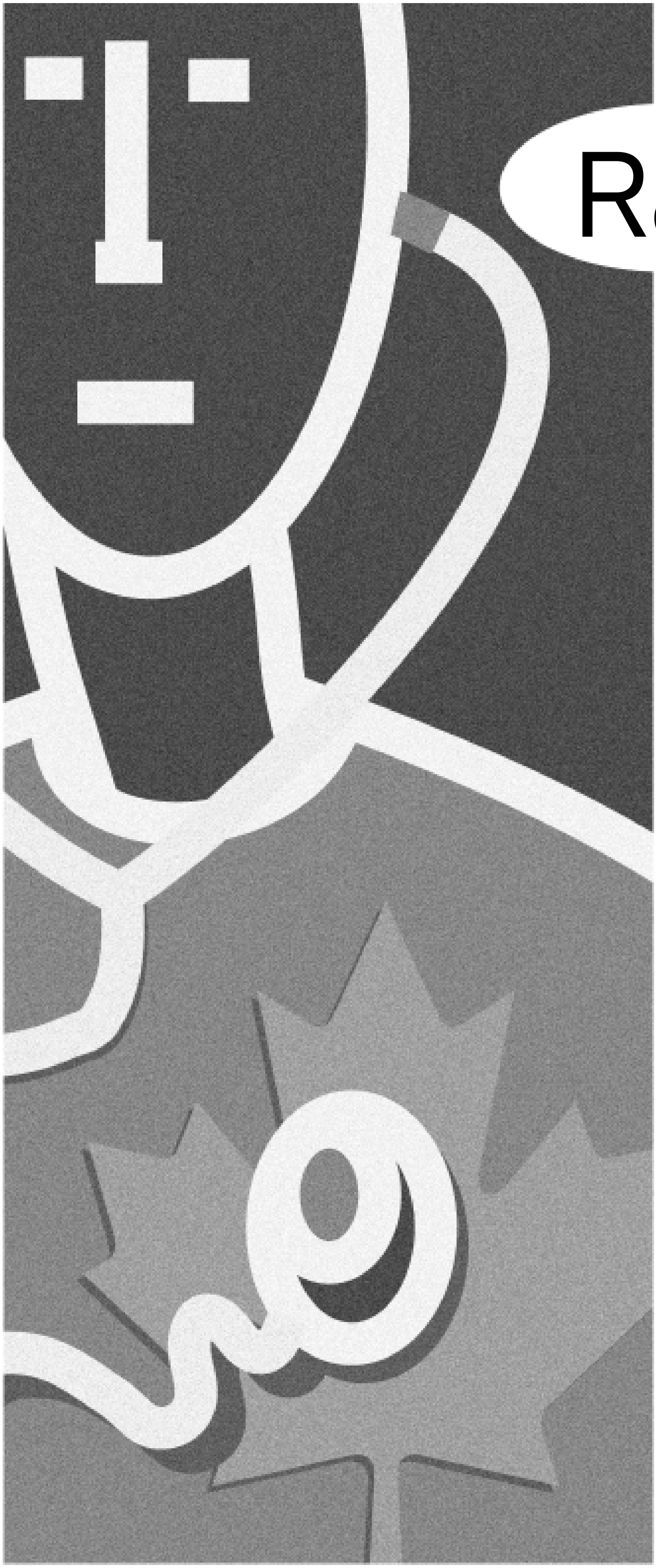

Research Articles

In-depth research and analysis in the fields of health and vital statistics

Teenage pregnancy

Heather Dryburgh

Abstract

Objectives

This article examines trends in teenage pregnancy in Canada, focussing on induced abortions, live births and fetal loss among women aged 15 to 19 in 1997.

Data sources

The data come from the Hospital Morbidity Data Base and the Canadian Vital Statistics Data Base at Statistics Canada, and the annual Therapeutic Abortion Survey, conducted by the Canadian Institute for Health Information. Data on abortions performed on Canadian residents in the United States are from an annual survey of selected states. International data are from the Alan Guttmacher Institute.

Analytical techniques

Pregnancy rates, abortion rates, live birth rates and fetal loss rates are calculated using population counts of women in the age groups 15 to 17, 18 to 19, and 15 to 19. The percentages of pregnancies that ended in the three outcomes are also calculated for these years.

Main results

The teenage pregnancy rate declined from 1994 to 1997, reflecting lower teenage birth and fetal loss rates. Through this period the abortion rate remained stable, with the result that slightly more than half of all teenage pregnancies ended in abortion by 1997. Younger teens are more likely to have an abortion than to give birth. The majority of pregnancies among older teens end in a live birth, although the number of live births is decreasing.

Key words

pregnancy in adolescence, pregnancy outcome, abortion, miscarriage

Author

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During the last quarter century, there has been an overall decline in the teenage pregnancy rate in Canada, perhaps reflecting the availability of contraceptives, and the increased awareness of the risks of unprotected sex brought about by the AIDS epidemic.[1] Nevertheless, in 1997, an estimated 19,724 women aged 15 to 19 gave birth, and a slightly larger number in this age range—21,233—had an abortion.

The social stigma that once attended out-of-wedlock pregnancy may have diminished; however, the risks of serious health consequences remain for babies born to mothers still in their teens. Children of teenagers are more likely to have low birth weights, and to suffer the associated health problems.[2]

Pregnant teens themselves are also at greater risk of health problems, including, for example, anemia, hypertension, renal disease, eclampsia and depressive disorders.[3,4] As well, teenagers who engage in unprotected sex are putting their own health at risk of sexually transmitted infections.[1]

Methods

Data sources

Live births and stillbirths are from the Vital Statistics Data Base, a virtually complete count of all vital statistics in Canada. This data base contains information collected from the vital statistics registry in each province and territory.

Since 1995, the Canadian Institute for Health Information (CIHI) has collected data on induced abortions (the Therapeutic Abortion Survey), which are forwarded to the Health Statistics Division at Statistics Canada for processing and analysis. Before 1995, Statistics Canada collected these data.

Induced abortion data used in this article include all reported abortions performed on Canadian residents in hospitals and clinics in Canada.

Each province reports counts of all abortions performed in its hospitals. Except for British Columbia and Québec, these provincial reports provide detailed information, such as age, province of residence, gestation period, marital status, and previous induced abortions. British Columbia provides only aggregate counts of abortions by procedure and age group. Québec provides detailed information on some cases and aggregate counts for others.

Detailed abortion clinic data are reported by the provincial health ministries in Ontario and Alberta. Clinic abortions in Québec and British Columbia are reported as aggregate counts by their respective health ministries. British Columbia clinics also report abortion counts directly to CIHI. All other abortion clinics are surveyed separately and report aggregate counts of abortions by the patient's province of residence.

Since abortion facilities are not available in Prince Edward Island, that province does not report abortions. Data for Prince Edward Island refer to residents who had an abortion outside the province.

Although not all provinces provide detailed information on abortion cases, the count of abortions and the province of residence of the patient are reliably reported, except for some cases in British Columbia and Québec. Based on an analysis of 1992 detailed abortion data for these two provinces, all cases where the province of residence was not provided were considered to be residents of the reporting province.

Miscarriage counts are taken from the Hospital Morbidity Data Base. This data base of hospital separation records from Canadian hospitals provides a count of cases discharged with a diagnosis of spontaneous or other unspecified abortion.

Historical data are from published reports.[5-7]

The population counts used to calculate rates were provided by Statistics Canada's Demography Division. The counts used were July-adjusted population estimates.

All of these data are available for ages 15 to 19, for the province of residence of the women.

American and other international data are from the Alan Guttmacher Institute and include estimated miscarriage numbers.

This article focusses on recent trends in pregnancy outcomes. (See also *Teenage pregnancies, 1974 to 1994* in Volume 9, Number 3 of *Health Reports*.[7])

Analytical techniques

The number of pregnancies is calculated by summing live births, induced abortions, stillbirths, and known miscarriages. Pregnancy rates, abortion rates and fetal loss rates are calculated using population counts of women aged 15 to 17, 18 to 19, and 15 to 19. The percentages of pregnancies that ended in a live birth, abortion or fetal loss were also calculated.

Limitations

Teenage pregnancy rates in this article may be underestimated because there is no way of knowing the total number of miscarriages. Not all women who miscarry require medical attention, and those who do are frequently treated in outpatient settings and thus are not included in the Hospital Morbidity Data Base (see *Estimating miscarriages*).

Pregnancies are counted at the time of termination of pregnancy, not conception. Therefore, the few women who became pregnant at age 14, but whose pregnancy did not end until they were 15, are included, but the larger number of 19-year-olds whose pregnancy ended at age 20 are not included.

The patient's age was not reported for all abortions in all provinces. When age was not reported for abortions in the years 1995 to 1997, the provincial distribution of cases for which age was known was applied. Because Prince Edward Island does not report abortions, and age is known for only a small proportion of Prince Edward Island residents who obtain abortions elsewhere, the Canadian age distribution of abortion recipients was applied to Prince Edward Island residents for whom age was not reported.

The method used to impute ages for data before 1995 may be slightly different. These differences are not substantial enough to change the overall trends.

For live births registered in Newfoundland between 1974 and 1985, vital statistics data did not include the age of the mother. It was assumed that the age distribution of women at the time of birth approximates that of women who had hospital deliveries in the province in a given year.

Abortion data vary in detail by province, and by whether the data are reported for hospitals or clinics. As well, there is a small potential overlap between abortions and stillbirths. Some stillbirths are reported with abortion as the cause of death. It is unclear whether these cases are also reported to the Therapeutic Abortion Survey. It is more likely, however, that abortions are slightly undercounted, since a small number are now performed in physicians' offices and are not currently included in the total abortion count for each province. Nonetheless, these numbers would not have been substantial in the 1995-to-1997 period.

Detailed characteristics of women having abortions, such as marital status, gestation period and previous deliveries, are not reported by all provinces or by all clinics.

Abortions performed on Canadian residents in the United States are reported to a yearly CIHI survey of selected states (Connecticut, Hawaii, Idaho, Maine, Michigan, Minnesota, Montana, New Mexico, New York, North and South Dakota, Oregon, Vermont, and Washington). The number of Canadian residents who obtained abortions in other states is not known. Because abortions performed on Canadian residents in the reporting states are relatively few and decrease each year, they are not included in the calculations for 1995 to 1997. Before 1995, US figures were included in the totals only, but because of the small number, excluding them in the 1995-to-1997 period does not affect trends. Their inclusion would increase the teenage pregnancy rate by only 0.1 pregnancy per 1,000 women aged 15 to 19 in 1995 (0.06 per 1,000 in both 1996 and 1997).

Teenage pregnancy also has economic consequences. Childbearing may curtail education and thereby reduce a young woman's employment prospects in a job market that requires ever higher levels of training.[8,9] In addition, recessions in the early 1980s and 1990s meant that to maintain an adequate standard of living, dual earning became the norm in many Canadian households.[10] But teenagers who give birth, particularly at ages 15 to 17, are likely to be single. Consequently, most teenage mothers lack a partner to contribute to the household income.[3]

This article focusses on recent trends in pregnancy rates and outcomes (live birth, induced abortion or fetal loss) for 15- to 19-year-olds (see *Methods* and *Definitions*).

Short-term trends

In 1997, an estimated 42,162 pregnancies of women aged 15 to 19 ended in birth, abortion or miscarriage. The number of pregnancies had declined steadily since 1994, when the estimated total was 46,753 (Appendix Table A) (see *Sexual activity and contraceptive use*).

Sexual activity and contraceptive use

According to the 1994/95 National Population Health Survey (NPHS), a substantial proportion of teenagers are sexually active.[11] An estimated 43% of women aged 15 to 19 had had at least one sex partner in the previous year, and about 13% reported having at least two partners during that time. Considering only those who were sexually active, 32% of these 15- to 19-year-old women had more than one partner.

Among sexually active 15- to 19-year-old women (excluding the small number who were married, in a common-law relationship, divorced or widowed, or who had had a single sex partner), 51% reported having sex without a condom in the past year.

The 1996/97 NPHS found that slightly over half of sexually active teenagers used oral contraceptives (unpublished tabulations). Among single (never married) 15- to 19-year-old women who had been sexually active in the previous year, 55% reported using the pill in the previous month.

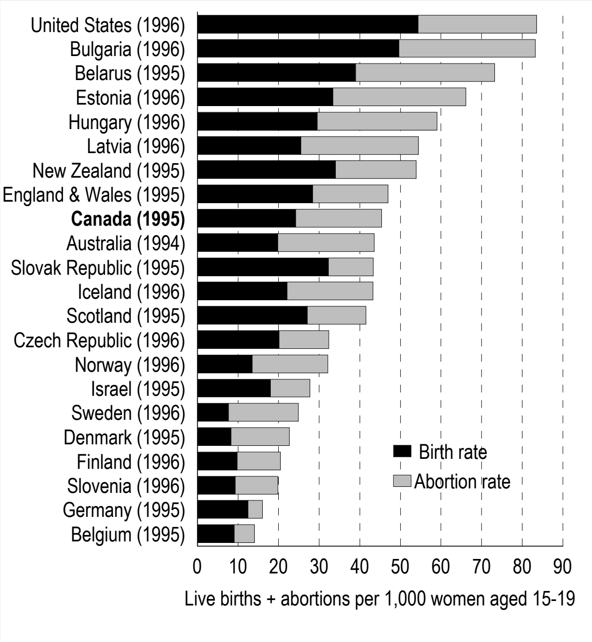
At the same time, the teenage pregnancy rate dropped, and by 1997, it stood at 42.7 pregnancies per 1,000 women aged 15 to 19. The decrease in the teenage pregnancy rate in Canada began several years later than that in the United States[3,12] (Chart 1). Nevertheless, the US rate remains about double the Canadian rate[13] (see *International comparisons*).

Older teens are more likely than younger teens to be sexually active.[8] This is reflected in much higher

International comparisons

Based on data from the Alan Guttmacher Institute, Canada's teenage pregnancy rate is ranked as moderate, compared with other western industrialized countries.[14] The Alan Guttmacher Institute is an independent, not-for-profit organization in the United States, whose mandate is to "inform individual decision-making, encourage scientific inquiry and enlightened public debate, and promote the formation of sound public- and private-sector programs and policies" related to "sexual behaviour, reproduction and family formation."[15]

International comparisons of teenage pregnancy rates, 1994, 1995 or 1996

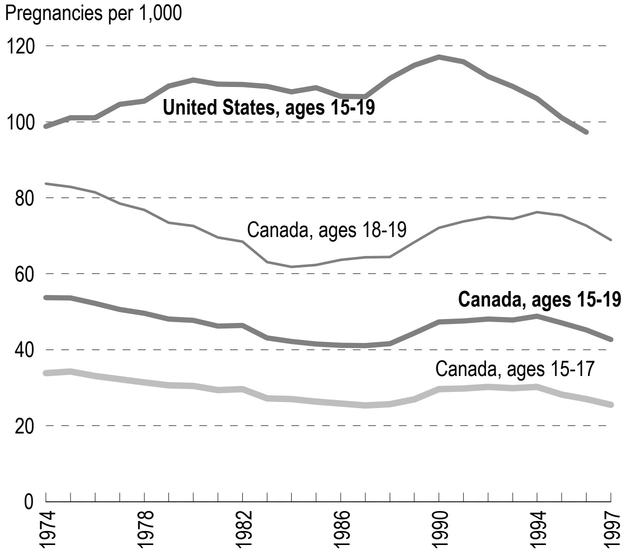


Data sources: *Alan Guttmacher Institute and Reference 14*
Note: *These rates do not include fetal loss; pregnancies are calculated here as the sum of live births and abortions.*

pregnancy rates at ages 18 to 19 than at ages 15 to 17: 68.9 versus 25.5 per 1,000 Canadian women in the respective age groups in 1997. Nonetheless, even at ages 18 to 19, the pregnancy rate was well below that of women aged 20 to 24 (100.6 per 1,000; data not shown).

Chart 1

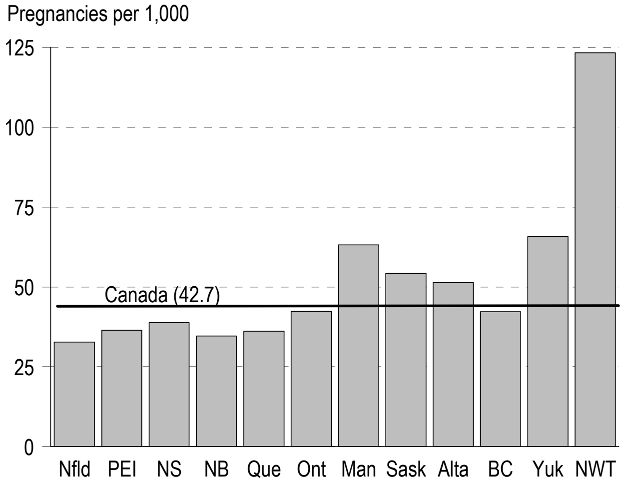
Teenage pregnancy rates, by age of women at end of pregnancy, women aged 15 to 19, Canada and United States, 1974 to 1997



Data sources: *References 5,6,7; Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information; Alan Guttmacher Institute*

Chart 2

Teenage pregnancy rates, women aged 15 to 19, by province and territory, 1997



Data sources: *Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*

Teenage pregnancy rates tend to be higher in the North and the Prairie provinces than in other regions (Chart 2). In 1997, the rate in the Northwest Territories was 123.3 pregnancies per 1,000 and over 60 per 1,000 in the Yukon and in Manitoba. On the other hand, rates in Newfoundland and New Brunswick were less than 35 per 1,000 (Appendix Table B).

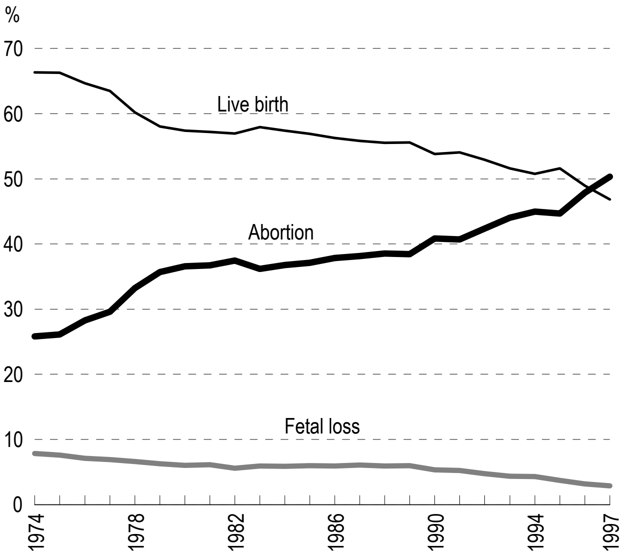
Abortion now most common outcome

In the past, more teenage pregnancies ended in a live birth than in an abortion. However, in 1997, with the decline in live births to teens, abortion became the most common outcome of teenage pregnancy (Chart 3). This had been the case for younger teens in most years since 1993.

This shift at the national level was influenced by changes in the three most populous provinces—Ontario, British Columbia and Québec—where abortions constituted the majority of pregnancy outcomes in 1997 (Appendix Table C). By contrast,

Chart 3

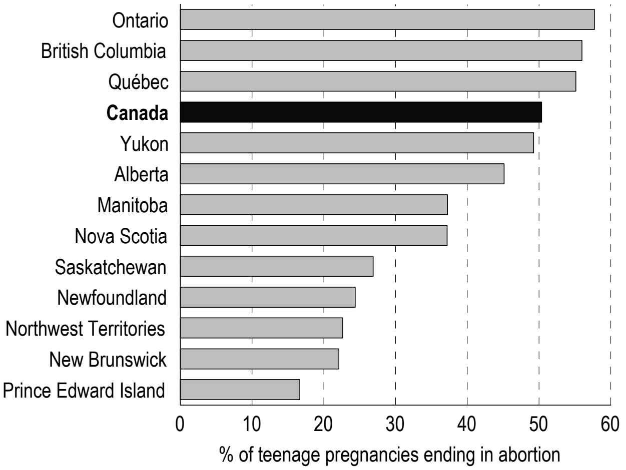
Percentage distribution of outcomes of teenage pregnancy, women aged 15 to 19, Canada, 1974 to 1997



Data sources: *References 5,6,7, Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*

Chart 4

Percentage of teenage pregnancies ending in abortion, women aged 15 to 19, Canada, provinces and territories, 1997



***Data sources**: Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*

Access to abortion

Before 1969, Canadian women who chose to terminate their pregnancy had no access to legal abortion. Between 1969 and January 1988, Canada's abortion law allowed induced abortions, subject to various criteria, including the approval of three physicians. In 1988, that legislation was struck down, leaving physicians the right to perform abortions. In addition, private clinics have opened across Canada except in Prince Edward Island, Saskatchewan, the Yukon and the Northwest Territories.

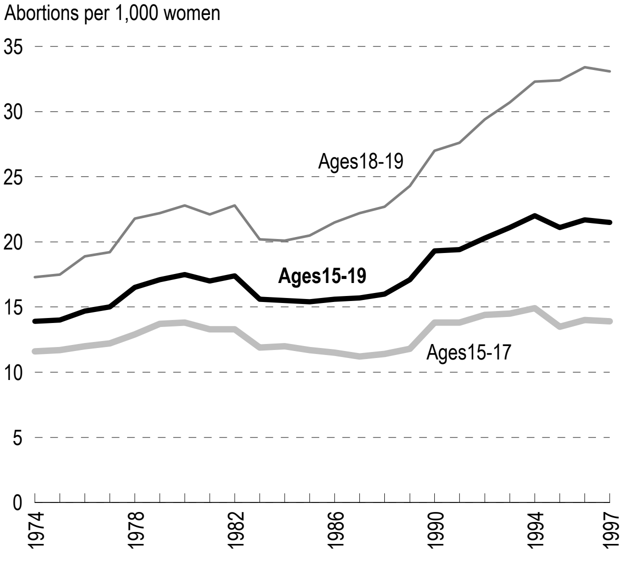
One immediate effect of greater accessibility was a sharp decline in the number of abortions obtained by Canadians in the United States. According to data from 14 states, the figure fell from 2,757 in 1987 to 293 in 1997 (72 of which were performed on 15- to 19-year-olds).

in the other provinces and territories, most teenage pregnancies ended in a live birth (Chart 4) (see *Access to abortion*).

The percentage of teenage pregnancies ending in an abortion is strongly weighted by trends among 18- to 19-year-olds, who account for the majority of teenage pregnancies (64% in 1997). Even in 1997, live births still slightly outnumbered abortions among older teens, but with the decline in live births, the percentage opting for abortion had risen from 43% in 1995 to 48% two years later. Among girls aged 15 to 17, 54% of pregnancies ended in an abortion in 1997 (Appendix Table C).

Chart 5

Teenage abortion rates, by age of women at end of pregnancy, women aged 15 to 19, Canada, 1974 to 1997



***Data sources:** References 5,6,7; Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*

Abortion rates stable from 1994 to 1997

Although the teenage pregnancy rate decreased, the abortion rate per 1,000 women aged 15 to 19 was stable between 1994 and 1997. Therefore, with fewer teenagers giving birth or experiencing fetal loss during this period, a greater proportion of all teenage pregnancies ended in abortion (Chart 5).

The abortion rate was much higher for older teens, even though pregnant 15- to 17-year-olds were more likely than pregnant 18- to 19-year-olds to have an abortion. The higher abortion rate at ages 18 to 19 reflects the higher number of pregnancies among older teens. The 1997 rate at ages 18 to 19 stood at an estimated 33.1 abortions per 1,000 women; at ages 15 to 17, the rate was 13.9 per 1,000.

Hospital and clinic patients differ

In provinces with access to both hospital and clinic abortions, teenagers are more likely to use hospitals (Table 1). However, based on an analysis of data from Ontario and Alberta, the only provinces that provide detailed information about patients in both hospitals and clinics, the characteristics of women using these establishments differ in some ways.

Clinic abortions were more likely to occur earlier or later in the pregnancy. In 1997, 40% of teenagers who had clinic abortions were less than 9 weeks pregnant, whereas this was the case for 25% of those who had hospital abortions (Table 2). The percentage of abortions performed at 17 or more weeks was over 5% in clinics, compared with less than 2% in hospitals. Also, compared with those who went to a hospital, a higher proportion of teenagers who had a clinic abortion had had at least one previous induced abortion: 24% versus 18%. Regardless of whether they went to a clinic or hospital, the vast majority (96%) of Ontario and Alberta teenagers who had an abortion in 1997 were single; fewer than 3% were living common-law, and just 1% were married.

Table 1
Percentage of teenage abortions performed in hospitals and clinics, by province, 1997

	Total	Hospitals	Clinics
	%	%	%
Newfoundland	100.0	63.8	36.2
Nova Scotia	100.0	92.7	7.3
New Brunswick	100.0	59.0	41.0
Québec	100.0	67.8	32.2
Ontario	100.0	58.9	41.1
Manitoba	100.0	91.1	8.9
Alberta	100.0	63.0	37.0
British Columbia	100.0	72.9	27.1

Data source: *Health Statistics Division*
Note: *Prince Edward Island, Saskatchewan, the Yukon and Northwest Territories do not have abortion clinics.*

Table 2
Characteristics of teenagers obtaining abortions in hospitals and clinics, Ontario and Alberta,† 1997

	Hospitals	Clinics
	%	%
Gestation period		
Total	100.0	100.0
Less than 9 weeks	24.6	39.9
9-12 weeks	62.3	39.0
13-16 weeks	11.2	15.5
17-20 weeks	1.7	5.5
21-40 weeks	0.2	--
Previous deliveries		
Total	100.0	100.0
None	83.4	83.9
One	14.4	13.7
More than one	2.2	2.3
Previous induced abortions		
Total	100.0	100.0
None	82.1	76.3
One	15.6	19.4
More than one	2.3	4.4
Marital status‡		
Total	100.0	100.0
Single	96.5	96.1
Married	1.3	0.9
Common-law	2.1	2.7

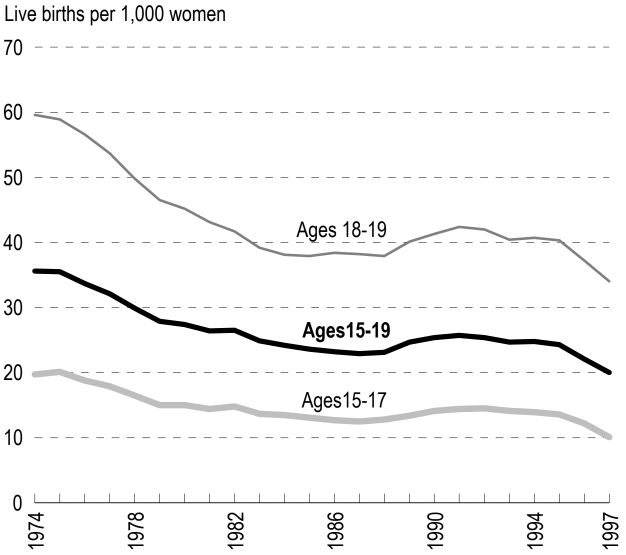
Data source: *Health Statistics Division*
Note: *Data may not add to totals because of rounding.*
† Ontario and Alberta were the only provinces providing detailed data on patients in both hospitals and clinics.
‡ Separated, divorced and widowed have too few cases to be reported.
-- Amount too small to be expressed.

Live births

Fewer teenagers are becoming pregnant, and as noted above, fewer of those who do are giving birth. In 1997, live births to teenagers numbered 19,724, and the birth rate for 15- to 19-year-olds reached an all-time low of 20 births per 1,000 (Chart 6). Rates declined among both younger and older teens.

Teenage birth rates were relatively high in the Prairie provinces and the territories, and low in Québec, Ontario and British Columbia (Appendix Table B).

Chart 6
Teenage live birth rates, by age of women at end of pregnancy, Canada, women aged 15 to 19, 1974 to 1997



Data sources: *References 5,6,7; Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*

Fetal loss

Since 1974, it has been estimated that fewer than 10% of teenage pregnancies have ended in fetal loss (miscarriage or stillbirth; see *Definitions*). However, fetal loss is underreported. While counts of stillbirths are virtually complete, it is difficult to estimate miscarriages because they may not come to the attention of the medical care system (see *Estimating miscarriages*).

Concluding remarks

In recent years, teenage pregnancy in Canada has declined. At the same time, the abortion rate for teenagers has stabilized. As a result, the proportion of teen pregnancies that end in an abortion has increased, exceeding live births for the first time.

Definitions

Teenage pregnancy is defined in this article as a pregnancy of a woman who was aged 15 to 19 when her pregnancy ended. Pregnancies are calculated as the sum of live births, induced abortions, and fetal loss (stillbirths and miscarriages) for which administrative records are available.

The *teenage pregnancy rate* is the number of pregnancies per 1,000 women aged 15 to 19.

The *teenage live birth rate* is the number of live births per 1,000 women aged 15 to 19.

Unless otherwise indicated, the term “abortion” is used in this article to refer to induced abortions. The *teenage abortion rate* is the number of induced abortions per 1,000 women aged 15 to 19.

Fetal loss is the sum of miscarriages plus stillbirths. *Miscarriages* are pregnancies that end by spontaneous abortion before 20 weeks’ gestation and include only those records with diagnoses of ICD-9 634, 636 or 637[16] that required inpatient care. A *stillbirth* is a product of conception of 20 or more weeks’ gestation or fetal weight of 500 grams or more, which did not breathe or show other signs of life.

The *teenage fetal loss rate* is the number of miscarriages plus stillbirths per 1,000 women aged 15 to 19.

In this analysis, the expression, “ending” a pregnancy covers the three outcomes: live birth, induced abortion, and hospitalized fetal loss.

Estimating miscarriages

There is no accurate method for counting miscarriages that do not result in hospitalization as an inpatient. Many countries, in fact, do not include miscarriages in their pregnancy calculations, and use only the more reliable numbers: live births, induced abortions and stillbirths. International comparisons, therefore, can be problematic. Two other approaches to estimating miscarriages have been taken: the use of survey data on fertility and a formula based on fetal life tables.

Based on the 1984 Canadian Fertility Survey, the miscarriage ratio (miscarriages to 100 live births) was 16.4 for women of all ages.[17] This figure was in line with an earlier study, which estimated miscarriages to be approximately 15% of all pregnancies.[18] However, that survey is now 16 years old, and the ratio may have changed. A more recent publication using US data estimated that miscarriages end 19% of all pregnancies. The formula for this estimate accounted for miscarriages of pregnancies that might have gone to term and for miscarriages that might have occurred had an abortion not been performed.[19] While this study is limited by its use of weekly fetal life tables from 1980 for New York City, the author argues that it is adequate for generalizations for the United States. The Alan Guttmacher Institute estimates miscarriages as 20% of live births plus 10% of abortions.[20] Their calculation of pregnancy rates takes account of live births, stillbirths, induced abortions, and estimated miscarriages.

The US National Center for Health Statistics (NCHS) and the Centers for Disease Control and Prevention also publish teenage pregnancy rates for the United States and use data from the 1982, 1988 and 1995 National Surveys of Family Growth to estimate miscarriages. Their numbers are slightly higher than those of the Guttmacher Institute. For instance, the 1996 NCHS estimate of pregnancy rates for 15- to 19-year-olds in the US was 98.7 per 1,000, compared with 97.3 per 1,000 reported by the Alan Guttmacher Institute.[21]

Teenage pregnancy rate, women aged 15 to 19, by method of measuring miscarriages, Canada, 1997

	Pregnancies per 1,000 women
Using available miscarriage data†	42.7
Excluding miscarriages and stillbirths	41.5
Miscarriages estimated as 16.4% of live births	44.8
Miscarriages estimated as 20% of live births and 10% of abortions (Alan Guttmacher Institute)	47.6

Data source: *Health Statistics Division*
† Conventional method used for calculating miscarriages in Canada, and the one used for all data presented in this article.

Pregnancy rates are higher for older teens than younger teens. Abortion is the most common outcome for pregnancies among women aged 15 to 17. Older teens, however, are still more likely to have a live birth.

Teenage pregnancy rates tend to be high in the North and the Prairie provinces and low in the Atlantic region. However, in every province and territory, except Québec, Ontario and British Columbia, the majority of teenage pregnancies end in a live birth rather than an abortion. ●

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Appendix

Table A

Outcomes of teenage pregnancy, by age at end of pregnancy, Canada, 1974 to 1994

	Total 15-19	15-17	18-19	Total 15-19	15-17	18-19
		Number			Per 1,000 women	
Total pregnancies						
1974	61,242	23,180	38,062	53.7	33.8	83.7
1975	61,964	23,899	38,065	53.6	34.3	82.9
1976	61,267	23,467	37,800	52.2	33.1	81.4
1977	59,923	22,985	36,938	50.6	32.2	78.5
1978	59,210	22,417	36,793	49.6	31.4	76.8
1979	57,423	21,629	35,794	48.0	30.6	73.4
1980	56,784	21,374	35,410	47.7	30.5	72.6
1981	53,782	19,865	33,917	46.2	29.4	69.6
1982	52,163	18,874	33,289	46.4	29.6	68.5
1983	46,190	16,251	29,939	43.1	27.2	63.1
1984	43,233	15,553	27,680	42.2	27.0	61.8
1985	40,892	15,020	25,872	41.5	26.3	62.3
1986	40,000	14,813	25,187	41.2	25.8	63.7
1987	39,340	14,449	24,891	41.1	25.3	64.3
1988	39,636	14,368	25,268	41.6	25.7	64.4
1989	42,133	14,744	27,389	44.4	26.9	68.3
1990	44,750	16,354	28,396	47.3	29.6	72.1
1991	44,745	16,725	28,020	47.6	29.8	73.8
1992	45,323	17,154	28,169	48.1	30.2	74.9
1993	45,412	16,986	28,426	47.8	29.9	74.4
1994	46,753	17,153	29,600	48.8	30.2	76.2
1995	45,402	16,273	29,129	47.1	28.2	75.4
1996	44,182	15,950	28,232	45.2	27.0	72.7
1997	42,162	15,196	26,966	42.7	25.5	68.9
Live births						
1974	40,623	13,513	27,110	35.6	19.7	59.6
1975	41,074	13,999	27,075	35.5	20.1	58.9
1976	39,612	13,323	26,289	33.7	18.8	56.6
1977	38,048	12,805	25,243	32.1	17.9	53.7
1978	35,630	11,756	23,874	29.9	16.5	49.8
1979	33,324	10,643	22,681	27.9	15.0	46.5
1980	32,596	10,546	22,050	27.4	15.0	45.2
1981	30,745	9,760	20,985	26.4	14.4	43.1
1982	29,708	9,414	20,294	26.5	14.8	41.7
1983	26,747	8,186	18,561	24.9	13.7	39.2
1984	24,802	7,759	17,043	24.2	13.5	38.1
1985	23,263	7,493	15,770	23.6	13.1	37.9
1986	22,498	7,317	15,181	23.2	12.7	38.4
1987	21,956	7,152	14,808	22.9	12.5	38.2
1988	22,019	7,151	14,868	23.1	12.8	37.9
1989	23,427	7,362	16,065	24.7	13.4	40.1
1990	24,083	7,807	16,276	25.4	14.1	41.3
1991	24,180	8,064	16,116	25.7	14.4	42.4
1992	23,985	8,202	15,783	25.4	14.5	42.0
1993	23,437	7,975	15,462	24.7	14.1	40.4
1994	23,728	7,904	15,824	24.8	13.9	40.7
1995	23,422	7,847	15,575	24.3	13.6	40.3
1996	21,601	7,171	14,430	22.1	12.2	37.2
1997	19,724	6,431	13,293	20.0	10.8	34.0
Abortions						
1974	15,805	7,937	7,868	13.9	11.6	17.3
1975	16,173	8,135	8,038	14.0	11.7	17.5
1976	17,315	8,551	8,764	14.7	12.0	18.9
1977	17,735	8,684	9,051	15.0	12.2	19.2
1978	19,681	9,228	10,453	16.5	12.9	21.8
1979	20,488	9,661	10,827	17.1	13.7	22.2
1980	20,765	9,650	11,115	17.5	13.8	22.8
1981	19,739	8,954	10,785	17.0	13.3	22.1
1982	19,536	8,463	11,073	17.4	13.3	22.8
1983	16,718	7,150	9,568	15.6	11.9	20.2
1984	15,883	6,887	8,996	15.5	12.0	20.1
1985	15,183	6,658	8,525	15.4	11.7	20.5
1986	15,133	6,636	8,497	15.6	11.5	21.5
1987	14,998	6,411	8,587	15.7	11.2	22.2
1988	15,277	6,361	8,916	16.0	11.4	22.7
1989	16,201	6,446	9,755	17.1	11.8	24.3
1990	18,274	7,635	10,639	19.3	13.8	27.0
1991	18,214	7,722	10,492	19.4	13.8	27.6
1992	19,190	8,153	11,037	20.3	14.4	29.4
1993	19,989	8,249	11,740	21.1	14.5	30.7
1994	21,026	8,486	12,540	22.0	14.9	32.3
1995	20,306	7,785	12,521	21.1	13.5	32.4
1996	21,176	8,225	12,951	21.7	13.9	33.4
1997	21,233	8,269	12,964	21.5	13.9	33.1
Fetal loss						
1974	4,814	1,730	3,084	4.2	2.5	6.8
1975	4,717	1,765	2,952	4.1	2.5	6.4
1976	4,340	1,593	2,747	3.7	2.2	5.9
1977	4,140	1,496	2,644	3.5	2.1	5.6
1978	3,899	1,433	2,466	3.3	2.0	5.1
1979	3,611	1,325	2,286	3.0	1.9	4.7
1980	3,423	1,178	2,245	2.9	1.7	4.6
1981	3,298	1,151	2,147	2.8	1.7	4.4
1982	2,919	997	1,922	2.6	1.6	4.0
1983	2,725	915	1,810	2.5	1.5	3.8
1984	2,548	907	1,641	2.5	1.5	3.7
1985	2,446	869	1,577	2.5	1.5	3.8
1986	2,369	860	1,509	2.4	1.5	3.8
1987	2,386	886	1,500	2.5	1.6	3.9
1988	2,340	856	1,484	2.5	1.5	3.8
1989	2,505	936	1,569	2.6	1.7	3.9
1990	2,393	912	1,481	2.5	1.7	3.8
1991	2,351	939	1,412	2.5	1.7	3.7
1992	2,148	799	1,349	2.3	1.4	3.6
1993	1,986	762	1,224	2.1	1.3	3.2
1994	1,999	763	1,236	2.1	1.3	3.2
1995	1,674	641	1,033	1.7	1.1	2.7
1996	1,405	554	851	1.4	0.9	2.2
1997	1,205	496	709	1.2	0.8	1.8

Data sources: *References 5,6,7; Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*

Table B
Outcomes of teenage pregnancy, by age at end of pregnancy, Canada, provinces and territories, 1997

	Number			Per 1,000 women		
	15-19	15-17	18-19	15-19	15-17	18-19
Total pregnancies						
Canada	**42,162**[†]	**15,196**[‡]	**26,966**[§]	**42.7**	**25.5**	**68.9**
Newfoundland	713	258	455	32.7	19.7	52.4
Prince Edward Island	180	57	123	36.5	19.4	61.6
Nova Scotia	1,210	451	759	38.9	24.2	60.7
New Brunswick	884	303	581	34.6	19.8	56.5
Québec	8,757	2,790	5,967	36.1	19.2	61.5
Ontario	15,038	5,615	9,423	42.4	26.2	67.1
Manitoba	2,437	943	1,494	63.2	40.6	97.6
Saskatchewan	2,076	776	1,300	54.2	33.4	86.2
Alberta	5,101	1,837	3,264	51.5	30.3	84.7
British Columbia	5,346	1,974	3,372	42.1	25.8	67.2
Yukon	67	29	38	65.8	44.8	102.4
Northwest Territories	331	159	172	123.3	98.2	161.5
Live births						
Canada	**19,724**[†]	**6,431**[‡]	**13,293**[§]	**20.0**	**10.8**	**34.0**
Newfoundland	492	162	330	22.6	12.4	38.0
Prince Edward Island	143	42	101	29.0	14.3	50.6
Nova Scotia	738	251	487	23.7	13.5	39.0
New Brunswick	649	217	432	25.4	14.2	42.0
Québec	3,745	1,018	2,727	15.5	7.0	28.1
Ontario	6,067	2,005	4,062	17.1	9.4	28.9
Manitoba	1,398	508	890	36.3	21.9	58.1
Saskatchewan	1,429	530	899	37.3	22.8	59.6
Alberta	2,561	838	1,723	25.8	13.8	44.7
British Columbia	2,206	730	1,476	17.4	9.5	29.4
Yukon	32	12	20	31.4	18.5	53.9
Northwest Territories	242	114	128	90.2	70.4	120.2

	Number			Per 1,000 women		
	15-19	15-17	18-19	15-19	15-17	18-19
Abortions						
Canada	**21,233**	**8,269**	**12,964**	**21.5**	**13.9**	**33.1**
Newfoundland	174	79	95	8.0	6.0	10.9
Prince Edward Island	30	12	18	6.1	4.1	9.0
Nova Scotia	450	187	263	14.5	10.0	21.0
New Brunswick	195	73	122	7.6	4.8	11.9
Québec	4,830	1,702	3,128	19.9	11.7	32.3
Ontario	8,683	3,495	5,188	24.5	16.3	36.9
Manitoba	908	368	540	23.6	15.8	35.3
Saskatchewan	558	202	356	14.6	8.7	23.6
Alberta	2,303	911	1,392	23.2	15.1	36.1
British Columbia	2,994	1,184	1,810	23.6	15.5	36.1
Yukon	x	x	x	32.4	24.7	45.8
Northwest Territories	x	x	x	27.9	24.7	32.9
Fetal loss						
Canada	**1,205**	**496**	**709**	**1.2**	**0.8**	**1.8**
Newfoundland	47	17	30	2.2	1.3	3.5
Prince Edward Island	7	3	4	1.4	1.0	2.0
Nova Scotia	22	13	9	0.7	0.7	0.7
New Brunswick	40	13	27	1.6	0.9	2.6
Québec	182	70	112	0.8	0.5	1.2
Ontario	288	115	173	0.8	0.5	1.2
Manitoba	131	67	64	3.4	2.9	4.2
Saskatchewan	89	44	45	2.3	1.9	3.0
Alberta	237	88	149	2.4	1.5	3.9
British Columbia	146	60	86	1.2	0.8	1.7
Yukon	x	x	x	2.0	1.5	2.7
Northwest Territories	x	x	x	5.2	3.1	8.5

Data sources: *References 5,6,7; Health Statistics Division; Canadian Vital Statistics Data Base; Canadian Institute for Health Information*
† Includes 22 live births with unknown province of residence.
‡ Includes 4 live births with unknown province of residence.
§ Includes 18 live births with unknown province of residence.
x Confidential to meet requirements of the Statistics Act.

Table C

Percentage distribution of outcomes of teenage pregnancy, by age at end of pregnancy, Canada, provinces and territories, 1997

	Total 15-19	15-17	18-19
Canada			
Number	42,162[†]	15,196[‡]	26,966[§]
% distribution	100.0	100.0	100.0
Live birth	46.8	42.3	49.3
Abortion	50.4	54.4	48.1
Fetal loss	2.9	3.3	2.6
Newfoundland			
Number	713	258	455
% distribution	100.0	100.0	100.0
Live birth	69.0	62.8	72.5
Abortion	24.4	30.6	20.9
Fetal loss	6.6	6.6	6.6
Prince Edward Island			
Number	180	57	123
% distribution	100.0	100.0	100.0
Live birth	79.4	73.7	82.1
Abortion	16.7	21.1	14.6
Fetal loss	3.9	5.3	3.3
Nova Scotia			
Number	1,210	451	759
% distribution	100.0	100.0	100.0
Live birth	61.0	55.7	64.2
Abortion	37.2	41.5	34.7
Fetal loss	1.8	2.9	1.2
New Brunswick			
Number	884	303	581
% distribution	100.0	100.0	100.0
Live birth	73.4	71.6	74.4
Abortion	22.1	24.1	21.0
Fetal loss	4.5	4.3	4.6
Québec			
Number	8,757	2,790	5,967
% distribution	100.0	100.0	100.0
Live birth	42.8	36.5	45.7
Abortion	55.2	61.0	52.4
Fetal loss	2.1	2.5	1.9
Ontario			
Number	15,038	5,615	9,423
% distribution	100.0	100.0	100.0
Live birth	40.3	35.7	43.1
Abortion	57.7	62.2	55.1
Fetal loss	1.9	2.0	1.8
Manitoba			
Number	2,437	943	1,494
% distribution	100.0	100.0	100.0
Live birth	57.4	53.9	59.6
Abortion	37.3	39.0	36.1
Fetal loss	5.4	7.1	4.3
Saskatchewan			
Number	2,076	776	1,300
% distribution	100.0	100.0	100.0
Live birth	68.8	68.3	69.2
Abortion	26.9	26.0	27.4
Fetal loss	4.3	5.7	3.5
Alberta			
Number	5,101	1,837	3,264
% distribution	100.0	100.0	100.0
Live birth	50.2	45.6	52.8
Abortion	45.1	49.6	42.6
Fetal loss	4.6	4.8	4.6
British Columbia			
Number	5,346	1,974	3,372
% distribution	100.0	100.0	100.0
Live birth	41.3	37.0	43.8
Abortion	56.0	60.0	53.7
Fetal loss	2.7	3.0	2.6
Yukon			
Number	67	29	38
% distribution	100.0	100.0	100.0
Live birth	47.8	41.4	52.6
Abortion	x	x	x
Fetal loss	x	x	x
Northwest Territories			
Number	331	159	172
% distribution	100.0	100.0	100.0
Live birth	73.1	71.7	74.4
Abortion	x	x	x
Fetal loss	x	x	x

Data sources: *Health Statistics Division, Canadian Vital Statistics Data Base, Canadian Institute for Health Information*

† Includes 22 live births with unknown province of residence.

‡ Includes 4 live births with unknown province of residence.

§ Includes 18 live births with unknown province of residence.

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Proxy reporting in the National Population Health Survey

Margot Shields

Abstract

Objectives

This article examines the extent of proxy reporting in the National Population Health Survey (NPHS). It also explores associations between proxy reporting status and the prevalence of selected health problems, and investigates the relationship between changes in proxy reporting status and two-year incidence of health problems.

Data source

Cross-sectional results are based on the 1996/97 NPHS Health file and General file. Longitudinal results are based on 1994/95 respondents who were still residing in households in 1996/97.

Analytical techniques

The extent of proxy reporting in the various NPHS files was computed. Prevalence estimates of selected health problems from the two 1996/97 cross-sectional files were compared. Multivariate analyses were used to estimate associations between proxy reporting status and health problems.

Main results

For several health conditions, prevalence estimates based on the 1996/97 cross-sectional Health file (where proxy reporting was less common) were significantly higher than estimates derived from the General file. Individuals whose data were proxy-reported in 1994/95 and self-reported in 1996/97 had higher odds of reporting new cases of certain health conditions.

Key words

chronic conditions, activity limitation, health surveys

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Proxy reporting often poses a dilemma to survey designers. While it is generally believed that information will be more accurate if it is provided directly by the individuals selected for the survey sample, there are often compelling reasons for accepting information provided on their behalf by others (proxy responses). One major reason for doing so is to reduce non-response rates; another is to reduce the costs of data collection.

Although previous research has not produced conclusive evidence,[1] several studies have suggested the possibility of a "proxy effect" for data collected in health surveys.[2-13] That is, individuals providing information on behalf of others may be less likely to report health events than people who give their own information directly. Lower estimates of hospitalization, chronic conditions, activity limitations, emotional problems, and pain have been attributed to proxy reporting.[2-13] For conditions based on a relatively short reference period (two weeks, for example), including acute illness, disability, and dental and doctor visits, findings have been contradictory. Some studies have found that self-respondents are more likely than proxy reporters to report events of this nature,[4,7,8,10,11] while others have not.[6,14,15] And some comparisons of survey data with medical files and physician reports suggest that even self-respondents may under-report health events.[2,12,13,16,17]

When the National Population Health Survey (NPHS) was designed in the early 1990s, the issue of proxy response was debated extensively. For several reasons, it was decided that the NPHS—like many other surveys—would accept proxy reporting. However, for certain components of the survey, proxy responses are strongly discouraged.

This article evaluates the extent of proxy reporting in the 1996/97 NPHS cross-sectional files. (See *Data source*, *Analytical techniques* and *Limitations*.) The characteristics of individuals with proxy response status (that is, those whose survey information was provided by another household member) are presented. The relationship between proxy reporting and the prevalence of various health conditions is examined to determine if there is a proxy effect. The relationship between new cases

Data source

The National Population Health Survey (NPHS), which began in 1994/95, collects information about the health of the Canadian population every two years. It covers household and institutional residents in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas. The NPHS is both longitudinal and cross-sectional. Longitudinal panel members will be followed for up to 20 years.

The analysis in this article is based on cross-sectional household data from the second cycle (1996/97) of the NPHS and longitudinal data for the first (1994/95) and second cycles (both for the 10 provinces). The 1996/97 cross-sectional sample is made up of longitudinal respondents and respondents who were selected as part of supplemental samples, or buy-ins, in three provinces. The additional respondents for these buy-ins were chosen using the random digit dialling technique and were included for cross-sectional purposes only.

The general component of the questionnaire was used to collect socio-demographic and some health information for each member of participating households. These data are found in the General file. The health component of the questionnaire was used to collect additional in-depth health information for one randomly selected household member. This additional information, as well as the information collected in the general component pertaining to that person, is found in the Health file.

The 1994/95 provincial, non-institutional sample consisted of 27,263 households, 88.7% of which agreed to participate. After the application of a screening rule (to ensure a more representative sample), 20,725 households remained in scope. In 18,342 of these households, the randomly selected person was aged 12 or older. Their response rate to the in-depth health component was 96.1% or 17,626 respondents. Of these 17,626 randomly selected respondents, 14,786 were eligible members of the NPHS longitudinal panel. In addition, 468 selected respondents for whom only general information had been collected in 1994/95 and 2,022 randomly selected respondents younger than 12 were also eligible. Thus, a total of 17,276 longitudinal panel members were eligible for re-interview in 1996/97. The remaining respondents to the 1994/95 survey were sponsored by the provincial governments that elected to enlarge the sample size in their province for cycle 1 only. These respondents were not followed up.

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

The one-time participation of additional respondents in cycle 2 for cross-sectional purposes yielded a total of 210,377 respondents to the general component (173,216 aged 12 or older) and 81,804 respondents to the health component (73,402 aged 12 or older). The overall response rate to the health component was 79.0%.

The data were weighted taking into account the sample design, adjustments for non-response, and post-stratification. The cross-sectional analysis is based on data from both the General and Health files for individuals aged 12 or older, weighted to represent about 24.6 million Canadians in the 10 provinces. The longitudinal analysis is based on individuals who were 12 or older in 1994/95, who were still living in a household in 1996/97 (that is, non-institutionalized) and for whom complete data (from the general and health components) were provided in both cycles. This sample of 13,427 was weighted to represent about 23.5 million Canadians.

More detailed descriptions of the NPHS design, sample and interview procedures can be found in published reports.[18-20]

(incidence) of selected health conditions and changes in proxy reporting status between cycles is also investigated, based on longitudinal data from the first two cycles of the NPHS (1994/95 and 1996/97).

Proxy versus self-response

Proxy reporting (see *Definitions*) is one of several methodological factors that may affect the accuracy of survey results—especially for health surveys, which often ask very personal questions. For a number of reasons,[8,12] data reported by proxy may be inaccurate:

- The reporter may not be fully aware of the health situation of another household member.

For proxy reporters to answer accurately, they must be fully aware of the health situation of the person for whom they are replying. Sometimes, individuals may deliberately conceal health problems or behaviours. For example, a husband may not tell his wife that he has been diagnosed with an ulcer, or a teenager may not want her parents to know that she smokes. Or a proxy reporter may not be aware of certain health information. For instance, the reporter may not know about all physician consultations another household member has had over the past 12 months.

- The reporter may not recall relevant health information.

The ability to recall information depends on its importance to the individual reporting it. Health conditions that are more serious, painful, persistent or potentially life-threatening are, in general, reported more often and more accurately.[2,4,8,17] Clearly, a condition is likely to be more immediate and important to the individual affected than to another household member. However, those other household members would be more likely to be aware of conditions such as diabetes or heart disease, because they are often reminded of them (for instance, they see the family member taking medication) and because such conditions may seriously affect the family member's health. Conditions such as allergies—to penicillin, for example—may be more easily forgotten by proxy reporters.

- The reporter may mislabel health problems.

Whether provided by proxy or by the individual affected, information tends to be more accurate if it pertains to conditions that are easily defined and labelled (diabetes and heart disease, for example), versus conditions that are more difficult to describe (such as recurring back trouble or chronic skin diseases).[13] For conditions in the latter category, information reported by proxy tends to be less accurate than self-reports.[13] And conditions that are not directly observable—pain or emotional distress, for example—are generally less adequately measured by proxy.[5]

- The reporter may deliberately not report certain information.

Conditions that are perceived to be very personal or potentially embarrassing tend to be under-reported. For example, several studies comparing survey responses with medical records have found that mental illness is under-reported.[16,17] In such cases, both self- and proxy reports may be subject to under-reporting.

Why accept proxy responses?

Given the problems that attend proxy data, it might seem that such responses should be avoided. However, there are several compelling reasons for accepting information provided by proxy.

The NPHS collects certain health information for all members of a household so that intra-household relationships of health characteristics can be investigated.[18] But contacting and interviewing each member of every sampled household is time-consuming and expensive, and often requires several follow-up calls. To save time and money, the NPHS, like many other health surveys, allows one knowledgeable household member—a proxy reporter—to answer questions on behalf of all people in the household.

The nature of the information to be collected is an important consideration in deciding whether to accept proxy responses. It is generally believed that opinions, attitudes, and questions of a subjective nature are best answered directly by the individual selected for the survey, while questions that solicit factual information about specific health conditions may be answered by proxy reporters.

Proxy information is also accepted because some people may be difficult to contact. If proxy responses are not accepted for such individuals, a survey risks a higher non-response rate. Furthermore, the characteristics of these "hard-to-contact" individuals are often very different from those of the general population, thereby also introducing the possibility of inaccurate estimates.

Finally, some individuals selected for the survey may be unable to provide their own information. Thus, many health surveys accept proxy information about individuals who cannot respond because of a physical or mental condition. And parents usually respond on behalf of their children.

NPHS proxy response rules

The NPHS questionnaire has two major sections: the general and health components. Socio-demographic and some health information is collected for each member of participating households using the general component. The health component is used to collect additional in-depth health information for one randomly selected household member.

The proxy response rules differ for the general and health components of the questionnaire (see *Definitions*). For the general component, where the information sought is, for the most part, objective and factual, interviewers are instructed to obtain the information about each person in the household from one knowledgeable member. The *Interviewer's Manual* suggests that, in many cases, this person "should be the mother, since she knows more about health status and utilization of health services in the family."

Analytical techniques

All analyses are based on weighted data. The percentages of individuals with proxy reporting status are presented for the population aged 12 or older, by sex, for both the cross-sectional files (General and Health) and the longitudinal file.

Multiple logistic regression was used to explore the relationship between proxy reporting status and various health outcomes. Based on NPHS respondent selection rules and a review of the literature on proxy reporting, several socio-demographic factors that are considered to be related to proxy reporting status were included in the models as control variables: sex, age group, presence of other adults in the household, marital status, education, employment status, income and self-reported health. With data from the cross-sectional Health file, multiple logistic regression was used to model the relationship between proxy reporting status in the general component and the reported prevalence of various health conditions. A separate model was fitted for each health condition considered.

Since the sex distribution of the proxy reporters differed by the sex of the individual for whom they reported, the regression models were recalculated, this time taking the sex of the proxy reporter into consideration. Three categories were considered for proxy reporting status: self-response, female proxy reporter, and male proxy reporter. The third category was used as the reference.

To explore the possibility of a proxy effect in incidence estimates of health conditions (new cases of a health condition in the two years between survey cycles), multiple logistic regression models were used to relate the incidence of a selected number of new health problems to changes in proxy reporting status. A separate model was fitted for each new health problem considered. In this case, proxy reporting status across survey cycles was defined as follows: proxy response in 1994/95 and 1996/97; proxy response in 1994/95 to self-response in 1996/97; self-response in 1994/95 to proxy response in 1996/97; and self-response in 1994/95 and 1996/97. The control variables entered into the models included the ones used in the cross-sectional analyses, as well as other variables to reflect changes between the two years. (See Appendix Table G for a complete list of the variables included in the longitudinal models.)

Because the two-year incidence rates for many health conditions were relatively low, sample sizes were often too small to ensure reliable results in the regression models. Only conditions for which there were at least 30 new cases for each of the four patterns of proxy reporting status were considered: other allergies, arthritis, back problems (excluding arthritis), activity restriction and long-term disability or handicap.

For all analyses, the bootstrap procedure was used to estimate sampling error in the estimation of coefficients of variation, in tests of significance on differences between rates, and in the calculation of confidence intervals for odds ratios.[21-23] This procedure yields an unbiased estimate of variance. Bonferroni tests of significance of differences between rates were used to take multiple comparisons into account. Critical values were adjusted in testing, according to the number of comparisons being made.

The health component is completed for one randomly selected household member, and the importance of having that individual provide information directly (non-proxy) is stressed in the *Interviewer's Manual* and during training. The detailed—and often very personal—nature of the information sought makes it essential that questions be answered directly by the selected individual. However, if that person is younger than 12, the information is collected from a parent. Proxy response is also accepted if the selected person is unable to answer because of special circumstances (for example, disability). Questions that are highly subjective and personal (mental health and social support, for example) are left unanswered if the only alternative would be to accept information from a proxy reporter. (See *Proxy reporting for the health component.*)

These rules were used for the first two cycles of the NPHS (1994/95 and 1996/97). In cycle 3 (1998/99), a slight modification was introduced for the general component of the questionnaire. Since randomly selected respondents are followed over time to produce the longitudinal file and the main purpose of the longitudinal file is to measure change, there was some concern that changes in proxy reporting status across cycles might distort measures of change. Therefore, for cycle 3, interviewers were instructed to collect information directly from the longitudinal panel member (non-proxy) for the entire questionnaire (the general and health components). That is, the rules previously used for the health component would also apply to the general component for longitudinal respondents. For the general component, however, proxy response could still be accepted to avoid non-response. The original rules (relying on a knowledgeable source for information pertaining to all household members and discouraging proxy reporting on behalf of the randomly selected member for the health component) still apply to households and individuals selected for the top-up sample (those added solely to maintain representative cross-sectional files).

Limitations

This analysis compares estimates of reported health problems between self- and proxy responses in a multivariate model, controlling for other socio-demographic confounders possibly related to an individual's proxy response status. Although every effort was made to consider all relevant variables, the results could be misleading if other variables related to morbidity and proxy reporting status were inadvertently excluded, or are not available from the National Population Health Survey (NPHS).

Other methods could have been used to assess the potential of a proxy effect on estimates of health conditions based on NPHS data. One would be to match the information with medical records and look for differences between self- and proxy-reported information. However, such a comparison would not only be complicated and expensive, but would also require assumptions about the completeness and accuracy of, and the success of matching, the medical records. A second possibility would be to conduct a controlled experiment in which data would be collected twice for some individuals: once from a knowledgeable household member and again directly from the individual. This would allow a comparison of proxy and self-reports. It would be necessary to ensure that each reporter was unaware of the other's responses. Again, this approach would be complicated and expensive, and would place a heavier burden on participating households.

It is assumed that the differences in the reporting of health problems between self- and proxy responses are caused by under-reporting by proxy reporters. While research based on comparisons with medical records has shown that under-reporting is more common for proxy reports,[2,12,13] it is possible that, in some cases, the problem may be over-reporting by self-respondents. For example, the criteria for chronic conditions to be reported in the NPHS are: "long-term conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional." Although reporters are reminded of this by interviewers, some individuals may report conditions that do not fully meet the criteria. For instance, a person who has been suffering from back pain for several months may report a back problem even if it has not been diagnosed by a health professional. If this is more likely to happen for self-responses, the effect would be over-reporting of morbidity.

Definitions

In the National Population Health Survey (NPHS), *proxy responses* are those obtained for a particular household member from another knowledgeable member of the household (the proxy reporter); for example, a parent may provide answers for a child, or a wife may respond on behalf of her husband.

Self-responses are those obtained directly from the individuals selected for the survey.

The *general component* of the NPHS contains questions on demographic and socioeconomic characteristics, as well as limited health information such as two-week disability, health care utilization, restriction of activities, and chronic conditions. This information is obtained for each person in the household from a knowledgeable household member.

The *health component* contains detailed questions on topics such as general self-perceived health, health status, medication use, smoking, alcohol consumption, mental health, social support, blood pressure check, height and weight, physical activity, and injuries. Given the detailed nature of the information requested, the randomly selected individual in the household usually answers on his or her own behalf (self- or non-proxy response).

To measure *chronic conditions*, individuals were asked about any "long-term conditions that have lasted or are expected to last six months or longer and that have been diagnosed by a health professional." Interviewers read a list of conditions and then asked about "any other long-term condition that has been diagnosed by a health professional" (such as cystic fibrosis or multiple sclerosis).

Two *other health conditions* were included in this analysis. Activity restriction due to a long-term physical or mental health problem is measured by a derived variable based on a positive response to any of the following questions, which were asked about every person in the household: "Because of a long-term physical or mental condition or a health problem, are you limited in the kind or amount of activity you can do: at home? at school? at work? in other activities?" Long-term disability or handicap was determined by asking, "Do you have any long-term disabilities or handicaps?"

Five *age groups* were defined for this analysis: 12 to 17, 18 to 24, 25 to 44, 45 to 64, and 65 or older.

Individuals were asked for their current *marital status*. Those who chose "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."

A derived variable, based on the ages of household members, was used to establish the presence of *other adult(s) aged 18 or older in household*.

Education was grouped into three categories, based on the highest level attained: high school graduation or less, some postsecondary, and postsecondary (college, trade school or university) graduation.

Individuals who were currently working at a job or business were considered to be *employed*.

Household income group was defined based on the number of people in the household and total household income from all sources in the 12 months before the 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

Self-perceived health was assessed with the question, "In general, would you say your health is: excellent? very good? good? fair? poor?" In the longitudinal analyses, an individual was classified as having improved general health if the 1996/97 rating was better than that given in 1994/95 (for example, an individual reported fair health in 1994/95, then good health in 1996/97). Likewise, an individual was classified as having had a decline in health if the 1996/97 rating was worse than that reported in 1994/95.

Cross-sectional files

The information collected using the general and health components forms two cross-sectional data files, named the General file and the Health file. The General file comprises the data collected using the general component of the questionnaire. This file contains separate records for *all* members of participating households, based on the socio-demographic and basic health information provided for everyone by one knowledgeable household member. The Health file contains *one* record per household with more in-depth health information about the randomly selected household member, along with the information collected about that person in the general component.

Because the proxy response rules differ for the two survey components, some records on the Health file can show a "mixed" proxy status. For example, in a household comprising a married couple and one child, the mother could be identified as the "knowledgeable household member," completing the general component for herself, her spouse and her child. The husband could be randomly selected to complete the health component, providing his own information. His record on the Health file would therefore have proxy responses for the general component and self-responses for the health component.

Comparison of cross-sectional files

The General and Health files can each be used to produce estimates for any items included in the general component of the questionnaire. The sample sizes, however, differ. Estimates produced using data from the General file have the advantage of a larger sample size, since they are based on information pertaining to all members of selected households. By contrast, Health file estimates are based on one randomly selected person per household.

The proxy reporting rates for the two files are quite different. For the General file, 42% of responses for the population aged 12 or older were completed by proxy. In contrast, the proxy reporting rate for the general component of the Health file was 28% (Table 1).

Table 1

Percentage of proxy responses to general component, General and Health files, 1996/97 National Population Health Survey, by sex and age, household population aged 12 or older, Canada excluding territories

	Proxy responses, general component			
	General file		**Health file**	
	'000	**%**	**'000**	**%**
Total	**24,595**	**42.2**	**24,595**	**27.5**
Sex				
Male	12,099	53.9†	12,099	36.5†
Female	12,495	31.0	12,495	18.7
Age group				
12-17	2,445	81.6‡	2,435	61.7‡
18-24	2,689	51.4‡	2,699	29.6‡
25-44	9,709	36.3	9,709	22.4
45-64	6,335	39.1§	6,335	25.2§
65+	3,416	29.6††	3,416	19.9††

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

Notes: *Bonferroni significance tests were used to adjust for multiple comparisons. Estimates on the General and Health files are post-stratified to agree with census projections by sex and age group. Since the age groups used in this analysis are not identical to those used in the post-stratification, the population estimates from the two files differ slightly in some cases (12-17 and 18-24 age groups). See Appendix Table A for unweighted sample counts.*

† Significantly higher than females ($p \leq 0.05$)

‡ Significantly higher than each older age group ($p \leq 0.05$)

§ Significantly higher than 45-64 age group ($p \leq 0.05$)

†† Significantly lower than each younger age group ($p \leq 0.05$)

Patterns by sex and age group in the two files were similar, however. Information for males was more likely than that for females to have been reported by proxy. Among age groups, responses for 12- to 17-year-olds were most likely to have been reported by proxy; those for people aged 65 or older, least likely. This is not surprising, given the proxy reporting rule requiring interviewers to ask one knowledgeable household member to provide information about all household members for the general component of the questionnaire. For children aged 12 to 17, this individual would likely be a parent. The relatively low proxy reporting rate for people aged 65 or older may reflect the fact that seniors are more likely than younger people to live alone. In such cases, no one else would be available in the household to provide a proxy response.

Because each file is weighted separately to represent the same total Canadian population by sex and age group, estimates of health characteristics derived from either one should be very close. But, if it is true that individuals responding on their own behalf are more likely to report health events, estimates based on the Health file may be higher (and probably more accurate), since it has a lower proxy reporting rate.

Health file yields higher estimates

A comparison of prevalence estimates of various health outcomes reveals that the Health file does yield significantly higher estimates than the General file for many conditions: food allergies, other allergies, asthma, arthritis or rheumatism, back problems (excluding arthritis), high blood pressure, migraine, sinusitis, thyroid disorder, activity restriction, and long-term disability or handicap (Table 2). For sinusitis and thyroid disorder, the prevalence estimates for females, but not for males, are greater in the Health file than in the General file.

Table 2

Prevalence estimates of chronic and other health conditions, general component, General and Health files, 1996/97 National Population Health Survey, by sex, household population aged 12 or older, Canada excluding territories

	Both sexes		Males		Females	
	General file	Health file	General file	Health file	General file	Health file
	%		%		%	
Chronic conditions						
Food allergies	6.3	6.8*	4.7	5.0	7.9	8.5
Other allergies	20.0	22.4****	16.5	18.6****	23.4	26.0****
Asthma	6.8	7.2*	5.7	6.0	7.9	8.4
Arthritis or rheumatism	12.6	13.8****	8.8	9.7**	16.3	17.8***
Back problems (excluding arthritis)	12.8	14.2****	12.2	13.4**	13.4	15.0****
High blood pressure	9.6	10.1*	8.3	8.7	10.8	11.4*
Migraine	6.8	7.8****	3.5	4.3**	10.1	11.2**
Chronic bronchitis or emphysema	2.6	2.8	2.2	2.3	3.0	3.3
Sinusitis	4.2	4.6*	3.1	3.4	5.2	5.7*
Diabetes	3.2	3.2	3.4	3.5	3.1	2.9
Epilepsy	0.5	0.6	0.6	0.7	0.5	0.6†
Heart disease	3.9	3.9	4.1	4.0	3.7	3.7
Cancer	1.4	1.5	1.2	1.2	1.7	1.8
Stomach or intestinal ulcers	2.5	2.7	2.4	2.5	2.6	2.9
Effects of a stroke	0.8	0.9	0.8	1.0	0.8	0.8
Urinary incontinence	1.4	1.5	1.0	1.0	1.8	2.0
Bowel disorder	1.5	1.5	1.0	1.0	1.9	2.1
Alzheimer's disease/Other dementia‡	0.3	0.3	0.3	0.3	0.3	0.3
Cataracts‡	2.9	3.0	2.1	2.3	3.7	3.6
Glaucoma‡	1.2	1.2	1.0	1.1	1.4	1.4
Thyroid disorder	3.2	3.5*	1.0	1.2	5.3	5.8*
Other§	5.5	5.6	4.9	5.2	6.0	6.0
At least one chronic condition	54.1	57.7****	49.1	52.8****	59.0	62.4****
Other health conditions						
Activity restriction due to long-term physical or mental health problem	11.9	13.0***	10.7	11.8**	12.9	14.1**
Long-term disability or handicap	10.7	11.6**	10.4	11.1*	10.9	12.1**

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

Notes: *Prevalence estimates were calculated excluding missing values. The percentage of missing values was less than one-quarter of a percentage point for each condition. Unweighted sample counts of the number of records with a report of each health condition (by proxy response status) for the General and Health files appear in Appendix Table B. A one-tailed significance test was used in comparing the prevalence estimates; based on the literature, it was hypothesized that the General file would yield lower prevalence estimates because it has a higher proxy reporting rate.*

† Coefficient of variation between 16.6% and 25.0%

‡ Only asked for population aged 18 or older

§ Any other long-term chronic condition; for example, cystic fibrosis or multiple sclerosis

** Significantly higher than General file estimate ($p \le 0.05$)*

*** Significantly higher than General file estimate ($p \le 0.01$)*

**** Significantly higher than General file estimate ($p \le 0.001$)*

***** Significantly higher than General file estimate ($p \le 0.0001$)*

In keeping with earlier research,[2,4,8,13] estimates were closer for conditions that proxy reporters would be more likely to notice and less likely to mislabel: diabetes, epilepsy, heart disease and cancer, for example.

This comparison of estimates from the general component of the General and Health files suggests the possibility of a proxy effect, resulting in underestimates of certain health conditions. Because the General file has a higher proxy reporting rate, estimates based on the file would tend to be more subject to this proxy effect. Nonetheless, the effect on the Health file itself (for which the proxy reporting rate was 28%) may not be negligible.

Characteristics of individuals with proxy response status

In exploring the association between health variables and proxy reporting, it must be kept in mind that proxy response to the NPHS general component is by no means random. Interviewers were given precise instructions about who could report for others. The population deemed to be "knowledgeable household members" did, for the most part, report their own information, while others in the household had their information provided by this proxy reporter. To understand if proxy responses affect the measurement of health outcomes, the characteristics of people for whom information is provided by proxy must be taken into account.

A multiple logistic regression model was set up using proxy response ("yes" or "no") as the dependent variable. The model is based on proxy response to the general component of the Health file because this file is used most often in analytical studies.

Proxy reporting was related to sex and age (Table 3). Males had significantly higher odds of having proxy responses provided for them than did females. And younger people (12 to 17 and 18 to 24) of both sexes had higher odds of having their information provided by proxy, compared with individuals aged 25 to 44. Although seniors (65 or older) have a lower proxy rate than any younger age group (Table 1), the odds of proxy response were

Table 3

Adjusted odds ratios relating selected characteristics to proxy response in general component, Health file, 1996/97 National Population Health Survey, household population aged 12 or older, Canada excluding territories

	Proxy response†	
	Adjusted odds ratio	95% confidence interval
Sex		
Males	2.5****	2.3, 2.7
Females‡	1.0	...
Age group		
12-17	4.3****	3.6, 5.2
18-24	1.4****	1.2, 1.6
25-44‡	1.0	...
45-64	1.1	1.0, 1.2
65+	1.0	0.9, 1.2
Marital status		
Married	1.1	1.0, 1.4
Never married	1.2	0.9, 1.4
Previously married‡	1.0	...
Other adult(s) aged 18 or older in household§	115.7****	85.5, 156.6
Education		
High school graduation or less	1.3****	1.2, 1.5
Some postsecondary	1.0	0.9, 1.1
Postsecondary (college, trade or university) graduation‡	1.0	...
Employed§	1.1*	1.0, 1.2
Household income		
Lowest/Lower-middle‡	1.0	...
Middle	1.1	1.0, 1.3
Upper-middle	1.1	1.0, 1.3
Highest	1.4***	1.1, 1.6
Self-perceived health††		
Excellent‡	1.0	...
Very good	1.1	1.0, 1.2
Good	1.1*	1.0, 1.3
Fair	1.3****	1.2, 1.5
Poor	1.8****	1.4, 2.2

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

Notes: *Based on 73,241 records, of which 20,451 were proxy responses to the general component; 161 records were removed from the analyses due to missing values. Missing categories for education, work status and income were included in the model to maximize sample size, but their respective odds ratios are not shown. Because of rounding, some confidence intervals with 1.0 as the lower limit were significant.*

† Reference category is self-response.

‡ Reference category, for which odds ratio is always 1.0

§ Reference category is absence of characteristic; for example, reference category for "Other adult(s) aged 18 or older in household" is "no other adult(s) aged 18 or older in household."

†† Collected as part of the health component where proxy reporting was very low (2.6%); used to predict proxy response to the general component

** $p \leq 0.05$*

**** $p \leq 0.001$*

***** $p \leq 0.0001$*

... Not applicable

not significantly lower for this age group, compared with 25- to 44-year-olds. Older individuals are more likely to live alone; therefore, including marital status and the presence of other adult(s) aged 18 or older in the regression model renders the odds ratio for seniors not statistically different. If these variables are removed from the model, older individuals have decreased odds of proxy reporting (data not shown). Not surprisingly, the odds ratio for the presence of other adults was extremely high. If there are no other adults in the household, proxy reporting is rare, since no one is available to act as proxy reporter.

When all other variables were taken into account, proxy reporting was also associated with lower levels of education. However, NPHS selection procedures partially account for this association. The household members for whom information was proxy-reported (especially children, who were still in school) tended to have less education than the reporting person, resulting in the observed relationship.

The association between higher income and proxy reporting is not surprising, given that households with two or more adults were more likely to be in the highest or upper-middle income group, compared with households with only one adult (data not shown), where proxy reporting is less common.

Some research has suggested that individuals whose information is reported by proxy are in better health.[9] (That is, because they are in better health, they are more likely to be busy and away from home; therefore, someone else provides their information.) It was possible to control for this potentially confounding factor in this analysis by using the information on self-perceived health collected in the health component, where the proxy reporting rate was extremely low (2.6%). And counter to the conjecture made in the previous study,[9] NPHS data showed that individuals in poor, fair, or good health had higher odds of having their information (for the general component) reported by proxy, compared with those in excellent health.

"Proxy effect" and prevalence estimates

To investigate a potential proxy effect on estimates of various health conditions, a series of multiple

Table 4

Adjusted odds ratios relating chronic and other health conditions to reporting status in the general component, Health file, 1996/97 National Population Health Survey, population aged 12 or older, Canada excluding territories

	Self-response†	
	Adjusted odds ratio	95% confidence interval
Chronic conditions‡		
Food allergies	1.3***	1.1, 1.5
Other allergies	1.6****	1.4, 1.7
Asthma	1.3***	1.1, 1.6
Arthritis or rheumatism	1.9****	1.6, 2.1
Back problems (excluding arthritis)	1.5****	1.3, 1.6
High blood pressure	1.2**	1.1, 1.4
Migraine	1.4***	1.2, 1.7
Chronic bronchitis or emphysema	1.6***	1.2, 2.0
Sinusitis	1.5****	1.2, 1.8
Diabetes	1.1	0.9, 1.4
Epilepsy	1.6	0.9, 2.7
Heart disease	1.1	0.9, 1.4
Cancer	1.1	0.8, 1.5
Stomach or intestinal ulcers	1.8****	1.4, 2.3
Effects of stroke	0.8	0.6, 1.2
Urinary incontinence	1.4*	1.0, 1.8
Bowel disorder	1.5**	1.1, 1.9
Cataracts	1.3*	1.0, 1.7
Glaucoma	1.0	0.7, 1.4
Thyroid disorder	1.6****	1.3, 2.0
Other§	1.4***	1.1, 1.6
At least one chronic condition‡	1.6****	1.4, 1.7
Other health conditions		
Activity restriction due to long-term physical or mental health problem	1.3****	1.1, 1.4
Long-term disability or handicap	1.2**	1.1, 1.4

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

Notes: *Presents results of the 24 separate regression models based on 73,402 records on the Health file. Sample counts of the number of records for which each health condition was reported appear in Appendix Table B. In each case, a small percentage (< 0.5%) of records was dropped because of missing values. Each regression includes selected control variables, but only the odds ratios for proxy reporting status are presented. (See Appendix Table F for a complete list of independent variables.) Results for complete models are available on request. Because of rounding, some confidence intervals with 1.0 as the lower limit were significant.*

† Reference category is proxy response.

‡ Alzheimer's disease was not included, since the proxy reporting rate for this condition was very high.

§ Any other long-term chronic condition; for example, cystic fibrosis or multiple sclerosis

* $p \le 0.05$

** $p \le 0.01$

*** $p \le 0.001$

**** $p \le 0.0001$

logistic regression models, based on data from the Health file, was used. For each regression, the outcome was a specific health condition. When all variables thought to be related to an individual's proxy response status were controlled, self-reporting individuals had higher odds of reporting most of the health conditions studied (Table 4), compared with those whose information was provided by proxy. But, consistent with previous research,[2,4,8,13] no proxy effect was found for conditions perceived to be more serious, or those less likely to be mislabelled. In this analysis, no differences were found for diabetes, epilepsy, heart disease, cancer, effects of a stroke or glaucoma.

Who provides the information?

The characteristics of the people who provided information on behalf of others (proxy reporters) differed based on the age and sex of the individual for whom the information was being provided (Table 5). For both males and females aged 12 to 24, the proxy reporter was most often a parent (86% and 84%, respectively). And when the proxy reporter was a parent, it was usually the mother (78%) (data not shown).

Proxy reporters for individuals aged 25 or older were typically spouses. For men, 83% of proxy reporters were their wives; for women, 66% of proxy reporters were their husbands. Largely as a result of this, 93% of proxy reports for men were provided by women, and 79% of reports for women were provided by men. Reports from an "other relative" were more common for females (25%) than for males (10%).

Some studies have suggested that women may be more inclined than men to report health conditions, both for themselves and for others.[12,17,24,25] To explore this issue, all the regression models for the various health conditions were rerun, taking into account the sex of the proxy reporter. Thus, three categories were considered for proxy reporting status: self-response; proxy response, female proxy reporter; and proxy response, male proxy reporter. The third category was used as the reference.

Compared with individuals whose information was reported by men, those whose information was reported by women had increased odds of reporting the following conditions: food allergies, other allergies, back problems (excluding arthritis), high blood pressure, chronic bronchitis or emphysema, sinusitis, effects of a stroke, urinary incontinence, cataracts, activity restriction due to a long-term physical or mental health problem, long-term disability or handicap, and "at least one chronic

Table 5

Population with proxy response status in general component, by characteristics of proxy reporter, Health file, 1996/97 National Population Health Survey, household population aged 12 or older, Canada excluding territories

		Sex of proxy reporter		Proxy reporter's relationship to individual with proxy response			
	Total	Male	Female	Spouse	Parent	Other relative	Non-relative
	'000	%		%			
All individuals with proxy response	**6,757**	**27**	**73**	**52**	**33**	**13**	**2**
Sex and age							
Males 12-24 with proxy response	1,247	25	75	3†	86	9	2
Females 12-24 with proxy response	1,054	25	75	3	84	11	2
Males 25+ with proxy response	3,170	7	93‡‡	83‡‡	5	10	2
Females 25+ with proxy response	1,286	79‡	21	66	6	25‡	3‡

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

Note: *Unweighted sample counts appear in Appendix Table C.*

† Coefficient of variation between 16.6% and 25.0%

‡ Significantly higher than value for males aged 25+ ($p \le 0.05$)

‡‡ Significantly higher than value for females aged 25+ ($p \le 0.05$)

condition" (Table 6). Again, these associations were found when controlling for all of the variables believed to be related to an individual's proxy response status.

Research consistently finds higher morbidity rates for women compared with men.[26] While various factors have been suggested as potential explanations for these differences (for example, women are more likely to go to a doctor and are therefore more likely to be diagnosed), the higher rates for women may be partly an artifact of proxy reporting, since women are more likely than men to self-report, and self-reporters tend to report more health conditions.[1,8,26] But with NPHS data, it is difficult to assess whether the proxy effect would be more pronounced for males or for females. The proxy reporting rate for males was close to double that for females (37% compared with 19%; Table 1), suggesting that a proxy effect (of lowering estimates) would have more impact on the estimates for males. However, proxy reports for females tended to be provided by a male proxy reporter (Table 5), and male proxy reporters have decreased odds of reporting morbidity, which might yield lower estimates of morbidity for females.

Proxy reporting, longitudinal Health file

In some cases, proxy reporting status changed across cycles; for example, data were provided by proxy in one cycle, and in the other cycle, the longitudinal panel member provided his or her own information.

Close to three-quarters (73%) of females, but just 42% of males, in the longitudinal sample self-reported for the general component in both cycles (Table 7). As well, males were more likely than females to move from self- to proxy status (9% versus 4%) between 1994/95 and 1996/97, or to have their information reported by proxy in both cycles (18% compared with 5%).

The longitudinal file was used to explore the possibility of a proxy effect in incidence measures of selected health conditions. For this analysis, incidence is defined as a new case reported in the two years between NPHS cycles. (It should be noted that, in some cases, interviewer probing indicated that the condition may have existed before the first

Proxy reporting for the health component

Proxy reporting for the health component of the National Population Health Survey was strongly discouraged because of the detailed, subjective and personal nature of the information. Thus, the extent of proxy reporting for this component on the 1996/97 cross-sectional Health file was very low (2.6%). Unlike the general component, the percentage of proxy responses for the health component was highest for the oldest age groups: 7% for people aged 75 to 84 and 17% for those aged 85 or older. The elderly were more likely to have "special circumstances" due to a physical or mental health problem that made it impossible for them to answer on their own behalf. Proxy reporting was also high (9%) for children aged 12 to 14. Some parents objected to having their children interviewed. In such cases, interviewers did not press for an interview with the children and accepted a parent's proxy response.

Percentage of proxy responses to health component, 1996/97 National Population Health Survey, by sex and age, household population aged 12 or older, Canada excluding territories

	Population	Proxy response	Unweighted sample counts of records with proxy response
	'000	%	
Total	**24,595**	**2.6**	**1,707**
Sex			
Male	12,099	3.4†	1,094
Female	12,495	1.8	613
Age group			
12-14	1,151	8.8‡	139
15-17	1,284	2.6§	71
18-44	12,408	1.4	479
45-64	6,335	2.1	352
65-74	2,096	3.8††	279
75-84	1,060	7.2‡	263
85+	261	17.2‡‡	124

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

Note: *Because of rounding, detail may not add to totals. Bonferroni significance tests were used to adjust for multiple comparisons.*

† Significantly higher than percentage for female ($p \leq 0.05$)

‡ Significantly higher than each age group, 15-to-74 range ($p \leq 0.05$)

§ Coefficient of variation between 16.6% and 25.0%

†† Significantly higher than 18-44 and 45-64 age groups ($p \leq 0.05$)

‡‡ Significantly higher than each younger age group, 15-to-84 range ($p \leq 0.05$)

Table 6

Adjusted odds ratios relating chronic and other health conditions to proxy reporting status and sex of proxy reporter in general component, Health file, 1996/97 National Population Health Survey, population aged 12 or older, Canada excluding territories

	Proxy response, female proxy reporter†	
	Odds ratio	95% confidence interval
Chronic conditions‡		
Food allergies	1.5**	1.2, 1.9
Other allergies	1.5****	1.3, 1.8
Asthma	1.2	1.0, 1.6
Arthritis or rheumatism	1.2	0.9, 1.6
Back problems (excluding arthritis)	1.4***	1.1, 1.7
High blood pressure	1.4**	1.1, 1.7
Migraine	0.9	0.6, 1.3
Chronic bronchitis or emphysema	1.8*	1.1, 3.0
Sinusitis	1.7**	1.2, 2.6
Diabetes	1.1	0.8, 1.6
Epilepsy	0.5	0.2, 1.4
Heart disease	1.3	0.8, 2.1
Cancer	1.0	0.5, 1.9
Stomach or intestinal ulcers	1.2	0.8, 1.8
Effects of stroke	1.9*	1.1, 3.2
Urinary incontinence	1.7*	1.1, 2.6
Bowel disorder	1.1	0.7, 1.7
Cataracts	1.6*	1.1, 2.5
Glaucoma	0.9	0.5, 1.8
Thyroid disorder	1.5	0.9, 2.4
Other§	1.2	0.9, 1.6
At least one chronic condition‡	1.4****	1.2, 1.6
Other health conditions		
Activity restriction due to long-term physical or mental health problem	1.3**	1.1, 1.7
Long-term disability or handicap	1.3*	1.1, 1.7

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

Notes: *Presents results of the 24 separate regression models based on 73,402 records on the Health file. Sample counts of the number of records for which each condition was reported appear in Appendix Table B. In each case, a small percentage (< 0.5%) of records were dropped because of missing values. Each regression includes selected control variables, but only the odds ratios for proxy reporting status are presented. (See Appendix Table F for a complete list of independent variables.) Results for complete models are available on request.*

† Reference category is proxy response, male proxy reporter; self-respondents were included in the model, but their odds ratios are not shown.

‡ Alzheimer's disease was not included since the proxy reporting rate for this condition was very high.

§ Any other long-term chronic condition; for example, cystic fibrosis or multiple sclerosis

* $p \le 0.05$

** $p \le 0.01$

*** $p \le 0.001$

**** $p \le 0.0001$

cycle [see *Changes in reporting status and inconsistencies*]). Again, multiple logistic regression was used to examine the possible associations of a new report of a health condition and proxy reporting status, controlling for other variables related to proxy reporting status and changes in proxy reporting status (see Appendix Table G for the variables that were included in the models). For the three chronic conditions with sufficiently large sample size of new cases (other allergies, arthritis, non-arthritic back problems) and "at least one chronic condition," individuals who had their information reported by proxy in 1994/95 and then reported their own information in 1996/97 had higher odds of reporting a new case of the condition, compared with those who had proxy response status in both cycles (Table 8). For arthritis and back problems (excluding arthritis), those who self-reported in both cycles also had increased odds of reporting a new case between 1994/95 and 1996/97, compared with individuals whose information was reported by proxy in both cycles.

New reports of activity restriction and disability were not significantly related to changes in reporting

Table 7

Reporting status in general component, Health file, 1994/95 and 1996/97 National Population Health Survey, by sex, household population aged 12 or older, Canada excluding territories

	Total	Males	Females
		'000	
Total population†	**23,519**	**11,568**	**11,951**
		%	
Reporting status			
Proxy response 1994/95 and 1996/97	11.7	18.4‡	5.1
Proxy response 1994/95 to self-response 1996/97	24.2	31.1‡	17.6
Self-response 1994/95 to proxy response 1996/97	6.4	8.8‡	4.1
Self-response 1994/95 and 1996/97	57.7	41.8	73.2§

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

Notes: *Because of rounding, percentages may not add to 100%. Bonferroni significance tests were used to adjust for multiple comparisons. Unweighted sample counts appear in Appendix Table D.*

† Based on respondents aged 12 or older in 1994/95 who were still alive and living in households in 1996/97.

‡ Significantly higher than value for females ($p \le 0.05$)

§ Significantly higher than value for males ($p \le 0.05$)

Changes in reporting status and inconsistencies

Longitudinal surveys look at the same individuals repeatedly to identify changes in their characteristics over several years. However, if a change is reported for an individual at some point, it is important to know if a "true" change has taken place (a new diagnosis of arthritis, for example) or if an inconsistency has arisen because of a reporting error or some other methodological problem.

The individuals selected for the longitudinal sample of the National Population Health Survey (NPHS) will be interviewed every 2 years for up to 20 years, and inconsistencies—changes that are not "true" changes—may occur. In cycles 1 and 2 (1994/95 and 1996/97), questions about chronic conditions and activity limitations were asked in the general component, where proxy responses were permitted. This may have compounded any problems arising from inconsistent reports.

To help minimize inconsistencies, cycle 1 data were incorporated into the computer-assisted questionnaire for cycle 2. Thus, when a change was reported between cycles for conditions that typically do not change over a two-year period (asthma, arthritis, high blood pressure, migraine, diabetes, epilepsy, ulcers, the effects of a stroke, and activity limitation), interviewers were automatically prompted to ask the reporting individual if there had indeed been a change, to give the reasons for the change, and to verify relevant dates. For example, if a chronic condition was reported for a respondent in cycle 2, but had not been reported in cycle 1, a follow-up question was posed to verify the date of diagnosis. If this date preceded the cycle 1 interview, there was an additional probe to determine if the respondent actually had the condition before the cycle 1 interview. This was the most frequent type of inconsistency on the longitudinal file. A total of 916 such inconsistencies arose for the eight chronic conditions for which probing was conducted. One or more such inconsistencies were reported for 6.3% of the longitudinal panel members (846 individuals). Inconsistencies were most common for reports of arthritis, high blood pressure and migraine (data not shown). Not surprisingly, inconsistencies were more frequent when the reporting status was "proxy response 1994/95 to self-response 1996/97." But inconsistencies were also relatively frequent for the "self-response 1994/95 and 1996/97" group.

Probing was omitted if it would have compromised the confidentiality of an individual's medical history. If, for example, a particular chronic condition such as diabetes had been self-reported in 1994/95, but a proxy reporter did not report the same condition in 1996/97, interviewers did not probe.

Reports may be inconsistent for several reasons. The individual reporting the information may have deliberately not reported the condition in 1994/95, or the reporter may have misunderstood the question during one of the interviews (1994/95 or 1996/97). An inconsistency could also have been introduced by a proxy reporter who was unaware of the condition, or by an interviewer who made a recording error. As well, there may have been a recall error about the date of diagnosis.

A possible explanation for the elevated inconsistency rate for the "proxy response 1994/95 to self-response 1996/97" group may be the "proxy effect" discussed in this article. If proxy reporters are less likely to report health events, it would not be surprising if 1996/97 self-reporters indicated that certain conditions had existed in 1994/95, but had not been reported by proxy.

The elevated rate for the "self-response 1994/95 and 1996/97" group is more puzzling. Inconsistencies for this group may involve an inaccurately reported date of diagnosis. For example, in some cases, self-reporters may remember the date when the symptoms first appeared, as it seems more important to them than the date when the condition was formally diagnosed by a health professional.

Percentage of individuals by reporting status, for whom at least one inconsistency was detected in cycle 2,[†] general component, 1994/95 and 1996/97 National Population Health Survey, household population aged 12 or older, Canada excluding territories

Reporting status	Reports with at least one inconsistency[†]	Unweighted sample count
	%	
Total population	**6.3**	**846**
Proxy response 1994/95 and 1996/97	3.3[‡]	41
Proxy response 1994/95 to self-response 1996/97	7.5*	178
Self-response 1994/95 to proxy response 1996/97	2.8[‡]	29
Self-response 1994/95 and 1996/97	6.8*	598

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

Note: *Bonferroni significance tests were used to adjust for multiple comparisons.*

† Probing in 1996/97 revealed that a chronic condition had existed before cycle 1, but had not been reported in 1994/95.

‡ Coefficient of variation between 16.6% and 25.0%

**Significantly higher than value for "proxy response 1994/95 and 1996/97" and "self-response 1994/95 to proxy response 1996/97" ($p \leq 0.05$)*

Table 8

Adjusted odds ratios relating incident cases of selected health conditions to reporting status in general component between 1994/95 and 1996/97, Health file, National Population Health Survey, population aged 12 or older, Canada excluding territories

	Proxy response 1994/95 to self-response 1996/97†		Self-response 1994/95 to proxy response 1996/97†		Self-response 1994/95 and 1996/97†	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Chronic conditions						
Other allergies	2.0****	1.4, 2.7	0.9	0.6, 1.5	1.4	1.0, 1.9
Arthritis	2.6**	1.4, 4.6	1.2	0.6, 2.5	2.4**	1.4, 4.2
Back problems (excluding arthritis)	2.0***	1.4, 2.8	1.2	0.7, 2.1	1.7**	1.2, 2.4
At least one new chronic condition‡	2.0****	1.6, 2.5	1.0	0.8, 1.4	1.4**	1.1, 1.7
Other health conditions						
At least one new activity restriction due to long-term physical or mental health problem	1.3	0.9, 1.8	0.9	0.5, 1.4	1.0	0.7, 1.4
Long-term disability or handicap	1.5	1.0, 2.3	1.1	0.6, 2.0	1.3	0.9, 2.1

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

Notes: *Presents the results of 6 separate regression models based on 13,427 records on the longitudinal Health file. In each case, a small percentage of records (< 2%) were dropped because of missing values. Each regression includes selected control variables, but only the odds ratios for proxy reporting status are presented. Unweighted sample counts appear in Appendix Table E. (See Appendix Table G for a complete list of the independent variables.) Results for complete models are available on request.*

† Reference category is proxy response 1994/95 and 1996/97

‡ Includes food allergies, other allergies, asthma, arthritis, back problems (excluding arthritis), high blood pressure, migraine, chronic bronchitis or emphysema, sinusitis, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, urinary incontinence, cataracts and glaucoma.

* $p \le 0.05$

** $p \le 0.01$

*** $p \le 0.001$

**** $p \le 0.0001$

status. Perhaps new cases of such conditions have more immediate consequences for proxy reporters, who are therefore more likely to recall and report them.

Concluding remarks

This analysis of the first two cycles of the National Population Health Survey (1994/95 and 1996/97) indicates that accepting proxy responses for certain health conditions may have resulted in underestimates of prevalence rates. A comparison of estimates from the Health and General files reveals that the Health file yields significantly higher estimates for many conditions, suggesting a proxy effect. However, as expected, estimates were closer for conditions that proxy reporters would be more likely to notice and less likely to mislabel: diabetes, epilepsy, heart disease and cancer, for example. Results of a multivariate analysis of the Health file revealed that self-response was associated with the reporting of several health conditions when factors related to an individual's response status were controlled. On the longitudinal file, an association between new reports of certain conditions and changes in reporting status was also found.

Interviewers are now instructed to attempt completion of the general component directly with the longitudinal panel member to avoid proxy response. This should reduce the possibility that changes in reporting status across cycles will affect incidence estimates. ●

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Appendix

Table A

Unweighted sample counts of individuals aged 12 or older with proxy response to general component, by sex and age, General and Health files, 1996/97 National Population Health Survey

	General file		Health file	
	Total	**Proxy response**	**Total**	**Proxy response**
Total	**173,216**	**78,158**	**73,402**	**20,469**
Sex				
Male	84,409	48,118	34,265	13,199
Female	88,807	30,040	39,137	7,270
Age group				
12-17	19,836	16,537	5,120	3,541
18-24	19,955	10,747	7,000	2,185
25-44	66,401	25,549	28,900	7,319
45-64	44,762	18,310	19,019	4,981
65+	22,262	7,015	13,363	2,443

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

Table B

Unweighted sample counts of individuals aged 12 or older reporting chronic and other health conditions, by proxy response to the general component, General and Health files, 1996/97 National Population Health Survey

	General file		Health file	
	Total	**Proxy response**	**Total**	**Proxy response**
Total	**173,216**	**78,158**	**73,402**	**20,469**
Chronic conditions				
Food allergies	11,257	3,826	5,335	1,035
Other allergies	34,708	11,906	16,221	3,234
Asthma	12,347	5,129	5,467	1,354
Arthritis or rheumatism	23,332	6,101	13,063	2,005
Back problems (excluding arthritis)	24,327	7,892	12,097	2,474
High blood pressure	16,336	5,303	8,676	1,731
Migraine	12,442	3,725	5,804	1,059
Chronic bronchitis or emphysema	4,471	1,265	2,429	410
Sinusitis	7,521	1,977	3,788	593
Diabetes	5,380	2,013	2,706	623
Epilepsy	956	380	446	99
Heart disease	6,765	2,345	3,695	772
Cancer	2,563	850	1,359	289
Stomach or intestinal ulcers	4,348	1,371	2,245	422
Effects of stroke	1,533	612	868	231
Urinary incontinence	2,669	694	1,596	246
Bowel disorder	2,862	767	1,520	245
Alzheimer's disease/Other dementia†	494	300	245	128
Cataracts†	4,250	1,113	2,679	406
Glaucoma†	1,736	519	1,013	172
Thyroid disorder	5,422	1,249	2,852	356
Other‡	9,171	3,103	4,597	973
At least one chronic condition	94,550	35,261	44,535	10,121
Other health conditions				
Activity restriction due to long-term physical or mental health problem	21,192	7,217	10,982	2,313
Long-term disability or handicap	18,106	6,539	9,446	2,111

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

† Asked only for population aged 18 or older

‡ Any other long-term chronic condition; for example, cystic fibrosis or multiple sclerosis

Table C

Unweighted sample counts of individuals aged 12 or older with proxy response to general component, by characteristics of proxy reporter, Health file, 1996/97 National Population Health Survey

		Sex of proxy reporter			Proxy reporter's relationship to individual with proxy response				
	Total	Male	Female	Missing	Spouse	Parent	Other relative	Non-relative	Missing
All individuals with proxy response	**20,469**	**5,945**	**14,522**	**2**	**12,525**	**5,338**	**2,084**	**519**	**3**
Sex and age									
Males 12-24 with proxy response	3,035	759	2,276	0	181	2,490	264	100	0
Females 12-24 with proxy response	2,691	775	1,916	0	162	2,202	237	90	0
Males 25+ with proxy response	10,164	552	9,612	0	8,766	443	758	197	0
Females 25+ with proxy response	4,579	3,859	718	2	3,416	203	825	132	3

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

Table D

Unweighted sample counts of individuals aged 12 or older with proxy response to general component, by sex, longitudinal Health file, 1994/95 and 1996/97 National Population Health Survey

	Total	Males	Females
Total	**13,427**	**6,071**	**7,356**
Proxy response 1994/95 and 1996/97	1,314	1,036	278
Proxy response 1994/95 to self-response 1996/97	2,603	1,628	975
Self-response 1994/95 to proxy response 1996/97	768	527	241
Self-response 1994/95 and 1996/97	8,742	2,880	5,862

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

Table E

Unweighted sample counts of individuals aged 12 or older reporting new cases of selected health conditions between 1994/95 and 1996/97, by reporting status, general component, Health file, National Population Health Survey

	Total	Proxy response 1994/95 and 1996/97	Proxy response 1994/95 to self-response 1996/97	Self-response 1994/95 to proxy response 1996/97	Self-response 1994/95 and 1996/97
Total	**13,427**	**1,314**	**2,603**	**768**	**8,742**
Chronic conditions					
Other allergies	1,453	88	349	52	964
Arthritis	766	34	135	32	565
Back problems (excluding arthritis)	1,027	73	235	47	672
At least one chronic condition†	4,854	337	982	223	3,312
Other health conditions					
Activity limitation due to long-term physical or mental health problem	1,298	107	240	61	890
Long-term disability or handicap	786	54	155	43	534

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

† Includes food allergies, other allergies, asthma, arthritis or rheumatism, back problems (excluding arthritis), high blood pressure, migraine, chronic bronchitis or emphysema, sinusitis, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, urinary incontinence, cataracts and glaucoma.

Table F

Variables included in multiple logistic regression models relating selected health characteristics to reporting status in 1996/97

Reporting status
Self-respondent
Proxy respondent[†]

Sex
Male[‡]
Female

Age[§]

Other adult(s) aged 18 or older in household[††]

Marital status
Married[‡]
Never married
Previously married

Education
High school graduation or less
Some postsecondary
Postsecondary (college, trade or university) graduation[‡]

Employed[††]

Household income
Lowest/Lower-middle[‡]
Middle
Upper-middle
Highest

Self-perceived health
Excellent[‡]
Very good
Good
Fair
Poor

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

[†] In the first set of regression models (Table 4), proxy response was used as the reference category. In the second set (Table 6), this category was split into two: proxy response, female proxy reporter; proxy response, male proxy reporter. In this second set, proxy response, male proxy reporter was used as the reference category.

[‡] Reference category

[§] Age was entered into the regression models as a continuous variable.

[††] Reference category is absence of the characteristic; for example, the reference category for "other adult(s) aged 18 or older in household" is "no other adult(s) aged 18 or older in household."

Table G

Variables included in multiple logistic regression models relating new cases of selected health conditions to changes in reporting status between 1994/95 and 1996/97

Reporting status
Proxy respondent 1994/95 to self respondent 1996/97
Self respondent 1994/95 to proxy respondent 1996/97
Self respondent 1994/95 and 1996/97
Proxy respondent 1994/95 and 1996/97[†]

Sex
Male[†]
Female

Age in 1994/95[‡]

Other adult(s) aged 18 or older in household 1994/95[§]
Other adult(s) aged 18 or older in household 1994/95 to no other adult(s) aged 18 or older in household 1996/97[§]
No other adult(s) aged 18 or older in household in 1994/95 to other adult(s) aged 18 or older in household 1996/97[§]

Marital status 1994/95
Married[†]
Never married
Previously married

Not married 1994/95 to married 1996/97[§]
Married 1994/95 to not married 1996/97[§]

Education 1994/95
High school graduation or less
Some postsecondary
Postsecondary (college, trade or university) graduation[†]

Employed 1994/95[§]
Employed 1994/95 to not employed 1996/97[§]
Not employed 1994/95 to employed 1996/97[§]

Household income 1994/95
Lowest/Lower-middle[†]
Middle
Upper-middle
Highest

Self-perceived health 1994/95
Excellent[†]
Very good
Good
Fair
Poor

Improvement in self-perceived health between 1994/95 and 1996/97[§]
Decline in self-perceived health between 1994/95 and 1996/97[§]

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

[†] Reference category

[‡] Age was entered into the regression models as a continuous variable.

[§] Reference category is absence of the characteristic; for example, the reference category for "other adult(s) aged 18 or older in household" is "no other adult(s) aged 18 or older in household."

Chronic back problems among workers

Claudio E. Pérez

Abstract

Objectives

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

Data source

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

Analytical techniques

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

Main results

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

Key words

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

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

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

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

Methods

Data source

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

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

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

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

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

A more detailed description of the NPHS design, sample, and interview procedures can be found in published reports.[7,8]

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

Analytical techniques

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

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

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

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

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

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

Some research has focussed on only one industry or occupation,[2,10-18] or on one sex.[10,19] Other studies have restricted the age of participants[11,20] or recruited subjects from clinic populations.[20-23] Several reports have not controlled for the level of physical demand on the job.[4,24] And a substantial number of studies have used cross-sectional data.[10,12,13,22,25-27] Because the sequence of events in these studies is unknown, the nature of associations (cause, effect or concomitant back problems) is even more difficult to determine.

Consequently, it is difficult to generalize results and identify individuals at higher risk of developing chronic back problems.[3]

Living with chronic back problems

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

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

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

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

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

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

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

Data source: *1996/97 National Population Health Survey, cross-sectional sample, Health file*
Note: *Non-respondents included in denominators of proportions*
†Includes massage therapy.
** Significantly different from no diagnosed chronic back problem*

Table 1

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

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

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

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

† Significantly higher than absence of characteristic ($p \leq 0.05$)

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

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

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

‡‡ Significantly higher than clerical occupations ($p \leq 0.05$)

§§ Significantly higher than non-smoker ($p \leq 0.05$)

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

One million new cases

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

Physical dimension important

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

Heavy exertion may increase the chances of some type of back problem, which may, in turn, become chronic.[4] Among workers reporting that their jobs in 1994/95 had entailed high or neutral physical exertion, an estimated 10% and 11%, respectively, had developed a chronic back problem by 1996/97. The comparable figure for those in positions requiring low exertion was 7%. However, as with most NPHS data, physical exertion is self-reported, and perceptions may vary among individuals performing similar tasks. People who perceive greater physical exertion may be prone to developing a chronic back problem. It has also been suggested that those who are already experiencing pain may overestimate physical exertion,[10] or may exert themselves more than their pain-free counterparts.

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

Work stressors

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

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

But while work-related psychosocial factors have been said to play a role in musculoskeletal problems,[9,32] the results of research have been inconclusive.[6] Several reports have found low emotional support at work to be associated with back problems,[4,6,12,13,25] but another study found no association.[10] One study observed such a relationship for factory workers, but not for office workers.[14] Other research has noted associations between job strain [25] or its individual components (low skill discretion,[33] low decision authority,[6,12] or high psychological demands[10,12,13,25]) and low back pain or musculoskeletal disease. One of these,[25] however, detected no significant association between decision latitude and musculoskeletal disease. The findings relating low job satisfaction and back problems have also been mixed.[6,13,25,28,32]

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

Personal stress, depression precede problems

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

Depression has been reported to be a predictor of first-time lower back pain,[35] and a significant but weak predictor of musculoskeletal pain.[36] One study observed that roughly half the depression associated with chronic lower back pain precedes the pain, while the other half follows it.[21] Yet another analysis, of male subjects only, suggested that depression followed but did not precede chronic lower back pain.[37]

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

Lifestyle

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

Injury, stress, depression remain significant

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

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

And even while controlling for back injury, along with the other selected variables, the odds of a newly diagnosed chronic back problem among workers in jobs that required high physical exertion, compared with those in jobs requiring low exertion, almost reached statistical significance.

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

None of the selected job-related stressors was significantly related to having a new chronic back problem. However, the odds for two non-work psychosocial factors—chronic stress and depression—were significant. Workers who reported high chronic stress had 1.5 times the odds of developing such a problem, compared with workers not exposed to high chronic stress. Similarly, workers who had experienced depressive symptoms in the 12 months before their 1994/95

Table 2

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

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

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

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

† Reference category is absence of characteristic.

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

§ Reference category

... Not applicable

* $p < 0.05$

[a] $0.05 < p \leq 0.06$

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

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

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

Concluding remarks

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

Limitations

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

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

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

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

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

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

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

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

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

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

The relationship between chronic back problems and psychosocial factors—both at and outside work—is complex. None of the selected work-related psychosocial characteristics was found to be significantly associated with a new diagnosis, either before or after adjusting for other explanatory variables. Depression and chronic stress, however, were significant. These two factors should be considered when attempting to identify individuals at risk of developing a chronic back problem, as they appear to play an independent role in the diagnosis of such problems. ●

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Appendix

Definitions

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

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

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

To measure work-related psychoscocial factors,[40-42] the NPHS asked participants to rank their responses to the following 12 statements using a five-point scale ranging from "strongly agree" (score 0) to "strongly disagree" (score 4).

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

Four components of work stress were assessed:

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

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

3) *Physical exertion*, measured by item h. Respondents who answered "strongly agree" or "agree" were categorized as experiencing high physical exertion. Those who answered "neither agree nor disagree" were considered to have neutral physical exertion.

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

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

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

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

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

The first three categories were combined for this analysis.

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

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

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

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

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

Scores of 2 or more were defined as high chronic stress. Such scores were in the upper 74th percentile of the weighted distribution of the 1994/95 cross-sectional file.

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

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

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

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

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

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

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

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

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

2\. During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row? (Yes - go to 3; No - go to 16)

16\. During the past 12 months, was there ever a time lasting two weeks or more when you lost interest in most things like hobbies, work, or activities that usually give you pleasure? (Yes - go to 17; No - end)

3./17. For the next few questions, please think of the two-week period during the past 12 months when: 3. these feelings were worst/ 17. you had the most complete loss of interest in things. During that time how long did these feelings usually last? (All day long; Most of the day; About half of the day; Less than half the day)

4./18. How often did you feel this way during those two weeks? (Every day; Almost every day; Less often)

5\. During those two weeks, did you lose interest in most things? (Yes; No)

6./19. Did you feel tired out or low on energy all of the time? (Yes; No)

7./20. Did you gain weight, lose weight, or stay about the same? (Gained weight; Lost weight; Stayed about the same; Was on a diet)

8./21. About how much did you gain/lose?

9./22. Did you have more trouble falling asleep than you usually do? (Yes; No),

10./23. How often did that happen? (Every night; Nearly every night; Less often)

11./24. Did you have a lot more trouble concentrating than usual? (Yes; No)

12./25. At these times, people sometimes feel down on themselves, no good, or worthless. Did you feel this way? (Yes; No)

13./26. Did you think a lot about death—either your own, someone else's or death in general? (Yes; No)

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

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

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

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

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

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

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

A number of questions probed respondents' health "during the past 14 days." They were asked if they "stayed in bed at all because of illness or injury, including any nights spent as a patient in a hospital." Another question asked if the respondent "cut down on things he/she normally does because of illness or injury." To determine the number of disability days in the last two weeks, the responses to the following questions were combined: "How many days [in the last 2 weeks] did you stay in bed for all or most of the day?" and "How many days [in the last 2 weeks] did you cut down on things for all or most of the day?"

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

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

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

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

Table A

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

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

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

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

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

-- Amount too small to be expressed

Table B

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

	Diagnosis of a chronic back problem in 1996/97	
	Yes	No
	%	%
Back injury in 1994/95		
Yes	10.0	3.1
No	90.0	96.9
Sex		
Men	53.3	55.1
Women	46.7	44.9
Age		
16-29	22.6	26.0
30-39	27.7	30.5
40-49	27.6	23.9
50-59	16.1	14.3
60+	6.0	5.3
Education		
Secondary graduation or less	39.3	35.3
Some postsecondary	45.4	46.2
Postsecondary graduation	15.2	18.5
Missing	0.6	0.1
Household income		
Middle or less	36.0	35.5
Upper-middle	40.9	40.3
High	19.9	19.5
Missing	3.3	4.7
Physical exertion at work		
High	39.9	35.3
Neutral	8.8	7.2
Low	29.0	37.0
Missing†	22.3	20.5
Occupation		
Administrative	14.1	13.3
Professional	18.8	18.5
Sales	7.3	8.9
Service	13.1	15.2
Blue-collar	33.8	28.5
Clerical	12.5	15.1
High job strain		
Yes	22.3	21.6
No	54.7	57.2
Missing†	23.0	21.1
High job insecurity		
Yes	16.8	15.1
No	61.0	64.4
Missing†	22.3	20.5
Low emotional support at work		
Yes	17.8	15.2
No	59.9	64.3
Missing†	22.3	20.5

	Diagnosis of a chronic back problem in 1996/97	
	Yes	No
	%	%
Low job satisfaction		
Yes	7.5	6.8
No	72.2	73.6
Missing†	20.3	19.6
High personal stress		
Yes	35.9	30.6
No	54.1	60.1
Missing	10.0	9.3
High chronic stress		
Yes	29.7	22.0
No	60.3	68.7
Missing	10.0	9.3
High family stress		
Yes	38.8	34.2
No	55.3	61.0
Missing	5.9	4.8
Low emotional support		
Yes	16.3	13.6
No	77.0	81.1
Missing	6.7	5.3
Low mastery		
Yes	17.4	15.2
No	75.4	79.5
Missing	7.2	5.3
Symptoms of depression		
Yes	8.9	5.3
No	84.7	89.3
Missing	6.4	5.4
Smoking		
Non-smoker	64.8	70.1
Occasional	4.6	4.5
Daily	30.6	25.4
Missing	0.2	0.1
Alcohol consumption		
Non-drinker	15.2	15.0
Occasional	18.9	19.0
Regular	65.9	66.0
Missing	0.5	0.1
Active in leisure time		
Yes	24.7	24.8
No	69.7	70.4
Missing	5.6	4.8

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

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

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

Household spending on health care

Robin Chaplin and Louise Earl

Abstract

Objectives

This article examines changes in household spending on health care between 1978 and 1998. It also provides a detailed look at household spending on health care in 1998.

Data sources

Data on household spending are from Statistics Canada's Family Expenditure Survey for survey years between 1978 and 1996, and from the annual Survey of Household Spending for 1997 and 1998.

Analytical techniques

Proportion of after-tax spending was calculated by subtracting average personal income taxes from average total expenditures and then dividing health care expenditures by this figure. Per capita spending was calculated by dividing average household spending by average household size. Constant dollar figures and adjustments for inflation were calculated using the Consumer Price Index (1998=100) to control for the effect of inflation over time.

Main results

Almost every Canadian household (98.2%) reported health care expenditures in 1998, spending an average of close to $1,200, up from around $900 in 1978.
In 1998, households dedicated a larger share of their average after-tax spending (2.9%) to health care than they did 20 years earlier (2.3%). Health insurance premiums claimed the largest share (29.8%) of average health care expenditures, followed by dental care, then prescription medications and pharmaceutical products.

Key words

health expenditures, dental care, dental health services, prescription drugs, non-prescription drugs

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While Canada's health care system provides universal medical care, not all health care expenses are covered by the various provincial plans.[1] Most households have out-of-pocket expenditures, including payments for health insurance premiums, eye care, and prescription and non-prescription medications and pharmaceutical products. The average amount Canadian households dedicated to health care spending declined noticeably after universal health care was fully implemented in the late 1960s. In the 1990s, however, that amount began to climb again.

Although health care expenditures account for a relatively small share of the average household budget, almost every Canadian household (98.2%) reported such spending in 1998. Households spent an average of close to $1,200 on health care, with the largest shares going to health insurance premiums and dental care (see *1998 total household budget*). By contrast, 20 years earlier, households averaged around $900 on health care (1998 constant dollars).

This article is based on data from the 1978 to 1996 Family Expenditure Survey (FAMEX) and the 1997 and 1998 Survey of Household Spending (SHS). These surveys collect information about household expenditures on a wide variety of goods and services. The analysis focusses on household spending on health care, examining changes between 1978 and 1998. It also presents 1998 household expenditures on health care by province, and in the context of all major

Methods

Data sources

Detailed information on all aspects of household spending is from the Survey of Family Expenditure (FAMEX), which was generally conducted every four years from 1969 through 1996, and the annual Survey of Household Spending (SHS), which replaced FAMEX in 1997.

This analysis uses data from the 1978, 1982, 1986, 1992 and 1996 FAMEX surveys and the 1997 and 1998 SHS to examine household spending on health care.

FAMEX covered the 10 provinces and two centres in the North. The SHS is carried out for households in all provinces and territories, and the following exclusions apply to both surveys: residents of Indian reserves and crown lands; official representatives of foreign countries living in Canada and their families; members of religious and other communal colonies; members of the Canadian Armed Forces on military bases; residents in homes for senior citizens; and individuals living full time in institutions (prisons, chronic care hospitals and nursing homes, for example).

The sample size for the 1998 SHS was 20,236 households, compared with 12,963 for the 1978 FAMEX. Households were selected from Statistics Canada's Labour Force Survey (LFS) sampling frame, and data were collected between January and March for the previous calendar year.

More information on FAMEX and the SHS can be found in published reports.[2-5]

Analytical techniques

The year 1978 is the first for which national data on household health care spending are available after the introduction of universal health care; therefore, it is used as the first year of the time series.

Per capita spending on health care and health care items was calculated by dividing average spending on health care per household by average household size. Although this formula allows for per person spending comparisons across time and household type, it does not account for household composition (for example, the number of adults, children and seniors), which may affect health care spending.

Proportion of after-tax spending was calculated by subtracting average personal income taxes from average total expenditures and then dividing health care expenditures by this figure.

Constant dollar figures and adjustments for inflation were calculated using the Consumer Price Index (1998=100) to control for the effect of inflation on purchasing power.

Since the SHS uses a complex sample design and estimation method, the standard error is estimated using a resampling method known as the jackknife technique with 0.05 designated as the level of significance.[6,7]

Limitations

Although few households keep detailed accounts of every expenditure, most have some records of their transactions: credit card or bank statements, chequebook entries or utility bills, for example. Through personal interviews, individuals are asked to recall their total household expenditures, including those for health care, for the past calendar year—a period that may be more clearly defined in respondents' minds than any other 12-month period. Respondents are instructed to report only direct costs for all personal health care, as well as amounts not covered by insurance (exclusions, deductibles and expenses over limits). They are also told to exclude payments for which they have been or will be reimbursed.

Like purchases of big-ticket items or substantial outlays for vehicles or furniture, major health care expenditures are usually recalled fairly readily, or receipts or records may be available. Spending on some items may be estimated based on amount and frequency of purchase (weekly or monthly, for example). Of course, the accuracy of data depends on the respondents' ability to remember and their willingness to consult records for the calendar year. It also depends on their understanding of the questions asked. In the case of health care, the distinction between private health insurance plans and public- or government-sponsored (provincial) plans is not always clear. Interviewers are trained to assist respondents, but the variations in coverage and administration among the various provincial health regimes makes this difficult.

To ensure that total expenditures are commensurate with household income and other sources of funds, a "balance edit" is conducted. This edit compares household receipts (income and other money received by the household) with disbursements (expenditures plus the net change in assets and liabilities). If the difference is greater than 10% of the larger of receipts or disbursements, respondents are contacted for additional information. While this edit ensures that total household spending is in line with income, it cannot verify that individual expenditures have been correctly recalled. Further, there is no way of establishing whether household members are spending less on some categories to accommodate out-of-pocket spending on health care. Finally, no questions are asked about the affordability of any goods or services, including health care.

1998 total household budget

After personal income taxes were excluded, overall average household spending totalled $40,397 in 1998. The biggest share of the household budget—about one-quarter or $10,092—went to shelter costs. Spending on transportation ranked second, followed by food.

In 1998, health care spending made up a relatively small proportion of total household expenditures (2.9%). However, almost every household (98.2%) reported spending on health care goods and services.

Average after-tax household spending, by major spending category, 1998

	Average expenditure per household	Proportion of after-tax spending
	$	%
Total after-tax spending	**40,397**	**100.0**
Shelter	10,092	25.0
Transportation	6,363	15.8
Food	5,880	14.6
Recreation	2,947	7.3
Personal insurance payments and pension	2,802	6.9
Household operation	2,362	5.8
Clothing	2,201	5.4
Household furnishings and equipment	1,489	3.7
Tobacco products and alcoholic beverages	1,214	3.0
Health care	**1,191**	**2.9**
Gifts of money and contributions to persons outside the home	1,144	2.8
Miscellaneous†	814	2.0
Personal care	693	1.7
Education	679	1.7
Reading materials and other printed matter	276	0.7
Games of chance (net amount)	249	0.6

Data source: *1998 Survey of Household Spending*
Note: *Data may not add to totals because of rounding.*
† Includes spending on other property (not principal accommodation or vacation home), legal services, financial services, dues to unions and professional associations, contributions and dues to social clubs, forfeits of deposits, money lost, and purchase of tools and equipment for work.

More information on household expenditures for 1978 and 1998 is available in published reports.[2,5,8]

household expenses. Further analysis of provincial trends and differences, as well as differences by age and socio-economic groups, are beyond the scope of this study.

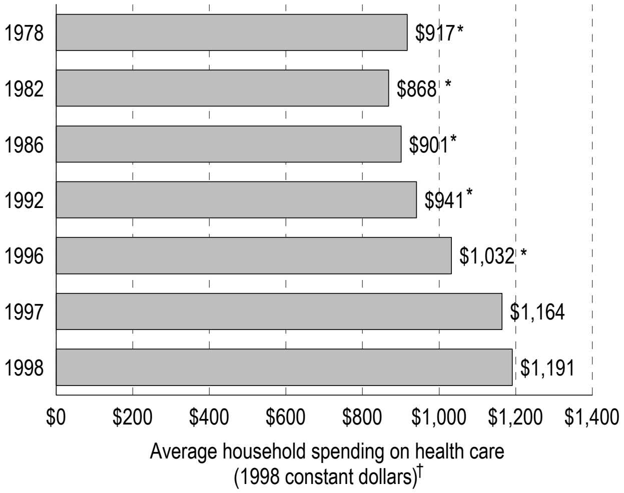
The year 1978, the first for which nationally comparable data are available after the implementation of universal health care, is used as the first year of the time series for health care spending. To account for the effects of inflation, amounts are presented in 1998 constant dollars. Percentages represent after-tax spending unless otherwise specified (see *Methods* and *Definitions*).

Health care spending up in 1990s

From 1978 to 1992, average annual household spending on health care fluctuated around $900. But in the early 1990s, household health care expenditures increased. On average, households spent close to $300 more on health care in 1998 than they did in 1978: $1,191 versus $917 (Chart 1) (see *The provinces*).

Moreover, households dedicated a larger share of their average after-tax spending to health care in 1998 than they did 20 years earlier: 2.9% compared with 2.3%. By contrast, the proportion allocated to

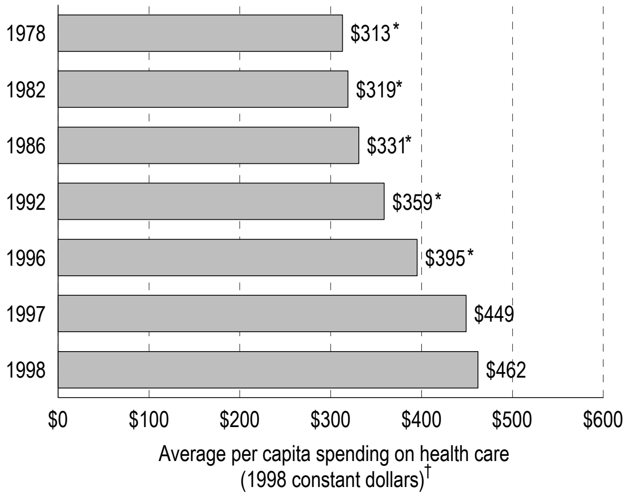
Chart 1
Average household spending on health care, Canada excluding territories, 1978 to 1998



Data sources: *1978, 1982, 1986, 1992 and 1996 Survey of Family Expenditure (FAMEX); 1997 and 1998 Survey of Household Spending (SHS)*
Note: *FAMEX was conducted periodically, generally every four years, through 1996, when it was replaced by the annual SHS.*
† Variations over several years represent real changes after inflation has been taken into account.
** Significantly lower than 1998 amount ($p \leq 0.05$)*

Chart 2

Average per capita spending on health care, Canada excluding territories, 1978 to 1998



Data sources: *1978, 1982, 1986, 1992 and 1996 Survey of Family Expenditure (FAMEX); 1997 and 1998 Survey of Household Spending (SHS)*
Note: *FAMEX was conducted periodically, generally every four years, through 1996, when it was replaced by the annual SHS.*
† Variations over several years represent real changes after inflation has been taken into account.
** Significantly lower than 1998 amount ($p \leq 0.05$)*

The provinces

In 1998, Canadian households spent an average of close to $1,200 on health care, although amounts varied substantially by province. Alberta households had the highest average health care expenditures ($1,693), followed by those in British Columbia and Saskatchewan. Health care spending was lowest for Newfoundland households ($913).

As a percentage of after-tax expenditures, health care spending ranged from 2.3% for Ontario households to 3.8% for those in Alberta. The figure was also relatively low (2.7%) in Newfoundland, and high in British Columbia (3.5%).

Average household spending on health care, Canada excluding territories, 1998

	Average expenditure per household $	Proportion of after-tax spending %
Newfoundland	913	2.7
Ontario	1,049	2.3
New Brunswick	1,081	3.2
Québec	1,106	3.2
Prince Edward Island	1,129	3.3
Nova Scotia	1,129	3.2
Manitoba	1,147	3.1
Saskatchewan	1,163	3.2
Canada	**1,191**	**2.9**
British Columbia	1,499	3.5
Alberta	1,693	3.8

Data source: *1998 Survey of Household Spending*

many other components of the household budget, such as food and clothing, declined steadily over the same period (from 19.8% to 14.6% and from 8.4% to 5.4%, respectively[2,5]). Finally, on a per capita basis, 1998 care spending stood at its highest level since 1978 (Chart 2).

The changes in household spending on health care could be partly due to declining average household size, which fell from 2.93 in 1978 to 2.58 two decades later,[2,5] as well as Canada's aging population.[9]

Health care and the household budget

In 1998, health insurance premiums claimed the largest share of average health care expenditures: 29.8% (Table 1). Dental care ranked second, followed by prescription medications/ pharmaceutical products. Not surprisingly, physician care and hospital care accounted for the smallest shares of out-of-pocket spending on health care, each around 1%.

However, not all households reported spending on the various aspects of health care. Consequently, the average amounts spent on these items by those households with actual expenditures was much higher than the average for households overall. For example, overall, households spent an average of $231 on dental care. But only about half of households reported such expenses. The corresponding average for those households that actually reported such spending was $476. Similarly, households overall spent an average of just $13 on physician care and $9 for hospital care. But when only the few households that reported such expenditures are considered, the figures were $232 and $391, respectively.

Health insurance premiums

Spending on health insurance premiums comprises payments for: public (government-supported) hospitals, medical and drug plans; private health insurance plans; dental plans sold as separate policies; and accident and disability insurance (see *Definitions*). Most household members are covered by a public plan administered either directly or indirectly by a provincial government. They may also have some supplementary health care benefits

Table 1
Average household spending on health care, Canada excluding territories, 1998

	Average expenditure per household	Proportion of total health care costs	Proportion of households reporting spending	Average expenditure per household reporting spending
	Constant 1998 $	%	%	Constant 1998 $
Total	**1,191**	**100.0**	**98.2**	**1,213**
Health insurance premiums[†]	355	29.8	51.5	689
Dental care	231	19.4	48.5	476
Prescription medications and pharmaceutical products	198	16.6	65.7	301
Eye care	151	12.7	50.6	298
Non-prescription medications and pharmaceutical products	131	11.0	87.1	150
Other health care practitioners[‡]	54	4.5	19.4	278
Health care supplies and goods	30	2.5	39.2	77
Other medical services[§]	19	1.6	7.9	244
Physician care	13	1.1	5.6	232
Hospital care	9	0.8	2.3	391

Data source: *1998 Survey of Household Spending*
† Provincial health/drug insurance plans (where applicable); private health insurance plans; dental plans; accident and disability insurance
‡ Includes nurses, therapists, chiropractors, osteopaths and podiatrists
§ Includes ambulances, medical equipment rentals, lab services, nursing homes, weight control and smoking cessation programs

Definitions

A *household* is defined as a person or group of persons occupying one dwelling unit (a separate set of living quarters with a private entrance).

Health care spending represents out-of-pocket costs incurred by household members for all health care received during the calendar year, including amounts not covered by insurance, such as exclusions, deductibles, and expenses over limits. All expenditures include the Goods and Services Tax, provincial retail sales tax, customs duties and any additional charges or taxes. Payments for which household members had been or would be reimbursed were excluded.

Spending on *health insurance premiums* includes payments for provincial (that is, public- or government-sponsored) health/drug insurance plans (where applicable) and private health insurance plans, including dental benefit plans and accident/disability insurance. Separate data for public and private plans are not presented in this analysis because their jurisdictions vary over time or from province to province.

Dental care refers to dental services and orthodontic and periodontal procedures such as examinations, cleanings, regular maintenance, root canal surgery, and dentures.

Eye care encompasses: prescription eye wear such as contact lenses and eyeglasses; other eye care goods including non-prescription eye wear, eyeglass cases and contact lens supplies; and eye exams, surgery (including laser treatments), and other eye care services.

Prescription medications and pharmaceutical products are those prescribed by a physician; *non-prescription medications and pharmaceutical products* are over-the-counter items such as vitamins, pain relievers and cough syrup.

Other health care practitioners are professionals such as nurses, therapists, chiropractors, osteopaths and podiatrists.

Health care supplies and goods includes items such as first aid kits, hearing aids and wheelchairs and other appliances.

Other medical services encompasses program enrolment fees, medical equipment rental, ambulances, lab services and nursing homes.

Physician care includes services provided by general practitioners or specialists.

Hospital care expenses represent all direct pay charges included in an individual's hospital bill.

with a private plan (either through employment or private insurance). Of course, the introduction of universal health care contributed to a decline in household spending on health insurance premiums during the 1970s. Beginning in the 1990s, however, average household expenditures for health insurance premiums began to rise.

A number of factors could be behind this increase. Although many employers offer some form of group health insurance, not all employees may be eligible for benefits. Part-time and contract workers, the self-employed, and employees and operators of small businesses may not have supplementary benefits, forcing some to purchase private coverage. Not all companies continue to fund benefits for retired employees, or such benefits may be co-funded; therefore, some retired individuals may have additional out-of-pocket expenditures for health insurance premiums. The rise may also partly reflect the premiums for provincial health insurance plans paid by Alberta and British Columbia residents.

In 1998, average household spending on health insurance premiums was $355, accounting for 29.8% of total health care expenditures. Only about half of households reported expenses for health insurance premiums in 1998, with an average expenditure per reporting household of $689. This compares with $568 (62.4% of households) in 1978 (Table 2).

Dental care

Between 1978 and 1998, the average amount households spent on dental care declined from $247 to $231. The share of total health care expenses dedicated to dental care also declined from 26.9% to 19.4%. In 1998, fewer than half of all households reported direct payments for dental services, suggesting that dental benefit plans cover the costs, or that patients may forego regular check-ups. A recent study based on data from the 1996/97 National Population Health Survey found that just over half (53%) of Canadians reported having dental insurance, and that many patients use dental services on an as-needed basis rather than as regularly scheduled clients.[10]

Among the 48.5% of households that actually reported dental care expenses in 1998, spending averaged $476. The comparable figures for 1978 were 52.3% and $472.

Table 2
Average household spending on health care, Canada excluding territories, 1978 and 1998

	Average expenditure per household		Proportion of total health care costs		Proportion of households reporting spending		Average expenditure per household reporting spending	
	1978	1998	1978	1998	1978	1998	1978	1998
	Constant 1998 $		%		%		Constant 1998 $	
Total	**917***	**1,191**	**100.0**	**100.0**	**95.7**	**98.2**	**958**	**1,213**
Health insurance premiums[†]	355	355	38.7	29.8	62.4	51.5	568	689
Dental care	247*	231	26.9	19.4	52.3	48.5	472	476
Prescription medications and pharmaceutical products	115*	198	12.5	16.6	60.5	65.7	189	301
Eye care	89*	151	9.7	12.7	34.9	50.6	254	298
Non-prescription medications and pharmaceutical products	48*	131	5.3	11.0	66.1	87.1	73	150
Physician care	21*	13	2.3	1.1	16.7	5.6	124	232
Other health care practitioners[‡]	19*	54	2.1	4.5	7.9	19.4	243	278
Health care supplies and goods	10*	30	1.1	2.5	25.4	39.2	40	77
Hospital care	9	9	1.0	0.8	4.7	2.3	185	391
Other medical services[§]	5*	19	0.5	1.6	4.3	7.9	116	241

Data source: *1978 Survey of Family Expenditure (FAMEX); 1998 Survey of Household Spending*
Note: *Detail may not add to totals because of rounding.*
[†] *Provincial health/drug insurance plans (where applicable); private health insurance plans; dental plans; accident and disability insurance*
[‡] *Includes nurses, therapists, chiropractors, osteopaths and podiatrists*
[§] *Includes ambulances, medical equipment rentals, lab services, nursing homes, weight control and smoking cessation programs*
* *Statistically different from amounts presented for 1998 ($p \le 0.05$)*

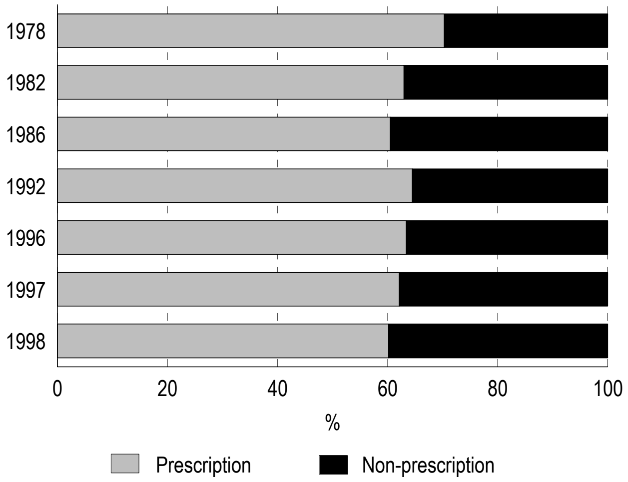
Medications and pharmaceutical products

Between 1978 and 1998, household spending on medications and pharmaceutical products (both prescription and non-prescription) increased steadily. In 1978, household spending averaged $163 on such items, compared with $329 in 1998. Such spending also represented a larger share of the total health care budget in 1998 than it did in 1978: 27.6% versus 17.8%.

In 1978 and 1998, a larger share of household spending on medications and pharmaceutical products went to prescription than to non-prescription items, although there was a shift in spending, with a much higher share being spent on non-prescription items in 1998 (39.8% versus 29.7%) (Chart 3). Overall, in 1998, Canadian households spent an average of $198 on prescription and $131 on non-prescription medications and pharmaceutical products. This compares with $115 and $48, respectively in 1978.

Not all households report spending on medications and pharmaceutical products, however. About two-thirds of households (65.7%) reported expenses for prescription items in 1998. This compares with 60.5% two decades earlier. Spending on non-prescription products was reported by 87.1% of households in 1998, a notable rise over 66.1% in 1978. Average spending per reporting household also rose over the 20-year period. For prescription items, this amount was $301 in 1998, up sharply from $189 in 1978. The amount spent on non-prescription products more than doubled from $73 to $150.

Chart 3
Percentage of prescription and non-prescription spending on medications and pharmaceutical products, Canada excluding territories, 1978 to 1998



Data sources: *1978, 1982, 1986, 1992 and 1996 Survey of Family Expenditure (FAMEX); 1997 and 1998 Survey of Household Spending (SHS)*
Note: *FAMEX was conducted periodically, generally every four years, through 1996 when it was replaced by the annual SHS.*

These increases suggest that, in the case of prescriptions, households may either be buying more, or are paying a larger share of the costs. Some benefit plans have introduced greater cost-sharing (through deductibles, co-insurance or co-payments) for prescriptions; some may encourage the use of generic drugs. In the first case, individuals pay more out of pocket for their prescriptions; in the second, the benefit plans cover only the cost of generic medications, leaving plan members to absorb the difference.[1,11,12]

It is also possible that consumers are spending more on over-the-counter products such as cold and flu medications, as well as vitamin and herbal remedies[13]—all now available in a vast selection. Along with the growing role of drug treatment,[1] as well as higher real costs for new prescription medications,[11] this may have increased household spending on medicinal and pharmaceutical products.

Eye care

In 1978, on average, households dedicated 9.7%, or $89, of their total health care spending to eye care. Such spending includes prescription eyeglasses and contact lenses, solutions or cleaning supplies, and eye exams. By 1998, average household spending had risen to $151 and represented 12.7% of total health care expenditures. Although there have been many innovations in eye care in recent years, including laser surgery and a large array of prescription and non-prescription eye wear, most 1998 expenses (75% or $113; data not shown) were for prescription eyeglasses and contact lenses.

When only those households that reported eye care expenses are considered (34.9% in 1978 and 50.6% in 1998), household spending averaged $254 and $298, respectively.

Physician care

The share of health care spending devoted to physician care, which includes out-of-pocket fees for general practitioners or specialists, declined between 1978 and 1998 (2.3% versus 1.1%). The proportion peaked in 1982, then remained around 1% between 1986 and 1998 (data not shown). The average expenditure per household was almost halved over the 20 years, falling from $21 to $13. One study has noted that extra billing and hospital user fees were commonplace in the late 1970s,[14] and this may be reflected in the much higher average for 1978. Fewer households reported spending on physician care in 1998; however, their average expenditure was close to double that recorded in 1978 ($232 compared with $124).

Other health care, hospital care

Out-of-pocket spending on other health care practitioners such as nurses, therapists, chiropractors and podiatrists averaged $54 per household in 1998, compared with $19 two decades earlier. This category also claimed a higher share of the household budget in 1998 than it did in 1978: 4.5% versus 2.1%. Almost one-fifth (19.4%) of households reported expenditures for other health care practitioners in 1998, spending an average of $278. Although some households may have access to provincial plans to help cover part of these costs, it is not surprising that spending is rather high.

Given that most hospital costs are covered by health care programs, it is not unexpected that the average household expenditure on hospital care was fairly low in 1998, as it was in 1978: $9 per household, accounting for around just 1% of total health care costs. Although only 2.3% of households reported spending on this category in 1998, their average expenditure was $391, up from $185 in 1978. This category represents any charges billed directly to and payable by the patient, such as the cost differential for a private room.

The average expenditure for health care supplies and goods, which includes items such as first aid kits, hearing aids and wheelchairs, accounted for a relatively small share of total health care costs (2.5%) in 1998. Similarly, other medical services (weight control and smoking cessation programs, for example), claimed a small proportion (1.6%) of overall health expenditures. However, larger percentages of households reported spending on both categories compared with 20 years earlier, and average expenditures per reporting household almost doubled for each.

Concluding remarks

Over the last 20 years, Canadians' out-of-pocket expenditures on health care have risen considerably. In 1998, health insurance premiums accounted for the largest share of average household spending on health care, followed by dental care, then prescription medications and pharmaceutical products. As expected, physician and hospital care accounted for the smallest proportions.

Data from Statistics Canada's household expenditure surveys show that, between 1978 and 1998, the average health care expenditure per household rose by close to $300 (in 1998 constant dollars). And in addition to spending more money, households also dedicated a larger share of their after-tax spending to health care—2.9% compared with 2.3%.

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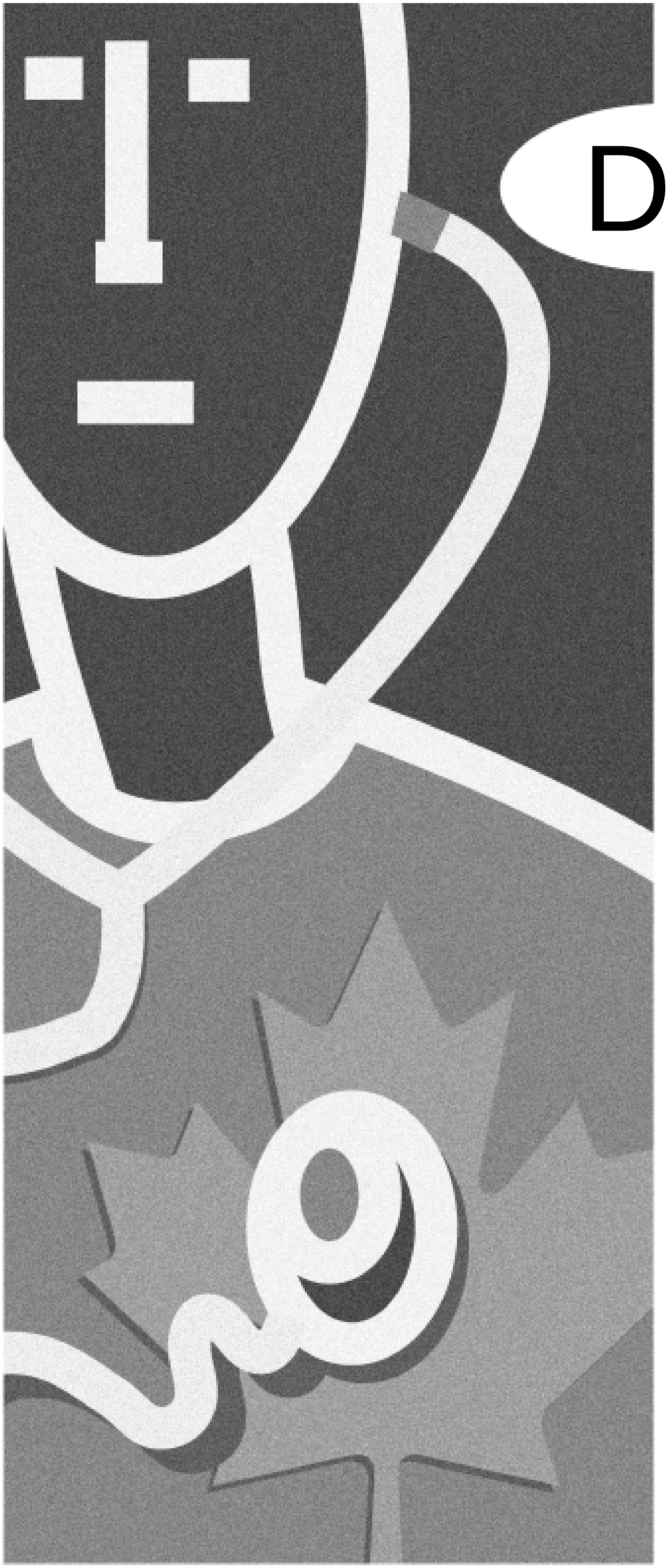


Data Releases

Synopses of recent health
information produced by
Statistics Canada

Public-use microdata file on residents of health care institutions, 1996/97

A cross-sectional public-use microdata file for the second cycle of the health institutions component of the National Population Health Survey (NPHS) is available on CD-ROM. The file covers a wide range of health issues affecting residents of Canadian health care facilities, including: chronic conditions, health status, activity restrictions, health services utilization, social support and behavioural risk factors such as alcohol use and smoking. Socio-demographic information such as age, sex and education is also provided.

The survey collected information from about 2,100 respondents, which ensures that representative estimates can be produced at the national level. This is the second NPHS health institutions public-use microdata file. The file for the first cycle was released in June 1996. Public-use microdata files are also available for the first and second cycles of the NPHS household component.

To order a copy of the *National Population Health Survey: Residents of health care institutions public-use microdata file* (82M0010XCB, $250), other NPHS public-use files or custom tabulations, or to obtain general information on the survey, contact Client Custom Services (613-951-1746; fax: 613-951-0792; hd-ds@statcan.ca), Health Statistics Division. For more information, or to enquire about the concepts, methods or data quality of this release or about NPHS concepts and methods, contact Sandrine Prasil (613-951-4409; fax: 613-951-4198; sandrine.prasil@statcan.ca), Health Statistics Division.

National Population Health Survey: Food Insecurity Supplementary Survey, 1998/99

Data are now available from the Food Insecurity Supplementary Survey, which was conducted as part of the household component of the 1998/99 National Population Health Survey (NPHS) on behalf of Human Resources Development Canada.

The supplement surveyed NPHS respondents who were deemed to be "food insecure"; that is, they had reported that they, or someone in their household, had had at least one of the following three concerns in the 12 months before the survey: they worried that there would not be enough to eat because of a lack of money; they did not have enough food to eat because of a lack of money; or they were not eating the quality or variety of foods they wanted to because of a lack of money.

About 1,300 people were asked about the difficulties they had shopping for food, the actions they took to stretch their food budget, and feeding their children. They were also asked about their expenditures for housing.

To order custom tabulations, contact Client Custom Services (613-951-1746; fax: 613-951-0792; hd-ds@statcan.ca), Health Statistics Division. For more information, or to enquire about the concepts, methods or data quality of this release, contact Mario Bédard (613-951-8933; fax: 613-951-4198; mario.bedard@statcan.ca), Health Statistics Division, Statistics Canada, or Satya Brink (819-953-6622; fax: 819-953-8868; satya.brink@spg.org), Applied Research Branch, Human Resources Development Canada.

Annual Hospital Survey, 1996/97 and 1997/98

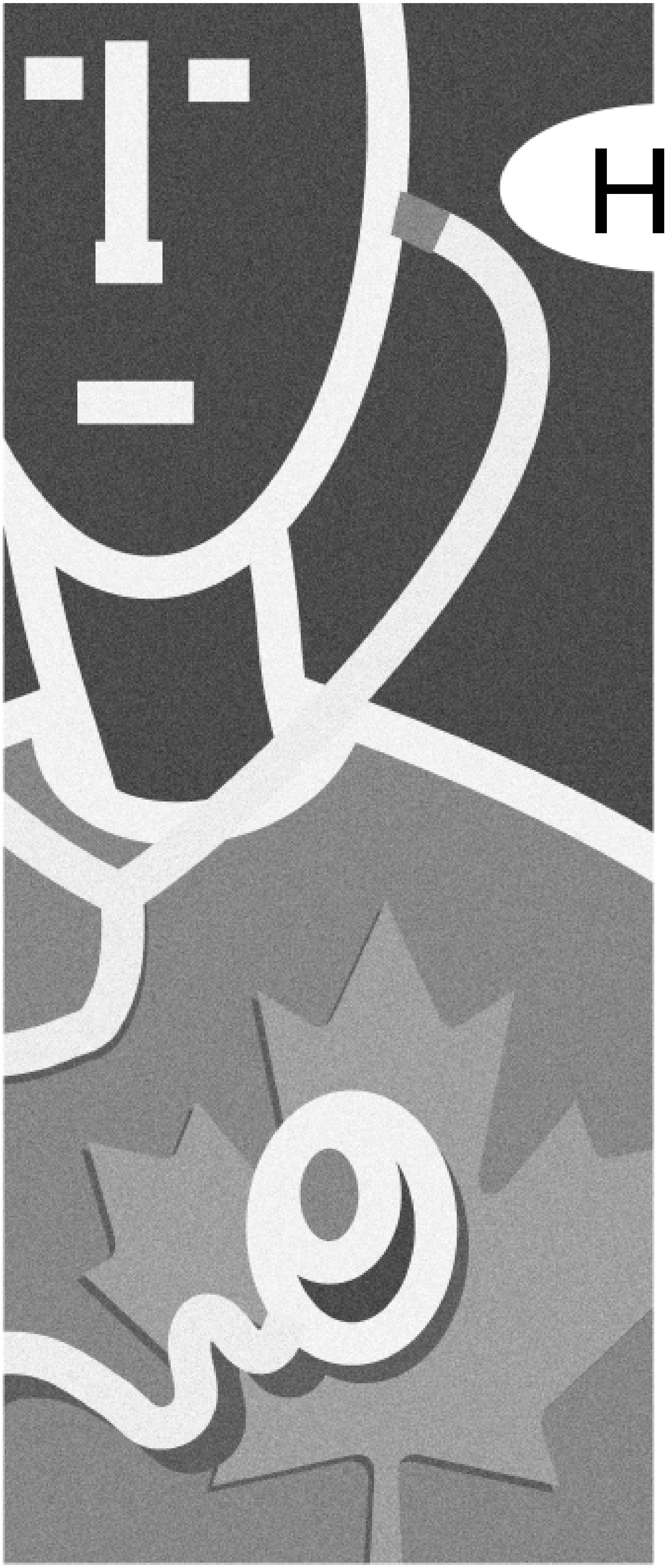
Data from the Annual Hospital Survey for fiscal years 1996/97 and 1997/98 are available from the Canadian Institute for Health Information (CIHI). Statistics Canada conducted this survey through fiscal year 1993/94, after which CIHI assumed responsibility for the survey and database.

For more information, or to enquire about the concepts, methods or quality of the data for 1996/97 and 1997/98, contact Karen McCarthy (613-241-7860, ext. 4026; fax: 613-241-8120), Canadian Institute for Health Information. For information on data from previous years, contact Richard Trudeau (613-951-8782; fax: 613-951-4251; richard.trudeau@statcan.ca), Health Statistics Division, Statistics Canada.

Health care in Canada 2000

Health care in Canada 2000: A first annual report (82-222-XIE, free) is available on Statistics Canada's Web site (www.statcan.ca). This report was originally jointly released on April 26 by the Canadian Institute for Health Information and Statistics Canada. Topics include the changing health care system, the cost of health care, the health care team, primary health care, hospitals, and health care beyond the hospital.

For more information, or to enquire about the concepts, methods or data quality of this release, contact Karen McCarthy (613-241-7860, ext. 4026; fax: 613-241-8120), Canadian Institute for Health Information, or Michel Séguin (613-951-4262; michel.seguin@statcan.ca), Health Statistics Division, Statistics Canada. ●



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				Price†		
Title		**Catalogue number**	**Format**	**Canada**	**US (US$)**	**Other countries (US$)**
Health Reports	· subscription · single issue	82-003-XPB	Paper	$116 $ 35	$116 $ 35	$116 $ 35
	· subscription · single issue	82-003-XIE	Internet	$ 87 $ 26	$ 87 $ 26	$ 87 $ 26
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Health Statistics: Catalogue of Products and Services		82F0058XIE	Internet	Free	Free	Free
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Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures and Treatments		82-562-XPB	Paper	$40	$48	$56
Life Expectancy						
Life Tables, Canada and Provinces, 1990-1992		84-537-XPB 84-537-XDB	Paper Diskette	$40 $40	$48 $40	$56 $40
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National Population Health Survey Overview 1994-95		82-567-XPB 82-567-XIB	Paper Internet	$10 $ 8	$12 $ 8	$14 $ 8
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User's guide for the public use microdata file National Population Health Survey 1998-99 - Household component (Available Fall 2000)		82M0009GPE	Paper	$50	$50	$50

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† All prices exclude sales tax.

			Price†		
Title	**Catalogue number**	**Format**	**Canada**	**US (US$)**	**Other countries (US$)**
National Population Health Survey (cont'd)					
User's guide for the public use microdata file National Population Health Survey 1996-97 - Household Component	82M0009GPE	Paper	$50	$50	$50
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Information about the National Population Health Survey See also section on Microdata files	82F0068XIE	Internet	Free	Free	Free
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Registered Nurses Management Data 1998, Shelf Table	83F0005XPB	Paper	$25	$25	$25
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Occupational Surveillance in Canada: Cause-specific mortality among workers, 1965-1991	84-546-XCB	CD-ROM	$500	$500	$500
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Mortality - Summary List of Causes, 1997	84F0209XIB	Internet	Free	Free	Free
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Other					
Validation study for a record linkage of births and deaths in Canada	84F0013XIE	Internet	Free	Free	Free
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Vital Statistics Compendium, 1996	84-214-XPE 84-214-XIE	Paper Internet	$45 $33	$45 $33	$45 $33
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† All prices exclude sales tax.

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Microdata Files

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Fax: (613) 951-0792
Email: HD-DS@statcan.ca

				Price†	
National Population Health Survey public-use microdata files		**Product number**	**Format**	**Canada**	**Other countries (US$)**
Cycle 3, 1998-99					
Household (Available Fall 2000)	Cross-sectional data in Flat ASCII files, User's Guide, data dictionary, indexes, layout, Beyond 20/20 Browser for the Health File	82M0009XCB	CD-ROM	$2,000	$2,000
Custom tables	Household	82C0013	Price varies with information requirements		
Cycle 2, 1996-97					
Household	Cross-sectional Flat ASCII Files, Beyond 20/20 Browser for HealthFile	82M0009XCB	CD-ROM	$500	$500
Health care institutions	Cross-sectional Flat ASCII File	82M0010XCB	CD-ROM	$250	$250
			Clients who purchase the 1996/97 Household file will receive Institutions file free of charge		
Custom tables	Household Institutions	82C0013 82C0015	Price varies with information requirements		
Cycle 1, 1994-95					
Household	Data, Beyond 20/20 Browser Flat ASCII Files, User's Guide	82F0001XCB	CD-ROM	$300	$300
Health care institutions	Flat ASCII Files	82M0010XDB	Diskette	$75	$75
Custom tables	Household Institutions	82C0013 82C0015	Price varies with information requirements		

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† All prices exclude sales tax.

Other Information

Canadian Community Health Survey (CCHS)

A new survey, the Canadian Community Health Survey (CCHS), is being conducted by Statistics Canada to provide regular and timely cross-sectional estimates of health determinants, health status and health system utilization for 132 health regions across the country.

For more information about this survey, visit our web site at http://www. statcan.ca, under “Concepts, definitions and methods,” followed by “Discussion papers or new surveys.”

National Population Health Survey (NPHS) Questionnaires

- Household
- Institutions
- North

The NPHS questionnaires are downloadable from Statistic Canada’s website at http://www.statcan.ca, under Concepts, definitions and methods, followed by Questionnaires and data dictionaries and National Population Health Survey.

Canadian Statistics

Obtain free tabular data on aspects of Canada’s economy, land, people and government.

For more information, visit our web site at http://www.statcan.ca: under “Canadian Statistics,” and then click on “Health.”