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Vol. 12 No. 2

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# Health Reports

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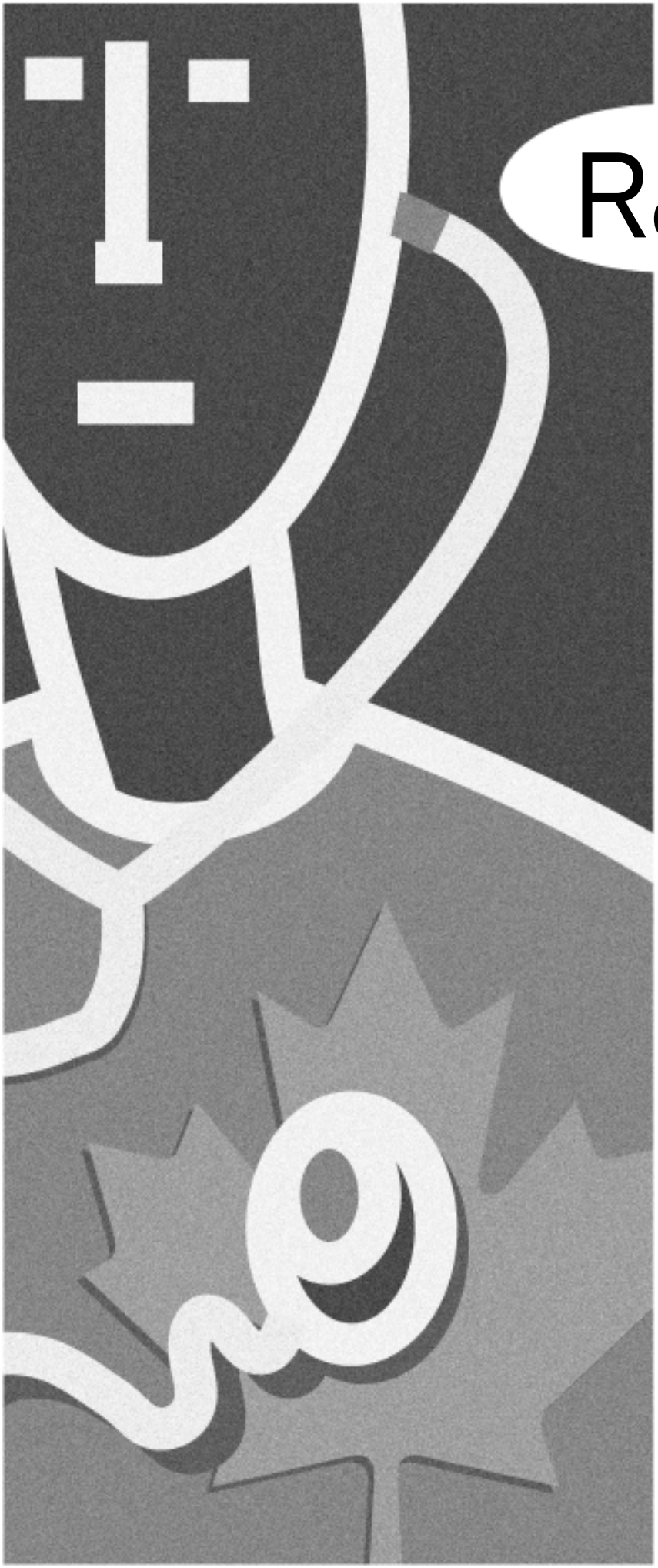

# Research Articles

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

# Hysterectomy, 1981/82 to1996/97

*Wayne J. Millar*


## Abstract

***Objectives***

This article examines national and provincial trends in hysterectomies from 1981/82 to 1996/97 among women aged 35 or older.

***Data sources***

Data for 1981/82 to 1994/95 were obtained from the Hospital Morbidity File maintained by Statistics Canada; for 1995/96 and 1996/97, from the Canadian Institute for Health Information. Supplementary data are from the 1998/99 National Population Health Survey.

***Analytical techniques***

Descriptive analyses present hospitalization rates for hysterectomy, the percentage performed vaginally, and average length of stay. A hierarchy of indications was used to establish the main reason for hysterectomy. Confidence intervals were calculated to determine significant changes over time and between provinces and the national level.

***Main results***

From 1981/82 to 1996/97, the hysterectomy rate declined; the proportion performed vaginally increased; and average length of stay for a hysterectomy decreased. These trends generally characterized each province, although there were substantial provincial differences in rates, procedures, and average length of stay.



## Key words

hospital separation records, hospital utilization, length of stay, surgical rates, women's health



## Author

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In Canada, the hysterectomy rate per 100,000 women aged 35 or older has declined sharply since the early 1980s. To some degree, this may be attributable to the development of alternatives in the treatment of gynecological problems.[1-5] As well, women's desire for less aggressive means of treatment may have produced a shift toward more careful patient screening and outpatient management of conditions that at one time might have resulted in a hysterectomy.[6,7]

While the hysterectomy rate fell in each province, interprovincial variations remained substantial. Regional differences in hysterectomy rates are not unique to Canada; they have been noted in the United States,[8-13] Britain[14] and Australia.[15] Such geographic variations cannot be attributed solely to differences in age distribution or in the incidence or risk of uterine disease.[12,16] The primarily elective nature of hysterectomy suggests that other factors may be involved.

Rates of surgery will tend to vary when the indications for a specific procedure are discretionary.[17] This is the case

## Methods

### Data sources

Hospital data are from Statistics Canada's Hospital Morbidity File for fiscal years 1981/82 to 1994/95, and from the Canadian Institute for Health Information for 1995/96 and 1996/97. This information comes from the admission/separation form completed by hospitals at the end of each patient's stay when the patient is separated as a discharge or a death. The file contains data on all inpatient cases that were separated from general and allied special care hospitals during the period.

Based on the *Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures (CCP)*, hysterectomy was defined as the presence (in the primary or secondary admission diagnoses) of codes 80.2 and 80.3 for abdominal hysterectomy; 80.4 for total or subtotal vaginal hysterectomy; and 80.5 to 80.7 for radical hysterectomy.[18] These codes correspond to the clinical modification of the *International Classification of Diseases*, *Ninth Revision* (ICD-9-CM) of 68.3 to 68.4 for abdominal hysterectomy, 68.5 for vaginal hysterectomy, and 68.6 to 68.8 for radical hysterectomy.[19]

Supplementary data on the prevalence of hysterectomy are from the 1998/99 National Population Health Survey.[20]

Provincial estimates of the adult female population were obtained from Statistics Canada's Demography Division.

### Analytical techniques

Because hysterectomy is relatively uncommon at younger ages, this analysis pertains only to women aged 35 or older.

Descriptive analyses present rates and percentages. Hospitalization rates were calculated by dividing the number of hysterectomy separations of women aged 35 or older by the population estimates for that age group and multiplying by 100,000. Age-adjusted rates were calculated by the direct method using the age distribution of women aged 35 or older in 1996. Average length of stay was calculated by dividing the total number of days that women admitted for hysterectomy spent in hospital by the number of separations.

Confidence intervals were calculated to assess the variation in rates between 1981/82 and 1996/97 for each province; two-sided tests were performed to determine statistically significant differences in the age-adjusted rates.[21] Comparisons of rates for each province with the national level were made for 1981/82 and 1996/97. Two-tailed tests were used to test mean differences in length of stay between 1981/82 and 1996/97, and between each province and the national level.

To determine the indications for hysterectomy, a hierarchy established by Hall and Cohen[17] was used. Indications for surgery were identified with the use of ICD-9-CM diagnostic codes and were collapsed into six categories: cancer, fibroids, endometriosis, uterine prolapse, menstrual hemorrhage and pain, and other. Because some records had more than one indication, a hierarchic rule was used to classify the main indication for hysterectomy in each patient. If any of the diagnosis codes indicated a malignant or pre-malignant tumour, the indication assigned to that patient was "cancer." For the remaining records, if any of the codes indicated "fibroids," that was the indication assigned, followed by "endometriosis," "prolapse," and "menstrual hemorrhage and pain." Cases lacking one of these five indications were assigned to the "other" category.

### Limitations

Hysterectomy rates are based on the total female population aged 35 or older. It was not possible to exclude those who had already had the procedure. Including these women in the calculations probably had the greatest effect on rates in provinces where rates had been relatively high in the past.[22] Had the figures been adjusted to account for women who were no longer eligible, hysterectomy rates would be higher than those presented here.

The figures refer only to women who were residents of the province where their hysterectomy was performed. Not all provincial databases contain information about residents who go out of province for hospital services. Consequently, the extent of out-of-province hospitalizations for hysterectomy cannot be assessed.

During each hospital stay, a patient may receive more than one diagnosis or undergo more than one surgical procedure. This analysis pertains to hysterectomies listed as the primary or secondary admission diagnosis. Because a hysterectomy is a major procedure, it is unlikely that using the first or second procedures would miss many such operations.

Hospital records are based on fiscal years, but the population estimates used to calculate rates refer to a specific point in the calendar year. Since the size of the population changes very little in a single year, any effect should be minimal and should not affect the validity of the results.

The Hospital Morbidity File for 1981/82 represents 95% of operating hospitals, which accounted for more than 99% of approved beds in Canada that year.[23] By the mid-1990s, the response rate to the Annual Survey of Health Care Facilities Hospitals was somewhat lower: over 80% of operating hospitals, which covered 90% of hospital beds.[24]

This analysis does not pertain to the entire Canadian population: hospital data for the northern territories were not available for the entire time series. However, the number of hysterectomies performed in the North is small and would not be expected to substantially affect the results.

with hysterectomies, an estimated 90% of which are elective.[8] Unlike many other surgical procedures, hysterectomies are performed for a wide range of indications. Malignant and pre-malignant conditions account for only a small proportion of hysterectomies. Most often, they are done to relieve symptoms caused by benign conditions: fibroids, dysfunctional uterine bleeding, endometriosis, chronic pain, and genital prolapse.[7,8,12,25-29]

The appropriate indications for hysterectomy remain controversial, even among health care professionals.[8,29] Moreover, there is real difficulty in diagnosing some of the conditions for which hysterectomy is commonly performed.[6] Concern that some hysterectomies may be unnecessary has long been expressed, not only by patients and policymakers, but also by physicians.[27]

This article analyzes national and provincial trends in hysterectomy among women aged 35 or older during the 16-year period from 1981/82 to 1996/97, based on data from Statistics Canada and the Canadian Institute for Health Information (see *Methods*). This is a descriptive analysis of hysterectomy statistics. It is not meant to suggest which hysterectomy rate, length of stay, or surgical technique is appropriate.

## Common procedure

Hysterectomy is one of the most common surgical procedures performed on women in their middle years and beyond (see *Hysterectomy procedures*). But while hysterectomy carries a low risk of mortality,[30,31] it is major surgery that can require weeks, and possibly months, for recovery.[10,27,28]

According to the 1998/99 National Population Health Survey, over one-fifth of women aged 35 or older—an estimated 22% or 1.8 million—have had a hysterectomy. The percentage rose from 7% for 35- to 44-year-olds to 37% at ages 65 to 74, and 30% at age 75 or older.

In 1996/97, abdominal hysterectomies ranked first among surgeries undergone by women aged 35 or older, and vaginal hysterectomies, fourth. Overall, hysterectomies accounted for about 8% of operations performed on women in that age range that year.

### Hysterectomy procedures

A hysterectomy may entail removal of the uterus and cervix (total) or removal of the uterus only (subtotal). Hysterectomy can be performed via the abdomen or vagina. The approach depends on the surgeon, the indication for surgery, the nature of the disease, and patient characteristics. Options include: vaginal hysterectomy, laparoscopically assisted vaginal hysterectomy, and abdominal hysterectomy (subtotal, total or radical). Postoperative rates of morbidity and complications are lower with the vaginal approach.

The abdominal approach may be indicated when exploratory surgery is necessary (for example, if cancer is present or suspected). Abdominal surgery may also be preferred when the uterus is enlarged and would be difficult to remove vaginally (as is often the case with fibroids); when the uterus has limited mobility because of adhesions from previous surgery; or when ovaries are to be removed.[3]

## Declining rates

In 1996/97, hysterectomies were performed on 48,572 women aged 35 or older. Since 1981/82, the annual total has remained relatively stable, never falling below 46,600 or exceeding 51,600 (Appendix Table A). At the same time, the number of women in this age range rose steadily, so the rate fell from 937 to 628 hysterectomies per 100,000 women aged 35 or older. This decline would be less pronounced if the rate was based on the number of women actually "at risk," that is, those who still had an intact uterus.[22]

In each province, too, stability in the annual number of hysterectomies and the increasing adult female population meant that rates dropped (Chart 1). The steepest decline was in Québec, which had had the highest rate in 1981/82. As well, Québec was the only province where fewer hysterectomies were performed in 1996/97 than in 1981/82. Rates also fell sharply in British Columbia, Alberta, Ontario and Nova Scotia. By contrast, Saskatchewan's rate fell only slightly.

The age-adjusted hysterectomy rate in 1996/97 ranged from a low of 579 surgeries per 100,000

## Hysterectomy guidelines

In April 1996, the Gynaecology Committee of the Society of Obstetricians and Gynaecologists of Canada published *Clinical Practice Guidelines for Hysterectomy*.[32] Hysterectomy may be considered for: benign disease, conditions that may progress to cancer, cancer, acute conditions, and a variety of other less common indications.

• The **benign disease** category encompasses fibroids, endometriosis, adnexal mass, prolapse, dysfunctional uterine bleeding, and chronic pelvic pain.

There are few indications for hysterectomy in a patient with *fibroids* but no symptoms. Hysterectomy is indicated when fibroids are growing rapidly, or after menopause when they may raise concerns about cancer. Fertility may be preserved with a myomectomy (surgical removal of fibroids). There is, however, a 15% recurrence rate, and 10% of women who undergo a myomectomy will require a hysterectomy within 10 years. Hysteroscopy is another alternative, but it carries a 10% to 20% risk of requiring further intervention.

*Endometriosis* is a chronic condition in which endometrium-like tissue grows outside the endometrial cavity. Drug treatment is often associated with metabolic and symptomatic side effects and has limited success in controlling symptoms due to adhesive disease or damaged pelvic organs. Conservative surgery may be undertaken, although it has limited long-term effect and entails a cumulative recurrence rate of 13% at three years and 40% at five years. Nonetheless, the decision to proceed with a hysterectomy is a major one that should be guided by the presence of severe symptoms, the failure of other treatments, and the desire for pregnancy.

The *Guidelines* recommend consideration of a hysterectomy for a *benign adnexal mass* only if it is accompanied by another surgical indication.

If there are no other complaints, mild to moderate degrees of genital *prolapse* should only rarely be corrected. There are, however, no successful surgical alternatives to advanced uterine prolapse other than hysterectomy and vaginal repair.

*Dysfunctional uterine bleeding* is essentially a diagnosis of exclusion. That is, the uterus is anatomically normal, and no neoplasms, injuries or other pathologic conditions account for the bleeding. The *Guidelines* suggest that medications be considered before surgical treatment. Depending on the severity of the condition, the age of the patient, her cultural beliefs and desire for fertility, a hysterectomy can be considered.

A relatively small proportion of hysterectomies are performed because of *chronic pelvic pain*. The underlying cause of the pain should be carefully investigated before considering a hysterectomy. There is a case for hysterectomy if a disease is present and the patient has completed her family.

• **Conditions that might progress to cancer** include endometrial hyperplasia, cervical squamous intraepithelial neoplasia, and adenocarcinoma in situ.

*Endometrial hyperplasia* is usually diagnosed because the patient complains of abnormal uterine bleeding. Most patients without malignant cells (atypia) can be treated with drugs, but if hyperplasia persists, they may be treated by hysterectomy. Those with atypia may be treated with drugs or a hysterectomy; however, about a quarter of cases treated with drugs progress to cancer in an average of four years.

*Cervical squamous intraepithelial neoplasia* is an indication for hysterectomy only if other gynaecologic conditions that justify the operation are also present.

For *adenocarcinoma in situ*, the *Guidelines* recommend a cylindrical-shaped cone biopsy. If the margins of the biopsy are clear, women who wish to remain fertile need not have a hysterectomy.

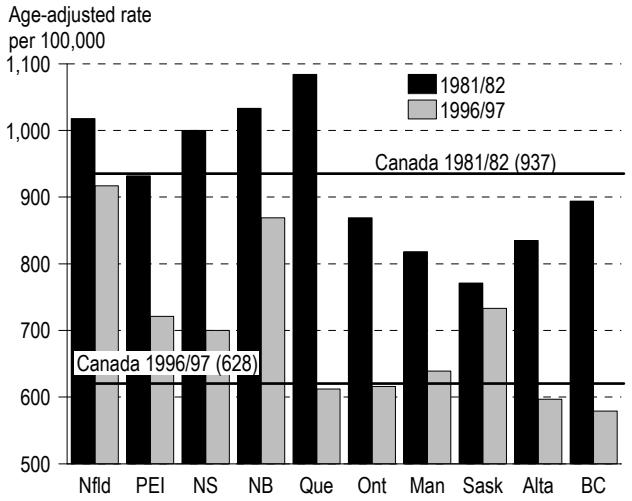
• Various forms of **cancer** are treated with hysterectomy, notably *endometrial cancer* and *uterine sarcomas*. *Cervical cancer* can be treated by either surgery or radiotherapy, as the cure rates are similar. The treatment of *ovarian cancer* may include a hysterectomy, although no data indicate that this would alter the generally poor prognosis. The reason for hysterectomy in such cases is to ensure that the uterus is not concealing disease. Hysterectomy is indicated for *fallopian tube cancer* to ensure that all of the fallopian tube has been removed and to ensure accurate follow-up.

• Several **acute conditions** may result in hysterectomy. Emergency peri-partum hysterectomy may be performed in the case of a life-threatening *hemorrhage*, although conservative measures to control obstetric hemorrhage are the mainstay of therapy.

Historically, all *tubo-ovarian abscesses* were treated by a hysterectomy, but with the development of broad-spectrum antibiotics, there are now three main indications for surgical intervention: intra-abdominal rupture of tubo-ovarian abscess, suspicion of other surgical emergencies such as appendicitis, and failure to respond to antibiotics within 48 to 72 hours. The surgical management of an unruptured abscess is less established, although a hysterectomy may be indicated.

• A number of **other indications** may prompt a hysterectomy. For instance, in consultation with an oncologist, patients with a *family history* of various forms of cancer of the reproductive system may opt for the procedure.

Chart 1
**Age-adjusted hysterectomy rates, women aged 35 or older, Canada and provinces, 1981/82 and 1996/97**




***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82; Canadian Institute for Health Information, 1996/97*
***Note:*** *Refers to CCP 80.2 to 80.7. Adjusted to age distribution of women aged 35 or older in 1996.*

women aged 35 or older in British Columbia to a high of 917 in Newfoundland.

## Indications

The degree of consensus on whether a hysterectomy should be performed depends on the condition for which it is being considered.[17,33] Some gynaecological disorders, which in earlier years might have meant a hysterectomy, are hormonally responsive and can be treated with drugs, or with less radical surgery.[1-5,8] There is general agreement on the need for hysterectomy to treat uterine cancer, but not for cervical cancer. For fibroids, the decision depends on their size, rate of growth, and the patient's symptoms. And for advanced uterine prolapse, there are no successful surgical alternatives to hysterectomy. Endometriosis has a wide variety of symptoms, which makes diagnosis difficult, and treatment options are numerous. For menstrual hemorrhage, the only objective measure of severity is whether it causes anemia.

Over the 1981/82 to 1996/97 period, rising proportions of hysterectomies were performed for clear-cut indications, and declining shares for more discretionary indications. In every province (except Prince Edward Island in 1981/82), fibroids was the leading reason in both 1981/82 and 1996/97, although the percentage was larger in 1996/97 (Table 1). At the same time, the percentage of hysterectomies performed for "other" reasons declined in each province.

In 1996/97, the proportion of hysterectomies attributable to fibroids varied from 29% in New Brunswick to 41% in Québec. Menstrual hemorrhage and pain was the main indication for 13% of hysterectomies in British Columbia, but accounted for 31% in New Brunswick. The percentage attributable to cancer ranged from 6% in Prince Edward Island and New Brunswick to 13% in Manitoba.

The publication of guidelines by the Society of Obstetricians and Gynaecologists of Canada[32] in 1996 may go some way toward resolving the lack of consensus that tends to surround the indications for hysterectomy, and thereby reduce geographic differences (see *Hysterectomy guidelines*). Some researchers, however, have questioned the value of such statements.[34] The decline in Québec's rates occurred in the "absence of any explicit recommendations from medical bodies."[35] On the other hand, in the 1970s in Saskatchewan, concern about rising hysterectomy rates resulted in the formation of a committee that set up criteria for the procedure.[36] From 1970 to 1974, the number of hysterectomies in that province fell by almost a third. Yet, as this analysis illustrates, from the early 1980s to the mid-1990s, Saskatchewan had the least change in hysterectomy rates.

## More vaginal procedures

One of the major decisions made about a hysterectomy is whether it will be abdominal or vaginal. The selection of the surgical approach is important because vaginal hysterectomies tend to be associated with less discomfort and risk of infection, a lower complication rate, a shorter hospital stay, an earlier resumption of normal activities, and lower costs.[28,37-39] Throughout the 1981/82 to 1996/97 period, the majority of hysterectomies were abdominal, although the number and percentage performed vaginally rose (Chart 2, Appendix Table B).

Table 1
**Percentage distribution, main indications for hysterectomy, Canada and provinces, 1981/82 and 1996/97**

| | Number of hysterectomies | Total | Fibroids | Menstrual hemorrhage and pain | Uterine prolapse | Endo-metriosis | Cancer | Other† |
|---|---|---|---|---|---|---|---|---|
| | | | | Percentage distribution | | | | |
| **Canada** | | | | | | | | |
| **1981/82** | **46,614** | **100.0** | **33.6** | **16.8** | **13.6** | **13.2** | **9.6** | **13.3** |
| **1996/97** | **48,572** | **100.0** | **39.4‡** | **16.1‡** | **13.7** | **11.7‡** | **10.2‡** | **8.8‡** |
| **Newfoundland** | | | | | | | | |
| 1981/82 | 974 | 100.0 | 24.3§ | 15.3 | 17.9§ | 17.3§ | 7.5§ | 17.8§ |
| 1996/97 | 1,310 | 100.0 | 33.6‡§ | 16.1 | 17.3§ | 13.1‡ | 7.9§ | 12.1‡§ |
| **Prince Edward Island** | | | | | | | | |
| 1981/82 | 208 | 100.0 | 22.1§ | 32.2§ | 9.6§ | 11.1 | 8.2 | 16.8 |
| 1996/97 | 246 | 100.0 | 30.1§ | 22.8‡§ | 13.0 | 17.9‡§ | 5.7§ | 10.6 |
| **Nova Scotia** | | | | | | | | |
| 1981/82 | 1,638 | 100.0 | 32.5 | 23.7§ | 11.7§ | 11.0§ | 8.3 | 12.8 |
| 1996/97 | 1,720 | 100.0 | 35.2§ | 21.9§ | 10.6§ | 13.8‡§ | 9.9 | 8.6‡ |
| **New Brunswick** | | | | | | | | |
| 1981/82 | 1,337 | 100.0 | 23.6§ | 23.4§ | 14.0 | 14.8 | 7.3§ | 17.0§ |
| 1996/97 | 1,704 | 100.0 | 29.3‡§ | 30.7‡§ | 12.6 | 13.3 | 6.3§ | 7.9‡ |
| **Québec** | | | | | | | | |
| 1981/82 | 14,819 | 100.0 | 36.7§ | 14.9§ | 12.4§ | 14.7§ | 6.6§ | 14.6§ |
| 1996/97 | 12,147 | 100.0 | 40.9‡§ | 16.2‡ | 14.2‡ | 11.3‡ | 9.4‡§ | 8.1‡§ |
| **Ontario** | | | | | | | | |
| 1981/82 | 16,060 | 100.0 | 32.2§ | 18.7§ | 14.6§ | 11.7§ | 10.8§ | 12.0§ |
| 1996/97 | 17,849 | 100.0 | 39.9‡ | 14.9‡§ | 14.4§ | 10.8‡§ | 11.0§ | 9.0‡ |
| **Manitoba** | | | | | | | | |
| 1981/82 | 1,713 | 100.0 | 35.7 | 13.5§ | 15.1 | 9.7§ | 15.5§ | 10.6§ |
| 1996/97 | 1,809 | 100.0 | 38.5 | 13.9§ | 15.7§ | 10.2§ | 12.5‡§ | 9.2 |
| **Saskatchewan** | | | | | | | | |
| 1981/82 | 1,414 | 100.0 | 31.5 | 13.8§ | 18.5§ | 10.1§ | 11.5§ | 14.5 |
| 1996/97 | 1,791 | 100.0 | 39.7‡ | 13.9§ | 13.9‡ | 12.6‡ | 10.6 | 9.5‡ |
| **Alberta** | | | | | | | | |
| 1981/82 | 3,332 | 100.0 | 33.0 | 23.2§ | 11.0§ | 11.7§ | 9.4 | 11.7§ |
| 1996/97 | 4,071 | 100.0 | 39.6‡ | 18.7‡§ | 9.8§ | 13.0§ | 9.5 | 9.4‡ |
| **British Columbia** | | | | | | | | |
| 1981/82 | 5,119 | 100.0 | 34.2 | 9.4§ | 13.8 | 15.4§ | 13.4§ | 13.7 |
| 1996/97 | 5,925 | 100.0 | 40.7‡§ | 12.8†§ | 13.6 | 13.2‡§ | 11.2‡§ | 8.5‡ |

***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82; Canadian Institute for Health Information,1996/97*
***Notes:*** *Because of rounding, percentages may not add to 100%. Refers to CCP 80.2 to 80.7.*
*† For example, menopausal disorders, ovarian diseases, contraceptive management*
*‡ Significantly different from figure for 1981/82 ($p \leq 0.05$)*
*§ Significantly different from national figure for respective year ($p \leq 0.05$)*

Except in Nova Scotia, the percentage of vaginal hysterectomies increased in each province. By 1996/97, vaginal hysterectomies accounted for almost half the total in Prince Edward Island and 4 out of 10 in New Brunswick. The greatest increases, however, were in Québec and Alberta (Chart 3). In 1981/82, just 16% and 18%, respectively, of hysterectomies in those provinces had been vaginal, but by 1996/97, the figure had risen to 33%. The provinces with the lowest percentages of vaginal hysterectomies (29% or 30%) in 1996/97 were Ontario, Manitoba and Saskatchewan. Even so, for Ontario and Manitoba, this marked an upturn from about 20% at the beginning of the period. By contrast, the change in Saskatchewan was relatively small: from 26% to 29%. And in Nova Scotia, the figure actually declined from 40% to 34%.

## Shorter stays

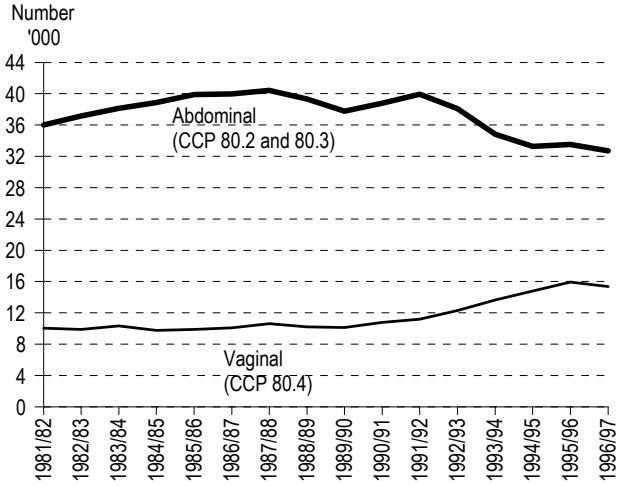
Over the last two decades, average stays for all types of hospitalization have decreased.[40] For hysterectomies, average hospital time was halved

from 9.7 days in 1981/82 to 4.8 days in 1996/97, a trend that has been noted in other countries[41,42] (Table 2, Appendix Table C). The average also dropped in each province. By 1996/97, Alberta had the shortest average length of stay (3.8 days), and Québec and Prince Edward Island, the longest (5.8 and 5.7 days, respectively).

Some of the decline in average stays reflects the rising proportion of vaginal hysterectomies. Until the early 1990s, vaginal hysterectomies involved more hospital time than did abdominal procedures (Chart 4). However, by 1996/97, the averages were 4.1 days for a vaginal hysterectomy and 5.1 days for an abdominal hysterectomy (Appendix Table D).

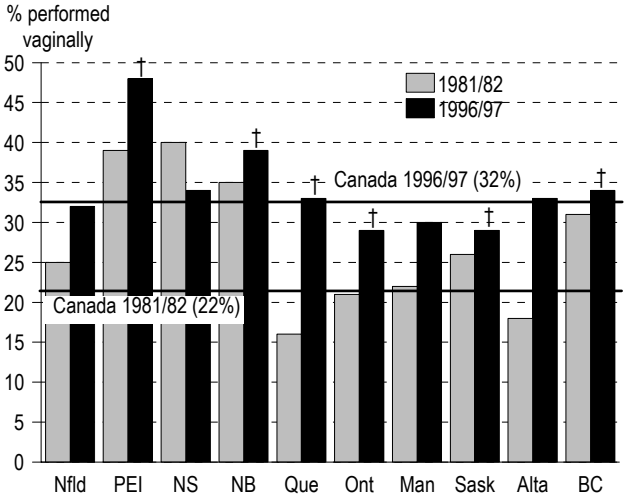
Average stays for both abdominal and vaginal hysterectomies fell in every province. Nonetheless, provincial differences persisted. In 1996/97, for an abdominal hysterectomy, Alberta women averaged 4.1 hospital days, compared with at least 6 days for their Québec and Prince Edward Island counterparts. Similarly, a vaginal hysterectomy entailed an average of 3.0 days in Alberta, but 5.2 days in Québec.

Chart 2
**Hospital separations, by type of hysterectomy, women aged 35 or older, Canada excluding territories, 1981/82 to 1996/97**




***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82 to 1994/95; Canadian Institute for Health Information, 1995/96 and 1996/97*

Chart 3
**Percentage of all hysterectomies performed vaginally, women aged 35 or older, Canada and provinces, 1981/82 and 1996/97**

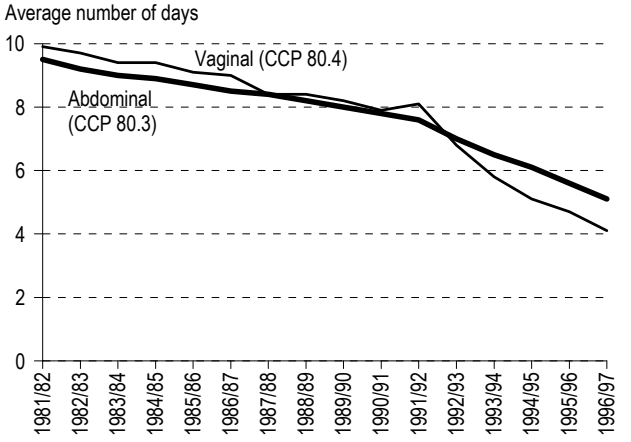



***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82; Canadian Institute for Health Information, 1996/97*
***Note:*** *Refers to CCP 80.4. Percentage performed vaginally significantly different in 1996/97 than in 1981/82 in all provinces except Prince Edward Island and Saskatchewan.*
*† Significantly different than national figure for 1996/97 ($p \leq 0.05$)*

## Fewer hospital days

Lower rates and shorter stays combined to drastically reduce the number of hospital days attributable to hysterectomies. In 1981/82, hysterectomies accounted for 450,500 days; by 1996/97, the total was down to 234,100. This trend characterized every province, although the extent of the downturn varied (Appendix Table C). Declines of around 50% occurred in Nova Scotia, Québec, Ontario, Manitoba and Alberta. By contrast, Prince Edward Island's

Chart 4
**Average length of hospital stay, by type of hysterectomy, women aged 35 or older, Canada excluding territories, 1981/82 to 1996/97**




***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82 to 1994/95; Canadian Institute for Health Information, 1995/96 and 1996/97*

Table 2
**Average length of hospital stay, by type of hysterectomy, Canada and provinces, 1981/82 and 1996/97**

| | Total (CCP 80.2 to 80.7) | | | Abdominal (CCP 80.2 and 80.3) | | | Vaginal (CCP 80.4) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981/82 | 1996/97 | Decline | 1981/82 | 1996/97 | Decline | 1981/82 | 1996/97 | Decline |
| | Average number of days | | | Average number of days | | | Average number of days | | |
| **Canada** | **9.7** | **4.8** | **4.9** | **9.5** | **5.1** | **4.4** | **9.9** | **4.1** | **5.8** |
| Newfoundland | 9.7 | 5.1† | 4.6 | 9.3 | 5.3 | 4.0 | 10.3 | 4.4† | 5.9 |
| Prince Edward Island | 8.8† | 5.7† | 3.1 | 8.6† | 6.5† | 2.1 | 8.3† | 4.8† | 3.5 |
| Nova Scotia | 9.9 | 4.6† | 5.3 | 10.5† | 5.0 | 5.5 | 8.7† | 3.6† | 5.1 |
| New Brunswick | 9.7 | 4.7 | 5.0 | 9.6 | 5.2 | 4.4 | 9.8 | 4.0 | 5.8 |
| Québec | 9.8 | 5.8† | 4.0 | 9.6 | 6.0† | 3.6 | 10.7† | 5.2† | 5.5 |
| Ontario | 9.9† | 4.5† | 5.4 | 9.7 | 4.7† | 5.0 | 10.1 | 3.8† | 6.3 |
| Manitoba | 10.1† | 4.9 | 5.2 | 10.0† | 5.1 | 4.9 | 10.3 | 4.3 | 6.0 |
| Saskatchewan | 10.3† | 5.1 | 5.2 | 10.1† | 5.2† | 4.9 | 10.9† | 4.3 | 6.6 |
| Alberta | 9.3† | 3.8† | 5.5 | 9.0† | 4.1† | 4.9 | 10.2 | 3.0† | 7.2 |
| British Columbia | 8.3† | 4.4† | 3.9 | 8.3† | 4.7 | 3.6 | 8.4† | 3.7† | 4.7 |

***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82; Canadian Institute for Health Information,1996/97*
*† Significantly different from national figure for respective year ($p \leq 0.05$)*

reduction in hospital days due to hysterectomy amounted to only 23%, and Newfoundland's, 29%.

## Notable differences

Contrasts in provincial hysterectomy trends and patterns are striking. For instance, Alberta had a steep drop in rates, a sharp upturn in the percentage performed vaginally, and in 1996/97, the shortest average length of stay. Québec also experienced a sharp decline in rates and a notable increase in the proportion performed vaginally. Yet women who had hysterectomies in Québec averaged the longest time in hospital.

The decline in Québec's hysterectomy rate (and indeed, in the number of hysterectomies) may be a long-term effect of the high rate in the past, which rendered large numbers of women ineligible for the procedure in more recent years. Had it been possible to exclude these women from the calculations, Québec's 1996/97 rate might be much higher.[22]

In Nova Scotia, contrary to the trend elsewhere, the proportion of hysterectomies performed vaginally declined. In fact, Nova Scotia was the only province that recorded fewer vaginal hysterectomies in 1996/97 than in 1981/82.

Saskatchewan's hysterectomy rate was relatively stable, with only a small increase in the proportion performed vaginally.

## Concluding remarks

The substantial provincial variations in hysterectomy rates, the proportion performed vaginally, and average length of stay may result from a combination of several factors. The literature attributes such differences to three main groups of causes: physician factors, the nature of the health care system, and patient characteristics.

Differences in hysterectomy rates and surgical approaches may reflect physicians' uncertainty about appropriate indications.[27,29] Thus, the degree of variation in any surgical procedure may be a measure of the relative importance of professional discretion in the decision to use it. A 1994 study noted large interregional differences in hysterectomy rates in Ontario for indications that are more discretionary, and less variation in rates when the diagnosis and

treatment options are clearer (notably, cancer and fibroids).[17] The decision to resort to hysterectomy may reflect physicians' diagnostic and practice styles, experience, and beliefs in the efficacy of the operation.[10] These, in turn, may be affected by the recency of physicians' training, as lower hysterectomy rates have been noted among recent medical school graduates,[8] who may be more aware of newer alternatives.

The same Ontario study found that regions with teaching hospitals tended to have lower hysterectomy rates, particularly for discretionary indications, but higher rates for definitive indications. Teaching hospitals are likely to be on the forefront of medical knowledge and to have access to surgical options, technologies, and alternatives not yet widely available.[17] As these alternatives become more common, their use tends to spread beyond the confines of a particular institution. Thus, the presence of a teaching hospital in a region may affect the attitudes not only of physicians affiliated with that hospital, but also those of physicians throughout the region.

Higher hysterectomy rates have been observed in less urbanized areas of the United States,[8,10,12,29,43] Great Britain[6,12] and Australia.[15] It might be that some geographic variations in hysterectomy rates in Canada also have to do with whether patients are city-dwellers. Because of the distances involved, it may be more difficult to offer rural women alternative treatment as outpatients.[15,16] In borderline cases, medical staff and the women themselves (wishing to avoid the inconvenience of travelling to specialists for regular monitoring) may opt for a hysterectomy. To some extent, this could account for the relatively high rates in the Atlantic provinces and Saskatchewan, which have substantial numbers of people living far from urban centres.

Patient characteristics, too, may be related to whether a hysterectomy is performed. Repeatedly, educational attainment has been shown to be negatively associated with having the procedure.[12,15,16,44,45] It has been speculated that medical or less radical surgical alternatives may more frequently be offered to or chosen by women with higher education.[44] And possibly because they are better able to communicate with doctors,[46] such women may get more discussion and reassurance about their symptoms and so be less inclined to choose surgery.[44] Therefore, the rising educational attainment of middle-aged women over the past 20 years[47] may have contributed to the decline in the hysterectomy rate.

Quality of life considerations, however, are often paramount in a patient's decision.[10,21] For some women, a hysterectomy is the preferred solution.[5] And for a wide range of conditions, women who have had a hysterectomy report a marked improvement in quality of life and high levels of satisfaction.[29]

The route to hysterectomy is complex. It may involve the use of a number of alternatives before the decision to proceed with surgery is made. Moreover, low hysterectomy rates do not inevitably mean superior standards of practice.[6,11] Despite the trend to non-hysterectomy management of gynaecological problems, it is not possible to conclude that high rates reflect unnecessary hysterectomies. ●

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## Appendix

Table A

**Hospital separations for hysterectomy and age-adjusted rates, women aged 35 or older, Canada and provinces, 1981/82 to 1996/97**

| | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number of separations** | | | | | | | | | | | |
| 1981/82 | **46,614** | 974 | 208 | 1,638 | 1,337 | 14,819 | 16,060 | 1,713 | 1,414 | 3,332 | 5,119 |
| 1982/83 | **47,631** | 1,099 | 247 | 1,729 | 1,329 | 14,750 | 16,333 | 1,647 | 1,526 | 3,935 | 5,036 |
| 1983/84 | **49,089** | 1,198 | 291 | 1,729 | 1,405 | 15,206 | 16,546 | 1,745 | 1,512 | 4,015 | 5,442 |
| 1984/85 | **49,083** | 1,150 | 221 | 1,780 | 1,474 | 14,654 | 16,705 | 1,947 | 1,574 | 4,195 | 5,383 |
| 1985/86 | **50,205** | 1,180 | 232 | 1,823 | 1,463 | 14,631 | 17,270 | 1,896 | 1,576 | 4,364 | 5,770 |
| 1986/87 | **50,557** | 1,342 | 254 | 1,866 | 1,554 | 14,031 | 17,557 | 1,919 | 1,685 | 4,613 | 5,736 |
| 1987/88 | **51,553** | 1,466 | 247 | 1,911 | 1,617 | 13,748 | 18,551 | 1,957 | 1,723 | 4,256 | 6,077 |
| 1988/89 | **50,082** | 1,311 | 219 | 1,952 | 1,627 | 13,019 | 18,253 | 1,817 | 1,788 | 4,414 | 5,682 |
| 1989/90 | **48,352** | 1,212 | 217 | 1,965 | 1,600 | 12,461 | 17,717 | 1,898 | 1,765 | 4,164 | 5,353 |
| 1990/91 | **50,067** | 1,183 | 208 | 1,873 | 1,592 | 12,946 | 18,793 | 1,701 | 1,459 | 4,235 | 6,077 |
| 1991/92 | **51,600** | 1,262 | 188 | 2,015 | 1,633 | 13,066 | 19,137 | 1,990 | 1,750 | 4,461 | 6,098 |
| 1992/93 | **50,921** | 1,225 | 203 | 1,977 | 1,660 | 12,992 | 18,806 | 1,854 | 1,808 | 4,564 | 5,832 |
| 1993/94 | **48,999** | 1,208 | 273 | 1,939 | 1,654 | 12,788 | 17,646 | 1,788 | 1,610 | 4,372 | 5,721 |
| 1994/95 | **48,560** | 1,097 | 273 | 1,890 | 1,688 | 13,024 | 17,545 | 1,696 | 1,574 | 4,181 | 5,592 |
| 1995/96 | **49,939** | 1,107 | 249 | 1,862 | 1,672 | 13,186 | 18,064 | 1,829 | 1,690 | 4,234 | 6,046 |
| 1996/97 | **48,572** | 1,310 | 246 | 1,720 | 1,704 | 12,147 | 17,849 | 1,809 | 1,791 | 4,071 | 5,925 |
| **Age-adjusted rate per 100,000** | | | | | | | | | | | |
| 1981/82 | **937** | 1,018 | 932 | 1,000 | 1,033 | 1,084† | 869† | 818 | 771† | 835† | 894 |
| 1982/83 | **927** | 1,115 | 1,042 | 1,017 | 987 | 1,050 | 857 | 775 | 820 | 933 | 848 |
| 1983/84 | **927** | 1,168 | 1,208 | 981 | 1,009 | 1,057 | 842 | 801 | 795 | 918 | 884 |
| 1984/85 | **903** | 1,087 | 867 | 982 | 1,025 | 995 | 827 | 883 | 820 | 934 | 842 |
| 1985/86 | **900** | 1,078 | 901 | 985 | 992 | 970 | 834 | 845 | 800 | 945 | 879 |
| 1986/87 | **883** | 1,193 | 958 | 986 | 1,028 | 908 | 827 | 836 | 851 | 967 | 848 |
| 1987/88 | **873** | 1,265 | 912 | 981 | 1,034 | 866 | 844 | 827 | 849 | 870 | 867 |
| 1988/89 | **824** | 1,107 | 793 | 978 | 1,012 | 800 | 803 | 758 | 870 | 875 | 780 |
| 1989/90 | **767** | 993 | 751 | 955 | 966 | 742 | 751 | 774 | 840 | 793 | 702 |
| 1990/91 | **769** | 944 | 700 | 885 | 928 | 748 | 771 | 680 | 665 | 775 | 762 |
| 1991/92 | **769** | 973 | 622 | 921 | 925 | 736 | 762 | 777 | 798 | 782 | 734 |
| 1992/93 | **737** | 922 | 654 | 884 | 921 | 714 | 728 | 711 | 813 | 770 | 674 |
| 1993/94 | **688** | 888 | 860 | 844 | 895 | 685 | 664 | 668 | 706 | 712 | 632 |
| 1994/95 | **663** | 796 | 845 | 805 | 894 | 682 | 641 | 622 | 679 | 656 | 591 |
| 1995/96 | **663** | 789 | 747 | 775 | 869 | 676 | 641 | 657 | 710 | 643 | 613 |
| 1996/97 | **628** | 917† | 721 | 700 | 869† | 612 | 616 | 639 | 733 | 597 | 579 |

***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82 to 1994/95; Canadian Institute for Health Information, 1995/96 and 1996/97*
***Note:*** *Refers to CCP 80.2 to 80.7. Adjusted to age distribution of women aged 35 or older in 1996. Declines in hysterectomy rates between 1981/82 and 1996/97 were significant in all provinces.*
*† Significantly different from national figure for respective year ($p \leq 0.05$)*

Table B
**Hospital separations, by type of hysterectomy, women aged 35 or older, Canada and provinces, 1981/82 to 1996/97**

| | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Abdominal (CCP 80.2 and 80.3)** | | | | | | | | | | | |
| 1981/82 | **36,016** | 717 | 125 | 978 | 865 | 12,155 | 12,547 | 1,338 | 1,043 | 2,728 | 3,520 |
| 1982/83 | **37,166** | 843 | 136 | 1,061 | 857 | 12,193 | 12,920 | 1,269 | 1,139 | 3,189 | 3,559 |
| 1983/84 | **38,132** | 903 | 182 | 1,041 | 931 | 12,433 | 13,098 | 1,388 | 1,151 | 3,213 | 3,792 |
| 1984/85 | **38,874** | 885 | 148 | 1,125 | 969 | 12,158 | 13,445 | 1,601 | 1,227 | 3,461 | 3,855 |
| 1985/86 | **39,875** | 921 | 141 | 1,158 | 998 | 12,222 | 14,013 | 1,541 | 1,179 | 3,511 | 4,191 |
| 1986/87 | **39,992** | 1,042 | 145 | 1,206 | 976 | 11,681 | 14,185 | 1,539 | 1,317 | 3,707 | 4,194 |
| 1987/88 | **40,426** | 1,163 | 147 | 1,261 | 1,017 | 11,210 | 14,951 | 1,547 | 1,326 | 3,414 | 4,390 |
| 1988/89 | **39,341** | 1,019 | 119 | 1,294 | 1,115 | 10,510 | 14,707 | 1,472 | 1,434 | 3,516 | 4,155 |
| 1989/90 | **37,759** | 908 | 144 | 1,288 | 1,076 | 10,037 | 14,161 | 1,528 | 1,372 | 3,367 | 3,878 |
| 1990/91 | **38,779** | 925 | 124 | 1,214 | 1,042 | 10,197 | 15,041 | 1,350 | 1,082 | 3,377 | 4,427 |
| 1991/92 | **39,917** | 956 | 124 | 1,326 | 1,124 | 10,263 | 15,278 | 1,533 | 1,380 | 3,509 | 4,424 |
| 1992/93 | **38,103** | 864 | 138 | 1,342 | 1,125 | 9,610 | 14,604 | 1,437 | 1,361 | 3,538 | 4,084 |
| 1993/94 | **34,820** | 872 | 189 | 1,224 | 1,116 | 9,052 | 12,864 | 1,358 | 1,133 | 3,063 | 3,949 |
| 1994/95 | **33,278** | 778 | 144 | 1,252 | 1,059 | 8,776 | 12,490 | 1,294 | 1,104 | 2,737 | 3,644 |
| 1995/96 | **33,535** | 772 | 125 | 1,196 | 1,063 | 8,795 | 12,393 | 1,321 | 1,183 | 2,794 | 3,893 |
| 1996/97 | **32,703** | 873 | 126 | 1,120 | 1,036 | 7,941 | 12,530 | 1,251 | 1,259 | 2,715 | 3,852 |
| **Vaginal (CCP 80.4)** | | | | | | | | | | | |
| 1981/82 | **10,070** | 247 | 81 | 649 | 469 | 2,386 | 3,325 | 369 | 366 | 594 | 1,584 |
| 1982/83 | **9,899** | 252 | 111 | 656 | 467 | 2,221 | 3,248 | 361 | 383 | 731 | 1,469 |
| 1983/84 | **10,341** | 284 | 109 | 662 | 471 | 2,461 | 3,250 | 342 | 354 | 785 | 1,623 |
| 1984/85 | **9,779** | 259 | 73 | 636 | 500 | 2,323 | 3,111 | 332 | 334 | 713 | 1,498 |
| 1985/86 | **9,874** | 247 | 91 | 635 | 463 | 2,249 | 3,073 | 341 | 383 | 834 | 1,558 |
| 1986/87 | **10,095** | 293 | 109 | 639 | 575 | 2,155 | 3,207 | 364 | 356 | 884 | 1,513 |
| 1987/88 | **10,620** | 283 | 100 | 633 | 596 | 2,309 | 3,446 | 393 | 377 | 827 | 1,656 |
| 1988/89 | **10,203** | 276 | 100 | 631 | 504 | 2,300 | 3,361 | 325 | 338 | 870 | 1,498 |
| 1989/90 | **10,138** | 287 | 71 | 654 | 521 | 2,266 | 3,387 | 346 | 383 | 774 | 1,449 |
| 1990/91 | **10,807** | 242 | 83 | 632 | 545 | 2,596 | 3,579 | 327 | 359 | 823 | 1,621 |
| 1991/92 | **11,182** | 286 | 64 | 665 | 503 | 2,657 | 3,663 | 439 | 361 | 920 | 1,624 |
| 1992/93 | **12,308** | 351 | 65 | 608 | 530 | 3,237 | 3,983 | 399 | 428 | 1,003 | 1,704 |
| 1993/94 | **13,670** | 322 | 82 | 683 | 532 | 3,577 | 4,587 | 413 | 463 | 1,284 | 1,727 |
| 1994/95 | **14,782** | 308 | 129 | 609 | 623 | 4,109 | 4,850 | 385 | 451 | 1,425 | 1,893 |
| 1995/96 | **15,940** | 318 | 124 | 640 | 604 | 4,247 | 5,494 | 487 | 488 | 1,419 | 2,119 |
| 1996/97 | **15,373** | 415 | 119 | 584 | 663 | 4,045 | 5,132 | 543 | 517 | 1,332 | 2,023 |

***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82 to 1994/95; Canadian Institute for Health Information, 1995/96 and 1996/97*

Table C
**Number of hospital days and average length of stay for hysterectomy, women aged 35 or older, Canada and provinces, 1981/82 to 1996/97**

| | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number of days** | | | | | | | | | | | |
| 1981/82 | **450,533** | 9,422 | 1,822 | 16,159 | 13,035 | 145,268 | 159,193 | 17,284 | 14,615 | 31,014 | 42,721 |
| 1982/83 | **448,391** | 9,928 | 2,148 | 17,001 | 13,046 | 141,348 | 156,963 | 16,384 | 15,920 | 35,511 | 40,142 |
| 1983/84 | **451,687** | 11,054 | 2,538 | 16,367 | 13,138 | 142,874 | 155,508 | 16,512 | 15,060 | 35,926 | 42,710 |
| 1984/85 | **446,299** | 10,508 | 1,891 | 16,376 | 13,869 | 136,584 | 154,247 | 18,653 | 15,560 | 36,695 | 41,916 |
| 1985/86 | **446,580** | 9,875 | 2,146 | 16,266 | 13,165 | 135,899 | 155,211 | 17,624 | 15,312 | 37,297 | 43,785 |
| 1986/87 | **440,862** | 10,895 | 2,194 | 16,100 | 13,662 | 128,897 | 153,870 | 17,853 | 16,115 | 38,754 | 42,522 |
| 1987/88 | **436,229** | 11,539 | 2,075 | 15,988 | 14,345 | 124,022 | 157,977 | 16,557 | 15,669 | 33,714 | 44,343 |
| 1988/89 | **416,140** | 10,557 | 1,814 | 16,236 | 13,483 | 115,733 | 151,513 | 16,462 | 15,205 | 34,695 | 40,442 |
| 1989/90 | **391,140** | 9,966 | 1,981 | 15,774 | 12,653 | 109,072 | 140,965 | 16,488 | 14,625 | 32,162 | 37,454 |
| 1990/91 | **394,873** | 9,632 | 1,697 | 14,812 | 12,711 | 113,790 | 143,932 | 13,718 | 11,917 | 31,132 | 41,532 |
| 1991/92 | **399,649** | 9,386 | 1,567 | 15,383 | 12,136 | 123,293 | 136,900 | 16,492 | 13,634 | 30,787 | 40,071 |
| 1992/93 | **358,914** | 8,802 | 1,571 | 14,062 | 11,933 | 111,041 | 120,344 | 13,878 | 12,245 | 28,377 | 36,661 |
| 1993/94 | **313,331** | 7,555 | 1,824 | 12,900 | 11,227 | 102,930 | 100,079 | 11,179 | 9,727 | 22,013 | 33,897 |
| 1994/95 | **284,555** | 6,803 | 1,835 | 10,553 | 9,806 | 100,153 | 91,064 | 9,728 | 8,466 | 17,197 | 28,950 |
| 1995/96 | **268,527** | 6,078 | 1,572 | 9,324 | 9,048 | 92,135 | 86,333 | 10,943 | 8,734 | 16,606 | 27,754 |
| 1996/97 | **234,132** | 6,698 | 1,401 | 7,861 | 8,072 | 70,765 | 80,032 | 8,841 | 9,074 | 15,410 | 25,978 |
| **Average number of days** | | | | | | | | | | | |
| 1981/82 | **9.7** | 9.7 | 8.8 | 9.9 | 9.7 | 9.8 | 9.9 | 10.1 | 10.3 | 9.3 | 8.3 |
| 1982/83 | **9.4** | 9.0 | 8.7 | 9.8 | 9.8 | 9.6 | 9.6 | 9.9 | 10.4 | 9.0 | 8.0 |
| 1983/84 | **9.2** | 9.2 | 8.7 | 9.5 | 9.4 | 9.4 | 9.4 | 9.5 | 10.0 | 8.9 | 7.8 |
| 1984/85 | **9.1** | 9.1 | 8.6 | 9.2 | 9.4 | 9.3 | 9.2 | 9.6 | 9.9 | 8.7 | 7.8 |
| 1985/86 | **8.9** | 8.4 | 9.3 | 8.9 | 9.0 | 9.3 | 9.0 | 9.3 | 9.7 | 8.5 | 7.6 |
| 1986/87 | **8.7** | 8.1 | 8.6 | 8.6 | 8.8 | 9.2 | 8.8 | 9.3 | 9.6 | 8.4 | 7.4 |
| 1987/88 | **8.5** | 7.9 | 8.4 | 8.4 | 8.9 | 9.0 | 8.5 | 8.5 | 9.1 | 7.9 | 7.3 |
| 1988/89 | **8.3** | 8.1 | 8.3 | 8.3 | 8.3 | 8.9 | 8.3 | 9.1 | 8.5 | 7.9 | 7.1 |
| 1989/90 | **8.1** | 8.2 | 9.1 | 8.0 | 7.9 | 8.8 | 8.0 | 8.7 | 8.3 | 7.7 | 7.0 |
| 1990/91 | **7.9** | 8.1 | 8.2 | 7.9 | 8.0 | 8.8 | 7.7 | 8.1 | 8.2 | 7.4 | 6.8 |
| 1991/92 | **7.7** | 7.4 | 8.3 | 7.6 | 7.4 | 9.4 | 7.2 | 8.3 | 7.8 | 6.9 | 6.6 |
| 1992/93 | **7.0** | 7.2 | 7.7 | 7.1 | 7.2 | 8.5 | 6.4 | 7.5 | 6.8 | 6.2 | 6.3 |
| 1993/94 | **6.4** | 6.3 | 6.7 | 6.7 | 6.8 | 8.0 | 5.7 | 6.3 | 6.0 | 5.0 | 5.9 |
| 1994/95 | **5.9** | 6.2 | 6.7 | 5.6 | 5.8 | 7.7 | 5.2 | 5.7 | 5.4 | 4.1 | 5.2 |
| 1995/96 | **5.4** | 5.5 | 6.3 | 5.0 | 5.4 | 7.0 | 4.8 | 6.0 | 5.2 | 3.9 | 4.6 |
| 1996/97 | **4.8** | 5.1 | 5.7 | 4.6 | 4.7 | 5.8 | 4.5 | 4.9 | 5.1 | 3.8 | 4.4 |

***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82 to 1994/95; Canadian Institute for Health Information, 1995/96 and 1996/97*
***Note:*** *Refers to CCP 80.2 to 80.7.*

Table D
**Average length of hospital stay, by type of hysterectomy, women aged 35 or older, Canada and provinces, 1981/82 to 1996/97**

| | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Average number of days | | | | | |
| **Abdominal (CCP 80.2 and 80.3)** | | | | | | | | | | | |
| 1981/82 | **9.5** | 9.3 | 8.6 | 10.5 | 9.6 | 9.6 | 9.7 | 10.0 | 10.1 | 9.0 | 8.3 |
| 1982/83 | **9.2** | 8.8 | 8.8 | 10.5 | 9.5 | 9.4 | 9.4 | 9.6 | 10.2 | 8.7 | 7.9 |
| 1983/84 | **9.0** | 9.0 | 8.5 | 9.8 | 9.4 | 9.2 | 9.2 | 9.2 | 9.6 | 8.6 | 7.8 |
| 1984/85 | **8.9** | 8.9 | 8.6 | 9.6 | 9.3 | 9.1 | 9.0 | 9.1 | 9.6 | 8.4 | 7.7 |
| 1985/86 | **8.7** | 8.2 | 9.7 | 9.2 | 9.2 | 9.1 | 8.8 | 9.0 | 9.3 | 8.3 | 7.6 |
| 1986/87 | **8.5** | 7.8 | 9.1 | 9.0 | 9.1 | 8.9 | 8.6 | 8.5 | 9.3 | 8.2 | 7.3 |
| 1987/88 | **8.4** | 7.7 | 9.0 | 8.9 | 9.5 | 8.8 | 8.4 | 8.3 | 8.8 | 7.7 | 7.3 |
| 1988/89 | **8.2** | 7.9 | 8.4 | 8.6 | 8.4 | 8.7 | 8.1 | 8.9 | 8.3 | 7.6 | 7.2 |
| 1989/90 | **8.0** | 7.9 | 9.5 | 8.3 | 8.1 | 8.5 | 7.8 | 8.6 | 8.1 | 7.6 | 7.0 |
| 1990/91 | **7.8** | 8.0 | 8.5 | 8.2 | 8.1 | 8.6 | 7.5 | 7.9 | 7.9 | 7.2 | 6.8 |
| 1991/92 | **7.6** | 7.2 | 9.0 | 7.7 | 7.6 | 9.0 | 7.0 | 7.7 | 7.7 | 6.8 | 6.7 |
| 1992/93 | **7.0** | 7.1 | 8.1 | 7.5 | 7.4 | 8.5 | 6.3 | 7.4 | 6.7 | 6.2 | 6.3 |
| 1993/94 | **6.5** | 6.4 | 6.7 | 7.0 | 7.1 | 8.2 | 5.8 | 6.2 | 6.3 | 5.3 | 6.0 |
| 1994/95 | **6.1** | 6.4 | 7.3 | 5.9 | 6.4 | 7.9 | 5.4 | 5.8 | 5.5 | 4.5 | 5.4 |
| 1995/96 | **5.6** | 5.6 | 7.3 | 5.4 | 5.9 | 7.2 | 5.0 | 6.3 | 5.5 | 4.3 | 4.9 |
| 1996/97 | **5.1** | 5.3 | 6.5 | 5.0 | 5.2 | 6.0 | 4.7 | 5.1 | 5.2 | 4.1 | 4.7 |
| **Vaginal (CCP 80.4)** | | | | | | | | | | | |
| 1981/82 | **9.9** | 10.3 | 8.3 | 8.7 | 9.8 | 10.7 | 10.1 | 10.3 | 10.9 | 10.2 | 8.4 |
| 1982/83 | **9.7** | 9.6 | 8.6 | 8.4 | 10.3 | 10.4 | 9.8 | 10.5 | 10.9 | 10.1 | 8.1 |
| 1983/84 | **9.4** | 9.7 | 9.1 | 8.2 | 9.2 | 10.2 | 9.8 | 9.5 | 11.0 | 9.9 | 7.7 |
| 1984/85 | **9.4** | 9.8 | 8.5 | 7.9 | 9.3 | 10.1 | 9.6 | 10.9 | 10.9 | 10.0 | 7.6 |
| 1985/86 | **9.1** | 8.7 | 8.6 | 7.7 | 8.5 | 10.1 | 9.1 | 9.8 | 10.9 | 9.4 | 7.5 |
| 1986/87 | **9.0** | 8.9 | 8.1 | 7.4 | 8.1 | 10.4 | 8.9 | 11.4 | 10.5 | 9.0 | 7.3 |
| 1987/88 | **8.4** | 7.9 | 7.6 | 6.9 | 7.8 | 9.5 | 8.5 | 8.8 | 9.9 | 8.6 | 7.1 |
| 1988/89 | **8.4** | 8.2 | 8.1 | 6.9 | 7.7 | 9.3 | 8.6 | 9.2 | 9.0 | 8.8 | 6.9 |
| 1989/90 | **8.2** | 8.5 | 8.1 | 7.1 | 7.4 | 9.4 | 8.1 | 8.8 | 8.7 | 8.0 | 6.8 |
| 1990/91 | **7.9** | 8.0 | 7.6 | 6.6 | 7.6 | 9.2 | 7.7 | 8.2 | 8.6 | 7.8 | 6.7 |
| 1991/92 | **8.1** | 7.3 | 7.1 | 7.0 | 7.0 | 10.7 | 7.4 | 10.0 | 7.9 | 7.1 | 6.2 |
| 1992/93 | **6.8** | 7.0 | 6.9 | 5.8 | 6.6 | 8.3 | 6.1 | 7.4 | 6.5 | 6.2 | 5.9 |
| 1993/94 | **5.8** | 5.8 | 6.6 | 5.7 | 5.9 | 7.5 | 5.0 | 6.2 | 5.3 | 4.3 | 5.6 |
| 1994/95 | **5.1** | 5.7 | 6.1 | 4.5 | 4.8 | 6.9 | 4.3 | 5.4 | 4.9 | 3.2 | 4.5 |
| 1995/96 | **4.7** | 5.0 | 5.3 | 4.1 | 4.5 | 6.5 | 4.0 | 4.8 | 4.2 | 3.0 | 4.0 |
| 1996/97 | **4.1** | 4.4 | 4.8 | 3.6 | 4.0 | 5.2 | 3.8 | 4.3 | 4.3 | 3.0 | 3.7 |

***Data sources:*** *Statistics Canada, Hospital Morbidity File, 1981/82 to 1994/95; Canadian Institute for Health Information, 1995/96 and 1996/97*

# Migraine

*Heather Gilmour and Kathryn Wilkins*


## Abstract

***Objectives***

This article provides prevalence and incidence estimates of migraine among Canadians aged 12 or older. Associations with selected socio-demographic factors and health characteristics are also examined. Selected health indicators and medication use, as well as health care use and attitudes, are discussed, comparing migraineurs with non-migraineurs.

***Data sources***

The findings are based on the cross-sectional and longitudinal household components of the first three cycles (1994/95, 1996/97 and 1998/99) of Statistics Canada's National Population Health Survey. Information on hospital stays is from the 1997/98 Hospital Morbidity Database, maintained by the Canadian Institute for Health Information.

***Analytical techniques***

Cross-tabulations were used to estimate the prevalence and incidence of migraine. Associations of migraine with selected factors were examined using generalized logistic regression.

***Main results***

In 1998/99, migraine was most prevalent among women, 25- to 54-year-olds, Whites, and individuals in low-income households. The odds of being diagnosed with migraine were higher for women with pre-existing sinusitis, bronchitis or emphysema, compared with women without these conditions. The odds of this disorder for men were associated with previously diagnosed arthritis or rheumatism.



## Key words

comorbidity, headache, longitudinal studies



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A substantial number of Canadians suffer from recurrent, potentially severe headaches known as "migraine" (see *What is migraine?*). According to the 1998/99 National Population Health Survey (NPHS), an estimated 8% of Canadians aged 12 or older—nearly 2 million people—have received a clinical diagnosis of migraine.

Previous studies indicate that migraine has a major impact on productivity and lifestyle.[1-7] It can result in days away from work, hinder job performance, restrict activities and disrupt relationships. In addition, the direct costs of doctor consultations, emergency room visits, and drug treatments for migraine are considerable. It has been estimated that migraine accounts for 7 million lost working days annually in Canada.[8] A recent US study estimated 112 million bedridden days a year for migraineurs, costing employers $13 billion (US) because of missed workdays and impaired work function, and $1 billion in direct costs for medical care.[6] (Direct costs include those associated with medical visits and medications.[6]) Although the impact of migraine is appreciable, little is known about the extent and burden of this health problem among Canadians.

## Methods

### Data sources

This analysis is based on data from Statistics Canada's National Population Health Survey (NPHS), weighted to represent the population of the 10 provinces. 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, on 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.

**Cross-sectional sample:** The 1994/95 and 1996/97 (cycles 1 and 2) cross-sectional samples are made up of longitudinal respondents and other members of their households, as well as individuals who were selected as part of supplemental samples, or "buy-ins," in some provinces. In 1994/95, the large majority of interviews were conducted in person. Most of the 1996/97 interviews were conducted by telephone, and the additional respondents for the buy-ins were chosen using the random digit dialling technique. The 1998/99 (cycle 3) cross-sectional sample is made up mostly of longitudinal respondents and their cohabitants. Again, most of the interviews were conducted by telephone. Although no buy-ins were added to the cycle 3 sample, infants born in 1995 or later and immigrants who entered Canada after 1994 were randomly selected and added to keep the sample representative. As well, to replace the sample that was lost to attrition, individuals in households that were part of the original sampling frame, but whose members did not respond in 1994/95, were contacted and asked to participate.

NPHS data consisting of socio-demographic and some health information obtained for each member of participating households are found in the General file. In-depth health information, which was collected for one randomly selected household member, as well as the information in the General file pertaining to that individual, is found in the Health file.

In households belonging to the cross-sectional buy-in component, one knowledgeable person provided the socio-demographic and health information about all household members for the General file. As well, one household member, not necessarily the same person, was randomly selected to provide in-depth health information about himself or herself for the Health file.

Among individuals in the longitudinal component in 1996/97 and 1998/99, 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 cycles 2 and 3. In households that were added to the 1998/99 cross-sectional sample (immigrants, infants and individuals in households that did not participate in cycle 1), the randomly selected respondent was also the person who provided information for the General file.

The 1994/95 provincial, non-institutional sample consisted of 27,263 households, of which 88.7% agreed to participate. After the application of a screening rule to maintain the representativeness of the sample, 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.

In 1996/97, the overall response rate at the household level was 82.6%. The response rate for the randomly selected individuals aged 2 or older in these households was 95.6%. In 1998/99, the overall response rate was 88.2% at the household level. The response rate for the randomly selected respondents aged 0 or older in these households was 98.5%.

**Longitudinal sample:** Of the 17,626 randomly selected respondents in 1994/95, 14,786 were eligible members of the longitudinal panel, along with 468 persons for whom only general information was collected. An additional 2,022 of the 2,383 randomly selected respondents under age 12 were also eligible for the longitudinal panel. Thus, 17,276 respondents were eligible for re-interview in 1996/97, and 16,677 were still alive in 1998/99. A response rate of 93.6% was achieved for the longitudinal panel in 1996/97, and a response rate of 88.9%, based on the entire panel, was achieved in 1998/99. Of the 16,168 participants in 1996/97, full information (that is, general and in-depth health information for the first two cycles of the survey or an outcome of death or institutionalization) was available for 15,670. The corresponding number for 1998/99 was 14,619 respondents. More detailed descriptions of the NPHS design, sample, and interview procedures can be found in published reports.[9,10]

Hospital discharge data for migraine were obtained from the Hospital Morbidity Database for 1997/98, which is maintained by the Canadian Institute for Health Information. The information in this database comes from the separation form completed by Canadian hospitals at the end of each patient's stay.

### Analytical techniques

Cross-tabulations, based on data from the cross-sectional Health files (all three cycles), were used to estimate the prevalence of migraine in the household population aged 12 or older. Data from the longitudinal Health file were used to estimate incidence. Incident cases of migraine were considered to occur in individuals who did not have reports of clinically diagnosed migraine in cycle 1 (1994/95), then had subsequent reports of migraine in cycle 2 and/or cycle 3 (1996/97 and/or 1998/99).

Women who lived in a household with a child younger than 1 were excluded from the analysis of overnight hospital stays, since they would likely have stayed in a hospital during childbirth.

Generalized logistic regression was used to model the relationship between incident cases of self-report of physician-diagnosed migraine and various socio-demographic and health factors. Individuals who indicated that they did not have diagnosed migraine in cycle 1 were identified as the population at risk of developing migraine. Chronic conditions that had been significantly more prevalent among migraineurs than non-migraineurs in any of the three cross-sectional cycles of the NPHS were included in the model. A variable to account for missing data on household income was included in the model for both sexes, but removed from the model for each sex because of small numbers. Education was not included in the model since individuals in the younger age groups would not yet have attained their highest level of education. (The relationships did not change when education was added to the model.)

All cross-sectional estimates based on NPHS data were weighted to represent the Canadian population at the date of each survey cycle. Longitudinal estimates were weighted to represent the 1994 Canadian population. To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique.[11-13]

This article examines the prevalence of migraine in Canada using cross-sectional data from the 1998/99 National Population Health Survey (NPHS). In addition, longitudinal data from individuals followed from 1994/95 to 1998/99 offer a unique opportunity to estimate migraine incidence and identify associated factors. (See *Methods, Limitations,* and *Supplementary definitions* in the Appendix.)

## One in twelve diagnosed

According to the 1998/99 NPHS, an estimated 2 million Canadians aged 12 or older had been diagnosed with migraine (Table 1). Earlier Canadian studies have reported a considerably higher figure of over 3 million.[8,14] The inconsistency likely arises from differences in the way migraine was defined (see *Defining migraine in the NPHS*). While the NPHS asked respondents if they had medically diagnosed migraine, the other studies defined migraine by asking questions about a specific set of symptoms identified by the International Headache Society.[15] For example, respondents were asked if headache pain occurred on one side of the head, had a pulsating quality, or was accompanied by nausea, vomiting, or sensitivity to light or sound. Because many migraineurs never actually receive a clinical diagnosis,[1,16-18] the NPHS likely underestimates prevalence.

## More common among women

Estimates from the 1998/99 NPHS show that migraine is three times as common in females (11.7%) as in males (3.8%) (Table 1). The higher prevalence of migraine among women has been well documented in population-based studies in Canada,[8,14] the United States[2,16,19] and other countries.[5,17,20-25] Hormonal fluctuations that women experience related to menstruation, oral contraceptive use, pregnancy, menopause, and

### Defining migraine in the NPHS

To establish the presence of chronic conditions, including *migraine*, National Population Health Survey (NPHS) respondents were asked if they had any "long-term conditions that have lasted or are expected to last six months or more and that have been diagnosed by a health professional" (see *Limitations*). In addition to migraine, chronic conditions relevant to this study are: food allergies, other allergies, asthma, arthritis or rheumatism, back problems excluding arthritis, high blood pressure, bronchitis or emphysema, sinusitis, stomach or intestinal ulcers, diabetes, epilepsy, heart disease, cancer, effects of a stroke, and urinary incontinence. Only those conditions that were significantly associated with migraine in bivariate analysis are shown in Tables 4, 6 and D.

Follow-up questions were asked in cycles 2 and 3 if the response to the question "Do you have migraine headaches?" was inconsistent with the response to the same question in the previous cycle. For example, if records showed "No" to "Do you have migraine headaches?" in cycle 1 and "Yes" to the same question in cycle 2, respondents were asked, "When were you diagnosed with this?". If the date given was before the previous interview, the respondent was asked, "So you had migraine headaches prior to our last interview?" Alternatively, if the respondent answered "Yes" in cycle 1 followed by "No" in cycle 2, the interviewer asked, "During our last interview it was reported that you had migraine headaches, but this time it was not. Has the condition disappeared since then?" Respondents could confirm that their migraine headaches had disappeared, or that the cycle 1 response was an error and they had never had migraine. For the longitudinal analysis, responses to these follow-up questions were taken into account when determining the number of respondents who had migraine in cycles 1 and 2. Specifically, respondents who indicated that they did have migraine in the previous cycle even though the response was "No" at that time were counted as migraineurs. Likewise, respondents who had said "Yes" they had migraine in the previous cycle, but in a subsequent cycle indicated that they never had migraine were not counted as migraineurs.

A possible explanation for inconsistent replies between cycles is that a proxy reporter gave the information for the selected respondent in the first cycle, then the selected individual was interviewed directly in subsequent cycles.[26] It is also possible that respondents did not clearly understand the question in one of the cycles. Alternatively, undiagnosed individuals may have consulted a physician between survey cycles and received a diagnosis of migraine. As a result of the follow-up questions, more people indicated that they actually did have migraine in the previous cycle than indicated that they never had migraine. Thus, the net effect of adjusting responses based on the follow-up questions was to increase the number of prevalent cases in cycle 1 and thus reduce the number of incident cases.

hormone replacement therapy appear to influence migraine prevalence.[27] However, the ratio of female-to-male migraineurs remains high even in older age groups, suggesting the existence of additional, but as yet unidentified, reasons for the elevated prevalence among women (Chart 1).[16]

Table 1
**Prevalence of migraine, by selected socio-demographic factors and health characteristics, household population aged 12 or older, Canada excluding territories, 1998/99**

| | Sample size | Estimated population | Prevalence |
|---|---|---|---|
| | | '000 | % |
| **Total** | **1,197** | **1,956** | **7.9** |
| **Sex** | | | |
| Male | 268 | 469 | 3.8 |
| Female | 929 | 1,485 | 11.7** |
| **Age group†** | | | |
| 12-24 | 149 | 290 | 5.6 |
| 25-39 | 449 | 679 | 9.9 |
| 40-54 | 382 | 657 | 9.9 |
| 55-69 | 153 | 244 | 6.5 |
| 70+ | 64 | 82 | 3.4 |
| **Race** | | | |
| White | 1,101 | 1,771 | 8.1* |
| Non-White | 92 | 178 | 5.9 |
| **Education‡** | | | |
| Secondary graduation or less | 366 | 594 | 7.8 |
| Some postsecondary or more | 682 | 1,070 | 8.9 |
| **Household income** | | | |
| Lowest | 238 | 280 | 8.9 |
| Lower-middle | 312 | 485 | 7.9 |
| Upper-middle | 380 | 670 | 7.9 |
| Highest | 213 | 422 | 8.1 |
| **Ever a daily smoker** | | | |
| Yes | 650 | 1,016 | 8.5* |
| No | 544 | 935 | 7.3 |
| **Type of drinker** | | | |
| Regular | 540 | 950 | 7.0 |
| Occasional/ Former/Abstainer | 654 | 1,000 | 8.9** |
| **Major depressive episode** | | | |
| Yes | 145 | 220 | 20.4** |
| No | 1,024 | 1,683 | 7.3 |

***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1998/99*
***Note:*** *Detail may not add to totals because of missing values for some variables.*
*† All pairwise comparisons ($p \leq 0.05$, adjusted for multiple comparisons) are significant with the exception of the comparisons between 12 to 24 and 55 to 69, and 25 to 39 and 40 to 54.*
*‡ Population age 25 or older*
** Significantly higher than value for other item in category ($p \leq 0.05$)*
*** Significantly higher than value for other item in category ($p \leq 0.01$)*

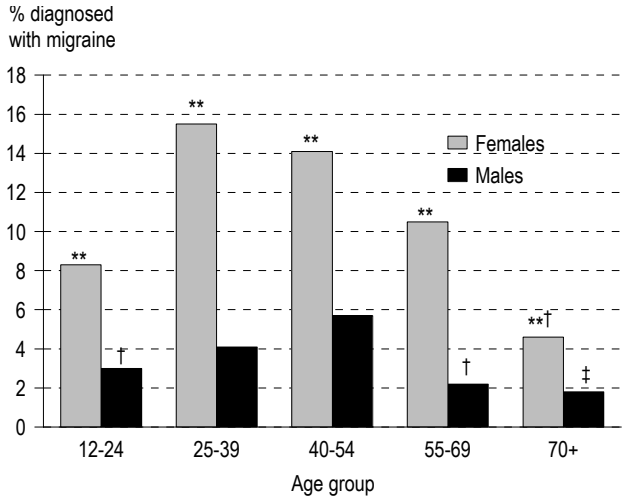
In contrast to the majority of chronic conditions, which are more prevalent in old age, migraine most frequently affects people during early to middle adulthood (ages 25 to 54).

## Heredity plays a role

Although migraine tends to run in families, a specific gene associated with the disorder has been found for only one rare type (familial hemiplegic).[28-30] Some research indicates that genetic factors may be partly responsible for a biochemical imbalance that makes some individuals more susceptible to migraine when they are exposed to certain triggers (see *What is migraine?*).[28,31]

NPHS data for 1998/99 show that a significantly higher proportion of Whites reported a diagnosis of migraine (8%) than did non-Whites (6%) (Table 1). Genetically based racial differences, rather than environmental or cultural factors, have been suggested as an explanation for the lower migraine prevalence found in African and Asian populations, since lower prevalence has also been noted in US residents of African and Asian descent.[32] However, the literature on the link between race and migraine

Chart 1
**Prevalence of migraine, by sex and age group, household population aged 12 or older, Canada excluding territories, 1998/99**




***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1998/99*
*† Coefficient of variation between 16.6% and 25.0%*
*‡ Coefficient of variation between 25.1% and 33.3%*
*** Significantly higher than value for males ($p \leq 0.01$)*

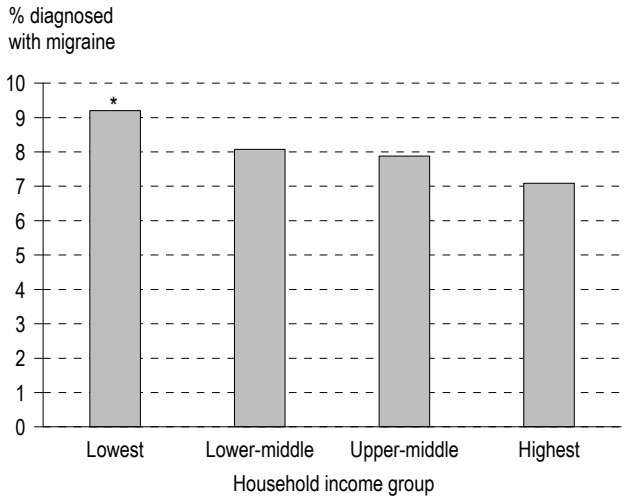
is not entirely consistent. Another US study found higher prevalence among Blacks than Whites.[33]

## Income, education and migraine

The relationship of migraine to socio-economic status is also unclear in the literature. Studies in the United States have found higher migraine prevalence among individuals in lower income households.[2,16,19] However, this link to low income was absent in previous Canadian studies,[3,8,14] as well as in research from other countries.[24,25] And it did not emerge in the first or third NPHS cycles (1994/95 and 1998/99), perhaps because of insufficient statistical power resulting from smaller sample sizes, or perhaps because of reporting error (see *Limitations*). But in 1996/97, when the sample size was much larger, the data show a slightly higher prevalence of migraine among individuals in the lowest household income group, compared with those in the highest (Chart 2).

Some researchers have suggested that "reverse causality" might explain the higher prevalence of migraine among members of lower income households; that is, migraine sufferers lose income or employment because of the effect of their

Chart 2
**Prevalence of migraine, by household income group, household population aged 12 or older, Canada excluding territories, 1996/97†**




***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1996/97*
*† No significant differences emerged in 1998/99.*
** Significantly higher than value for highest household income group ($p \leq 0.05$, adjusted for multiple comparisons)*

## What is migraine?

Migraine is a complex biochemical disorder causing recurrent headaches that are often characterized by throbbing pain on one side of the head. Such headaches may be accompanied by nausea, vomiting, sensitivity to light or sound, or visual disturbances, and may be exacerbated by movement or physical activity.[34] A migraine attack can last from several hours to several days, and the pain and associated symptoms can be disabling. The frequency of attacks can vary, from two to three per year to two or more per week.[4,14]

Current research suggests that migraine originates in the brain, either in the brainstem or the occipital cortex. Impulses from these areas appear to stimulate nerve endings in the blood vessels of the meninges, causing these vessels to become dilated and inflamed, thus generating migraine pain. Some researchers believe that migraine and tension-type headaches are separate disorders; others believe they are on opposite ends of a continuum of the same disorder, differing only in severity.[35]

Migraine can occur with or without aura, even in the same individual.[36] Aura refers to neurologic symptoms that can occur 20 minutes to one hour before the headache actually begins. These symptoms may include visual or sensory disturbances such as blurred vision, numbness and tingling. In some cases, these symptoms may also accompany the headache; in others, a headache does not follow the aura. Migraine without aura is characterized by the sudden onset of a headache, without any warning signals. (The NPHS does not differentiate between the sub-types of migraine.)

The exact cause of migraine is unknown, but certain factors are believed to provoke such headaches in some people. These "triggers" include alcohol, aged cheeses, flavour enhancers or food preservatives, irregular sleep patterns, hormonal changes (often related to menstruation), stress and anxiety, and environmental factors.[34]

Medications used to treat migraine include over-the-counter and prescription analgesics, serotonin agonists to abort migraine, and drugs typically used to treat other medical conditions (antidepressants, beta-blockers, or hormone replacement therapy, for example).[34,37] As well, several non-drug therapies such as biofeedback, relaxation therapy, acupuncture and physiotherapy can be used to treat migraine.[38] Although the NPHS asks respondents about medication use and alternative/complementary therapies in general, it is not known if migraine was the reason for use of these medications and therapies. In a separate question, migraineurs are asked if they received any treatment or medication for their headaches; however, the response categories (drug, diet, exercise/physiotherapy, other) do not permit the identification of specific medications or therapies (see *Limitations*).

condition.[7,16,35,39,40] To explore this possibility, data on changes in income were examined using the NPHS longitudinal file. Among people aged 16 or older who lived in households where employment was the main source of income, the proportions of migraineurs and non-migraineurs who experienced a decline in household income between cycles 1 and 3 did not differ significantly. However, the time period for comparison is brief and data on personal income were not available, which may explain the lack of an association between a decline in income and a diagnosis of migraine.

Previous Canadian studies have found that migraineurs tend to have a higher level of education than non-migraineurs.[3,8] NPHS data relating education to migraine are partially consistent with this earlier research. Although the differences were not statistically significant in 1998/99, data from cycles 1 and 2 reveal a higher prevalence of diagnosed migraine among people with at least some postsecondary education, compared with those who had attained only secondary graduation or less (Appendix Table A). This finding is curious, considering the inverse relationship between income and migraine prevalence noted above. In the United States, migraine prevalence (based both on symptoms and self-reported diagnosis) has been found to be inversely related to educational level.[33]

## Links to smoking, depression

According to the 1998/99 NPHS, the prevalence of migraine was higher among current or former daily smokers, compared with occasional or former occasional smokers, or individuals who had never smoked (Table 1). This is consistent with previous research showing smoking to be associated with migraine.[33,41]

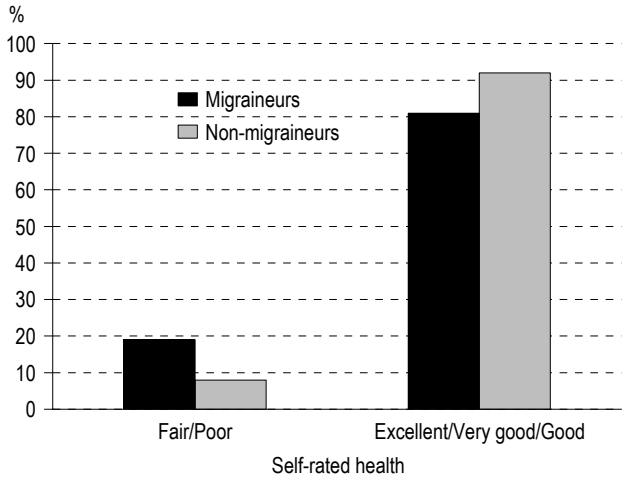
Migraine prevalence in 1998/99 was slightly lower among individuals who reported having one alcoholic drink at least once per month than among those who drank less frequently, or who were former drinkers or abstainers. It may be that migraine sufferers tend to avoid alcohol because it can trigger an episode. Some research indicates no association between migraine and alcohol use or abuse,[33,42] although in one study, people suffering from migraine with aura had increased odds of either alcohol dependence or abuse, or illicit drug dependence or abuse.[41]

The prevalence of migraine was nearly three times as high among people who reported suffering from depression at some point during the 12 months before the interview as among those who did not: 20% compared with 7%. Other studies, too, have reported associations between migraine and depression, mood and anxiety disorders.[41-44]

## Fair, poor health ratings

Reflecting increases in the prevalence of chronic diseases and other disorders that accompany aging, the level of self-rated health tends to decline with age in the general population.[45] Despite the relatively young age of migraineurs, however, higher proportions rated their health as fair or poor when compared with non-migraineurs in 1998/99 (Chart 3). Conversely, non-migraineurs were significantly more likely to rate their health as good, very good, or excellent.

Chart 3
**Self-rated health of migraineurs and non-migraineurs, household population aged 12 or older, Canada excluding territories, 1998/99**




***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1998/99*
***Notes:*** *Chi-squared test used 500 bootstrap weights and included the Rao-Scott second-order correction[46] to account for the complex survey design. Chi-squared = 48.21, df = 1, $p \leq 0.001$.*

## Many migraineurs do not receive treatment

Although migraine is not curable, episodes can usually be managed with medication and/or non-drug therapies (see *What is migraine?* ). However, previous studies have shown that many migraine sufferers do not seek medical care.[1,5,15] NPHS data indicate that a growing proportion of migraine sufferers reported receiving treatment. In 1998/99, 56% of diagnosed migraineurs received treatment—a statistically significant increase from 48% in 1996/97 ($p \leq 0.001$; data not shown). Greater awareness of the disorder and recent advancements in medications may account for this rise.

NPHS data suggest that treatment for migraine is somewhat sporadic. Among respondents who reported migraine in both 1996/97 (cycle 2) and 1998/99 (cycle 3), one-third (33%) of those not receiving treatment in cycle 2 reported receiving it in cycle 3—principally medications. In contrast, one-

### Limitations

National Population Health Survey (NPHS) data are self- or proxy-reported, and the degree to which they are inaccurate because of reporting error is unknown. There was no independent source to confirm diagnosis of migraine or other health problems. Determination of migraine for the NPHS is based on a self-report of clinical diagnosis (see *Defining migraine in the NPHS*), not on questions about symptoms of migraine, as contained in the International Headache Society criteria used in most recent analytical studies.[47] Because many migraineurs do not seek medical attention,[1,15,22] and many of those who do remain undiagnosed,[12,15] it is likely that the NPHS underestimates migraine prevalence. Thus, caution is advised when comparing estimates of migraine prevalence based on NPHS data with those from other population surveys.

Characteristics of diagnosed migraineurs (as in the NPHS) may differ from those of non-diagnosed migraineurs. For example, a US study showed that female migraineurs and migraineurs in higher income households were more likely than male or low-income migraineurs to have obtained a medical diagnosis.[18] If this relationship also exists in Canada, the NPHS data would underestimate migraine prevalence in lower income households relative to higher income households, and for men relative to women.

The NPHS is a general health survey; it was not designed to collect detailed information about migraine sufferers. For example, respondents are not asked to identify sub-types of migraine (with or without aura), or to report the frequency or duration of attacks. As well, an individual's migraine history before the first survey cycle is unknown; therefore, it was assumed that those who did not report diagnosed migraine in 1994/95 did not have migraine before then. It is also not known if respondents with migraine are indicating whether they have ever had migraine, or whether they have recently experienced it. Finally, because the NPHS questions on migraine cover only individuals aged 12 or older, the prevalence and incidence of migraine among children cannot be determined.

Although the NPHS collects self-reported data on overnight hospital stays and consultations with medical professionals, the reasons for these contacts with the health care system are not known. Data on outpatient treatment and visits to emergency departments are not available.

A period of longer than four years would be preferable to examine incidence rates and the temporal relationship between risk factors and the subsequent onset of migraine. This will be possible with future cycles of longitudinal data.

Information on individual income is not available for all three cycles, thus household income was used to investigate the relationship between migraine prevalence and income. It is not possible to determine what proportion of income migraineurs who live with others contribute to the total household income.

In cycles 2 and 3, respondents who indicated that they had received a clinical diagnosis of migraine were asked if they received any treatment or medication for it, and whether the treatment consisted of drugs, diet, exercise/physiotherapy (cycle 3 only), or other. It is not known how respondents interpreted the word "treatment." It could be understood to mean only treatment prescribed or recommended by a physician, or it could be interpreted as including self-treatment such as non-prescription drugs or alternate therapies. Respondents are also asked about specific medications they are taking. Migraine medications per se are not included in the list, although some medications that can be used to treat migraine (pain killers and codeine, for example) are included.

Although there is evidence for associations of migraine with epilepsy,[48,49] and head trauma,[50] the numbers of people reporting epilepsy or head injury in the NPHS sample were too small to produce reliable estimates. Consequently, these disorders were not included in the multivariate model. A separate multivariate analysis was run including oral contraceptive use among women aged 12 to 49; however, no significant association was found.

quarter (25%) of migraineurs who received treatment in cycle 2 did not in cycle 3. These findings may reflect the intermittent pattern of migraine episodes, or perhaps the inadequacy, undesirable side effects, or expense of treatment.

## Health status and medication use

Reports of activity restriction, pain, and use of medications were more common among individuals with diagnosed migraine than those without (Table 2; Appendix Table B). However, it is not possible to determine if these differences were actually caused by migraine. In 1998/99, migraineurs were more likely than non-migraineurs to report activity restrictions (26% versus 13%), although only a small proportion of people with activity limitation (0.5%; data not shown) indicated that the primary reason for their activity restrictions was migraine. Higher proportions of migraineurs reported that, during the two weeks before their NPHS interview, they had stayed in bed or cut down on their activities because of illness or injury. Migraine sufferers also reported a higher average number of disability days (1.8) for that two-week period than did individuals without migraine (0.8).

Although most people reported that they were usually free of pain or discomfort, this was the case for a substantially smaller percentage of migraineurs than non-migraineurs. In the month before their NPHS interview, migraineurs were also more likely than non-migraineurs to have used pain relievers, codeine, Demerol® or morphine, and antidepressants.

## Heavy users of health care

Although migraineurs appear to receive treatment for migraine only sporadically, they are relatively heavy users of health care (Table 3; Appendix Table C). In 1998/99, they were more likely than non-migraineurs to have had seven or more consultations with a health care professional in the 12 months before their NPHS interview. The same pattern was observed in the two previous survey cycles. Yet in 1998/99, a significantly higher proportion of migraineurs (26%) than non-migraineurs (22%) indicated a preference for self-care over reliance on physicians.

A higher percentage of migraineurs than non-migraineurs spent at least one night in hospital during the 12 months before their interview. Although migraine does not generally require hospitalization, severe episodes can result in a hospital stay. (The reason for hospitalization is not available from the NPHS.) According to hospital records for 1997/98, close to 10,000 (9,895) hospital

Table 2
**Selected health indicators and medication use, migraineurs and non-migraineurs, household population aged 12 or older, Canada excluding territories, 1998/99**

| | Migraineurs | Non-migraineurs |
|---|---|---|
| Activity restriction (%) | 25.5** | 12.9 |
| Usually free of pain or discomfort (%) | 72.6** | 87.4 |
| In last two weeks: | | |
| Cut down on activities (%) | 22.8** | 10.5 |
| Stayed in bed (%) | 13.9** | 5.6 |
| Mean number of disability days | 1.8** | 0.8 |
| In last month, used: | | |
| Pain relievers (%) | 83.8** | 63.2 |
| Codeine/Demerol®/morphine (%) | 15.8** | 3.9 |
| Antidepressants (%) | 10.3** | 3.6 |

***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1998/99*
*** Significantly different from value for non-migraineurs (p ≤ 0.01)*

Table 3
**Health care use and attitudes of migraineurs and non-migraineurs, household population aged 12 or older, Canada excluding territories, 1998/99**

| | Migraineurs | Non-migraineurs |
|---|---|---|
| | % | % |
| Seven or more consultations with health care professionals in previous 12 months | 32.9** | 15.6 |
| Hospital stay in previous 12 months† | 9.7** | 6.1 |
| Needed, but did not receive, care for physical problem in previous 12 months | 10.5** | 4.0 |
| Prefer self-care over reliance on doctor‡ | 25.6** | 21.8 |

***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1998/99*
*† Excludes women with a child younger than 1, as these women would likely have stayed overnight in a hospital.*
*‡ Population aged 18 or older*
*** Significantly higher than value for non-migraineurs (p ≤ 0.01)*

discharge summaries for a stay of one or more days included a diagnosis of migraine.

Although they consult medical professionals and are hospitalized more frequently than non-migraineurs, a higher proportion of migraineurs reported that they felt they needed, but did not receive, medical care for a physical problem in the previous 12 months (10% compared with 4%).

## Other chronic conditions

The heavy use of health care by migraine sufferers may partly reflect the presence of additional illnesses (Table 4; Appendix Table D). Nearly 3 of every 10 female migraineurs and 2 of every 10 of their male counterparts reported that they had other chronic conditions. The prevalence of food allergies, other allergies, arthritis or rheumatism, back problems other than arthritis, sinusitis, and stomach or intestinal ulcers was significantly higher among both male and female migraineurs than among non-migraineurs. It is possible that respondents may confuse avoidance of certain foods that trigger migraine episodes with actual food allergies. As well, it is possible that pain medications, if taken frequently by migraineurs, could contribute to the higher prevalence of stomach ulcers among migraineurs. In women, the prevalence of asthma and chronic bronchitis or emphysema was significantly higher among migraineurs compared with non-migraineurs. Consistent with these findings, the 1990 Ontario Health Survey showed significantly higher rates of hay fever/other allergies, arthritis/rheumatism, skin allergies/skin diseases, and back pain in migraineurs.[3] Finally, the prevalence of a major depressive episode was higher among migraineurs of both sexes. This finding corroborates earlier studies showing a higher risk of major depression in people with migraine.[41-44,51]

Given that migraineurs may have other chronic conditions that could require frequent medical consultations, it is possible that they would have more opportunity to mention their headaches, and to be diagnosed as having migraine.

Table 4
**Selected health problems of migraineurs and non-migraineurs, by sex, household population aged 12 or older, Canada excluding territories, 1998/99**

| | Migraineurs | Non-migraineurs |
|---|---|---|
| | % | % |
| **Chronic conditions** | | |
| **Food allergies** | | |
| Females | 15.1** | 7.2 |
| Males | 10.4†* | 5.2 |
| **Other allergies** | | |
| Females | 42.7** | 25.4 |
| Males | 28.4* | 20.2 |
| **Asthma** | | |
| Females | 16.5** | 7.9 |
| Males | 9.4† | 7.2 |
| **Arthritis or rheumatism** | | |
| Females | 22.7‡* | 18.7† |
| Males | 16.5* | 11.0 |
| **Back problems excluding arthritis** | | |
| Females | 25.2** | 13.2 |
| Males | 25.9** | 12.5 |
| **High blood pressure** | | |
| Females | 10.5 | 13.0 |
| Males | 10.9† | 9.0 |
| **Chronic bronchitis or emphysema** | | |
| Females | 5.1** | 2.6 |
| Males | -- | 2.1 |
| **Sinusitis** | | |
| Females | 12.6** | 5.7 |
| Males | 10.8†** | 3.6 |
| **Stomach or intestinal ulcers** | | |
| Females | 6.5** | 2.6 |
| Males | 6.0‡* | 2.5 |
| **Three or more chronic conditions (other than migraine)** | | |
| Females | 26.7** | 13.7 |
| Males | 18.7** | 8.5 |
| **Major depressive episdoe** | | |
| Females | 13.0** | 4.9 |
| Males | 6.8†* | 2.9 |

***Data source:*** *National Population Health Survey, cross-sectional sample, Health file, 1998/99*
*† Coefficient of variation between 16.6% and 25.0%*
*‡ Coefficient of variation between 25.1% and 33.3%*
*-- Coefficient of variation greater than 33.3%*
** Significantly higher than value for non-migraineurs ($p \leq 0.05$)*
*** Significantly higher than value for non-migraineurs ($p \leq 0.01$)*

## Is migraine becoming more common?

Reports from other countries suggest an increase in the prevalence and incidence of migraine.[52-55] In Canada, a comparison of migraine prevalence in 1978/79 with that in 1998/99 indicates a significant rise in the disorder among women aged 45 to 64.[45]

Over a much shorter period, NPHS cross-sectional data from 1994/95 (cycle 1) and 1998/99 (cycle 3) indicate that the estimated prevalence of diagnosed migraine among women aged 25 to 54—the peak age for this disorder—rose from 13% to 15% (Table 5). In contrast, among younger males

Table 5
**Prevalence of migraine, household population aged 12 or older, by sex and age group, Canada excluding territories, 1994/95 and 1998/99**

| | 1994/95 | 1998/99 |
|---|---|---|
| | % | % |
| **Females** | | |
| 12-24 | 7.4 | 8.3 |
| 25-54 | 12.8 | 14.8** |
| 55+ | 6.6 | 8.1 |
| All ages | 10.1 | 11.7** |
| **Males** | | |
| 12-24 | 5.3 | 3.0†** |
| 25-54 | 4.5 | 4.9 |
| 55+ | 2.8 | 2.1† |
| All ages | 4.3 | 3.8 |

***Data source:*** *National Population Health Survey, cross-sectional samples, Health file, 1994/95 and 1998/99*
*† Coefficient of variation between 16.6% and 25.5%*
*** Statistically different from value for 1994/95 ($p \leq 0.01$)*

(aged 12 to 24), migraine prevalence fell from 5% to 3% between the first and third cycles.

Greater awareness among both patients and doctors could be partly responsible for the increase in diagnosed migraine. It is also possible that the availability and awareness of new medication and treatment options may have prompted some individuals who were previously undiagnosed to consult physicians. While increases in diagnosed migraine among women may also reflect a true increase of the disorder, the decrease among 12- to 24-year-old males remains unexplained.

## Higher incidence among females

According to NPHS longitudinal data for 1994/95 through 1998/99, the estimated four-year cumulative incidence of newly diagnosed migraine among people aged 12 or older was 3.8 cases per 100 individuals. The incidence rate for women was significantly higher than that for men: 5.7 per 100, compared with 1.9 (data not shown).

These findings strongly suggest that females are at higher risk of migraine than males. However, as the NPHS questions on migraine cover only individuals aged 12 or older, the data may slightly underestimate the incidence in males. A population-based survey of adolescents and young adults in the United States found that migraine incidence for males peaked before age 12, compared with 12 or older for females.[56] Similarly, another study found the age of migraine diagnosis peaked at 10 to 14 for males, compared with 20 to 24 for females.[53]

## Who is at risk?

To gain a better understanding of who is at risk of developing migraine, it is useful to compare the baseline morbidity and socio-demographic characteristics of people who reported a new diagnosis of migraine in 1996/97 or 1998/99 with those of individuals who did not. Chronic conditions that were associated with migraine in the bivariate analysis and factors reported in the literature were included in the multivariate analyses. Previously reported chronic conditions included food allergies[57] and depression.[41-44,51]

To control for the possibility that people who see a physician frequently have greater opportunity to have their migraine diagnosed, the variables representing the number of medical consultations and general health status were included in the model. Smoking status and alcohol consumption were also included.

As expected from the patterns of migraine prevalence and incidence, females had higher odds of developing migraine than males, as did individuals in the age groups 12 to 24 and 25 to 54 (Table 6). Even when controlling for the effects of general level of health, frequency of medical consultations, and selected factors related to migraine, the odds of being diagnosed with migraine were higher for women with previously diagnosed chronic bronchitis/emphysema, compared with women without these conditions. The higher odds for new migraine among people with chronic bronchitis or emphysema remain significant even when accounting for smoking. Migraine has been previously associated with respiratory diseases such as bronchitis and asthma,[58-61] suggesting a biological link or shared risk factors.

The odds of a new diagnosis of migraine were also higher among women with sinusitis. Since sinusitis can cause headaches, it is possible that these higher odds among women who had already been

Table 6
**Adjusted odds ratios for migraine in 1996/97 or 1998/99, by selected characteristics in 1994/95, household population aged 12 or older,† Canada excluding territories**

| | Females | | Males | | Both sexes | |
|---|---|---|---|---|---|---|
| Characteristics in 1994/95 | Odds ratio | 95% confidence interval | Odds ratio | 95% confidence interval | Odds ratio | 95% confidence interval |
| **Sex** | | | | | | |
| Female | ... | ... | ... | ... | 3.0** | 2.1, 4.1 |
| Male | ... | ... | ... | ... | 1.0 | ... |
| **Age group** | | | | | | |
| 12-24 | 5.0** | 2.5, 10.2 | 2.3 | 0.8, 6.8 | 4.5** | 2.5, 8.2 |
| 25-54 | 2.9** | 1.6, 5.5 | 2.8* | 1.2, 6.7 | 3.1** | 1.8, 5.2 |
| 55+‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Race** | | | | | | |
| White‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| Non-White | 0.7 | 0.3, 1.6 | 1.3 | 0.4, 3.7 | 0.8 | 0.5, 1.5 |
| **Household income group** | | | | | | |
| Low | 1.3 | 0.9, 2.0 | 1.6 | 0.8, 3.5 | 1.4 | 1.0, 2.0 |
| High‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Major depressive episode** | | | | | | |
| Yes | 1.5 | 0.8, 2.7 | 1.7 | 0.6, 4.5 | 1.5 | 0.9, 2.4 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Food allergies** | | | | | | |
| Yes | 0.9 | 0.4, 2.1 | 1.5 | 0.2, 14.9 | 1.0 | 0.5, 2.0 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Other allergies** | | | | | | |
| Yes | 0.9 | 0.5, 1.5 | 0.5 | 0.3, 1.2 | 0.8 | 0.5, 1.2 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Asthma** | | | | | | |
| Yes | 0.9 | 0.3, 2.3 | -- | -- | 0.8 | 0.3, 1.7 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Arthritis or rheumatism** | | | | | | |
| Yes | 0.9 | 0.5, 1.5 | 2.7* | 1.2, 6.1 | 1.2 | 0.7, 1.9 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Back problems, excluding arthritis** | | | | | | |
| Yes | 1.6 | 1.0, 2.7 | 1.4 | 0.6, 3.2 | 1.6* | 1.0, 2.4 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Bronchitis or emphysema** | | | | | | |
| Yes | 2.4* | 1.1, 5.1 | -- | -- | 2.2* | 1.1, 4.3 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Sinusitis** | | | | | | |
| Yes | 2.2* | 1.1, 4.2 | -- | -- | 1.9* | 1.0, 3.5 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Stomach or intestinal ulcers** | | | | | | |
| Yes | 1.2 | 0.5, 2.6 | 2.6 | 0.7, 9.6 | 1.5 | 0.8, 2.8 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Seven or more medical consultations** | | | | | | |
| Yes | 1.1 | 0.6, 1.7 | 0.8 | 0.3, 1.9 | 1.0 | 0.7, 1.6 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Self-rated health** | | | | | | |
| Excellent, very good or good | 0.6 | 0.4, 1.0 | 0.8 | 0.3, 1.9 | 0.6* | 0.4, 1.0 |
| Fair or poor‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Ever a daily smoker** | | | | | | |
| Yes | 1.1 | 0.7, 1.6 | 1.2 | 0.6, 2.5 | 1.2 | 0.8, 1.6 |
| No‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |
| **Type of drinker** | | | | | | |
| Regular | 0.8 | 0.5, 1.1 | 0.9 | 0.4, 1.9 | 0.8 | 0.6, 1.1 |
| Occasional, former or abstainer‡ | 1.0 | ... | 1.0 | ... | 1.0 | ... |

***Data source:*** *National Population Health Survey, longitudinal sample, Health file, 1998/99*
***Note:*** *Because of rounding, some confidence intervals with 1.0 as the lower or upper limit were significant.*
*† Individuals without reports of migraine in 1994/95*
*‡ Reference category, for which odds ratio is always 1.0*
** $p \leq 0.05$*
*** $p \leq 0.01$*
*··· Not applicable*
*-- Excluded from the multivariate analysis because the sample count was too low and caused instability in the regression model.*

diagnosed with sinusitis could reflect the difficulty in initially distinguishing the two conditions.

Among males, incident migraine was associated with previously diagnosed arthritis or rheumatism. For both sexes combined, non-arthritic back problems were significantly associated with subsequent migraine.

The possibility of a common origin of migraine and osteoarthritis, both disorders that involve inflammation, has been investigated.[62] However, the genetic factor studied did not support the theory that the comorbid association among the disorders was caused by shared pathophysiology. Another study found that migraineurs were two to four times as likely as non-migraineurs to report joint, back, stomach or neck pain, and perhaps had a higher propensity to report pain, or had a lower pain threshold.[63] One theory, based on the possible role of neurogenic inflammation in several disorders including migraine, asthma, rhinitis, rheumatoid arthritis and fibromyalgia, hypothesizes that they can be exacerbated by exposure to environmental chemicals.[64]

Associations between oral contraceptive use and migraine use have also been noted.[65] A separate multivariate model, which added a variable for oral contraceptive use, was run for women aged 12 to 49, but it showed that oral contraceptive use was not significantly associated with incident cases of migraine (data not shown). It is possible that onset of migraine preceeded the use of oral contraceptives for some women. One might also expect that women with migraine avoid the use of oral contraceptives because they could increase the frequency or intensity of their headaches.

## Concluding remarks

This analysis has used the first population-based Canadian longitudinal health survey, the National Population Health Survey, to estimate the incidence of migraine and to examine associated risk factors. Migraine is a relatively common disorder: nearly 2 million Canadians were suffering from clinically diagnosed migraine in 1998/99.

Despite their stated preference for self-care, migraineurs made more use of health care services than did non-migraineurs. Results also suggest that migraine sufferers perceive more difficulty in obtaining the health care they believe they need. This may be partly because migraine is difficult to treat, or it could be that migraineurs tend to have more chronic conditions than other people. The proportion of migraineurs receiving treatment remains low, perhaps indicating a need for more awareness of treatment options.

This analysis adds to the evidence that migraine prevalence has been increasing among 25- to 54-year-old women in recent years. The prevalence of migraine was found to be higher among individuals from low-income households, Whites, and individuals with certain other chronic conditions.

As expected, the odds of developing migraine were higher for females and for both sexes under age 55. Even after accounting for the number of medical consultations sought, several chronic conditions remained significantly associated with developing migraine, including musculoskeletal, inflammatory and respiratory conditions.

Specific factors associated with developing migraine are difficult to pinpoint, however, and may be due to interactions between genetic and socio-demographic factors and environmental conditions. Nonetheless, longitudinal analysis can contribute to the understanding of potential risk factors, which may ultimately lead to an understanding of the causes and means of controlling, or even preventing, migraine. ●

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# Appendix

## Supplementary definitions

Five *age groups* were formed for this analysis: 12 to 24, 25 to 39, 40 to 54, 55 to 69, and 70 or older. However, due to sample size constraints, for multivariate analysis and comparison of migraine prevalence by sex between cycles 1 and 3, age was collapsed into three age groups: 12 to 24, 25 to 54, and 55 or older.

*Race* was determined by asking, "How would you best describe your race or colour?".

For univariate analysis, four *household income groups* were established, 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 or 2 | Less than $15,000 |
| | 3 or 4 | Less than $20,000 |
| | 5 or more | Less than $30,000 |
| Lower-middle | 1 or 2 | $15,000 to $29,999 |
| | 3 or 4 | $20,000 to $39,999 |
| | 5 or more | $30,000 to $59,999 |
| Upper-middle | 1 or 2 | $30,000 to $59,999 |
| | 3 or 4 | $40,000 to $79,999 |
| | 5 or more | $60,000 to $79,999 |
| Highest | 1 or 2 | $60,000 or more |
| | 3 or more | $80,000 or more |

For multivariate analysis, *household income groups* were combined into two groups:

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

*Education* was examined for the population aged 25 or older and was collapsed into two categories: high school graduation or less, and any postsecondary.

Two groups were used to classify *type of smoker:* those who had ever smoked daily, and those who had not. Type of smoker was derived from responses to the following questions: "At the present time, do you smoke cigarettes daily, occasionally or not at all?" , "Have you ever smoked cigarettes at all?" and "Have you ever smoked cigarettes daily?"

Due to sample size constraints, *type of drinker* was collapsed into two categories: regular drinker (at least one drink per month) and occasional or former drinker, or abstainer.

Using the methodology of Kessler et al,[66] the NPHS measures the probability of a major depressive episode (MDE) with a subset of questions from the Composite International Diagnostic Interview. These questions cover a cluster of symptoms for depressive disorder, which are listed in the *Diagnostic and Statistical Manual of Mental Disorders (DSM III-R)*.[67] Responses to these questions were scored and transformed into a probability estimate of a diagnosis of MDE. If this estimate was 0.9 or more (that is, 90% or higher certainty of a positive diagnosis), the respondent was considered to have experienced depression in the previous 12 months.

*Self-rated health* was assessed with the question, "In general, would you say your health is: excellent? very good? good? fair? poor?"

A respondent who answered "Yes" to the question, "In the past 12 months, have you been a patient overnight in a hospital, nursing home or convalescent home?" was considered to have had a *hospital stay*. Women who lived in a household with a child under age 1 were excluded, as they would likely have stayed in a hospital during childbirth.

The *number of consultations with health care professionals* was determined from responses to the question, "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 a family doctor or general practitioner, eye specialist or other medical doctor about your physical, emotional or mental health?" Responses were categorized as: 0 to 6 visits, and 7 or more visits.

Respondents were asked if, during the past 12 months, there was a time they felt they needed, but did not receive, health care for a physical problem.

In cycle 3 (1998/99), the NPHS used the method of The Community Health Survey from the Kaiser Permanente Center for Health Research,[68] to determine attitudes toward *self-care*. Respondents aged 18 or older were asked to rank their responses to the following five statements using a five-point scale ranging from "strongly agree" (score 1) to "strongly disagree" (score 5):

- I prefer doctors who give me choices or options and let me decide for myself what to do (reverse scored).
- Patients should never challenge the authority of the doctor.
- I prefer that the doctor assume all of the responsibility for my medical care.
- Except for serious illness, it is generally better to take care of your own health than go to a doctor (reverse scored).
- It is almost always better to go to a doctor than to try to treat yourself.

The values were recoded to 0 to 4 and reverse coding was done where noted. Then values were summed to an index score of between 0 and 20, with 0 indicating a preference to rely on a doctor; 20, a preference for self-care. Respondents with an index score of 15 or higher (22.1%) were considered to prefer self-care.

*Oral contraceptive* use was determined by asking females aged 12 to 49, "In the past month, did you take birth control pills?".

Respondents were considered to have an *activity restriction* if they indicated that, because of a long-term physical or mental condition or health problem, they were limited in the kind or amount of activity that they could do at home, school, or work, or in other activities such as transportation to or from work or school or leisure-time activities. "Long-term" refers to conditions/problems that have lasted or are expected to last six months or more.

*Disability days* refers to the number of days during the two-week period before their NPHS interview when respondents stayed in bed or cut down activities because of illness or injury.

Respondents were asked if they were usually *free of pain or discomfort*. They were also asked about prescription or over-the-counter medications that they had taken during the last year (although the reason for medication use is unknown). Pain relievers, including acetylsalicylic acid, acetaminophen, codeine, Demerol® and morphine, and antidepressants were relevant to this analysis.

Table A
**Prevalence of migraine, by selected socio-demographic factors and health characteristics, household population aged 12 or older, Canada excluding territories, 1994/95 and 1996/97**

| | 1994/95 | | | 1996/97 | | |
|---|---|---|---|---|---|---|
| | Sample size | Estimated population | Prevalence of migraine | Sample size | Estimated population | Prevalence of migraine |
| | | '000 | % | | '000 | % |
| **Total** | **1,366** | **1,737** | **7.3** | **5,804** | **1,915** | **7.8** |
| **Sex** | | | | | | |
| Male | 346 | 510 | 4.3 | 1,414 | 515 | 4.3 |
| Female | 1,020 | 1,226 | 10.1** | 4,390 | 1,400 | 11.2** |
| **Age group** | | | | | | |
| 12-24 | 230 | 322 | 6.3 | 838 | 296 | 5.8 |
| 25-39 | 487 | 594 | 8.1 | 2,176 | 695 | 9.6 |
| 40-54 | 388 | 538 | 9.3 | 1,753 | 619 | 9.9 |
| 55-69 | 175 | 200 | 5.6 | 754 | 232 | 6.3 |
| 70+ | 86 | 80 | 3.7 | 283 | 71 | 3.2 |
| **Race** | | | | | | |
| White | 1,279 | 1,594 | 7.4 | 5,392 | 1,752 | 8.0* |
| Non-White | 84 | 131 | 5.8 | 386 | 156 | 6.3 |
| **Education** | | | | | | |
| Secondary graduation or less | 446 | 529 | 6.6 | 1,916 | 597 | 7.4 |
| Some postsecondary or more | 687 | 882 | 8.2** | 3,017 | 1,013 | 9.0** |
| **Household income** | | | | | | |
| Lowest | 366 | 327 | 8.0 | 1,068 | 297 | 9.2† |
| Lower-middle | 390 | 491 | 7.2 | 1,322 | 500 | 8.1 |
| Upper-middle | 426 | 609 | 7.5 | 1,695 | 627 | 7.9 |
| Highest | 139 | 241 | 6.6 | 636 | 220 | 7.1 |
| **Ever a daily smoker** | | | | | | |
| Yes | 790 | 944 | 8.1** | 3,082 | 1,009 | 8.8** |
| No | 575 | 791 | 6.5 | 2,707 | 902 | 6.9 |
| **Type of drinker** | | | | | | |
| Regular | 632 | 867 | 6.6 | 2,695 | 942 | 7.3 |
| Occasional/ Former/Abstainer | 732 | 868 | 8.0** | 3,064 | 962 | 8.5** |
| **Major depressive episode** | | | | | | |
| Yes | 214 | 249 | 19.9** | 639 | 190 | 19.1** |
| No | 1,103 | 1,397 | 6.6 | 4,948 | 1,634 | 7.2 |

***Data source:*** *National Population Health Survey, cross-sectional samples, Health files, 1994/95 and 1996/97*
***Note:*** *Detail may not add to totals because of missing values for some variables. All pairwise comparisons are significant except for those between 12-24 and 55-69, and 25-39 and 40-54 in 1994/95 and 1996/97, and between 12-24 and 25-39, and 55-69 and 70+ in 1994/95, $p < 0.01$ adjusted for multiple comparisons.*
*† Significantly higher than value for highest household income group ($p \leq 0.05$) adjusted for multiple comparisons*
** Significantly higher than value for other item in category ($p \leq 0.05$)*
*** Significantly higher than value for other item in category ($p \leq 0.01$)*

Table B
**Selected health indicators and medication use, migraineurs and non-migraineurs, household population aged 12 or older, Canada excluding territories, 1994/95 and 1996/97**

| | 1994/95 | | 1996/97 | |
|---|---|---|---|---|
| | Migraineurs | Non-migraineurs | Migraineurs | Non-migraineurs |
| Activity restriction (%) | 34.1** | 15.0 | 24.5** | 12.0 |
| Usually free of pain or discomfort (%) | 66.9** | 84.4 | 73.1** | 88.0 |
| In last two weeks: | | | | |
| Cut down on activities (%) | 26.4** | 11.1 | 18.8** | 9.3 |
| Stayed in bed (%) | 15.4** | 6.2 | 12.7** | 5.3 |
| Mean number of disability days | 2.1** | 0.8 | 1.6** | 0.8 |
| In last month, used: | | | | |
| Pain relievers (%) | 87.5** | 59.3 | 85.5** | 62.3 |
| Codeine/Demerol®/morphine (%) | 15.2** | 3.4 | 15.3** | 3.7 |
| Antidepressants (%) | 7.5** | 2.4 | 9.5** | 3.0 |

***Data source:*** *National Population Health Survey, cross-sectional samples, Health file, 1994/95 and 1996/97*
*** Significantly different from value for non-migraineurs ($p \leq 0.01$)*

Table C
**Health care use and attitudes of migraineurs and non-migraineurs, household population aged 12 or older, Canada excluding territories, 1994/95 and 1996/97**

| | 1994/95 | | 1996/97 | |
|---|---|---|---|---|
| | Migraineurs | Non-migraineurs | Migraineurs | Non-migraineurs |
| | % | | | |
| Seven or more consultations with health care professionals in previous 12 months | 34.5** | 17.2 | 31.7** | 14.6 |
| Hospital stay in previous 12 months† | 11.0** | 7.6 | 9.9** | 6.8 |
| Needed, but did not receive, care for physical problem in previous 12 months | 6.5** | 2.6 | 9.1** | 3.6 |
| Prefer self-care over reliance on doctor‡ | .. | .. | .. | .. |

***Data source:*** *National Population Health Survey, cross-sectional samples, Health file, 1994/95 and 1998/99*
*† Excludes women with a child younger than 1, as these women would likely have stayed overnight in a hospital*
*‡ Population aged 18 or older*
*** Significantly higher than value for non-migraineurs ($p \leq 0.01$)*
*.. Figures not available*

Table D
**Selected health characteristics of migraineurs and non-migraineurs, by sex, household population aged 12 or older, Canada excluding territories, 1994/95 and 1996/97**

| | 1994/95 | | 1996/97 | |
|---|---|---|---|---|
| | Migraineurs | Non-migraineurs | Migraineurs | Non-migraineurs |
| | % | % | % | % |
| **Chronic conditions** | | | | |
| **Food allergies** | | | | |
| Females | 14.2** | 5.8 | 15.9** | 7.6 |
| Males | 9.8†** | 4.1 | 14.5†** | 4.6 |
| **Other allergies** | | | | |
| Females | 35.2** | 17.4 | 39.6** | 24.3 |
| Males | 18.5 | 16.0 | 25.4** | 18.3 |
| **Asthma** | | | | |
| Females | 13.6** | 6.0 | 14.1** | 7.7 |
| Males | 5.6† | 6.2 | 8.9* | 5.9 |
| **Arthritis or rheumatism** | | | | |
| Females | 21.0** | 15.2 | 23.7** | 17.1 |
| Males | 17.0** | 9.2 | 14.3** | 9.5 |
| **Back problems excluding arthritis** | | | | |
| Females | 30.9** | 12.1 | 27.1** | 13.4 |
| Males | 32.6** | 13.1 | 23.9** | 12.9 |
| **High blood pressure** | | | | |
| Females | 11.7 | 9.8 | 11.0 | 11.4 |
| Males | 9.7† | 7.2 | 11.5 | 8.6 |
| **Chronic bronchitis or emphysema** | | | | |
| Females | 8.3** | 3.3 | 6.6** | 2.9 |
| Males | 5.7†* | 2.3 | 4.3†* | 2.2 |
| **Sinusitis** | | | | |
| Females | 14.8** | 4.2 | 12.8** | 4.8 |
| Males | 13.4†** | 2.7 | 8.1†** | 3.2 |
| **Stomach or intestinal ulcers** | | | | |
| Females | 8.5** | 2.9 | 5.6** | 2.5 |
| Males | 9.4†** | 2.9 | 4.5** | 2.5 |
| **Three or more chronic conditions (other than migraine)** | | | | |
| Females | 26.7** | 10.4 | 27.2** | 12.8 |
| Males | 18.6** | 7.1 | 16.4** | 7.3 |
| **Major depressive episode** | | | | |
| Females | 17.2** | 6.3 | 11.7** | 4.8 |
| Males | 9.8†** | 3.4 | 6.8†** | 2.7 |

***Data source:*** *National Population Health Survey, cross-sectional samples, Health files, 1994/95 and 1996/97*
*† Coefficient of variation between 16.6% and 25.0%*
** Significantly higher than value for non-migraineurs ($p \leq 0.05$)*
*** Significantly higher than value for non-migraineurs ($p \leq 0.01$)*

# Trends in colorectal cancer incidence and mortality

*Laurie Gibbons, Chris Waters, Yang Mao and Larry Ellison*


## Abstract

***Objectives***

This article examines recent trends in the incidence of and mortality from colorectal cancer among Canadian men and women, then further analyzes trends by three subsites.

***Data sources***

Incidence data for colorectal cancer were obtained from the National Cancer Incidence Reporting System and from the Canadian Cancer Registry. Mortality data were extracted from the Canadian Vital Statistics Database. Supplementary data on nutrition are from the National Population Health Survey.

***Analytical techniques***

Age-standardized incidence and mortality rates were calculated for men and women. Age-specific incidence and mortality rates were calculated by 10-year age groups. Joinpoint analysis was applied to detect statistically significant changes in linear trends.

***Main results***

Since the mid-1980s, colorectal cancer incidence has been declining, with steeper rates of decrease among women. Decreasing rates of colorectal cancer are limited to tumours located in the distal colon and rectum; the incidence of cancers of the proximal colon has not changed over time.



## Key words

colon, rectum, proximal, distal



## Authors

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Over their lifetime, 1 in 16 Canadian men and 1 in 18 women will develop colorectal cancer.[1] It has been estimated that 17,000 new cases of colorectal cancer would be diagnosed in Canada in 2000, and that 6,500 Canadians would die of this disease.[1] Colorectal cancer ranks third overall in the number of both new cancer cases and cancer deaths, behind prostate and lung cancer among men and behind lung and breast cancer among women. For cancers common to both sexes, colorectal cancer ranks second in incidence and mortality, following lung cancer.

Over the past decade, colorectal cancer rates have been declining in Canada, and differences between men and women have been noted.[1] Colorectal cancer has typically been examined as one entity; however, tumours may occur in different sites throughout the large intestine. Trends over time may differ by subsite, as well as by sex. Preventive strategies, such as early detection and reducing exposure to known risk factors, may have different effects in men and women, and may affect the sites where tumours are found. A detailed examination of the differences between men and

## Methods

### Data sources

Incidence data for colorectal cancer in Canada were obtained from the National Cancer Incidence Reporting System for 1969 to 1991 and from the Canadian Cancer Registry for 1992 to 1996. Each year provincial and territorial cancer registries report information on all cases of cancer diagnosed among their residents to the Health Statistics Division at Statistics Canada, which maintains these databases. Mortality data for 1969 to 1997 were obtained from the Canadian Vital Statistics Database, which compiles information provided by the vital statistics registrars in each province and territory. Supplementary data on nutrition are from the 1998/99 National Population Health Survey, cross-sectional sample, Health file.

### Analytical techniques

Incidence and mortality rates were age-standardized to the 1991 Canadian population to account for changes in the age structure of the population over time. Population estimates were adjusted to account for net census undercoverage from 1971 onward.

A joinpoint regression model and permutation tests for identifying changes in linear trends[2] were applied to each of the sex- and subsite-specific age-standardized incidence rates from 1979 to 1996. This analysis identified the year at which the change in linear trend is significant. For most of the sex- and subsite-specific rates, the year at which the linear trend changes significantly was 1985. The exceptions were: men, total colorectal (1984); men, proximal (1983); and women, proximal (1983).

Age-specific incidence and mortality rates were calculated by 10-year age groups, beginning at 40 through 80 or older. Changes in annual age-standardized and age-specific incidence and mortality rates were examined by computing the average annual percentage change (AAPC) over two periods: 1969 to 1985 and 1986 to 1996 (incidence) or 1997 (mortality). These timespans were chosen based on the results of the joinpoint analysis. Rates were first log-transformed, then a linear model was fitted. Poisson regression was applied to the age-specific rates. For both methods, the AAPC is equal to $100(e^{ß}-1)$, where ß is the slope of the regression line. AAPC is closely approximated by 100ß since $|ß| \leq 0.05$ $e^{ß} = 1 + ß$. The difference between slopes was examined using a t-test and was interpreted as the difference in AAPC.

Information about the location of the tumour within the colon and rectum was obtained by examining the incidence and mortality data by their four-digit *International Classification of Diseases* (ICD) code. If the location of the tumour was not recorded, it was coded as "unspecified" or "other." Incidence data from 1969 to 1978 (*International Classification of Diseases, Eighth Revision*[3]) showed a high proportion (29%) of unspecified colon cancers. From 1979 onward (*International Classification of Diseases, Ninth Revision*[4]), the percentage of unspecified cancers dropped to 13%. For this reason, only ICD-9 information was used when examining incidence by subsite. It was not possible to examine the mortality data by subsite because of the very large proportion (64%) of colorectal cancer deaths coded as unspecified or other between 1979 and 1997.

To compare the incidence of colorectal cancer by age and subsite among both men and women, male-to-female incidence rate ratios were computed. This is a ratio of the male-to-female age-specific incidence rates. A ratio greater than 1 indicates a higher incidence among men; a ratio less than 1 means that the incidence rate is higher among women.

Using data on colorectal cancer cases diagnosed in 1992 from the Canadian Cancer Registry, crude and relative five-year survival rates were calculated using the strel[5] module in STATA.[6] Information on individual death status was not available for cases from Québec; therefore, this province was excluded from the analysis. Those colorectal cancer cases who had previously had cancer were excluded as were those whose colorectal cancer had been determined through autopsy or death certificate only. For the most part, relative survival rates were calculated using 1991 provincial life tables; Canadian life tables were used for Prince Edward Island, the Yukon, and the Northwest Territories.

### Limitations

Because data on cancer incidence are provided by provincial cancer registries, variations may exist because of the way in which new cancer cases are registered, as well as in the types of procedures used to define an invasive cancer. Since 1984, however, cancer registration has become relatively consistent across Canada. It has been estimated that cancer incidence data are approximately 95% complete, although this figure may vary by province and cancer site.[7] Nevertheless, reporting procedures do vary from province to province, which limits the interpretation of interprovincial differences somewhat.

Between 1969 to 1991, data on new cancer cases were collected by the National Cancer Incidence Reporting System, an event-oriented system that did not link cases at a national level to identify patients with more than one primary tumour. Patients registered in more than one province were not routinely deleted before 1991.[7] Despite limiting the subsite information to the data coded in ICD-9 only, it is still possible that between 1979 and 1996, changes occurred in the coding of the "other" or "unspecified" categories.

women, particularly within each colorectal subsite, may serve to generate some hypotheses about the etiology of colorectal cancer and the effects of primary and secondary prevention for this disease.

This article examines recent trends in the incidence of and mortality from colorectal cancer among men and women aged 40 or older from 1969 to 1996. It further examines colorectal cancer incidence by location of the tumour; specifically, in three subsites (proximal, distal and rectal) from 1979 to 1996 (see *Methods, Definitions* and *Colorectal cancer*).

## Overall trends

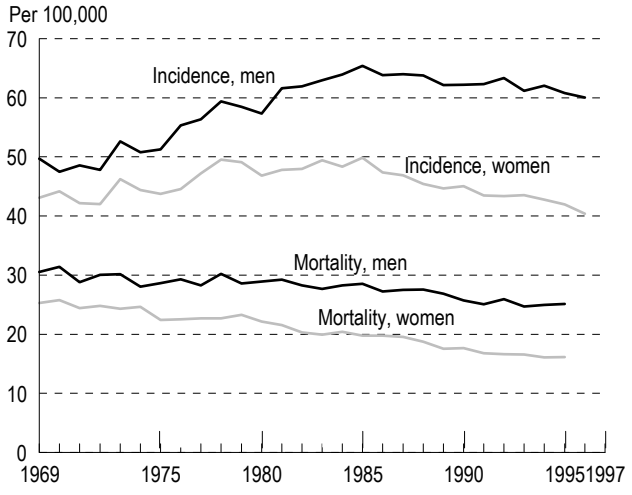
Total colorectal cancer incidence rates for both men and women rose between 1969 and 1985, and then declined, though more precipitously among women (Chart 1). From 1969 to 1985, colorectal cancer incidence rates for men increased annually by 2.08%; from 1986 to 1996 rates declined by 0.55% per year. Among women, incidence rates rose by 0.99% yearly until 1985, after which they declined by 1.37% per year. The rates of increase and decrease differed significantly by sex (Chart 2).

Age-standardized mortality rates for total colorectal cancer have fallen since 1969 (Chart 1). Among men, mortality decreased annually by 0.45% from 1969 to 1985, and then by 1.33%. Declines in mortality rates among women were significantly greater in both periods, with an average annual percentage change of 1.66% between 1969 and 1985, and 2.27% between 1986 and 1997) (Chart 2).

Studies in the United States have found that, since the mid-1980s, colorectal cancer incidence and mortality have been declining in White populations.[8-10] That research, which was able to examine incidence and mortality trends by stage at diagnosis, indicates that much of the decline in mortality is attributable to increased rates of colorectal cancer screening.[8-10] Colorectal cancers are being found earlier in their disease progression, which leads to improved prognosis for many more people. These assumptions cannot be tested in this analysis because complete stage data are not yet available. Canada has no organized screening program for colorectal cancer, but it is likely that rates of informal screening have increased over the past two decades. This may have contributed to the decline in colorectal cancer mortality.

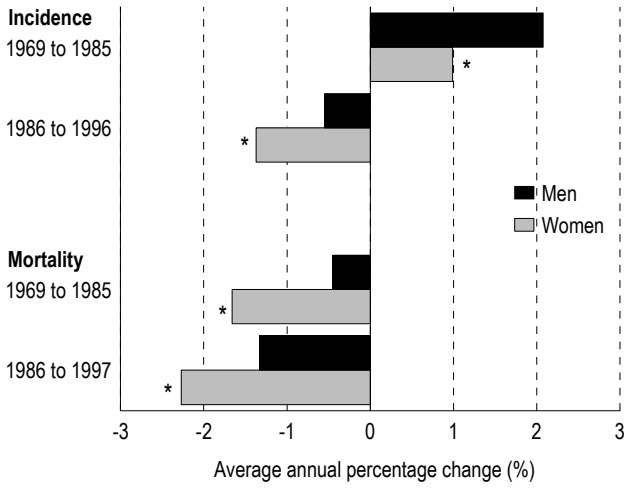
The differential rate of decline in mortality between men and women reflects the steeper

Chart 1
**Age-standardized incidence and mortality rates, colorectal cancer, men and women, Canada, 1969 to 1996 (incidence) or 1997 (mortality)**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry, (1992 to 1996), Canadian Vital Statistics Database*
***Note:*** *Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage.*

Chart 2
**Average annual percentage change, colorectal cancer incidence and mortality, men and women, Canada, 1969 to 1985 and 1986 to 1997**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry (1992 to 1996), Canadian Vital Statistics Database*
** Difference between sexes is statistically significant ($p \leq 0.05$)*

decrease in colorectal cancer incidence among women since 1985, a phenomenon also noted in the United States.[8-10] The reasons for this trend have not yet been determined, but it has been suggested that differences in exposure to risk factors such as diet and hormones may be protecting women from developing colorectal cancer.[12]

It is thought that women may consume less fat and more vegetables and fibre than men.[12,13] Recent data from the 1998/99 National Population Health Survey (NPHS), which indicate that Canadian women may be more concerned about nutrition than their male counterparts, support this theory. For example, significantly more women (33%) than men (23%) said they either chose or avoided foods because they were worried about developing cancer. Specific food choices described in the NPHS suggest that the diet of Canadian women may protect them from colorectal cancer (Chart 3). In 1998/99, women were significantly more likely than men to choose foods because of lower fat and higher fibre content. And a higher proportion of women than men selected foods based on their vitamin and mineral content.

In addition, it may be that the increased use of oral contraceptives and hormone replacement therapy (exogenous hormones) by women over the past several decades may be conferring a significant protective effect against the development of colorectal cancer.[14-16]

## Definitions

From 1969 to 1978, *colorectal cancer* was identified by codes from the *International Classification of Diseases, Eighth Revision*[3] (ICD-8). The codes used to identify relevant colorectal cancer subsites are:

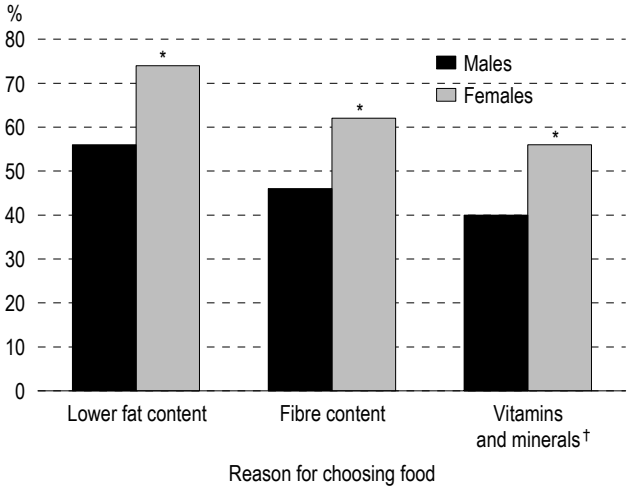
*Proximal colon*: 153.0, caecum, appendix and ascending colon; 153.1, transverse colon, including hepatic and splenic flexures.
*Distal colon*: 153.2, descending colon; 153.3, sigmoid colon.
*Rectum*: 154.0, rectosigmoid junction; 154.1, rectum.
*Unspecified*: 153.8, large intestine (including colon), part unspecified; 153.9, intestinal tract, part unspecified.

From 1979 on, colorectal cancer was identified by codes 153 and 154 from the *International Classification of Diseases, Ninth Revision* (ICD-9).[4] The ICD-9 codes used to identify each subsite are:

*Proximal colon*: 153.0, hepatic flexure; 153.1, transverse colon; 153.4, caecum; 153.5, appendix; 153.6, ascending colon; 153.7, splenic flexure.
*Distal colon*: 153.2, descending colon; 153.3, sigmoid colon.
*Rectum*: 154.0, rectosigmoid junction; 154.1, rectum.
*Unspecified*: 153.8, other; 153.9, colon, unspecified; 159.0, intestinal tract, part unspecified.

*Incidence*: The number of new cases of colorectal cancer diagnosed each year.
*Mortality*: The number of deaths during the year attributed to colorectal cancer as the underlying cause of death.
*Age-standardized rate*: The number of new colorectal cancer cases or deaths per 100,000 that would have occurred in the standard population (1991 Canadian population) if the actual age-specific rates observed in a given population had prevailed in the standard population.
*Age-specific rate*: The number of new colorectal cancer cases or deaths occurring each year, expressed as a rate per 100,000 in that age group.
*Crude survival rate:* The estimated probability of survival from all causes of death at the end of some specified period of time. In this analysis, crude survival was computed for the period ending five years after the initial diagnosis of colorectal cancer.
*Relative survival rate:* The ratio of the observed survival of the group of people under study and the survival experienced by the general population similar to the study group.[11] For this study, the mortality rate of colorectal cancer patients over five years was compared with the five-year mortality rate in the population with the same distribution of sex, age and province of residence.

Chart 3
**Percentage of household population aged 15 or older who chose foods for specific reasons, by sex, Canada excluding territories, 1998/99**




***Data source:*** *1998/99 National Population Health Survey, cross-sectional sample, Health file*
*† Excludes calcium and iron, for which differences between men and women were also significant.*
** Difference between sexes is statisticaly significant ($p \leq 0.05$)*

## Incidence trends by age

Colorectal cancer incidence rates increase with age for both men and women (Charts 4 and 5). However, the time trends—the increase from 1969 to 1985 and the subsequent decline—prevailed among men and women in most age groups.

Between 1969 and 1985, increases in incidence rates were significantly higher among men compared with women in all age groups, except the youngest. Between 1986 and 1996, incidence rates declined significantly more among women aged 60 to 69 and 70 to 79 than among men of the same ages (Chart 6).

## Incidence trends by subsite

Three colorectal cancer subsites were examined. Tumours found in the upper, or ascending, colon were included in the proximal subsite. Cancers below the splenic flexure, in the descending colon, were said to be distal, and tumours below the sigmoid colon were defined as rectal.

Incidence rates for the three subsites and trends over time differ between the sexes (Chart 7). Among men, incidence rates were highest for rectal cancer, followed by proximal colon cancers and then by cancers located in the distal sites. Proximal cancers were the leading site among women, followed by rectal, and then distal colon cancers.

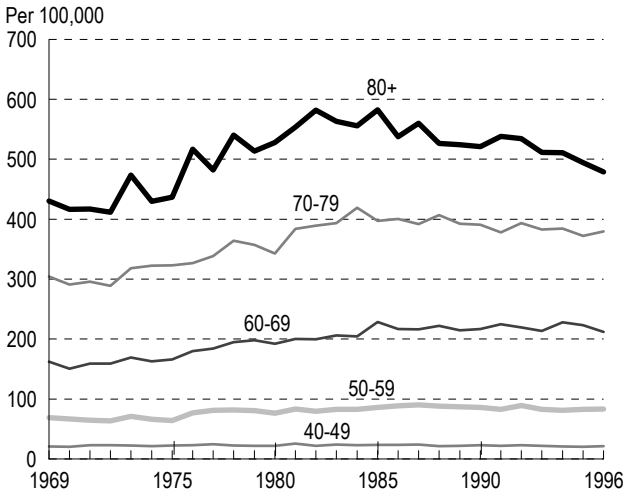
Between 1979 and 1985, rates for all three sites rose among men—most steeply among the proximal cancers (average annual percentage change, 4.56%) (Chart 8). After 1985, there were slight declines for distal and rectal cancers (AAPCs, –0.61% and –0.38%, respectively), while proximal cancers continued to increase very slightly (0.19%).

Among women, proximal cancer rates rose annually by 2.67% between 1979 and 1985, after which they declined slightly (–0.44%). After a small upturn between 1979 and 1985, both distal and rectal cancer incidence rates declined (–2.10% and –1.41%, respectively). Differences between men and women in the annual rates of decrease for distal and rectal cancers were significant in the 1986-to-1996 period.

It is possible that the declines in newly diagnosed distal colon and rectal cancers among men and women since the mid-1980s are partly due to more colorectal cancer screening through the use of the flexible sigmoidoscope.[17] Informal use of this screening tool in Canada may have increased the detection of benign adenomas in the distal colon and rectum, leading to a decreased incidence of these cancers.

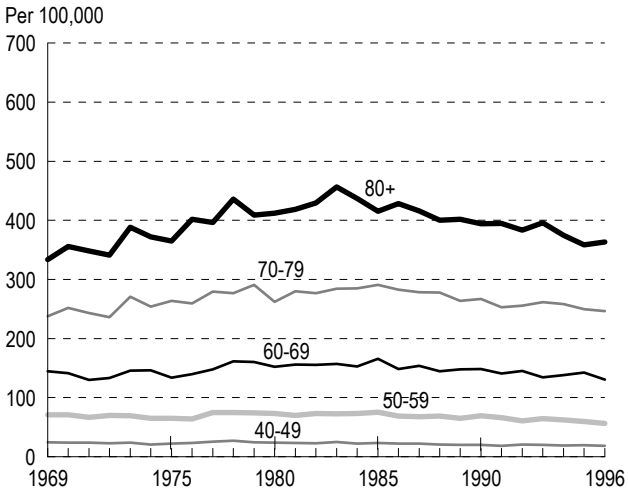
Cancers in the proximal colon are outside the visual range of the flexible sigmoidoscope. Only a colonoscope can visualize the entire colon and detect

Chart 4
**Age-specific colorectal cancer incidence rates, men aged 40 or older, Canada, 1969 to 1996**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry (1992 to 1996)*

Chart 5
**Age-specific colorectal cancer incidence rates, women aged 40 or older, Canada, 1969 to 1996**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry (1992 to 1996)*

## Colorectal cancer

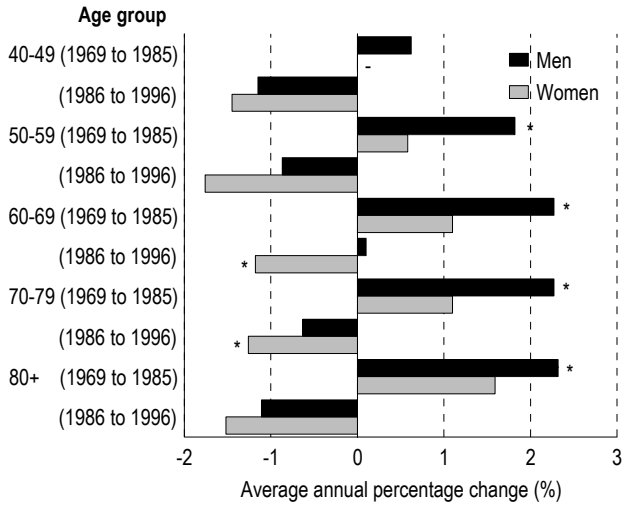
Tumours that grow in the colon and rectum begin as polyps, or adenomas, which arise through a series of genetic mutations caused by several hereditary and/or environmental factors. If left undetected over a period of 10 to 15 years, these benign polyps may become cancerous tumours.[18] Two genetic syndromes increase the risk of developing colorectal cancer: familial adenomatous polyposis and hereditary nonpolyposis colorectal cancer. These syndromes account for less than 1% and approximately 2% of all colorectal cancers, respectively.[18]

In the absence of these syndromes, family history also predisposes individuals to colorectal cancer. People with a first-degree relative who has been diagnosed with colorectal cancer are twice as likely to develop it as those who do not have a family history of this disease.[18] Individuals with inflammatory bowel disease such as Crohn's disease or colitis are also at increased risk.[18]

Epidemiological studies have found associations between a number of modifiable risk factors and the development of colorectal adenomas and their subsequent transformation into colorectal carcinoma. There appears to be a direct relationship between consumption of red meat and developing colorectal cancer, while eating vegetables and fruit and foods high in fibre appears to have a protective effect.[19-21] Physical activity has been shown to reduce the risk of colorectal cancer,[19,22] as has the use of acetylsalicylic acid and other non-steroidal anti-inflammatories.[23,24] The use of exogenous hormones in the form of oral contraceptives or hormone replacement therapy among women has been shown to be protective.[14-16] Alcohol use and long-term cigarette smoking have also been implicated in the development of colorectal cancer.[19,25,26]

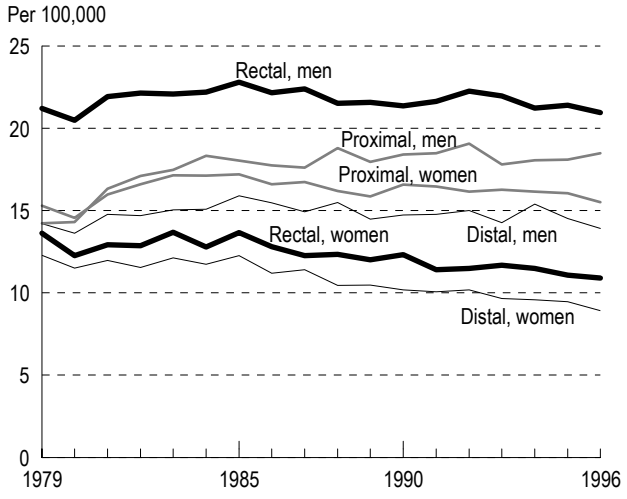
Colorectal cancer can be detected in several ways, including faecal occult blood testing (FOBT), double contrast barium enema, flexible sigmoidoscopy, and colonoscopy. When colorectal cancer is detected at early stages, patients survive longer than those whose cancer is found after the tumour has spread.[18] Data from US studies show that the five-year survival rate for localized disease approaches 90% for cancer of the colon and 80% for cancer of the rectum; the five-year case fatality rate for advanced disease is 50%.[27] Screening for colorectal cancer may result in the detection of benign polyps before they become cancerous. Surgical removal of the tumour is the primary form of treatment for colorectal cancer. Patients with more advanced disease may also receive chemotherapy and radiation treatment.

Chart 6
**Average annual percentage change, age-specific colorectal cancer incidence rates, men and women, Canada, 1969 to 1985 and 1986 to 1996**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry (1992 to 1996)*
*- Nil*
** Difference between sexes is statistically significant ($p \leq 0.05$)*

Chart 7
**Age-standardized incidence rates, colorectal cancer, men and women, by subsite, Canada, 1979 to 1996**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry (1992 to 1996)*
***Note:*** *Rates are age-standardized to the 1991 Canadian population adjusted for net census undercoverage.*

tumours or benign polyps located in the proximal colon. Two recently published studies found that screening asymptomatic men with colonoscopy was effective in detecting advanced proximal colon cancer.[28,29] Although the presence of distal polyps predicted proximal neoplasia, in both studies approximately half the sample with proximal tumours had no distal polyps, so their cancers would not have been detected with sigmoidoscopy screening alone. Investigators have been studying a screening test based on faecal occult blood testing (FOBT), which, if positive, is followed by investigation by colonoscopy.[30-32] Perhaps the use of these techniques in Canada has not yet become routine and/or sufficient time has not yet elapsed to see the expected decrease in the incidence of all subsites of colorectal cancer, including those tumours located in the proximal colon.

## Incidence rate ratios

Incidence rate ratios by sex, age and subsite indicate whether the incidence of a specific form of colorectal cancer is higher among men or women in a particular age group. A ratio greater than 1.00 indicates a higher incidence among men; less than 1.00, a higher incidence among women. For example, in 1996, when the total colorectal cancer rates were 60.04 new cases per 100,000 men and 40.41 new cases per 100,000 women, the male-to-female incidence rate ratio was 1.49 (60.04 divided by 40.41).

Among all age groups, the incidence rate ratios for proximal cancers were close to 1.00 throughout the period (Appendix Table A). As well, there was little difference in ratios by age group.

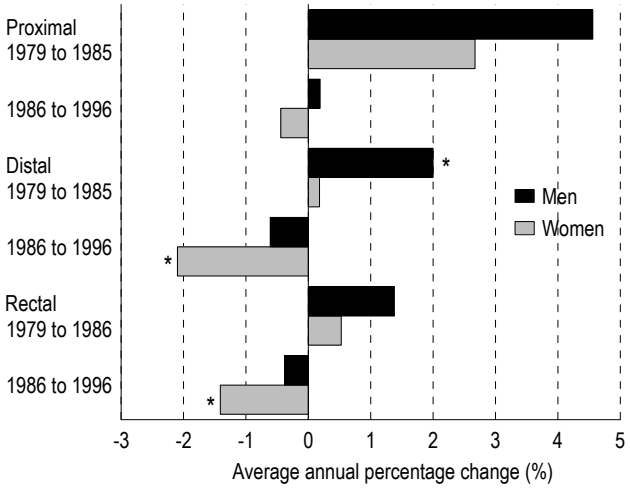
By 1996, the rate ratios for distal cancers indicated a higher incidence among men than among women at older ages. However, in the early years of the period, among people in their forties and fifties, the incidence of distal cancer had actually been higher among women.

Rectal cancer, too, was more common among men than women in all age groups in 1996. The disproportion was most pronounced among people in their sixties and seventies. Moreover, with only minor exceptions in the early 1980s, the higher incidence among men had prevailed in all age groups since 1979.

It is not clear why the incidence of distal colon and rectal cancer is lower among women than men. Differing susceptibilities to carcinogens may exist within various sites in the colon because of biological differences in the intestine.[33] For instance, genetic factors may play an important role in the development of proximal tumours whereas external risk factors such as diet, physical activity and hormone use are associated more with distal tumours.[33] Thus, higher rectal and distal cancer rates among men may be due to greater exposure to specific risk factors that cause cancers at these subsites. Lower male-to-female rate ratios for distal cancer in those under 60 (until the mid-1980s) may indicate either different risk factors affecting each subsite by sex, or the same risk factor with different latent periods for each subsite.

Distal cancer rates among women aged 60 to 69 began to drop in the mid-1980s, as did rectal cancer rates among women older than 50. This suggests either an increase in exposure to some protective effect, or a decrease in exposure to one or more risk factors. One hypothesis is that endogenous

Chart 8
**Average annual percentage change, colorectal cancer incidence, men and women, by subsite, Canada, 1979 to 1985 and 1986 to 1996**




***Data sources:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry (1992 to 1996)*
** Difference between sexes is statistically significant ($p \leq 0.05$)*

## Survival rates

Estimated crude five-year survival from colorectal cancer decreases with age. Among people diagnosed with colorectal cancer at ages 40 to 49, 57% of men and 64% of women will survive five years. These figures fall to 24% among men and 30% among women diagnosed at ages 80 to 99. Because crude survival reflects mortality from all causes, not just cancer, this is as expected.

Relative survival compares the mortality rate of cancer patients to the overall mortality rate of a population with the same distribution of age, sex, and province of residence. In Canada, a man aged 60 to 69 diagnosed with colorectal cancer has a 56% chance of surviving five years, compared with a 60- to 69-year-old man without colorectal cancer in the same province. Relative survival in women the same age is 62%. By ages 80 to 99, relative survival drops to 50% for men and to 51% for women.

**Five-year crude and relative survival rates, men and women aged 40 or older, by sex and age at diagnosis, colorectal cancer cases diagnosed in 1992†**

| | Crude survival rate | 95% confidence interval | Relative survival rate | 95% confidence interval |
|---|---|---|---|---|
| | % | | % | |
| **Men** | | | | |
| 40-49 | 57 | 51-62 | 58 | 52-63 |
| 50-59 | 56 | 53-60 | 59 | 56-63 |
| 60-69 | 50 | 47-52 | 56 | 54-59 |
| 70-79 | 42 | 39-44 | 56 | 53-60 |
| 80-99 | 24 | 21-27 | 50 | 44-56 |
| 40-99 | 45 | 43-46 | 56 | 54-58 |
| **Women** | | | | |
| 40-49 | 64 | 58-70 | 65 | 59-71 |
| 50-59 | 62 | 58-66 | 64 | 59-68 |
| 60-69 | 58 | 55-60 | 62 | 59-65 |
| 70-79 | 49 | 47-52 | 59 | 56-62 |
| 80-99 | 30 | 27-33 | 51 | 47-56 |
| 40-99 | 49 | 48-51 | 59 | 57-61 |

***Data source**: 1992 Canadian Cancer Registry*
*† Excluding Québec*

hormones may have been protecting some women from developing colorectal cancer at the distal and rectal sites and that increases in the use of exogenous hormones, through use of hormone replacement therapy or oral contraceptives, may have resulted in further decreases in these cancers since the mid-1980s. This putative protective effect has not extended to cancers of the proximal colon, supporting the idea that the carcinogenic process differs by subsite.

## Provincial incidence and mortality

Compared with national rates from 1986 to 1996, colorectal cancer incidence rates increased significantly among men in Newfoundland. Among women in Prince Edward Island, both incidence and mortality rates increased significantly during the same period, though these rates are based on small numbers and may be imprecise.

The reasons for provincial differences in colorectal cancer incidience and mortality are not known. Exposure to risk factors may vary by province, as might rates of screening. (See Appendix Tables B through E for provincial incidence and mortality rates, by sex.)

## Concluding remarks

Colorectal cancer incidence and mortality rates have been declining in recent years. Mortality has been decreasing since 1969, but incidence rates only began to decline in the mid-1980s.

Screening for colorectal cancer may have contributed to some of the decrease in mortality by detecting early cancers that are more easily treated. Detection and treatment of pre-cancerous polyps may also have contributed to declines in incidence. Healthier diets and lifestyle habits may be factors as well. The rate of decline in both mortality and incidence was significantly steeper in women, though not for cancers of the proximal colon.

Women may be inherently more protected against cancers of the distal colon and rectum because of naturally occurring hormones. As well, differential rates of exposure to external risk factors such as diet, exercise and therapeutic hormones may have contributed to steeper rates of decline among women for these two subsites.

Cancer of the proximal colon seems to have a different etiology than those of the other subsites. It has been relatively unaffected by whatever changes have produced declines over time in cancers of the distal colon and rectum, and it does not seem to be as influenced by sex-related differences.

Table 1
**Average annual percentage change, colorectal cancer incidence and mortality, men and women, Canada and the provinces, 1969 to 1985 and 1986 to 1996 (incidence) or 1997 (mortality)**

| | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average annual percentage change (%) | | | | | | | | | | |
| **Incidence, 1969 to 1985** | | | | | | | | | | | |
| Men | **2.08** | 2.36 | 2.42 | 1.03 | 2.10 | 3.94* | 1.36 | 1.76 | 2.48 | 2.34 | 1.26 |
| Women | **0.99** | 2.94* | 0.84 | –0.76* | 0.95 | 2.69* | 0.35 | 0.68 | 1.29 | 1.24 | 0.34 |
| **Mortality, 1969 to 1985** | | | | | | | | | | | |
| Men | **–0.45** | 0.11 | –1.39 | –1.44 | –0.06 | –0.31 | –0.55 | 0.84 | 0.62 | –0.66 | –1.08 |
| Women | **–1.60** | 0.74* | –4.43* | –2.70 | –2.54 | –1.72 | –1.54 | –1.14 | 0.43* | –1.77 | –2.14 |
| **Incidence, 1986 to 1996** | | | | | | | | | | | |
| Men | **–0.55** | 1.33* | –1.27 | –0.84 | –0.16 | –0.36 | –0.76 | –0.31 | –0.54 | –0.01 | –0.81 |
| Women | **–1.37** | –1.00 | 4.62* | –1.25 | –1.99 | –1.43 | –1.36 | –1.39 | –1.28 | –1.08 | –1.51 |
| **Mortality, 1986 to 1997** | | | | | | | | | | | |
| Men | **–1.33** | –0.86 | 0.48 | –1.56 | –2.67 | –0.17 | –2.05 | –1.70 | –0.02 | –1.35 | –1.89 |
| Women | **–2.27** | –2.72 | 1.11* | –1.01 | –1.59 | –1.31 | –2.81 | –2.11 | –3.48 | –3.90 | –2.70 |

***Data source:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry, (1992 to 1996), Canadian Vital Statistics Database*
** Slope of regression line is significantly different from that for Canada ($p \leq 0.05$).*

Certain public health implications stem from these findings. Primary prevention strategies for colorectal cancer (increasing or decreasing exposure to specific risk factors) may have different effects on men and women.

The distribution of colorectal subsites by sex and age, and their different behaviour over time, seem to reveal that colorectal cancer may be two or even more distinct diseases that may have different etiologies. This has ramifications for primary, as well as secondary, prevention of colorectal cancer. If proximal colon cancer does, indeed, have a different etiology that is less susceptible to known modifiable risk factors, then research could focus on such tumours to determine how they can best be detected and prevented. ●

## Acknowledgements

The authors thank Claudio Pérez for the analysis of National Population Health Survey Data on food choices.

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# Appendix

Table A

**Male-to-female age-specific colorectal cancer incidence rate ratios, by age and subsite, Canada, 1979 to 1996**

| | Age group | | | | |
|---|---|---|---|---|---|
| | 40-49 | 50-59 | 60-69 | 70-79 | 80+ |
| **Proximal** | | | | | |
| 1979 | 0.93 | 1.06 | 0.89 | 0.89 | 0.90 |
| 1980 | 1.13 | 0.81 | 0.98 | 0.91 | 1.09 |
| 1981 | 1.18 | 0.97 | 1.08 | 0.96 | 1.06 |
| 1982 | 1.19 | 1.00 | 1.01 | 1.01 | 1.04 |
| 1983 | 1.17 | 0.99 | 1.08 | 1.05 | 0.86 |
| 1984 | 1.16 | 0.86 | 1.07 | 1.19 | 0.96 |
| 1985 | 0.85 | 0.89 | 1.09 | 1.01 | 1.17 |
| 1986 | 1.00 | 1.02 | 1.10 | 1.07 | 1.05 |
| 1987 | 1.00 | 1.04 | 1.09 | 1.01 | 1.06 |
| 1988 | 1.12 | 1.12 | 1.25 | 1.13 | 1.12 |
| 1989 | 1.02 | 1.17 | 1.05 | 1.19 | 1.15 |
| 1990 | 1.00 | 1.10 | 1.14 | 1.12 | 1.07 |
| 1991 | 1.21 | 1.10 | 1.16 | 1.09 | 1.08 |
| 1992 | 0.97 | 1.28 | 1.24 | 1.17 | 1.10 |
| 1993 | 0.75 | 1.11 | 1.18 | 1.08 | 1.09 |
| 1994 | 1.12 | 1.04 | 1.19 | 1.06 | 1.13 |
| 1995 | 1.06 | 1.17 | 1.16 | 1.09 | 1.12 |
| 1996 | 1.26 | 1.17 | 1.20 | 1.18 | 1.14 |
| **Distal** | | | | | |
| 1979 | 0.73 | 0.87 | 1.14 | 1.16 | 1.76 |
| 1980 | 0.65 | 0.82 | 1.20 | 1.46 | 1.40 |
| 1981 | 0.61 | 1.02 | 1.14 | 1.55 | 1.49 |
| 1982 | 0.85 | 0.89 | 1.12 | 1.52 | 1.77 |
| 1983 | 0.78 | 0.89 | 1.25 | 1.41 | 1.52 |
| 1984 | 0.70 | 1.07 | 1.20 | 1.49 | 1.54 |
| 1985 | 0.82 | 1.03 | 1.32 | 1.54 | 1.45 |
| 1986 | 0.80 | 1.27 | 1.36 | 1.65 | 1.50 |
| 1987 | 0.86 | 1.13 | 1.19 | 1.47 | 1.65 |

| | Age group | | | | |
|---|---|---|---|---|---|
| | 40-49 | 50-59 | 60-69 | 70-79 | 80+ |
| **Distal - Concluded** | | | | | |
| 1988 | 0.91 | 1.15 | 1.56 | 1.64 | 1.60 |
| 1989 | 1.11 | 1.05 | 1.39 | 1.60 | 1.41 |
| 1990 | 1.07 | 0.99 | 1.41 | 1.57 | 1.94 |
| 1991 | 0.85 | 1.02 | 1.59 | 1.70 | 1.65 |
| 1992 | 0.98 | 1.23 | 1.48 | 1.67 | 1.70 |
| 1993 | 1.07 | 1.22 | 1.53 | 1.70 | 1.49 |
| 1994 | 1.04 | 1.41 | 1.79 | 1.72 | 1.65 |
| 1995 | 1.04 | 1.39 | 1.58 | 1.58 | 1.79 |
| 1996 | 0.90 | 1.35 | 1.61 | 1.85 | 1.43 |
| **Rectal** | | | | | |
| 1979 | 1.08 | 1.38 | 1.65 | 1.63 | 1.74 |
| 1980 | 1.00 | 1.44 | 1.69 | 1.92 | 1.93 |
| 1981 | 1.47 | 1.48 | 1.64 | 1.88 | 1.77 |
| 1982 | 0.96 | 1.39 | 1.93 | 1.96 | 1.68 |
| 1983 | 0.93 | 1.47 | 1.72 | 1.76 | 1.59 |
| 1984 | 1.42 | 1.50 | 1.73 | 1.93 | 1.74 |
| 1985 | 1.38 | 1.43 | 1.82 | 1.74 | 1.72 |
| 1986 | 1.33 | 1.57 | 2.02 | 1.86 | 1.47 |
| 1987 | 1.20 | 1.83 | 1.95 | 1.98 | 1.69 |
| 1988 | 1.29 | 1.73 | 1.86 | 1.88 | 1.56 |
| 1989 | 1.37 | 1.78 | 2.07 | 1.82 | 1.62 |
| 1990 | 1.40 | 1.59 | 1.90 | 1.91 | 1.48 |
| 1991 | 1.44 | 1.68 | 2.10 | 2.02 | 1.88 |
| 1992 | 1.52 | 1.95 | 1.92 | 2.16 | 1.82 |
| 1993 | 1.33 | 1.70 | 2.22 | 1.96 | 1.71 |
| 1994 | 1.21 | 1.53 | 2.19 | 1.96 | 1.81 |
| 1995 | 1.05 | 1.68 | 2.16 | 2.17 | 1.77 |
| 1996 | 1.40 | 1.81 | 2.18 | 2.03 | 1.63 |

***Data source:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry, (1992 to 1996), Canadian Vital Statistics Database*

Table B
**Age-standardized incidence rates, colorectal cancer, men, Canada and provinces, 1969 to 1996**

| | Canada | New-foundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskat-chewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | New cases per 100,000 men | | | | | | |
| 1969 | 49.72 | 45.16 | 47.87 | 57.24 | 53.40 | 41.53 | 56.01 | 53.67 | 41.59 | 41.89 | 50.80 |
| 1970 | 47.45 | 54.16 | 37.00 | 59.45 | 49.34 | 37.72 | 54.20 | 52.50 | 39.73 | 37.00 | 49.41 |
| 1971 | 48.53 | 47.46 | 40.55 | 49.93 | 43.75 | 42.96 | 51.32 | 51.07 | 48.55 | 40.50 | 55.01 |
| 1972 | 47.80 | 57.28 | 36.06 | 55.62 | 44.59 | 40.93 | 53.30 | 48.45 | 43.27 | 39.77 | 49.68 |
| 1973 | 52.59 | 38.04 | 59.04 | 56.74 | 45.62 | 45.00 | 60.98 | 56.57 | 46.76 | 48.74 | 47.34 |
| 1974 | 50.77 | 42.57 | 59.43 | 47.71 | 52.02 | 40.98 | 58.26 | 55.59 | 43.67 | 45.47 | 54.23 |
| 1975 | 51.25 | 48.06 | 38.85 | 59.36 | 49.14 | 43.51 | 55.86 | 54.65 | 44.29 | 43.67 | 56.29 |
| 1976 | 55.33 | 58.19 | 38.06 | 65.95 | 40.55 | 45.73 | 64.05 | 60.66 | 47.34 | 46.46 | 55.13 |
| 1977 | 56.37 | 62.56 | 42.56 | 51.43 | 60.99 | 58.64 | 58.58 | 55.63 | 53.56 | 45.13 | 53.97 |
| 1978 | 59.36 | 57.54 | 46.77 | 53.76 | 61.21 | 60.72 | 62.36 | 66.15 | 55.22 | 48.05 | 56.42 |
| 1979 | 58.45 | 47.04 | 61.44 | 64.16 | 52.47 | 58.45 | 63.25 | 55.85 | 56.01 | 47.27 | 54.66 |
| 1980 | 57.31 | 60.12 | 63.16 | 55.74 | 67.02 | 47.21 | 62.97 | 67.32 | 54.05 | 50.79 | 57.60 |
| 1981 | 61.60 | 59.69 | 58.20 | 59.28 | 55.49 | 66.75 | 62.33 | 63.33 | 58.15 | 52.29 | 58.88 |
| 1982 | 61.91 | 64.72 | 49.87 | 63.25 | 56.68 | 66.86 | 62.82 | 64.53 | 54.10 | 53.76 | 59.44 |
| 1983 | 62.96 | 70.39 | 56.73 | 55.64 | 60.44 | 69.95 | 64.13 | 60.56 | 60.38 | 56.61 | 55.83 |
| 1984 | 63.95 | 63.61 | 50.68 | 64.37 | 59.88 | 65.93 | 67.72 | 65.09 | 55.37 | 55.38 | 60.05 |
| 1985 | 65.41 | 63.62 | 67.89 | 71.43 | 68.55 | 67.72 | 65.76 | 69.54 | 62.41 | 56.49 | 63.45 |
| 1986 | 63.82 | 67.82 | 72.45 | 73.94 | 63.01 | 67.95 | 63.01 | 70.88 | 58.37 | 54.87 | 60.50 |
| 1987 | 64.00 | 66.48 | 79.01 | 75.38 | 63.05 | 66.47 | 65.14 | 59.43 | 60.31 | 53.76 | 61.62 |
| 1988 | 63.75 | 64.91 | 66.67 | 66.65 | 72.04 | 66.45 | 67.02 | 59.62 | 62.94 | 58.97 | 51.29 |
| 1989 | 62.13 | 61.98 | 41.35 | 64.83 | 62.08 | 62.53 | 65.82 | 66.65 | 48.86 | 60.58 | 55.69 |
| 1990 | 62.22 | 62.10 | 58.49 | 75.27 | 60.76 | 63.22 | 66.83 | 63.00 | 61.21 | 49.52 | 50.86 |
| 1991 | 62.32 | 73.05 | 48.59 | 74.01 | 57.73 | 65.76 | 63.62 | 66.15 | 51.96 | 52.09 | 57.21 |
| 1992 | 63.33 | 69.21 | 75.36 | 68.52 | 67.83 | 67.23 | 64.07 | 63.10 | 55.55 | 57.56 | 57.33 |
| 1993 | 61.16 | 80.10 | 65.74 | 64.94 | 65.72 | 64.95 | 61.58 | 66.24 | 57.63 | 49.78 | 55.63 |
| 1994 | 62.02 | 69.12 | 53.52 | 66.93 | 69.18 | 64.10 | 62.76 | 65.18 | 57.20 | 55.91 | 57.67 |
| 1995 | 60.78 | 79.10 | 68.00 | 70.79 | 62.62 | 64.54 | 60.34 | 60.97 | 56.13 | 59.72 | 52.39 |
| 1996 | 60.04 | 67.20 | 55.72 | 65.72 | 59.95 | 63.96 | 61.11 | 61.68 | 55.44 | 54.50 | 52.45 |
| **Average annual percentage change** | | | | | | | | | | | |
| 1969-1985 | 2.08% | 2.36% | 2.42% | 1.03% | 2.10% | 3.94%* | 1.36% | 1.76% | 2.48% | 2.34% | 1.26% |
| 1986-1996 | –0.55% | 1.33%* | –1.27% | –0.84% | –0.16% | –0.36% | –0.76% | –0.31% | –0.54% | –0.01% | –0.81% |

***Data source:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry, (1992 to 1996)*
** Provincial average annual percentage change is significantly different from that for Canada ($p \leq 0.05$).*

Table C
**Age-standardized incidence rates, colorectal cancer, women, Canada and provinces, 1969 to 1996**

| | Canada | New-foundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskat-chewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | New cases per 100,000 women | | | | | | |
| 1969 | 43.11 | 32.24 | 38.98 | 55.95 | 39.99 | 36.36 | 47.91 | 44.86 | 37.75 | 40.32 | 41.58 |
| 1970 | 44.18 | 43.50 | 46.61 | 61.38 | 50.11 | 36.47 | 48.63 | 46.33 | 37.02 | 36.39 | 45.07 |
| 1971 | 42.15 | 39.55 | 43.65 | 58.98 | 42.32 | 34.97 | 44.92 | 46.35 | 33.42 | 36.13 | 46.88 |
| 1972 | 41.99 | 40.27 | 73.11 | 49.20 | 44.99 | 37.42 | 45.21 | 43.63 | 42.57 | 33.12 | 39.98 |
| 1973 | 46.20 | 38.94 | 45.48 | 52.45 | 49.03 | 39.55 | 51.79 | 45.46 | 37.77 | 39.74 | 47.38 |
| 1974 | 44.39 | 35.85 | 45.32 | 50.67 | 54.61 | 38.00 | 49.48 | 42.39 | 37.36 | 37.16 | 44.18 |
| 1975 | 43.73 | 47.54 | 46.83 | 50.32 | 44.81 | 35.15 | 46.74 | 55.43 | 41.23 | 38.54 | 46.55 |
| 1976 | 44.57 | 30.71 | 43.97 | 54.63 | 43.82 | 37.40 | 49.93 | 46.66 | 38.65 | 37.72 | 46.50 |
| 1977 | 47.19 | 49.13 | 56.97 | 55.98 | 46.43 | 45.51 | 49.57 | 51.37 | 38.87 | 40.40 | 44.57 |
| 1978 | 49.54 | 54.04 | 49.88 | 52.28 | 48.79 | 50.00 | 51.42 | 48.78 | 40.21 | 38.91 | 49.18 |
| 1979 | 49.10 | 48.14 | 48.64 | 58.37 | 49.83 | 48.40 | 50.95 | 52.11 | 45.44 | 45.21 | 43.47 |
| 1980 | 46.81 | 50.92 | 46.98 | 61.18 | 54.78 | 38.70 | 50.34 | 52.39 | 47.30 | 40.88 | 45.64 |
| 1981 | 47.80 | 51.98 | 53.41 | 47.14 | 47.86 | 52.04 | 47.36 | 48.04 | 44.54 | 40.08 | 44.52 |
| 1982 | 47.95 | 49.97 | 47.14 | 43.55 | 50.12 | 51.04 | 49.24 | 50.26 | 39.23 | 41.70 | 44.20 |
| 1983 | 49.44 | 67.11 | 50.54 | 46.70 | 45.72 | 54.31 | 49.71 | 44.85 | 44.56 | 44.68 | 44.41 |
| 1984 | 48.34 | 48.11 | 59.34 | 50.26 | 53.38 | 48.81 | 50.24 | 47.34 | 42.81 | 41.21 | 46.34 |
| 1985 | 49.83 | 54.82 | 50.61 | 55.45 | 52.61 | 50.76 | 49.47 | 52.99 | 44.60 | 46.24 | 48.50 |
| 1986 | 47.39 | 56.11 | 32.31 | 53.97 | 48.53 | 51.51 | 46.87 | 45.56 | 41.72 | 40.93 | 43.96 |
| 1987 | 46.86 | 55.38 | 44.62 | 52.58 | 48.19 | 50.64 | 47.50 | 45.69 | 41.87 | 37.54 | 41.60 |
| 1988 | 45.42 | 45.77 | 50.72 | 51.96 | 49.09 | 45.35 | 47.09 | 50.28 | 41.55 | 35.61 | 42.50 |
| 1989 | 44.68 | 51.36 | 39.14 | 52.85 | 46.92 | 45.38 | 45.32 | 47.18 | 41.48 | 39.89 | 41.30 |
| 1990 | 45.05 | 50.00 | 51.03 | 54.72 | 47.57 | 47.52 | 45.41 | 41.89 | 40.62 | 38.43 | 40.97 |
| 1991 | 43.46 | 57.26 | 43.13 | 49.35 | 42.57 | 43.75 | 45.67 | 46.45 | 41.88 | 35.76 | 36.85 |
| 1992 | 43.36 | 56.81 | 70.68 | 50.93 | 46.71 | 47.40 | 42.45 | 47.90 | 33.92 | 35.61 | 38.95 |
| 1993 | 43.52 | 49.90 | 56.40 | 49.97 | 42.19 | 46.67 | 43.56 | 43.47 | 40.13 | 36.00 | 39.54 |
| 1994 | 42.76 | 49.48 | 58.30 | 49.82 | 41.92 | 45.97 | 43.77 | 39.29 | 36.84 | 36.76 | 37.01 |
| 1995 | 41.96 | 55.75 | 50.43 | 46.00 | 40.02 | 43.99 | 42.88 | 41.90 | 35.75 | 35.04 | 38.14 |
| 1996 | 40.41 | 42.14 | 60.23 | 48.54 | 41.88 | 41.34 | 40.58 | 41.99 | 40.33 | 35.39 | 37.77 |
| **Average annual percentage change** | | | | | | | | | | | |
| 1969-1985 | 0.99% | 2.94%* | 0.84% | –0.76%* | 0.95% | 2.69%* | 0.35% | 0.68% | 1.29% | 1.24% | 0.34% |
| 1986-1996 | –1.37% | –1.00% | 4.62%* | –1.25% | –1.99% | –1.43% | –1.36% | –1.39% | –1.28% | –1.08% | –1.51% |

***Data source:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry, (1992 to 1996)*
** Provincial average annual percentage change is significantly different from that for Canada ($p \leq 0.05$).*

Table D
**Age-standardized mortality rates, colorectal cancer, men, Canada and provinces, 1969 to 1997**

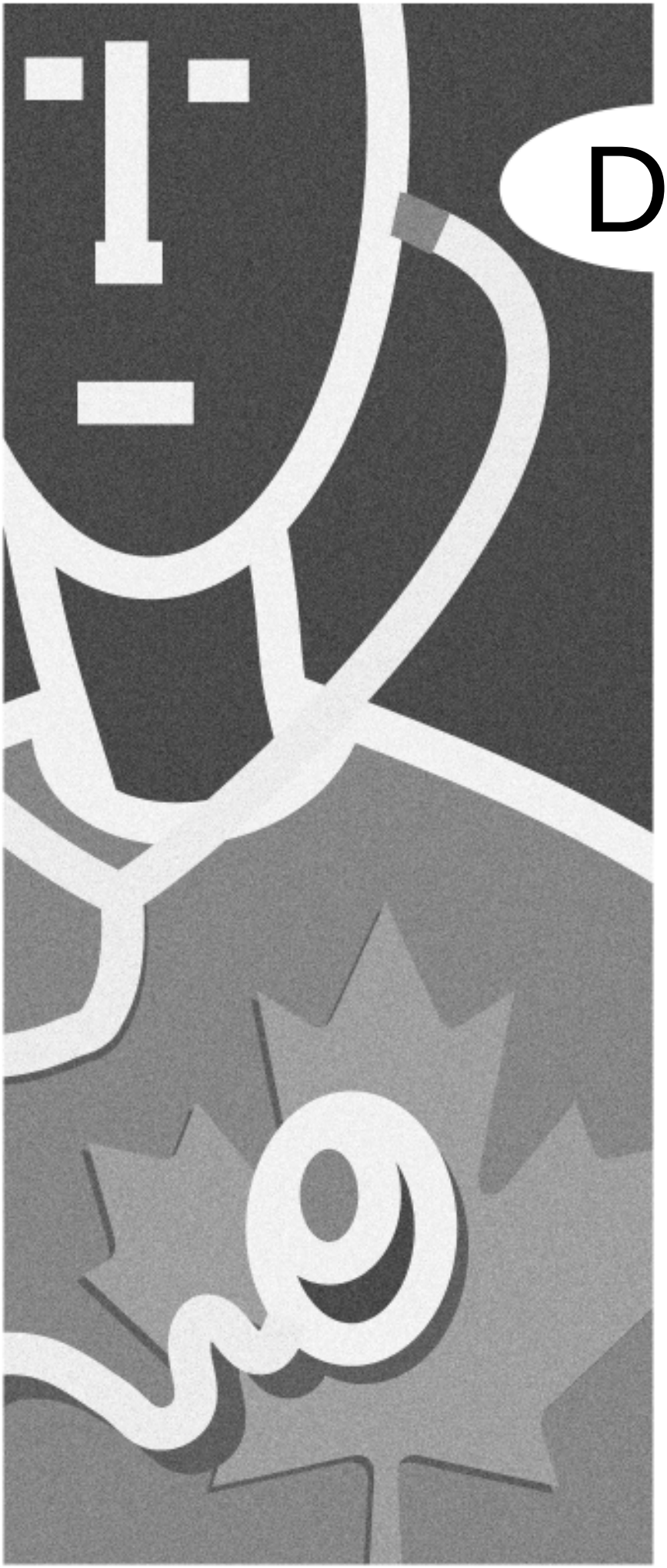
| | Canada | New-foundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskat-chewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Deaths per 100,000 men | | | | | | |
| 1969 | 30.53 | 22.90 | 29.93 | 25.10 | 32.21 | 32.83 | 33.26 | 26.08 | 19.06 | 24.43 | 32.90 |
| 1970 | 31.42 | 40.68 | 15.57 | 36.84 | 28.80 | 31.89 | 33.05 | 28.66 | 27.15 | 27.19 | 28.91 |
| 1971 | 28.82 | 26.18 | 19.40 | 29.76 | 26.55 | 33.19 | 30.61 | 24.85 | 20.15 | 21.68 | 26.90 |
| 1972 | 30.07 | 30.25 | 31.74 | 36.76 | 28.61 | 32.95 | 32.62 | 22.92 | 22.76 | 24.58 | 26.02 |
| 1973 | 30.16 | 19.22 | 36.43 | 26.12 | 23.56 | 34.28 | 30.62 | 28.37 | 28.39 | 26.36 | 29.87 |
| 1974 | 28.02 | 33.67 | 32.34 | 25.34 | 35.46 | 29.19 | 29.52 | 27.42 | 15.79 | 26.95 | 25.53 |
| 1975 | 28.66 | 30.74 | 11.68 | 34.58 | 33.66 | 29.81 | 30.55 | 27.18 | 26.06 | 23.49 | 23.87 |
| 1976 | 29.27 | 26.50 | 18.66 | 32.72 | 28.57 | 31.95 | 31.01 | 28.84 | 21.13 | 25.20 | 25.45 |
| 1977 | 28.24 | 23.22 | 13.33 | 29.42 | 23.32 | 27.57 | 30.82 | 33.58 | 21.97 | 25.33 | 26.21 |
| 1978 | 30.19 | 33.86 | 21.78 | 26.06 | 30.11 | 33.42 | 31.33 | 30.15 | 23.03 | 24.45 | 30.02 |
| 1979 | 28.60 | 28.23 | 23.77 | 32.52 | 31.09 | 30.44 | 30.31 | 27.94 | 25.33 | 19.52 | 25.78 |
| 1980 | 28.90 | 27.48 | 17.19 | 31.39 | 42.13 | 29.68 | 30.66 | 28.59 | 20.63 | 23.07 | 26.21 |
| 1981 | 29.23 | 28.64 | 27.63 | 27.09 | 30.28 | 30.94 | 31.65 | 30.54 | 26.16 | 21.72 | 25.05 |
| 1982 | 28.24 | 26.89 | 30.75 | 26.84 | 32.99 | 30.41 | 29.03 | 29.06 | 24.31 | 26.56 | 24.13 |
| 1983 | 27.66 | 26.18 | 8.09 | 24.32 | 26.14 | 29.55 | 29.57 | 27.76 | 23.92 | 23.57 | 25.20 |
| 1984 | 28.26 | 37.11 | 17.06 | 25.09 | 27.86 | 31.41 | 29.25 | 28.89 | 21.86 | 22.02 | 26.64 |
| 1985 | 28.55 | 24.72 | 31.91 | 22.61 | 24.98 | 33.65 | 29.97 | 29.51 | 24.99 | 23.04 | 23.24 |
| 1986 | 27.20 | 27.95 | 16.78 | 26.00 | 24.63 | 30.83 | 29.76 | 24.39 | 20.54 | 23.12 | 21.17 |
| 1987 | 27.50 | 28.90 | 25.68 | 23.28 | 26.27 | 31.73 | 28.15 | 30.89 | 22.81 | 22.53 | 23.41 |
| 1988 | 27.55 | 17.11 | 9.78 | 27.24 | 27.87 | 33.50 | 29.14 | 27.04 | 23.49 | 23.53 | 19.46 |
| 1989 | 26.84 | 26.86 | 21.12 | 22.64 | 23.36 | 31.68 | 28.63 | 23.48 | 22.43 | 23.30 | 21.11 |
| 1990 | 25.71 | 24.80 | 17.21 | 21.02 | 23.34 | 31.83 | 26.20 | 28.45 | 21.40 | 20.11 | 19.44 |
| 1991 | 25.09 | 23.61 | 25.56 | 24.02 | 18.75 | 30.20 | 25.40 | 24.74 | 24.82 | 21.21 | 19.71 |
| 1992 | 25.93 | 32.23 | 19.92 | 23.39 | 18.55 | 33.91 | 25.48 | 23.98 | 19.69 | 23.04 | 19.44 |
| 1993 | 24.71 | 26.30 | 13.51 | 20.73 | 17.93 | 30.21 | 24.48 | 27.01 | 22.89 | 22.66 | 19.67 |
| 1994 | 24.96 | 26.09 | 16.96 | 22.13 | 20.12 | 31.71 | 24.74 | 26.88 | 23.22 | 18.98 | 19.80 |
| 1995 | 25.13 | 23.01 | 21.12 | 22.46 | 21.67 | 30.27 | 26.03 | 24.44 | 22.59 | 21.73 | 18.75 |
| 1996 | 24.34 | 24.89 | 19.01 | 23.93 | 21.71 | 32.37 | 23.88 | 22.20 | 19.94 | 20.99 | 17.21 |
| 1997 | 23.49 | 20.26 | 18.01 | 19.48 | 19.44 | 31.02 | 23.36 | 20.97 | 23.33 | 19.13 | 17.51 |
| **Average annual percentage change** | | | | | | | | | | | |
| 1969-1985 | –0.45% | 0.11% | –1.39% | –1.44% | –0.06% | –0.31% | –0.55% | 0.84% | 0.62% | –0.66% | –1.08% |
| 1986-1997 | –1.33% | –0.86% | 0.48% | –1.56% | –2.67% | –0.17% | –2.05% | –1.70% | –0.02% | –1.35% | –1.89% |

***Data source:*** *Canadian Vital Statistics Database*

Table E
**Age-standardized mortality rates, colorectal cancer, women, Canada and provinces, 1969 to 1997**

| | Canada | New-foundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskat-chewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1969 | 25.27 | 15.12 | 36.53 | 29.41 | 29.55 | 27.70 | 25.28 | 21.89 | 16.55 | 21.29 | 26.37 |
| 1970 | 25.75 | 26.11 | 25.17 | 31.24 | 25.85 | 28.32 | 26.82 | 24.66 | 17.41 | 20.06 | 23.05 |
| 1971 | 24.39 | 24.83 | 37.54 | 31.27 | 28.97 | 25.43 | 25.43 | 23.72 | 16.85 | 18.44 | 22.20 |
| 1972 | 24.81 | 19.96 | 25.50 | 28.79 | 30.82 | 28.01 | 24.75 | 24.55 | 21.37 | 21.15 | 20.89 |
| 1973 | 24.32 | 16.37 | 32.79 | 27.74 | 30.67 | 25.45 | 25.08 | 20.48 | 20.90 | 19.21 | 24.41 |
| 1974 | 24.65 | 23.46 | 24.81 | 29.41 | 28.21 | 27.75 | 24.54 | 22.43 | 20.09 | 22.53 | 21.07 |
| 1975 | 22.43 | 29.20 | 29.27 | 25.14 | 20.88 | 25.40 | 22.50 | 23.16 | 13.25 | 20.63 | 18.83 |
| 1976 | 22.52 | 20.16 | 12.17 | 23.98 | 25.84 | 23.37 | 23.47 | 24.00 | 18.46 | 20.37 | 19.80 |
| 1977 | 22.66 | 20.43 | 18.83 | 23.02 | 24.10 | 23.81 | 23.78 | 20.65 | 17.56 | 22.70 | 20.09 |
| 1978 | 22.66 | 23.78 | 19.39 | 25.40 | 27.68 | 24.07 | 22.69 | 19.82 | 16.95 | 21.56 | 22.03 |
| 1979 | 23.27 | 29.08 | 21.09 | 28.71 | 32.18 | 22.96 | 23.36 | 21.47 | 22.92 | 20.90 | 21.36 |
| 1980 | 22.15 | 27.10 | 15.84 | 28.15 | 25.87 | 22.73 | 22.97 | 21.96 | 21.62 | 16.63 | 18.60 |
| 1981 | 21.56 | 19.93 | 19.19 | 21.54 | 26.11 | 21.88 | 22.50 | 21.20 | 18.75 | 16.86 | 21.36 |
| 1982 | 20.28 | 24.49 | 14.93 | 20.70 | 23.13 | 21.34 | 21.42 | 24.15 | 17.00 | 16.07 | 15.39 |
| 1983 | 19.94 | 20.85 | 21.17 | 19.87 | 20.03 | 21.84 | 20.06 | 22.41 | 18.41 | 16.07 | 17.62 |
| 1984 | 20.39 | 27.09 | 19.42 | 18.25 | 15.59 | 23.61 | 20.93 | 16.87 | 16.80 | 17.33 | 17.78 |
| 1985 | 19.75 | 18.07 | 16.27 | 22.69 | 19.74 | 21.30 | 20.21 | 18.61 | 20.72 | 15.28 | 17.12 |
| 1986 | 19.74 | 23.56 | 13.98 | 17.03 | 17.47 | 23.29 | 19.64 | 18.52 | 16.94 | 18.66 | 16.11 |
| 1987 | 19.56 | 20.62 | 12.75 | 14.77 | 15.74 | 23.59 | 19.23 | 19.10 | 16.59 | 17.51 | 17.18 |
| 1988 | 18.75 | 21.72 | 15.87 | 16.77 | 13.92 | 22.56 | 19.01 | 19.81 | 16.12 | 15.40 | 14.37 |
| 1989 | 17.56 | 18.50 | 11.06 | 19.49 | 12.74 | 20.82 | 17.74 | 15.43 | 15.35 | 13.95 | 14.97 |
| 1990 | 17.67 | 20.81 | 12.04 | 16.04 | 14.37 | 21.57 | 17.19 | 15.23 | 15.36 | 14.77 | 15.54 |
| 1991 | 16.76 | 17.57 | 19.55 | 14.64 | 17.15 | 20.49 | 16.56 | 16.24 | 13.64 | 13.52 | 13.64 |
| 1992 | 16.62 | 14.52 | 16.23 | 12.89 | 14.03 | 21.78 | 16.15 | 19.54 | 14.05 | 13.16 | 11.76 |
| 1993 | 16.56 | 16.75 | 15.42 | 16.06 | 16.28 | 22.07 | 15.39 | 15.71 | 13.62 | 13.94 | 12.17 |
| 1994 | 16.07 | 19.07 | 11.45 | 18.27 | 14.24 | 20.63 | 15.14 | 14.80 | 13.04 | 10.82 | 13.80 |
| 1995 | 16.16 | 15.57 | 20.16 | 13.05 | 10.92 | 20.68 | 16.27 | 16.44 | 10.74 | 11.62 | 13.34 |
| 1996 | 15.74 | 14.78 | 14.04 | 16.44 | 14.15 | 20.83 | 15.08 | 15.98 | 10.76 | 13.29 | 11.17 |
| 1997 | 15.23 | 20.10 | 13.84 | 14.64 | 13.78 | 19.26 | 14.15 | 13.85 | 14.02 | 11.60 | 13.38 |
| **Average annual percentage change** | | | | | | | | | | | |
| 1969-1985 | –1.60% | 0.74%* | –4.43%* | –2.70% | –2.54% | –1.72% | –1.54% | –1.14% | 0.43%* | –1.77% | –2.14% |
| 1986-1997 | –2.27% | –2.72% | 1.11%* | –1.01% | –1.59% | –1.31% | –2.81% | –2.11% | –3.48% | –3.90% | –2.70% |

***Data source:*** *National Cancer Incidence Reporting System (1969 to 1991), Canadian Cancer Registry, (1992 to 1998), Canadian Vital Statistics Database*
** Provincial average annual percentage change is significantly different from that for Canada ($p \leq 0.05$).*



# Data Releases

Synopses of recent health information produced by Statistics Canada

## Health indicators, 2000

*Health indicators* is a Web-based data publication produced by Statistics Canada and the Canadian Institute for Health Information. It provides a set of indicators that measures the health of the Canadian population and the health care system. These indicators provide comparable information at the health region and provincial/territorial level, and are based on standard definitions and methods.

The indicators are organized into four categories: health status (including health conditions, mortality rates and measures of well-being); non-medical determinants of health (socio-economic characteristics and health behaviours); health system performance (measures of accessibility, appropriateness and effectiveness of health care services); and community and health system characteristics (contextual information).

*Health indicators* contains tables showing a variety of indicators, by sex and by health region. Each table provides provincial and national data.

*Health indicators* (82-221-XIE) is available free on Statistics Canada's Web site. Selected health indicators at the regional level are also available in the *Statistical profile of Canadian communities* on Statistics Canada's Web site (www.statcan.ca). For more information, contact Jason Gilmore (613-951-7118; jason.gilmore@statcan.ca), Statistics Canada, or Phil Taylor (416-481-2002; ptaylor@cihi.ca), Canadian Institute for Health Information.

## National Population Health Survey: Household component, public-use microdata files, 1998/99

The cross-sectional, public use microdata files from the household component of the third cycle (1998/99) of the National Population Health Survey (NPHS) were released December 19, 2000. Available on CD-ROM, these files include a wide range of health information; for example, general health status, use of health care services and health determinants such as smoking, alcohol use and physical activity. In 1998/99, medical history of immediate family members, self-care and nutrition were also collected.

To order a copy of the *National Population Health Survey, household component, 1998-1999 public-use microdata files* (82M0009XCB, $2,000), other NPHS public-use files or custom tabulations, contact Client Custom Services (613-951-1746; fax: 613-951-0792; hd-ds@statcan.ca), *Health Statistics Division.*

Data from the household component of the third cycle of the NPHS were first released March 29, 2000. Several analytical articles based on these data were published in *Health Reports* (82-003-XPB).

The downloadable publication *Information about the National Population Health Survey* (82F0068XIE) contains links to the questionnaires and other sources of information on the NPHS. Some tabular NPHS data are available on the *Canadian statistics* page of Statistics Canada's Web site (www.statcan.ca). Public-use microdata files are also available for the first and second cycles of the household and health institutions components.

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.

## National Population Health Survey: Residents of Health Care Institutions, 1998/99

Longitudinal data from the health care institutions component of the 1998/99 National Population Health Survey (NPHS) were released December 15, 2000. In 1994/95 (cycle 1), the survey began following a group of approximately 2,300 residents of health care institutions. These respondents were then re-interviewed in cycles 2 and 3 (1996/97 and 1998/99). About half of the people interviewed in the first cycle were deceased by the third cycle.

By 1998/99, four out of five residents had a long-term disability, and two-thirds had more chronic health problems than they did in 1994/95. The number of newly reported osteoporosis, heart disease or Alzheimer's disease (and other forms of dementia) cases was higher than for other chronic health conditions. However, in 1998/99, three-fifths of respondents assessed their general health as comparable to or even better than in 1994/95.

For general information on these data or other NPHS components, or to order custom tabulations, contact Client Custom Services (613-951-1746; fax 613-951-0792; hd-ds@statcan.ca), Health Statistics Division. To enquire about the concepts, methods or data quality, contact Mario Bédard (613-951-8933; fax: 613-951-4198; mario.bedard@statcan.ca), Health Statistics Division.

## Therapeutic abortions, 1998

In 1998, Canadian women obtained 110,331 therapeutic abortions, a 1.2% decrease from 111,709 a year earlier. The number of abortions declined in seven provinces and territories: Newfoundland, Prince Edward Island, New Brunswick, Ontario, Manitoba, British Columbia and the Northwest Territories.

Two-thirds of 1998 abortions were performed in hospitals; the remaining one-third, in clinics. Canadian women obtained 297 therapeutic abortions in the United States, virtually unchanged from 1997.

Therapeutic abortions were most common among women in their twenties, who accounted for half the total. On average, 27 out of every 1,000 women in this age group had an abortion.

Therapeutic abortion data for 1998 were collected by the Canadian Institute for Health Information. Selected tables are available in *Canadian Statistics*. For more information on the therapeutic abortions database, contact Judy Lee (416-481-2002, extension 3407; fax: 416-481-2950), Canadian Institute for Health Information.

For information on long-term trends in therapeutic abortions, or to enquire about the concepts, methods or data quality of this release, contact Paula Woollam (613-951-0879; paula.woollam@statcan.ca) or Richard Trudeau (613-951-8782; richard.trudeau@statcan.ca), Health Statistics Division, Statistics Canada.

## Divorces, 1998

For the first time in four years, the number of marriages ending in divorce rose in 1998. That year, 69,088 couples divorced, up 2.5% from 1997. The crude divorce rate rose to 228 per 100,000, up slightly from 225 the previous year.

The number of divorces increased in most provinces and territories, except Nova Scotia, Québec and Manitoba. Crude divorce rates were highest in Yukon (370 per 100,000), Alberta (264) and British Columbia (246). The lowest rates were in the Northwest Territories (138), Newfoundland (173) and New Brunswick (196).

In 1998, the divorce rate peaked during the fifth year of marriage. Based on the total divorce rate, about one-third of marriages (36%) are now expected to end in divorce within 30 years; 39% within 50 years.

Marriages that ended in divorce in 1998 had lasted an average of 13.7 years, about a year longer than in 1989 when the average had been 12.9 years.

The average age of men who divorced in 1998 was 42; women, 39.4. Since 1989, the average age at divorce has increased 2.6 years for both men and women, a trend that may be associated with couples marrying at older ages in recent years.

In 1998, 21,448 divorce cases involved a custody order for dependent children. In 60% of such cases, custody was granted to the wife, far ahead of joint custody (30%) or to the husband only (10%). In many cases not involving a custody order, residential arrangements are negotiated by parents outside the divorce proceedings; therefore, these statistics should not be interpreted as representing all outcomes for children of divorce.

*Divorces 1998* (standard tables; 84F0213XPB, $20) was released September 28, 2000. To order this product or to request custom tabulations, call Client Services (613-951-1746), Health Statistics Division. For more information, or to enquire about the concepts, methods or data quality of this release, contact Patric Blouin (613-951-1670; patric.blouin@statcan.ca) or Leslie Geran (613-951-5243; leslie.geran@statcan.ca), Health Statistics Division.

### Residential Care Facilities Survey, 1996/97 and 1997/98

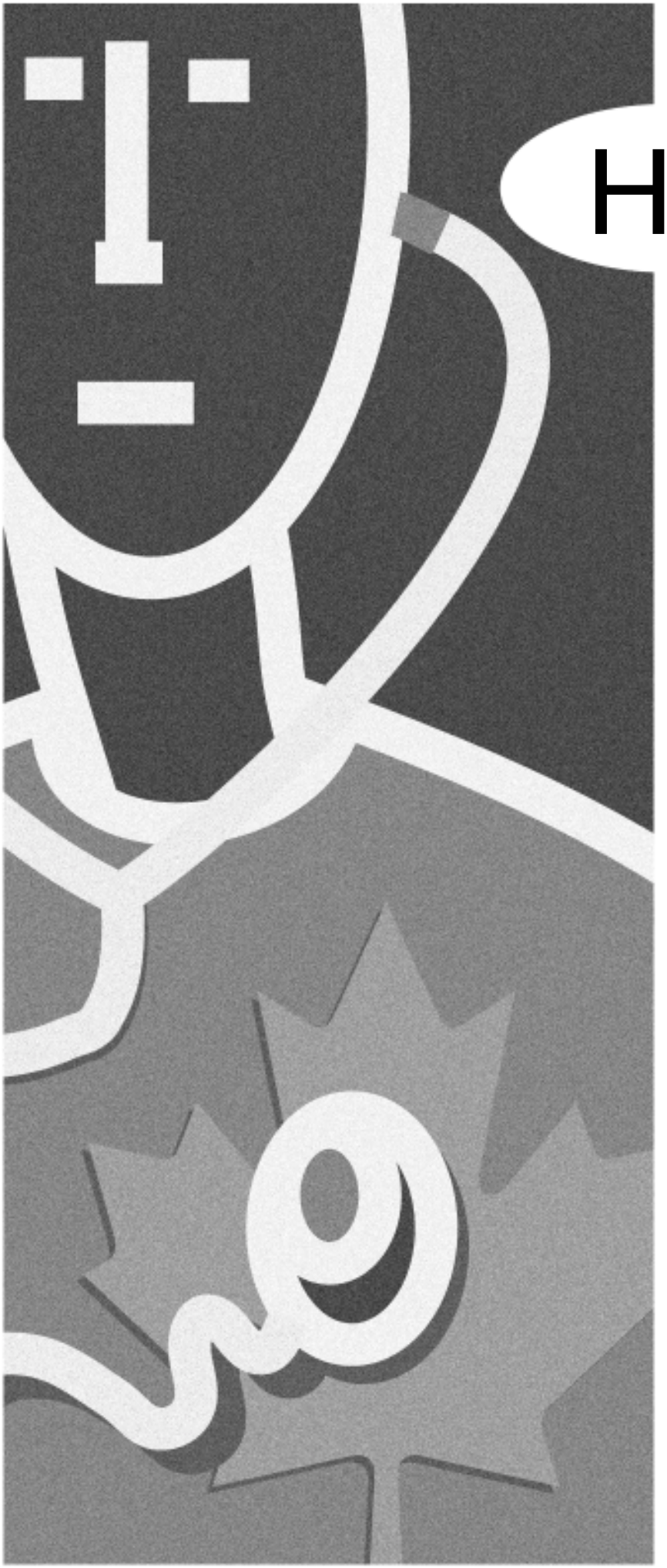
Data from the Residential Care Facilities Survey for fiscal years 1996/97 and 1997/98 are now available from Health Statistics Division.

For 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 quality of the data for 1996/97 and 1997/98, contact Richard Trudeau (613-951-8782; richard.trudeau@statcan.ca) or Mike Gagnon (613-951-8570; mike.gagnon@statcan.ca), Health Statistics Division.

### Cancer incidence, 1996 (complete), 1997 and 1998 (partial)

National cancer incidence data for 1996 were released December 1, 2000, along with partial cancer incidence data for 1997 and 1998. The 1997 data include information on new cases, as reported by 11 of the 12 provincial and territorial cancer registries (Ontario data are missing). The 1998 data are from 10 of the 12 registries (Ontario and Québec are missing).

Trends and cancer estimates for 2001 based on these data will be released in April 2001. For more information, or to enquire about the concepts, methods or data quality, contact Michel Cormier (613-951-1775; michel.cormier@statcan.ca) or Client Custom Services (613-951-1746; fax: 613-951-0792; hd-ds@statcan.ca), Health Statistics Division. ●



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| | · subscription<br>· single issue | 82-003-XIE | Internet | $ 44<br>$ 15 |
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| Cancer Incidence in Canada, 1969-1993<br>*(For 1994 to 1996, available as shelf table or custom tabulations through the Client Custom Services Unit - see page 67)* | | 82-566-XPB | Paper | $ 42 |
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| **National Population Health Survey** | | | | |
| National Population Health Survey Overview 1994-95 | | 82-567-XPB<br>82-567-XIB | Paper<br>Internet | $ 10<br>$ 8 |
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| National Population Health Survey public-use microdata files | | Product number | Format | Price (CAN$)†‡ |
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| Custom tables | Household | 82C0013 | Price varies with information requirements | |
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*† All prices exclude sales tax.*
*‡ See inside cover for shipping charges.*


**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.

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