Canadian Cancer Statistics

2001

Produced by:
Canadian Cancer Society
National Cancer Institute of Canada
Statistics Canada
Provincial/Territorial Cancer Registries
Health Canada

Canadian Cancer Society / Société canadienne du cancer
National Cancer Institute of Canada / Institut national du cancer du Canada
Health Canada / Santé Canada

http://www.cancer.ca

Steering Committee Members:

John R. McLaughlin (Chair), Ph.D.
Division of Epidemiology and Biostatistics, Samuel Lunenfeld Research Institute, Mount Sinai Hospital, Toronto, Ontario

Dagny Dryer, M.D., F.R.C.P.C.
PEI Cancer Treatment Centre and Cancer Registry, Charlottetown, Prince Edward Island

Yang Mao, Ph.D.
Cancer Bureau, Centre for Chronic Disease Prevention and Control, Health Canada, Ottawa, Ontario

Brent Schacter, M.D., F.R.C.P.C.
Cancer Care Manitoba, Winnipeg, Manitoba

Ghislaine Villeneuve, M.P.A.
Health Statistics Division, Statistics Canada, Ottawa, Ontario

Barbara Whylie, M.B., B.Ch., B.A.O.
Cancer Control Policy, Canadian Cancer Society and National Cancer Institute of Canada, Toronto, Ontario

Analytic and Statistical Support:

Chris Waters, B.Sc.(Stats)
Cancer Bureau, Centre for Chronic Disease Prevention and Control, Health Canada, Ottawa, Ontario

Robert Semenciw, M.Sc.
Cancer Bureau, Centre for Chronic Disease Prevention and Control, Health Canada, Ottawa, Ontario

"National Cancer Institute of Canada: **Canadian Cancer Statistics 2001**, Toronto, Canada, 2001."

April 2001, ISSN 0835-2976

On the Internet this report is available at http://www.cancer.ca and http://www.ncic.cancer.ca

Additional copies may be requested from Divisions of the Canadian Cancer Society, Statistics Canada, or the Cancer Bureau, Health Canada (see pages 9 to 12).

La version française de cette publication est disponible sur demande.

ACKNOWLEDGEMENTS

This monograph was developed by a Steering Committee reporting to the Joint Advisory Committee on Cancer Control of the National Cancer Institute of Canada and the Canadian Cancer Society. The Steering Committee includes representatives of the National Cancer Institute of Canada, the Canadian Cancer Society, Health Canada, Statistics Canada, the Canadian Council of Cancer Registries and university-based cancer researchers.

The production and distribution of the monograph is the result of collaboration among all these groups.

- The provincial and territorial cancer registries supply and review the cancer incidence data used to produce the statistics in this report. The Committee wishes to acknowledge the essential contribution of the staff at the registries.
- The Cancer Bureau, Centre for Chronic Disease Prevention and Control (CCDPC), Health Canada, produced the estimates, trends, projections, tables and figures for all sections of the document. Other analyses include producing the probabilities of developing and dying of cancer, calculations of premature mortality, and the contribution of risk factors to cancer. Dr. Howard Morrison of Health Canada contributed to the section on childhood cancer statistics.
- The Health Statistics Division, Statistics Canada, provided data for development of the tables and figures and several sections of the text.
- The Scientific Publication and Multimedia Services unit, Management Planning and Operations Directorate, Health Canada, was responsible for the actual production of the monograph.
- Michel Beaupré of the Fichier des tumeurs du Québec reviewed the French translation. Dr. Heather Bryant of the Alberta Cancer Board contributed to the Special Topic, Colorectal Cancer.
- Dr. Mary McBride of the Division of Epidemiology and Cancer Prevention, B.C. Cancer Agency, provided the estimates for non-melanoma skin cancer.
- The National Cancer Institute of Canada and the Canadian Cancer Society provide administrative support to produce, print and distribute this report. The work of Ms. Sarah Kettel in particular is acknowledged.
- The Canadian Cancer Society, Health Canada and Statistics Canada distributed this monograph.
- The National Cancer Institute of Canada supports the work of the Steering Committee and the publication of the monograph with charitable funds collected by volunteers of the Canadian Cancer Society.

TABLE OF CONTENTS

Tables

Figures

Tables in Appendix I

EVALUATION AND ORDER FORMS

Please help us improve this publication. Your feedback on the contents of this report will be used to prepare future editions. It would be helpful for planning if you could complete and return this form by August 31, 2001 to:

Canadian Cancer Statistics
Canadian Cancer Society National Office
10 Alcorn Ave., suite 200
Toronto, Ont.
M4V 3B1

However, we will be pleased to receive your completed form at any time.

1. For how many years have you used the Canadian Cancer Statistics booklet?

   _____

2. How do you prefer to access the Canadian Cancer Statistics booklet?
   - ❑ Hard copy
   - ❑ Electronic copy on the internet

3. In which of your professional activities does this publication assist you?
   - ❑ Planning for cancer care and treatment services
   - ❑ Health policy and planning
   - ❑ Planning cancer prevention programs
   - ❑ Teaching
   - ❑ Research — clinical trials
   - ❑ Research — other
   - ❑ Journalistic reporting
   - ❑ Actuarial purposes
   - ❑ Fundraising
   - ❑ Other: _____

4. What use will you make of the information in Canadian Cancer Statistics 2001?
   - ❑ As a reference document for current data on cancer
   - ❑ To identify national cancer trends
   - ❑ To compare cancer trends between provinces
   - ❑ As evidence to lobby for more resources for cancer prevention/cancer treatment
   - ❑ Other: _____

5. Please rate each section of Canadian Cancer Statistics 2001 for its usefulness.

	Not useful	Somewhat useful	Very useful
Highlights	❑	❑	❑
Current incidence and mortality	❑	❑	❑
Geographic patterns of cancer occurrence	❑	❑	❑
Trends in incidence and mortality	❑	❑	❑
Age and gender distribution of cancer	❑	❑	❑
Probability of developing/dying from cancer	❑	❑	❑
Potential years of life lost due to cancer	❑	❑	❑
Cancer in children	❑	❑	❑
Special topic			
Colorectal Cancer	❑	❑	❑

6. Which figures and tables do you find most useful?

7. Which figures and tables do you find least useful?

8. What additional information would you like to see in the text, figures or tables in the next issue?

9. What special topic would you suggest for future editions?

10. Do you have any additional suggestions to make this publication more useful to you?

❑ **YES!** **Please send me the next edition of this report (hardcopy of the year 2002 edition).**

Name: _____

Title: _____

Organization: _____

Address: _____

City: _____ Province: _____

Postal Code: _____

FOR FURTHER INFORMATION

For general information regarding cancer statistics or any other aspect of cancer (such as cancer prevention, screening, diagnosis, treatment and care, etc.), contact the **Canadian Cancer Society's Cancer Information Service at 1-888-939-3333**. A list of the offices of the CCS – the National Office and the divisional offices – is provided on page 12. Your local CCS office is listed in the white pages of the telephone directory.

For information regarding cancer research sponsored by the **National Cancer Institute of Canada (NCIC)**, with funds provided by the CCS and The Terry Fox Foundation, contact the NCIC at the address provided on page 12.

For Information from Health Canada:
Information on risk assessment and surveillance of cancer is available from the **Cancer Bureau, Health Canada**, Tunney's Pasture, Ottawa, Ontario, K1A 0L2. Tel. (613) 957-0327, Fax. (613) 941-2057.

Cancer Surveillance On-Line is an interactive, web-based tool for easy access to cancer surveillance data. It allows the user to generate data according to choice of parameters such as cancer site, geographic area, period of time and choice of presentation mode such as tables, charts and maps. See the Health Canada website noted below for the URL.

For Information from Statistics Canada:
Detailed standard tables or custom tabulations are available on a cost recovery basis upon request from the Health Statistics Division: (613) 951-1746. Analytic articles appear regularly in *Health Reports*, Statistics Canada, Catalogue 82-003, quarterly.

For Information from the Provincial Cancer Registries:
Cancer incidence data are supplied to Statistics Canada by **provincial/territorial cancer registries**. Detailed information regarding the statistics for each province or territory is available from the relevant registry. (See pages 10 and 11 for addresses, telephone numbers and fax numbers.)

Data contained in this document are available on the CCS and NCIC websites at (http://www.cancer.ca) or (http://www.ncic.cancer.ca). Additional information is also available from the following:

- Canadian Cancer Society (CCS)
  http://www.cancer.ca
- National Cancer Institute of Canada (NCIC)
  http://www.ncic.cancer.ca
- Health Canada
  http://www.hc-sc.gc.ca/hpb/lcdc/webmap (select cancer button)
- Statistics Canada
  http://www.statcan.ca
- Canadian Strategy for Cancer Control
  http://www.cancercontrol.org

CANADIAN COUNCIL OF CANCER REGISTRIES

NEWFOUNDLAND

Chief Executive Officer
Newfoundland Cancer Treatment and Research Foundation
Dr. H. Bliss Murphy Cancer Centre
300 Prince Philip Drive
St. John's, Newfoundland A1B 3V6
Tel: 709-777-7592
Fax: 709-753-0927
http://www.nctrf.nf.ca

PRINCE EDWARD ISLAND

Director
P.E.I. Cancer Registry
Queen Elizabeth Hospital
Riverside Drive
Charlottetown, Prince Edward Island
C1A 8T5
Tel: 902-894-2027
Fax: 902-894-2187
Registry No.: 902-894-2167
Email: kavriends@ihis.org

NOVA SCOTIA

Manager
Nova Scotia Cancer Registry
QEII Health Sciences Centre
Room 569, Bethune Building
1278 Tower Road
Halifax, Nova Scotia B3H 2Y9
Tel: 902-473-6084
Fax: 902-473-4425
Email: ccmmi@qe2-hsc.ns.ca

NEW BRUNSWICK

Provincial Epidemiologist
Director of Provincial Epidemiology Service
Department of Health and Wellness
P.O. Box 5100
520 King Street, 2nd Floor
Fredericton, New Brunswick E3B 5G8
Tel: 506-453-3092
Fax: 506-453-2780

QUÉBEC

Fichier des tumeurs du Québec
Ministère de la Santé et des Services sociaux
Direction générale de la santé publique
Bureau de surveillance épidémiologique
1075, chemin Ste-Foy, 2^{e} étage
Québec, Québec G1S 2M1
Tel: 418-266-6739
Fax: 418-266-6708
http://www.msss.gouv.qc.ca/f/statistiques/index.htm

ONTARIO

Director
Ontario Cancer Registry
Division of Preventive Oncology
Cancer Care Ontario
620 University Avenue
Toronto, Ontario M5G 2L7
Tel: 416-971-9800
Fax: 416-971-6888
http://www.cancercare.on.ca

MANITOBA

Director
Department of Preventive Oncology and Epidemiology
Cancer Care Manitoba
675 McDermot Avenue
Winnipeg, Manitoba R3E OV9
Tel: 204-787-2178
Fax: 204-783-6875
http://www.cancercare.mb.ca/epi/epi_home.html

SASKATCHEWAN

Director
Cancer Registry
Saskatchewan Cancer Foundation
Allan Blair Cancer Centre
4101 Dewdney Avenue
Regina, Saskatchewan S4T 7T1
Tel: 306-766-2695
Fax: 306-766-2179

FOR FURTHER INFORMATION

ALBERTA

Director
Epidemiology, Prevention and Screening
Alberta Cancer Board
c/o Room 382
Heritage Medical Research Bldg.
3330 Hospital Drive, N.W.
Calgary, Alberta T2N 4N1
Tel: 403-220-4302, 403-262-4460
Fax: 403-270-3898

BRITISH COLUMBIA

Director, Cancer Registry
Vancouver Cancer Clinic
BC Cancer Agency
600 West 10th Avenue
Vancouver, British Columbia V5Z 4E6
Tel: 604-877-6000, Local 6122
Fax: 604-877-1868
http://www.bccancer.bc.ca

NORTHWEST TERRITORIES

Medical Officer and Director
Cancer Registry
Department of Health
Government of the N.W.T.
Box 1320, 5022 49th Street
Centre Square Tower, 6th Floor
Yellowknife, Northwest Territories
X1A 2L9
Tel: 867-920-3231
Fax: 867-873-0442

YUKON

Director of Insured Health Services
Yukon Cancer Registry
Health Services Branch
Yukon Government
Box 2703, Whitehorse, Yukon Y1A 2C6
Tel: 867-667-5620
Fax: 867-393-6486

NUNAVUT

Director of Registry
Department of Health and Social Services
Box 1000, Station 1000
Igaluit, Nunavut X0A 0H0
Tel.: 867-975-5700
Fax: 867-957-5780

STATISTICS CANADA

Director
Health Statistics Division
18-F, R.H. Coats Building
Tunney's Pasture, Ottawa, Ontario
K1A 0T6
Tel: 613-951-8571
Fax: 613-951-0792

NATIONAL CANCER INSTITUTE OF CANADA/ CANADIAN CANCER SOCIETY

National Office

Canadian Cancer Society & National Cancer Institute of Canada
10 Alcorn Avenue, Suite 200
Toronto, Ontario M4V 3B1
Tel. (416) 934-5673
Fax. (416) 961-4189

Newfoundland & Labrador Division

Canadian Cancer Society
Crosbie Building, 2nd Floor
P.O. Box 8921
1 Crosbie Place, Crosbie Road
St. John's, Newfoundland A1B 3R9
Tel. (709) 753-6520
Fax. (709) 753-9314

Prince Edward Island Division

Canadian Cancer Society
1 Rochford Street, Suite 1
Charlottetown, Prince Edward Island
C1A 9L2
Tel. (902) 566-4007
Fax. (902) 628-8281

Nova Scotia Division

Canadian Cancer Society
5826 South Street, Suite 1
Halifax, Nova Scotia B3H 1S6
Tel. (902) 423-6183
Fax. (902) 429-6563

New Brunswick Division

Canadian Cancer Society
133 Prince William Street
P.O. Box 2089
Saint John, New Brunswick E2L 3T5
Tel. (506) 634-6272
Fax. (506) 634-3808

Québec Division

Maison de la Société canadienne du cancer
5151 boul. l'Assomption
Montréal, Québec H1T 4A9
Tel. (514) 255-5151
Fax. (514) 255-2808

Ontario Division

Canadian Cancer Society
1639 Yonge Street
Toronto, Ontario M4T 2W6
Tel. (416) 488-5400
Fax. (416) 488-2872

Manitoba Division

Canadian Cancer Society
193 Sherbrook Street
Winnipeg, Manitoba R3C 2B7
Tel. (204) 774-7483
Fax. (204) 774-7500

Saskatchewan Division

Canadian Cancer Society
1870 Albert Street, Suite 340
Regina, Saskatchewan S4P 4B7
Tel. (306) 757-4260
Fax. (306) 569-2133

Alberta/N.W.T. Division

Canadian Cancer Society
#200, 2424-4th Street S.W.
Calgary, Alberta T2S 2T4
Tel. (403) 228-4487
Fax. (403) 228-4506

British Columbia & Yukon Division

Canadian Cancer Society
565 West Tenth Avenue
Vancouver, British Columbia V5Z 4J4
Tel. (604) 872-4400
Fax. (604) 879-4533

INTRODUCTION

This monograph is published by the Canadian Cancer Society and the National Cancer Institute of Canada in collaboration with Health Canada, Statistics Canada, provincial/territorial cancer registries and university-based researchers. It is part of an annual series that began publication in 1987.

The main purpose of the publication is to provide health professionals, researchers and policy-makers with detailed information regarding the incidence and mortality of the most common types of cancer by age, gender, time period and province or territory. It is hoped that these data will stimulate new research and assist decision-making and priority-setting processes at the individual, community, provincial/territorial and national levels. The monograph is also used by educators, the media and members of the public with an interest in cancer.

Special Topics are included each year. This year the Special Topic section reviews trends in colorectal cancer. In past years, other Special Topics included:

- an overview of progress in cancer control over the past few decades (2000);
- an analysis of the relative impact of population growth and aging on cancer incidence in Canada (1999);
- a review of current directions in cancer surveillance in Canada (1999);
- international comparisons (1998);
- a comparison of cancer in Canada from 1987 to 1997 (1997);
- an evaluation of the accuracy of previously reported estimates (1996);
- detailed reviews of prostate cancer (1996), colorectal cancer (1995) and breast cancer (1993);
- survival rates (1991-1993, 1995);
- prevalence estimates (1995);
- smoking prevalence and lung cancer (1991);
- cancer in Aboriginal populations (1991);
- age-specific trends among women (1990);
- cancer rates by income level (1990); and
- the economic burden of cancer (1990, 1996).

Information on cancer incidence and mortality comes from the provincial and territorial cancer registries and offices of vital statistics, which send their data to Statistics Canada for compilation at the national level. The process of collecting complete information about cancer cases in each province and then compiling this information at the national level results in a considerable delay before reliable information for a particular year is available for all of Canada. This report contains actual rates and frequencies up to the most recent year for which complete data are available (1996 for incidence; 1997 for mortality) and, in addition, estimated values for the years up to 2001. The estimates are made in the following way: first, time trends in the known rates are examined; second, these trends are projected to the present time to obtain current rate estimates; and third, these rate estimates for the current year are applied to current population estimates.

The statistical methodology used for publication in recent years involves the standardization of incidence and mortality rates on the basis of the 1991 Canadian population rather than the World Standard Population. Age-standardized rates are higher with this methodology because the Canadian population has a higher proportion of older people, among whom cancer is more common. Standardization using the Canadian population provides results that are more relevant and useful to those concerned with cancer in Canada. **Nevertheless, it should be noted that it is not appropriate to compare the**

age-standardized rates presented here with those from publications that employ a different standard population.

Details of the statistical methods used to produce the projections are described in *Appendix II: Methods*. **It is important to emphasize that the figures provided for 2001 are estimates, rather than actual data.**

The statistics contained herein refer to all types of cancer, defined according to the standardized classification that is used worldwide. As is customary in reports from cancer registries, the statistics exclude skin cancers other than melanoma. Benign tumours and carcinoma in situ are also excluded. Details of how cancer sites are classified and definitions of technical terms are provided in the *Glossary*.

Individuals who require additional information can refer to the section entitled *For Further Information*, which indicates how to contact the various agencies involved, including Health Canada, Statistics Canada, the Canadian Cancer Society, the National Cancer Institute of Canada, and provincial and territorial cancer registries. Related information can also be found in other publications, including reports from provincial and territorial cancer registries; Cancer Incidence in Canada, 1969-1993,[1] and Health Reports, published by Statistics Canada; Chronic Diseases in Canada and the Canadian Cancer Incidence Atlas,[2] published by Health Canada; a collaborative monograph entitled The Making of the Canadian Cancer Registry; Cancer Incidence in North America,[3] published by the North American Association of Central Cancer Registries; and Cancer Incidence in Five Continents,[4] published by the International Agency for Research on Cancer.

The development of this publication over the years has benefited considerably from the comments and suggestions of readers. The Steering Committee appreciates and welcomes such comments, including ideas on how the report can be improved (an ***Order and Evaluation Form*** is included on pages 7 and 8 of this report). Finally, **readers can be included on the mailing list for next year's publication by completing the *Order and Evaluation Form*.**

HIGHLIGHTS

Current Incidence and Mortality

An estimated 134,100 new cases of cancer and 65,300 deaths from cancer will occur in Canada in 2001.

In 2001, the most frequently diagnosed cancers will continue to be breast cancer for women and prostate cancer for men.

Lung cancer remains the leading cause of cancer death for both genders. Almost one-third of the cancer deaths in men and almost one-quarter in women are due to lung cancer alone.

Trends in Incidence and Mortality

Among men the cancer mortality rate for all cancers combined has been declining slowly since 1988 as a result of decreases in mortality rates for lung, colorectal, and certain other cancers.

From the 1970s to the present, among women, there has been a steady and significant decline in mortality rates for all cancers combined exclusive of lung cancer.

Among Canadian men, prostate cancer will continue to be the most frequently occurring cancer in 2001. Beginning in 1994 actual incidence rates for prostate cancer began to decline after having increased rapidly for several years. With mortality rates remaining stable during this period, these trends were likely due to the rapid increase in the use of early detection techniques (such as measurement of Prostate Specific Antigen levels).

Following several decades of rapid increase, actual lung cancer incidence and mortality rates among women began to level off in 1993 reflecting a decline in smoking rates among women that began in the mid-1970s. However, they remain more than four times as high as rates in 1971 and are only a little less than half as high as rates among men.

Following small but steady annual increases over three decades actual breast cancer incidence among women leveled off in 1993. Mortality rates for breast cancer have declined steadily since 1986. This pattern of divergent trends is consistent with the benefits being achieved through screening programs and improved treatments.

For colorectal cancer, the third most common cancer for both men and women, both incidence and mortality rates have declined steadily over the past decade and a half, the rate of decline being more pronounced among women.

Thyroid cancer is a relatively rare disease, which in the past decade has had the most rapidly increasing incidence rate among both men and women. The rate of increase is less pronounced in men, and mortality rates have dropped for men and remained quite stable for women.

Mortality rates for Hodgkin's disease and stomach cancer have been dropping steadily.

Age and Gender Distribution of Cancer

Cancer is primarily a disease of older Canadians, with 70% of new cancer cases and 81% of deaths due to cancer occurring among those who are at least 60 years old.

After age 70, the rate at which men die from cancer is higher than the rate at which women develop cancer.

HIGHLIGHTS

Probability of Developing/Dying from Cancer

During their lifetimes, 2 in 19 women are expected to develop breast cancer, 1 in 18 will develop colorectal cancer, and 1 in 19 will develop lung cancer.

Among men, 1 in 9 will develop prostate cancer during their lifetime, mostly after age 70, 2 in 23 will develop lung cancer and 1 in 16 will develop colorectal cancer.

The probability of developing cancer is lower for younger people, such that over the next 10 years it is 1 in 90 among 30-year-old women but 1 in 7.5 among 70-year-old women. The probability of developing prostate cancer during the next decade among 30-year old men is essentially zero and among 70-year-old men is 1 in 16.

Potential Years of Life Lost Due to Cancer

Cancer is the leading cause of premature death in Canada, being responsible for almost one-third of all potential years of life lost.

Because of its relative frequency among younger Canadians and poor survival rates, lung cancer is by far the leading cause of premature death due to cancer.

Smoking is responsible for about one-third of potential years of life lost (PYLL) due to cancer, about one-quarter of PYLL due to diseases of the heart and about one-half of PYLL due to respiratory disease.

Cancer in Children Aged 0-19 Years

In recent years, cancer was diagnosed, on average, in 1,266 Canadian children, of whom 249 died each year. The most common childhood cancer is leukemia, which accounts for over 26% of new cases and 32% of deaths.

Colorectal Cancer

An estimated 17,200 new cases and 6,400 deaths from colorectal cancer will occur in Canada in 2001.

When both women and men are considered together, colorectal cancer is the second most frequent cause of death from cancer among Canadians.

Colorectal cancer is responsible for more deaths that are not due primarily to tobacco use than any other type of cancer.

Both incidence rates and mortality rates for colorectal cancer have declined steadily over the past 15 years, with the rate of decline being more pronounced among women than men.

The similarities in the trends in incidence and mortality rates suggest that a large part of the mortality rate decline has been due to a reduction in the occurrence of the disease.

The reasons for the reduction in colorectal cancer incidence rates are not known with certainty, but are likely a combination of disease prevention through changes in exposures to risk factors, and detection at an earlier stage through screening. Directions for further research on reducing the impact of colorectal cancer in Canada are outlined.

CURRENT INCIDENCE AND MORTALITY

The importance of different forms of cancer in Canada in 2001 can be measured in three ways, shown in Table 1. Incidence is expressed as the number of new cases of a given type of cancer diagnosed per year. Mortality is expressed as the number of deaths attributed to a particular type of cancer during the year. The deaths to cases ratio (the number of deaths divided by the number of new cases) is a crude indicator of disease severity. The closer a value is to 1.0, the poorer the prognosis for that cancer. Frequencies listed in Tables 1 to 6 are estimates based on modelling trends in cancer and population data since 1986 for both cancer incidence and mortality (incidence estimates for prostate cancer were modelled using data from 1980-1989). These estimates are rounded to the nearest 5, 10, 50 or 100. Readers requiring actual data or information on less common sites of cancer may refer to Tables 1 to 6 in *Appendix I* or to source publications.[1,4]

Some problems that may be inherent in using these statistics are considered below.

Sources of Data

Incidence figures collected by provincial and territorial cancer registries are reported to the Canadian Cancer Registry (CCR) maintained by Statistics Canada, beginning with cases diagnosed in 1992. The patient-oriented CCR has evolved from the event-oriented National Cancer Incidence Reporting System, which collected data from 1969-1991. The new CCR is regularly updated, it is internally linked to track patients with tumours diagnosed in more than one province, and its records are linked to death certificates. Data from these series are published by Statistics Canada,[1] the North American Association of Central Cancer Registries,[3] every five years by the International Agency for Research on Cancer,[4] and in occasional reports.[1,2]

Every effort is made to count all newly diagnosed cases of cancer among people who reside in a given province at the time of diagnosis, and to accurately and consistently record for each case the site and histological type of cancer from pathology reports and other records, according to definitions in the CCR Data Dictionary. Cancer sites included in this report are defined according to the groupings listed in the *Glossary*. Although the provincial/territorial cancer registries strive, through the Canadian Council of Cancer Registries and its Standing Committee on Data Quality, to achieve uniformity in defining and classifying new cases, reporting procedures may still vary across the country. This is particularly true for skin cancer (other than melanoma), which occurs frequently but is difficult to register completely because it is usually treated successfully without requiring hospitalization or the review of a pathologic specimen. **For this reason, all tables in this monograph exclude the estimated 70,000 cases of non-melanoma skin cancer for Canada in 2001.*** Registration levels for cancer have become more comparable across the country, particularly in the period between 1981 and the mid-1980s, as registries standardized their procedures for case-finding, including linkage to provincial mortality data files.

Cancer mortality statistics are derived from death records maintained by the provincial and territorial registrars of vital statistics for persons residing in that province or territory at the time of death. Cancer deaths are those attributed to some form of cancer as the underlying cause of death by the certifying physician.

* *The number of new cases of non-melanoma skin cancer is estimated using incidence rates from the cancer registry in British Columbia, which is considered to have the most complete data. Please refer to Appendix II: Methods for further details.*

Although these procedures have been standardized both nationally and internationally, some lack of uniformity is inevitable. The description of the type of cancer provided on the death certificate is usually less precise than that obtained by the cancer registries from hospital and pathology records. Also, cancer deaths occurring in a given year will usually be the result of cancers diagnosed in previous years.

Estimates for Cancer Incidence and Mortality, Canada, 2001

An estimated 134,100 new cases of cancer and 65,300 deaths from cancer will occur in Canada in 2001. Men outnumber women for both new cases and deaths, by 4.8% for incidence and 12.7% for mortality (Table 1).

Three types of cancer account for at least 50% of the new cases in each sex: prostate, lung, and colorectal cancers in males, and breast, lung, and colorectal cancers in females. Almost one-third of the cancer deaths in men and almost one-quarter in women are due to lung cancer alone (Figures 1.1 and 1.2).

Lung cancer will continue as the leading cause of cancer death among Canadian women in 2001, accounting for an estimated 7,400 deaths, as compared with the 5,500 deaths expected for breast cancer. This reflects the rapid increase in lung cancer mortality rates among women over the past 15 years, while age-standardized breast cancer mortality rates declined slightly. Lung cancer incidence among women also continues to rise. With an estimated 9,200 new cases, lung cancer is the second leading form of cancer in women, ahead of the 7,900 new cases expected for colorectal cancer, which ranks third. Breast cancer continues to lead in incidence among Canadian women, with more than twice as many new cases as lung cancer.

Among Canadian men in 2001, prostate cancer will continue as the leading form of cancer incidence, with an estimated 17,800 newly diagnosed cases, as compared with 12,100 lung cancers. The rapid increase in the number of prostate cancers detected in all provinces a few years ago resulted from the widespread rise in the use of earlier detection techniques. The downturn in new cases seen since 1993 indicates that these dramatic increases in prostate cancer incidence have been reversed. To reflect this, the number of new prostate cancer cases was derived from an earlier period (see *Appendix II: Methods*) and can be viewed as a conservative estimate of the number expected in 2001.

Lung cancer will remain the leading cause of cancer death among Canadian men in 2001; the estimated 10,700 lung cancer deaths far exceed the 4,300 deaths due to prostate cancer, the second leading cause of cancer death in men.

Deaths to Cases Ratio

The ratio of deaths to new cases, at 49% overall, is slightly higher in males than in females. On the basis of these ratios, the cancer sites listed in Table 1 could be classified arbitrarily into three groups: those with a very good prognosis (a ratio of 30% or less — breast, prostate, melanoma, body of the uterus, thyroid, cervix, Hodgkin's disease and testis, with male bladder on the borderline); those with a fairly good prognosis (a ratio greater than 30% but less than 50% — colorectal, non-Hodgkin's lymphoma, female bladder, kidney, oral and larynx); and those with a poor prognosis (ratio greater than 50% — lung, adult leukemia, pancreas, stomach, ovary, brain, multiple myeloma and esophagus).

Table 1

Estimated New Cases and Deaths for Cancer Sites by Gender, Canada, 2001

	New Cases 2001 Estimates			Deaths 2001 Estimates			Deaths/Cases Ratio 2001 Estimates		
	Total	M	F	Total	M	F	Total	M	F
All Cancers	**134,100**	**68,600**	**65,400**	**65,300**	**34,600**	**30,700**	**0.49**	**0.50**	**0.47**
Lung	21,200	12,100	9,200	18,000	10,700	7,400	0.85	0.89	0.80
Breast	19,500	–	19,500	5,500	–	5,500	0.28	–	0.28
Prostate[1]	17,800	17,800	–	4,300	4,300	–	0.24	0.24	–
Colorectal	17,200	9,300	7,900	6,400	3,400	3,000	0.37	0.37	0.38
Non-Hodgkin's Lymphoma	6,200	3,400	2,800	2,700	1,400	1,250	0.44	0.42	0.45
Bladder	4,700	3,500	1,250	1,500	1,050	460	0.32	0.30	0.37
Kidney	3,900	2,400	1,500	1,450	890	550	0.37	0.37	0.36
Melanoma	3,800	1,950	1,800	820	490	330	0.22	0.25	0.18
Leukemia	3,500	2,000	1,500	2,100	1,200	940	0.61	0.61	0.62
Body of Uterus	3,500	–	3,500	670	–	670	0.19	–	0.19
Pancreas	3,100	1,500	1,650	3,100	1,500	1,650	1.00	0.99	1.01[2]
Oral	3,100	2,100	980	1,050	730	320	0.34	0.34	0.33
Stomach	2,800	1,750	1,000	1,950	1,200	770	0.70	0.67	0.76
Ovary	2,500	–	2,500	1,500	–	1,500	0.60	–	0.60
Brain	2,400	1,300	1,050	1,550	880	670	0.66	0.67	0.64
Thyroid	1,900	510	1,400	160	50	110	0.09	0.10	0.08
Multiple Myeloma	1,700	960	760	1,250	670	590	0.73	0.70	0.77
Cervix	1,450	–	1,450	420	–	420	0.29	–	0.29
Esophagus	1,350	930	420	1,450	1,050	400	1.09[2]	1.15[2]	0.95
Larynx	1,250	1,000	240	520	430	90	0.42	0.42	0.38
Hodgkin's Disease	810	430	380	120	70	55	0.15	0.16	0.14
Testis	790	790	–	35	35	–	0.05	0.05	–
All Other Sites	9,500	4,900	4,600	8,700	4,600	4,100	0.91	0.93	0.89

– Not applicable

[1] The number of new prostate cases was estimated on the basis of data years 1980-1989. Please refer to *Appendix II: Methods* for further details.

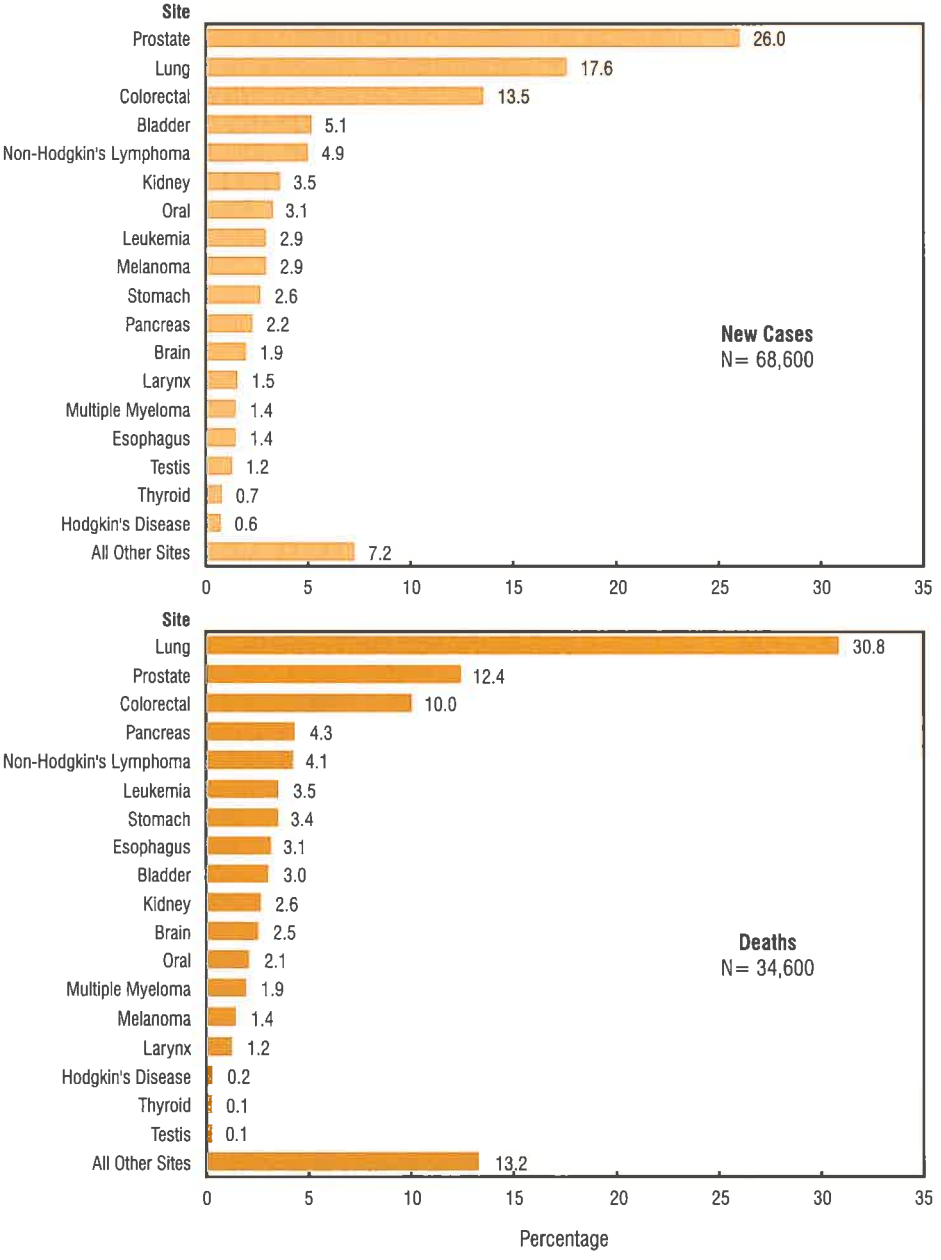
[2] The high ratio (in excess of 1.0) for cancers of esophagus and pancreas may result from incomplete registration of this cancer before death. Please refer to *Appendix II: Methods* for further details.

Note: Incidence figures exclude an estimated 70,000 new cases of non-melanoma skin cancer (ICD-9 173). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 1.1

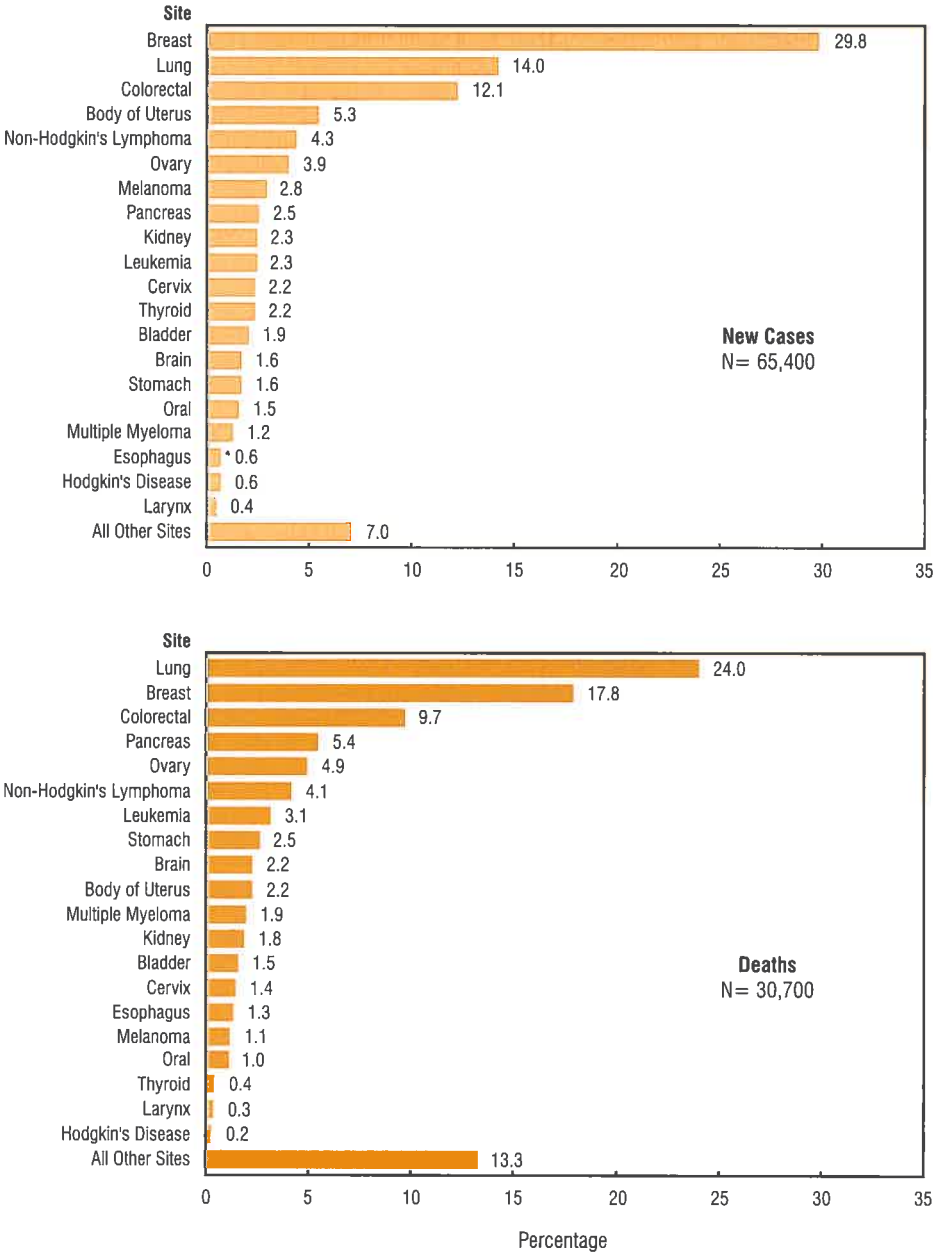
Percentage Distribution of Estimated New Cases and Deaths for Selected Cancer Sites, Males, Canada, 2001



Note: Incidence figures exclude an estimated 70,000 new cases of non-melanoma skin cancer (ICD-9 173).
Source: Cancer Bureau, CCDPC, Health Canada

Figure 1.2

Percentage Distribution of Estimated New Cases and Deaths for Selected Cancer Sites, Females, Canada, 2001



Note: Incidence figures exclude an estimated 70,000 new cases of non-melanoma skin cancer (ICD-9 173).
Source: Cancer Bureau, CCDPC, Health Canada

GEOGRAPHIC PATTERNS OF CANCER OCCURRENCE

Table 2 presents population projections and estimates of new cases and deaths for all cancer sites combined, by gender and province or territory for 2001. Tables 3 and 4 present estimates of the number of new cases and the age-standardized incidence rates for each of the major cancer sites, by gender and province for 2001. The age-standardized estimates take into consideration the differences in provincial age distributions, thus facilitating inter-provincial comparisons. Similarly, Tables 5 and 6 present estimates of the number of deaths and the age-standardized mortality rates for each of the major cancer sites, by gender and province for 2001. The calculation of standardized rates using the 1991 Canadian population as the standard is described in the *Glossary*. Adjustments were necessary for estimated incident cases in most provinces; however, these adjustments were not made in the age-standardized rates, which are modelled independently.

Tables 3 to 6 in *Appendix I* provide the most recent actual data across the provinces. This is a new feature in this publication.

Data on provincial numbers and rates of incident cancer cases and cancer deaths provide valuable information for research, knowledge synthesis, planning and decision-making at the provincial/territorial level. These data are therefore of interest to researchers, health care workers, planners and policy-makers. Inevitably, these data will be used for inter-provincial comparisons. While the incidence rates for some cancers (e.g. breast) appear to be consistent across jurisdictions, the rates for others (e.g. prostate) appear to vary more widely. Interpretation of these variations must be done with caution, however, because a variety of reasons could account for the observations.

First, if the cancer is rare, the number of cases occurring annually in a given province may be so small that rate estimates may be unreliable. Second, correlations found between the incidence of disease and the prevalence of risk factors for a given geographic location can be misleading. Proof of a causal association between a risk factor and a disease requires more detailed studies of individuals. However, different patterns of tobacco consumption among the provinces contribute to some of the variation.

Third, for many cancers there is a long interval between exposure to a risk factor and the occurrence of disease, and often the information on the prevalence of risk factors from previous decades is inadequate. Lower socio-economic status has been associated with higher cancer mortality and increased incidence of certain cancers (e.g. cervical) but decreased incidence of others.

Fourth, the availability of and the completeness in target populations of screening programs (e.g. for breast and cervical cancer) differ among provinces. The year of initiative of screening programs differs by province, and cancer rates will be altered temporarily through identification of previously undiagnosed cases in asymptomatic individuals. As well, the availability of diagnostic procedures may differ regionally.

Finally, there are differences in the reporting procedures used in cancer registration (e.g. registration of second primary cancers and availability of death certificate information). Nevertheless, these comparisons may prove useful in some instances for generating hypotheses that lead to further epidemiologic studies, which may reveal true differences and causal associations with significant importance for cancer control planning.

Table 2

Estimated Population, New Cases and Deaths for All Cancers by Gender and Geographic Region, Canada, 2001

	Population (000s) 2001 Estimates[1]			New Cases 2001 Estimates[2]			Deaths 2001 Estimates		
	Total	M	F	Total	M	F	Total	M	F
Canada	**31,050**	**15,353**	**15,697**	**134,100**	**68,600**	**65,400**	**65,300**	**34,600**	**30,700**
Newfoundland	533	264	269	2,000	1,050	960	1,200	700	510
Prince Edward Island	137	68	70	700	350	350	330	190	140
Nova Scotia	938	461	478	4,700	2,500	2,200	2,500	1,300	1,150
New Brunswick	750	372	379	3,600	1,900	1,700	1,800	980	820
Quebec	7,400	3,646	3,753	34,700	17,900	16,800	17,500	9,400	8,100
Ontario	11,818	5,819	5,998	50,200	25,400	24,900	23,800	12,500	11,300
Manitoba	1,146	568	578	5,400	2,800	2,600	2,600	1,300	1,300
Saskatchewan	1,026	509	516	4,500	2,400	2,100	2,300	1,250	1,050
Alberta	3,071	1,544	1,527	10,800	5,300	5,400	5,100	2,700	2,400
British Columbia	4,131	2,050	2,081	17,200	8,900	8,300	8,200	4,300	3,900
Yukon	29	15	14	95	55	40	45	25	20
Northwest Territories	43	22	21	100	50	50	55	25	30
Nunavut	27	14	13	55	30	25	40	20	20

[1] 2001 population projections were provided by the Census and Demographics Branch, Statistics Canada.
[2] Figures exclude non-melanoma skin cancer (ICD-9 173).
Note: Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods*.
Source: Cancer Bureau, CCDPC, Health Canada

Table 3

Estimated New Cases for Major Cancer Sites by Gender and Geographic Region, Canada, 2001

	New Cases										
	Canada[1]	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**68,600**	**1,050**	**350**	**2,500**	**1,900**	**17,900**	**25,400**	**2,800**	**2,400**	**5,300**	**8,900**
Prostate	17,800	300	100	750	550	3,800	6,700	780	720	1,450	2,700
Lung	12,100	150	65	440	380	3,900	4,100	450	350	840	1,300
Colorectal	9,300	200	50	330	240	2,300	3,500	400	310	740	1,150
Bladder	3,500	40	15	170	100	1,350	1,050	140	170	140	310
Non-Hodgkin's Lymphoma	3,400	40	15	110	85	880	1,300	150	110	260	430
Kidney	2,400	40	15	85	70	590	900	130	80	210	270
Oral	2,100	60	10	65	45	540	830	100	75	160	250
Leukemia	2,000	15	5	40	50	490	800	70	95	200	210
Melanoma	1,950	25	10	100	65	280	810	65	65	210	330
Stomach	1,750	50	10	55	55	480	630	70	55	140	220
Pancreas	1,500	10	10	40	50	430	520	60	50	130	190
Brain	1,300	20	5	40	35	380	480	45	40	110	160
Larynx	1,000	20	5	30	25	360	350	35	25	65	100
Multiple Myeloma	960	15	5	35	20	270	350	45	25	65	120
Females											
All Cancers	**65,400**	**960**	**350**	**2,200**	**1,700**	**16,800**	**24,900**	**2,600**	**2,100**	**5,400**	**8,300**
Breast	19,500	320	100	670	530	5,000	7,200	800	630	1,700	2,600
Lung	9,200	90	45	340	260	2,600	3,300	330	260	690	1,200
Colorectal	7,900	160	65	320	230	2,000	2,900	330	270	570	950
Body of Uterus	3,500	55	15	120	80	790	1,350	160	110	330	450
Non-Hodgkin's Lymphoma	2,800	40	10	90	95	710	1,100	120	90	230	350
Ovary	2,500	30	10	75	50	750	980	90	95	170	280
Melanoma	1,800	35	15	95	50	290	710	70	60	220	260
Pancreas	1,650	5	10	55	55	440	600	70	55	150	200
Kidney	1,500	20	10	55	50	390	580	70	55	140	150
Leukemia	1,500	15	5	35	35	380	630	65	65	130	150
Cervix	1,450	30	10	50	35	300	600	60	50	140	180
Thyroid	1,400	25	5	30	25	360	570	50	35	150	160
Bladder	1,250	10	5	80	35	460	360	50	60	55	110
Brain	1,050	10	5	25	20	320	400	40	35	80	110
Stomach	1,000	35	5	30	30	280	360	35	35	80	120
Oral	980	10	5	35	20	200	410	50	30	80	140
Multiple Myeloma	760	10	5	20	20	210	300	30	25	55	95

[1] Canada totals include provincial and territorial estimates

Note: Total of rounded numbers may not equal rounded total number. New prostate cancer cases were estimated based on data years 1980-1989. The Canada and provincial totals for all cancers exclude an estimated 70,000 cases of non-melanoma skin cancer (ICD-9 173). Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2001 estimates are compared with previously published estimates. These estimates may vary from actual figures. Please see *Appendix I* for most current actual data or contact provincial cancer registries for further information.

Source: Cancer Bureau, CCDPC, Health Canada

Table 4

Estimated Age-Standardized Incidence Rates for Major Cancer Sites by Gender and Geographic Region, Canada, 2001

	Rate per 100,000										
	Canada[1]	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**444**	**370**	**460**	**493**	**499**	**491**	**423**	**476**	**374**	**400**	**446**
Prostate	118	95	113	142	154	111	108	140	78	114	163
Lung	77	53	92	86	95	105	68	75	60	64	58
Colorectal	59	72	66	66	61	63	59	66	55	56	52
Bladder	22	18	22	34	25	37	16	22	28	14	14
Non-Hodgkin's Lymphoma	21	13	18	20	21	22	21	24	18	18	20
Kidney	16	14	21	16	17	15	15	20	13	15	13
Oral	13	21	7	12	10	13	13	16	12	11	11
Leukemia	13	5	10	7	13	14	13	11	16	14	10
Melanoma	12	9	15	22	16	7	13	11	12	14	15
Stomach	11	18	9	10	14	13	10	10	9	10	10
Pancreas	9	2	13	7	12	11	9	9	8	10	9
Brain	8	7	4	8	7	10	8	7	7	7	8
Larynx	6	7	9	5	6	9	6	5	4	4	4
Multiple Myeloma	6	5	9	8	5	7	6	7	4	5	5
Females											
All Cancers	**344**	**302**	**407**	**362**	**353**	**351**	**344**	**364**	**322**	**341**	**321**
Breast	105	95	119	109	108	104	105	113	99	105	102
Lung	47	26	53	55	50	53	44	47	38	44	46
Colorectal	38	48	67	48	44	40	39	41	34	35	35
Body of Uterus	18	18	16	19	16	16	19	23	17	21	18
Non-Hodgkin's Lymphoma	15	12	14	13	19	15	15	16	13	14	13
Ovary	13	9	12	12	11	16	14	12	14	10	11
Melanoma	10	10	16	17	11	6	10	10	9	13	11
Thyroid	9	7	2	5	6	8	9	8	7	9	7
Pancreas	8	2	7	8	10	9	8	8	6	9	7
Cervix	8	9	15	9	8	7	9	9	9	8	8
Kidney	8	7	11	9	10	8	8	9	8	8	6
Leukemia	8	5	7	6	7	8	9	9	9	8	6
Bladder	6	4	3	10	7	9	4	5	8	4	4
Brain	6	3	4	4	5	7	6	5	5	5	5
Oral	5	4	1	5	4	4	6	6	4	5	5
Stomach	5	10	3	4	6	5	5	4	4	5	4
Multiple Myeloma	4	2	3	2	4	4	4	3	3	3	3

[1] Canada totals include provincial and territorial estimates

Note: Rates for prostate cancer were estimated based on data years 1980-1989. Rates exclude non-melanoma skin cancer (ICD-9 173) and are adjusted to the age distribution of the 1991 Canadian population. Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2001 estimates are compared to previously published estimates. These estimates may vary from actual figures.

Source: Cancer Bureau, CCDPC, Health Canada

Table 5

Estimated Deaths for Major Cancer Sites by Gender and Geographic Region, Canada, 2001

	Deaths										
	Canada[1]	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**34,600**	**700**	**190**	**1,300**	**980**	**9,400**	**12,500**	**1,300**	**1,250**	**2,700**	**4,300**
Lung	10,700	240	55	430	350	3,500	3,500	350	320	740	1,200
Prostate	4,300	85	25	170	120	890	1,600	180	250	410	550
Colorectal	3,400	60	15	100	65	1,100	1,250	130	130	250	350
Pancreas	1,500	20	10	55	45	380	540	50	55	130	190
Non-Hodgkin's Lymphoma	1,400	15	5	70	45	310	540	80	55	110	190
Stomach	1,200	45	5	45	40	370	400	45	40	70	130
Leukemia	1,200	10	5	30	25	280	490	50	50	110	150
Bladder	1,050	20	5	40	25	260	360	45	50	75	150
Kidney	890	25	10	35	35	230	290	45	30	75	110
Brain	880	15	–	35	25	260	280	35	30	80	120
Oral	730	15	5	30	20	220	250	30	15	50	95
Multiple Myeloma	670	10	5	30	20	170	240	30	25	45	90
Melanoma	490	5	–	25	10	85	220	20	15	45	60
Larynx	430	5	5	15	15	160	130	15	15	20	50
Females											
All Cancers	**30,700**	**510**	**140**	**1,150**	**820**	**8,100**	**11,300**	**1,300**	**1,050**	**2,400**	**3,900**
Lung	7,400	100	50	290	160	2,100	2,500	250	250	600	1,050
Breast	5,500	95	25	200	140	1,450	2,100	210	170	450	630
Colorectal	3,000	50	20	100	70	1,000	1,000	120	85	160	310
Pancreas	1,650	25	10	65	50	410	600	65	65	160	220
Ovary	1,500	30	5	50	30	360	570	70	65	130	210
Non-Hodgkin's Lymphoma	1,250	15	10	60	35	270	510	65	55	85	160
Leukemia	940	20	5	35	25	210	370	40	45	80	120
Stomach	770	30	5	25	20	250	240	30	30	60	85
Body of Uterus	670	10	5	30	20	190	250	30	15	55	70
Brain	670	5	5	25	15	210	220	25	20	55	90
Multiple Myeloma	590	15	–	20	10	150	220	25	25	60	60
Kidney	550	10	5	20	25	160	170	30	30	35	65
Bladder	460	10	–	20	15	110	160	25	15	35	70
Cervix	420	10	–	20	10	85	160	15	15	45	60
Melanoma	330	5	–	5	10	55	150	10	10	30	45
Oral	320	–	–	15	5	70	130	20	10	25	45

– Fewer than 5 cases

[1] Canada totals include provincial and territorial estimates

Note: Total of rounded numbers may not equal rounded total number. Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2001 estimates are compared to previously published estimates. These estimates may vary from actual figures.

Source: Cancer Bureau, CCDPC, Health Canada

Table 6

Estimated Age-Standardized Mortality Rates for Major Cancer Sites by Gender and Geographic Region, Canada, 2001

	Rate per 100,000										
	Canada[1]	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Males											
All Cancers	**227**	**267**	**262**	**271**	**253**	**261**	**216**	**217**	**213**	**205**	**199**
Lung	69	89	75	87	89	95	58	59	55	57	56
Prostate	30	32	40	35	32	28	30	29	39	34	26
Colorectal	22	23	19	20	16	31	21	21	22	19	16
Pancreas	9	7	10	11	11	10	9	8	8	9	9
Non-Hodgkin's Lymphoma	9	5	9	12	11	8	9	12	9	8	9
Leukemia	8	5	7	6	6	8	8	8	8	8	7
Stomach	7	17	10	8	10	10	6	6	6	4	6
Bladder	7	9	6	9	6	8	6	7	7	6	7
Kidney	6	8	7	7	9	6	5	7	4	5	5
Oral	5	5	6	6	4	6	4	5	3	4	4
Brain	5	4	4	6	5	7	4	6	6	5	5
Multiple Myeloma	4	4	7	6	5	5	4	5	4	3	4
Larynx	3	3	3	3	4	4	2	2	2	2	2
Melanoma	3	1	3	5	2	2	4	3	3	3	3
Females											
All Cancers	**151**	**155**	**151**	**175**	**158**	**160**	**147**	**160**	**141**	**147**	**141**
Lung	37	28	52	44	32	41	33	34	35	37	37
Breast	27	29	21	29	26	29	27	28	23	26	23
Colorectal	14	14	15	14	12	19	12	13	9	9	10
Pancreas	8	8	11	9	9	8	8	7	8	9	8
Ovary	8	8	4	8	7	7	8	9	8	8	8
Non-Hodgkin's Lymphoma	6	4	6	9	6	5	7	8	7	5	6
Brain	4	2	2	3	4	4	3	3	3	4	4
Leukemia	4	5	2	5	3	4	5	5	6	5	4
Stomach	3	8	4	3	3	5	3	2	3	3	3
Body of Uterus	3	2	3	4	4	3	3	4	2	3	2
Multiple Myeloma	3	4	–	3	2	3	3	2	3	3	2
Kidney	3	2	1	3	5	3	2	3	4	2	2
Oral	2	–	1	2	–	1	2	2	1	2	2
Melanoma	2	1	2	1	1	1	2	2	1	2	2
Cervix	2	3	3	3	1	2	2	2	1	3	2
Bladder	2	2	1	1	3	2	2	3	2	2	2

– Estimated age-standardized mortality rate is less than 0.5 per 100,000

[1] Canada totals include provincial and territorial estimates

Note: Rates adjusted to the age distribution of the 1991 Canadian population. Due to changes and improvements in source data and in methodology (as described in *Appendix II: Methods*), caution is needed if the 2001 estimates are compared to previously published estimates. These estimates may vary from actual figures.

Source: Cancer Bureau, CCDPC, Health Canada

TRENDS IN INCIDENCE AND MORTALITY

Recent trends in incidence and mortality for major types of cancer are assessed by comparing annual age-standardized rates. Figures 2.1 and 2.2 present the number of new cases and deaths for Canadian men and women together with the corresponding age-standardized rates from 1972-1996 and 1972-1997 respectively, with estimates to the year 2001. Figures 2.3 and 2.4 depict the relative contribution to the change in the total number of new cases and deaths that can be attributed to changes in cancer rates, population size and the aging of the population. Detailed depictions of the trends in annual rates for selected sites since 1972 are presented in Figures 3.1, 3.2 and 4.1, 4.2 with the data points provided in Tables 7.1, 7.2 and 8.1, 8.2. The average annual percent changes in site-specific incidence and mortality rates since 1989 are listed in Table 9 and plotted in Figure 5.

The process of age standardization permits comparisons between calendar years, since it accounts for changes that have occurred over time in the age distribution of the population. Rates in this publication have been standardized to the 1991 Canadian population and cannot be compared directly with those in editions before 1995. Note also that the rapid increase in incidence rates throughout the 1970s displayed in Figures 2.1 and 2.2 largely reflects improved registration of new cases in several provincial registries during this period. Registration levels, however, have generally stabilized since 1981 because of increasing consistency of cancer reporting procedures across Canada.[1]

All Sites

Among men, the cancer mortality rate, after reaching a peak in 1988 (Figure 2.2, Table 7.2), is declining slowly as a result of decreases in mortality rates for lung, colorectal and other cancers. In contrast, the cancer incidence rate rose slightly in the early 1990s because of the sharp increase in incidence of prostate cancer and more recently has begun to level off or decline slightly. Among women, cancer incidence has risen slightly since 1989, and mortality rates have declined slightly since 1988 (Figures 2.1 and 2.2, Tables 8.1, 8.2).

Figures 2.1 and 2.2 show that despite the relative stability in the age-standardized rates, the numbers of new cases and deaths continue to rise steadily as the Canadian population ages. The numbers of new cases and deaths, as opposed to rates, are an important measure of the cancer burden on the Canadian population and health care system. In 2001, the number of new cases is estimated to be 134,100 and the number of new deaths to be 65,300. These numbers can be used to plan patient services and health care facilities to meet the increasing demand.

Figures 2.3 and 2.4 show how changes since 1971 in the total population and in the age structure of the population have affected trends in the total number of cases and deaths. The lowest plot in these graphs represents the total number of cases (or deaths) that would have occurred each year if only the rates had changed but the population had remained the same as in 1971. The middle line represents the number of cases (or deaths) that would have occurred each year if the annual rates had acted upon a population that grew larger but maintained the same age distribution as in 1971. The top line represents the number of cases (or deaths) that actually occurred and thus reflects the combined impact of rate change, population growth and the aging of the population. These figures demonstrate that changes in the population size and age structure have been the major determinants of the increasing burden of cancer among Canadians. An important implication is that as the Canadian population continues to age and grow in size, there will be a concordant increase in the number of new cases and deaths each year.

Figure 6 plots an index (see definition in *Glossary*) of age-standardized mortality rates since 1971 for all sites combined and for all sites excluding lung cancer. Among men, lung cancer was responsible for the increase in cancer mortality rates until overall rates peaked in 1988. Since then, overall cancer mortality rates among men declined by similar percentages, whether or not lung cancer rates were included. Among women, the index shows that overall cancer mortality rates remained essentially stable between 1972 and 1997. However, cancer mortality for all sites other than lung cancer has dropped by about 17% since 1972.

Trends by Selected Sites

Time trends of incidence and mortality rates since 1972 for selected cancer sites are shown for men in Figures 3.1 and 3.2 and for women in Figures 4.1 and 4.2, with the corresponding data points tabulated in Tables 7.1, 7.2, 8.1 and 8.2. Average annual percent changes for the set of cancer sites examined in this publication are summarized in Table 9 and Figure 5. In general, incidence and mortality rates for the majority of cancer sites have stabilized or declined during the past decade, with some notable exceptions.

Among women, lung cancer incidence and mortality rates continue their rapid increase and are now almost four times as high as rates in 1972. However, estimated rates for lung cancer incidence and mortality among women in 2001 are still much lower than those for men. Among men, lung cancer rates levelled off in the mid-1980s and have since consistently declined, reflecting men's drop in tobacco consumption beginning in the mid-1960s. Among women, smoking rates did not begin to decline until the mid-1970s. The effect of this decline in women's smoking habits is beginning to be seen in the levelling off in actual lung cancer rates since 1992 (Table 8.1).

After years of steady increases, incidence rates of prostate cancer rose particularly sharply from 1989 to 1993 (Table 7.1). By contrast, mortality rates have risen much more slowly since 1978, and appear to have stabilized in the early 1990s. Increased incidence of prostate cancer before 1990 is at least partly due to increased detection of cancers following trans-urethral resection of the prostate (TURP) for suspected benign prostatic hypertrophy.[5] The sharp increase since 1990 is predominantly the result of increased early detection using PSA (determination of the Prostate Specific Antigen level).[6] This rate is now starting to show a decline (expected on theoretical grounds and illustrated by the experience to date in the United States[7]), probably because early detection has now exhausted the pool of prevalent cancers in the population. Despite the sharp increase in incidence it is especially relevant to note that, at this time, there has not been any substantial associated change in mortality rates, i.e. the increase in incidence has not had a significant impact on mortality in either a positive or a negative direction. Other methods of early detection that have been considered include digital rectal examination and transrectal ultrasonography.[8] Although much of the past increase in incidence has likely been due to early detection, changes in risk or protective factors might also account for some of the increases. However, no such risk or protective factors have yet been identified that could explain these changes.[6] To reflect these patterns, a conservative estimate for prostate cancer incidence was derived from rates in an earlier period (see *Appendix II: Methods*).

Breast cancer incidence among women also rose steadily, but gradually, over the past decade; this increase may be due, in part, to the rising number of mammographic examinations since the mid-1980s, but may also be affected by reproductive histories.

However, while incidence is rising, mortality rates for breast cancer have declined steadily since 1990. The most recent actual data for 1997 showed the breast cancer mortality rate to be at its lowest since 1950.[9] Similar declines are also occurring in the United States, the United Kingdom and Australia.[9] Further research is needed to determine whether early detection through screening, improved treatment or changes in risk or protective factors are responsible for this decline.

Of all the cancers analyzed in this report, the incidence of just two cancers among men and two among women has increased at an average rate greater than 2% annually since 1989 (Table 9). These were cancers of the prostate (+2.7%) and thyroid (+3.8%) in men, and lung (+2.4%) and thyroid cancer (+5.4%) in women. (Note: the estimated rate of increase in prostate cancer incidence is based partly on artifacts as noted on p. 30). The increasing rate of thyroid cancer has also been noted in Europe and parts of the United States. It is postulated that improved early detection practices and technologies (ultrasound and needle biopsy) are identifying early stage cancers more frequently than was possible in the past. As modern treatment achieves normal survival in the majority of patients it is unlikely that the mortality rate will increase. The only other cancer showing a significant increase, but of less than 2%, was non-Hodgkin's lymphoma in both men and women.

Lung cancer mortality among women increased at +2.5% per year. In both men and women non-Hodgkin's lymphoma (+1.2% and +0.8% respectively) showed a statistically significant annual increase in mortality.

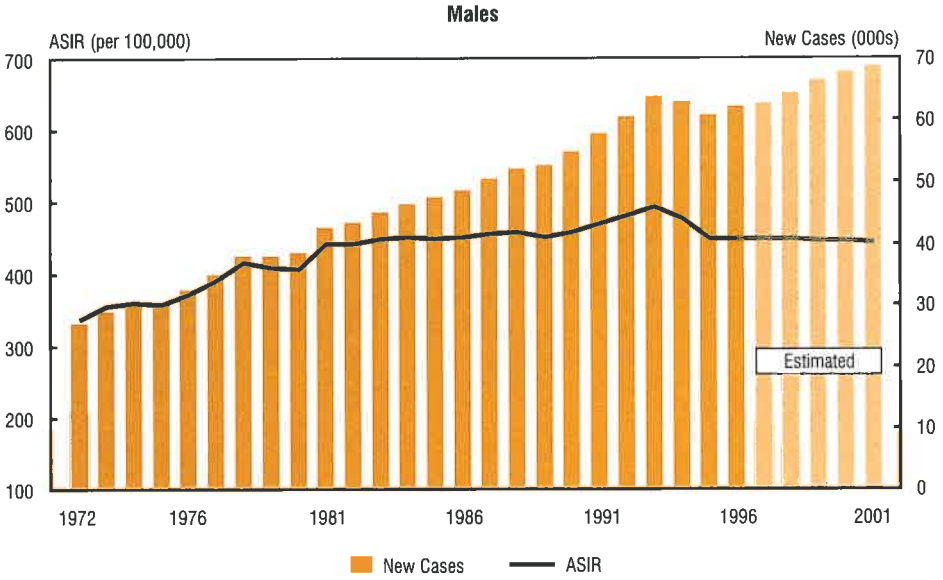
Rates for other cancer sites generally declined. Incidence and mortality rates for colorectal cancer continued to decrease, particularly among women, although the reasons are not completely understood. Some evidence suggests that lifestyle changes such as diet may have contributed to the declines. In addition, consensus is emerging internationally about the benefits of population-based screening for colorectal cancer. This is under consideration in Canada at both provincial and national levels. However, casual screening is already prevalent in Canada and may have contributed to the reduction in mortality rates. This effect can best be evaluated by the establishment and evaluation of organized screening programs.

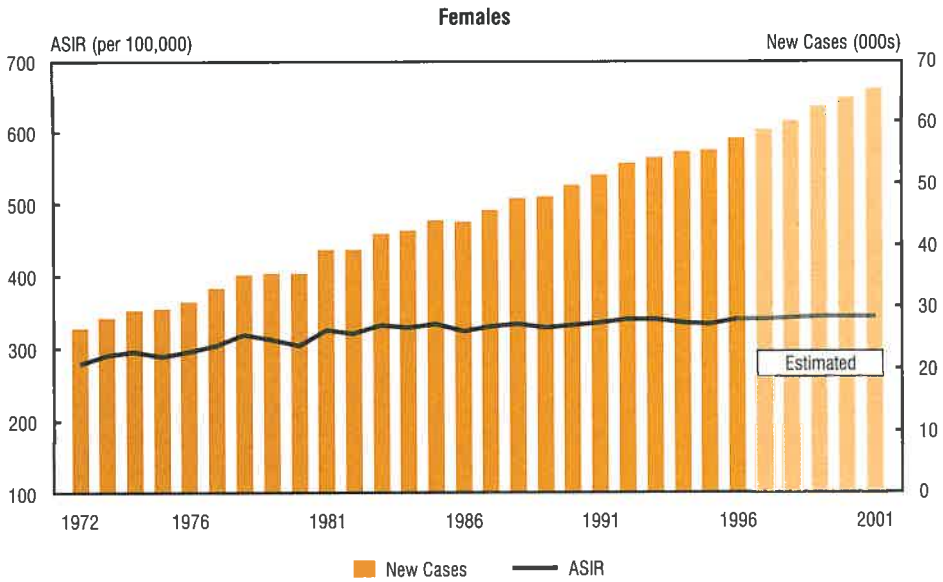
Rates of bladder cancer have declined since 1987 among both men and women by about 1.5% per year for incidence and by close to 1% per year for mortality. Part of the decline in incidence can be attributed to changing reporting procedures among registries in Canada.[1] However, the fact that mortality is also declining, but at a slower pace, may indicate improved survival, a true decline in incidence or both.

Mortality rates have dropped dramatically for testicular cancer (-2.3%) and Hodgkin's disease (-5.5% among men and –5.4% among women) as a result of improved treatment methods. The lower mortality has occurred despite stable or increasing incidence rates, indicating improved survival. Continuing large declines in incidence for stomach cancer (-3.1% for men and -2.6% for women) and mortality (-3.3% among men and -3.2% among women) may reflect improved diets, while lower rates of invasive cervical cancer (-1.6% incidence and -2.1% mortality) may reflect the impact of early detection through Pap smear screening programs. Statistically significant declines in incidence also occurred for oral cancer, cancer of the pancreas, larynx and lung in men and colorectal cancer in women. Likewise, small but statistically significant declines in mortality rates have occurred in oral, laryngeal and lung cancer in men and colorectal, breast, and uterine cancers, and leukemia in women.

Figure 2.1

New Cases and Age-Standardized Incidence Rates (ASIR) for All Cancers, Canada, 1972-2001



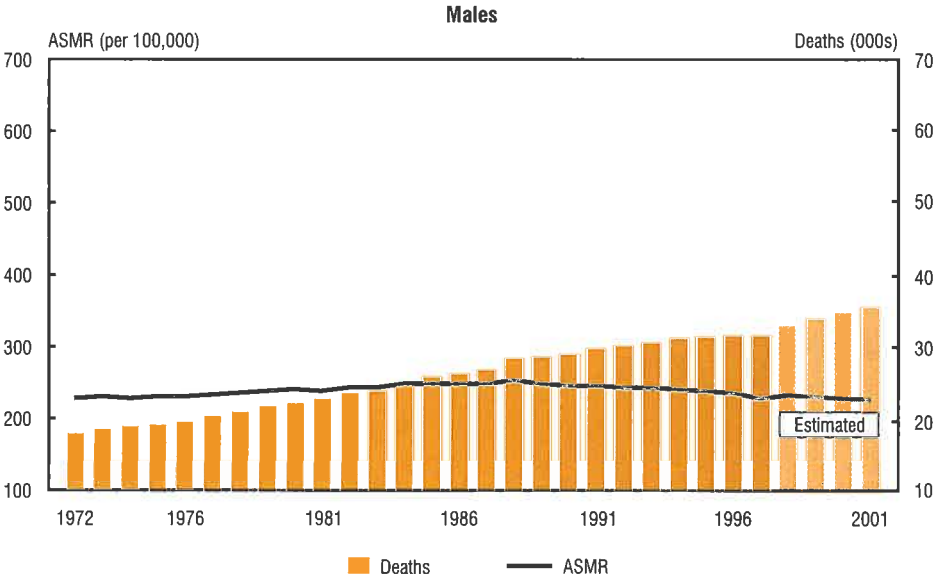


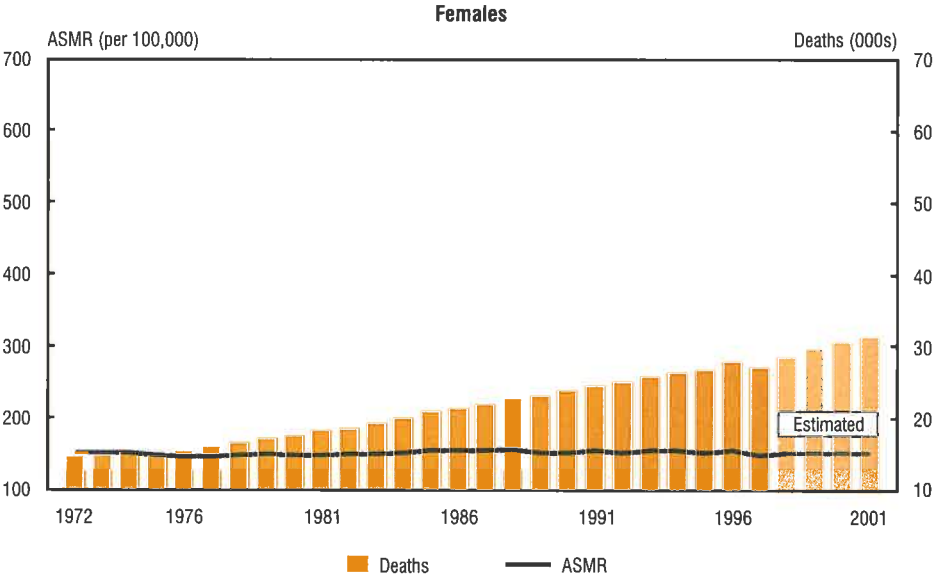
Note: All cancers exclude non-melanoma skin cancer (ICD-9 173). Rates are standardized to the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 2.2

Deaths and Age-Standardized Mortality Rates (ASMR) for All Cancers, Canada, 1972-2001



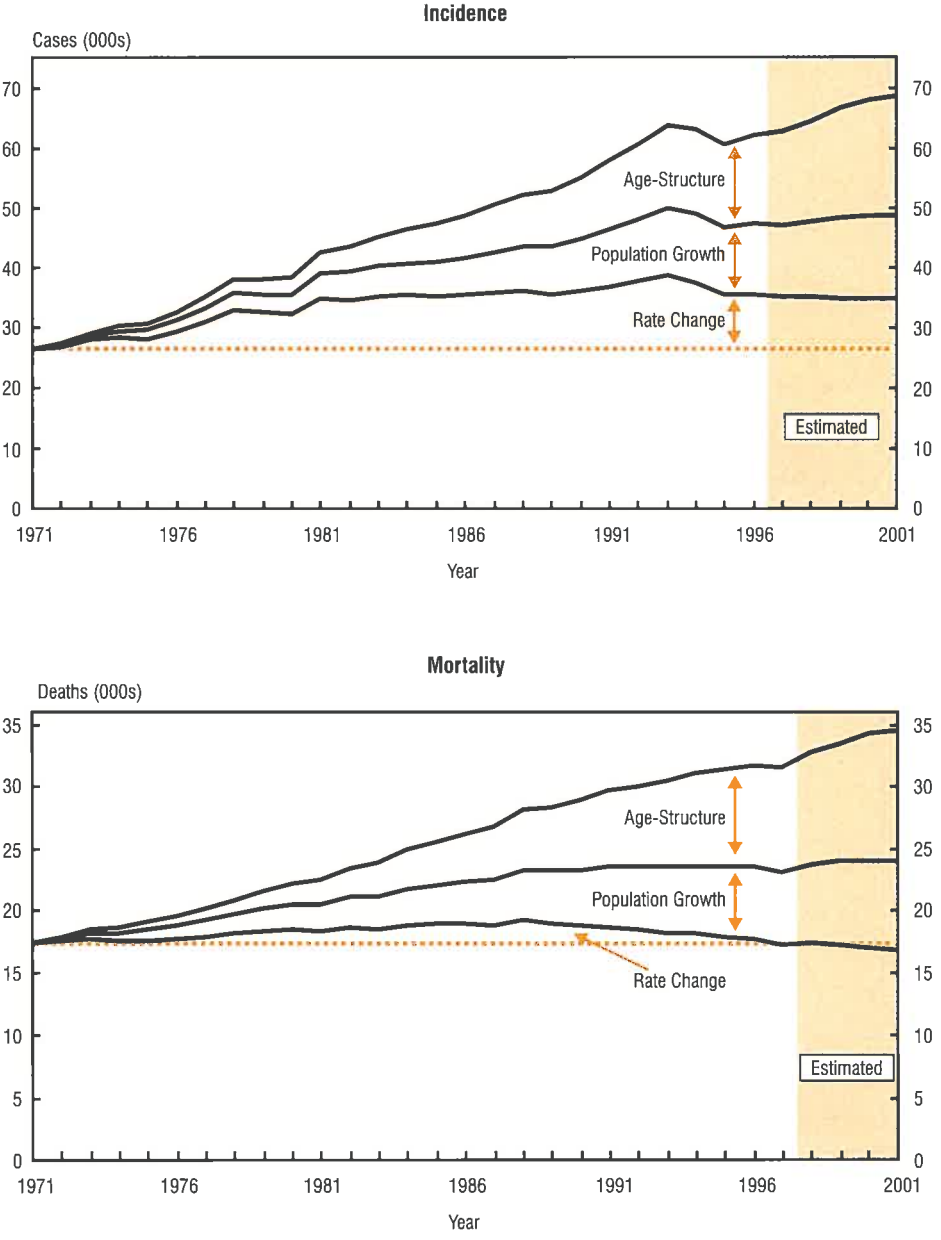


Note: All cancers exclude non-melanoma skin cancer (ICD-9 173). Rates are standardized to the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 2.3

Trends in New Cases and Deaths Attributed to Cancer Rate, Population Growth, and Population Age-Structure, All Cancers, All Ages, Males, Canada, 1971-2001

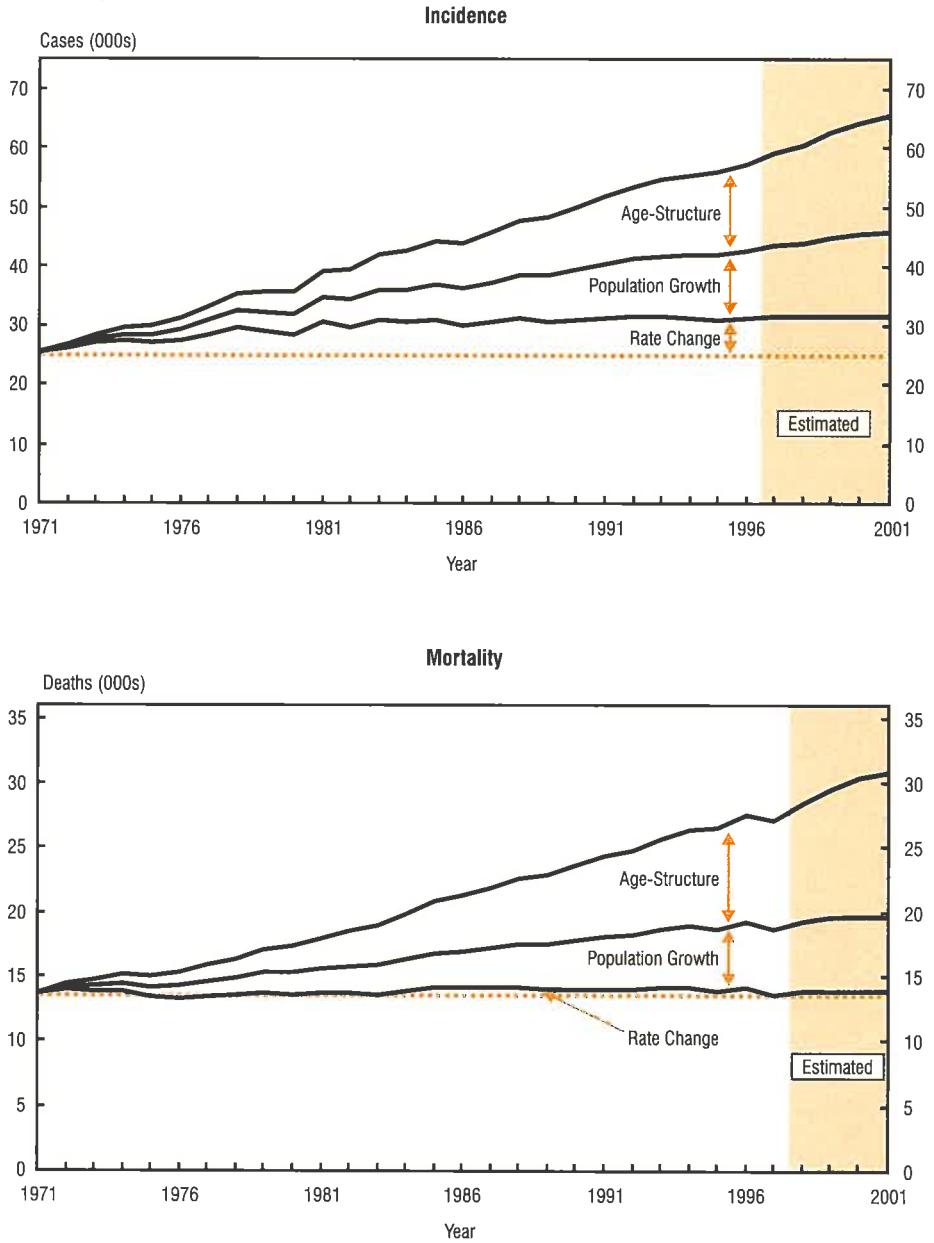


Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173). Magnitude of area represents the number of cases/deaths due to each change. Please refer to *Appendix II: Methods* for futher details.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 2.4

Trends in New Cases and Deaths Attributed to Cancer Rate, Population Growth, and Population Age-Structure, All Cancers, All Ages, Females, Canada, 1971-2001

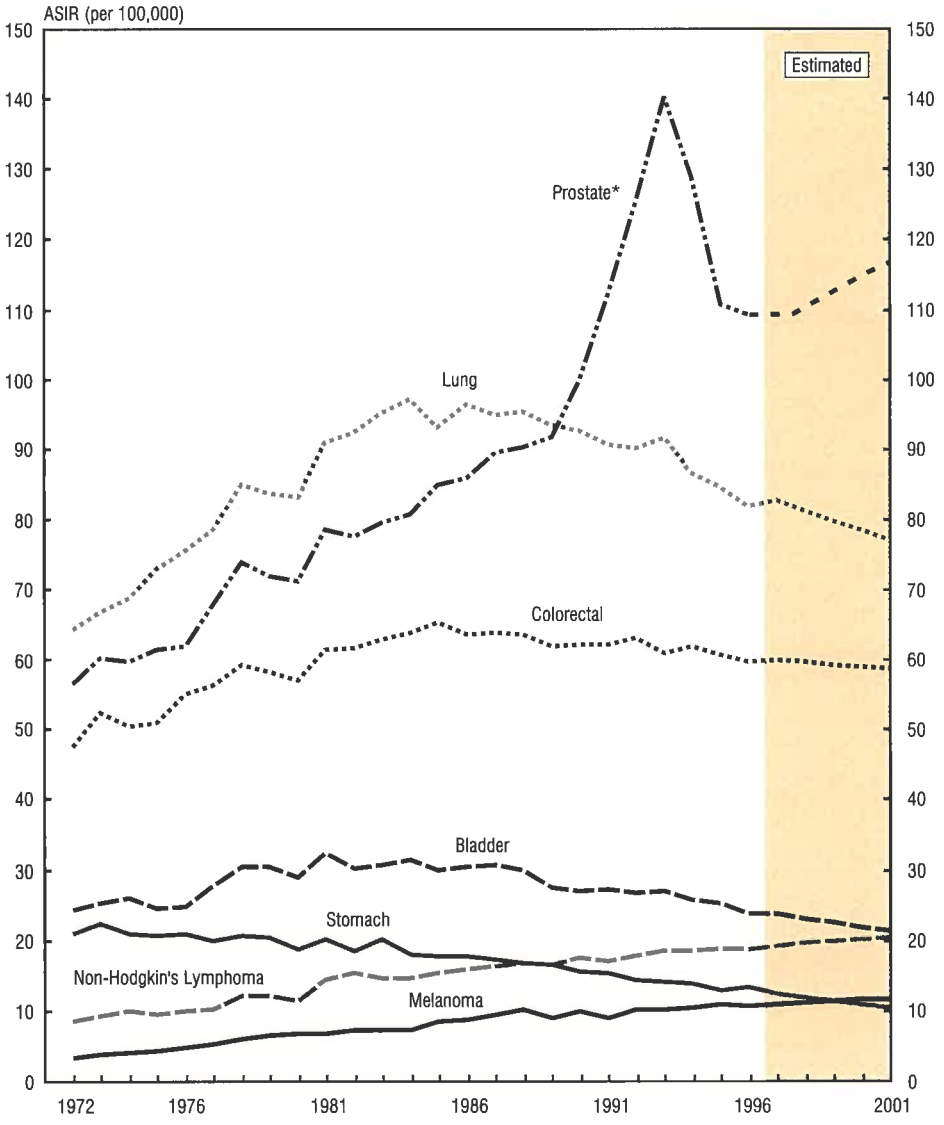


Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173). Magnitude of area represents the number of cases/deaths due to each change. Please refer to *Appendix II: Methods* for futher details.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 3.1

Age-Standardized Incidence Rates (ASIR) for Selected Cancer Sites, Males, Canada, 1972-2001



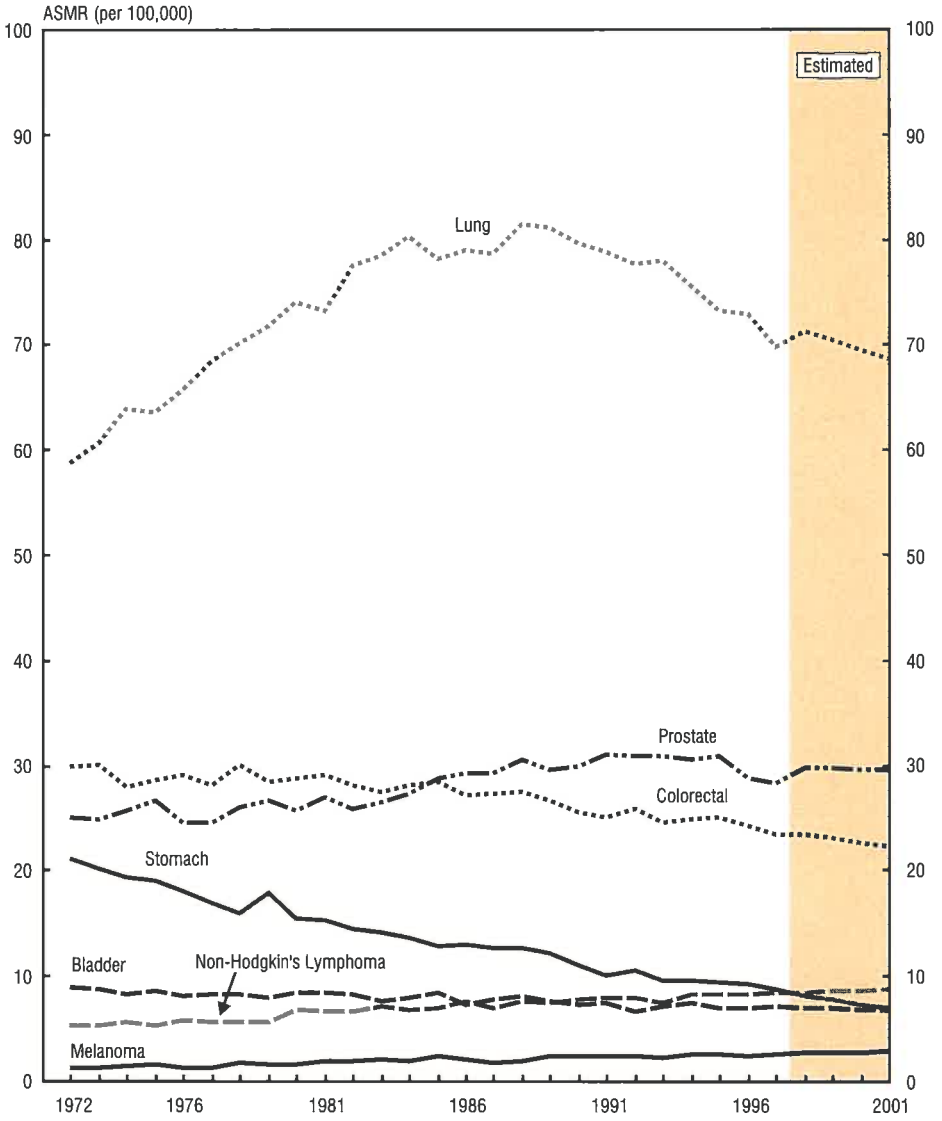
* The rate for postate cancer is based on data from 1980 to 1989. Please refer to *Appendix II: Methods* for futher details.

Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 7.1 for data points.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 3.2

Age-Standardized Mortality Rates (ASMR) for Selected Cancer Sites, Males, Canada, 1972-2001

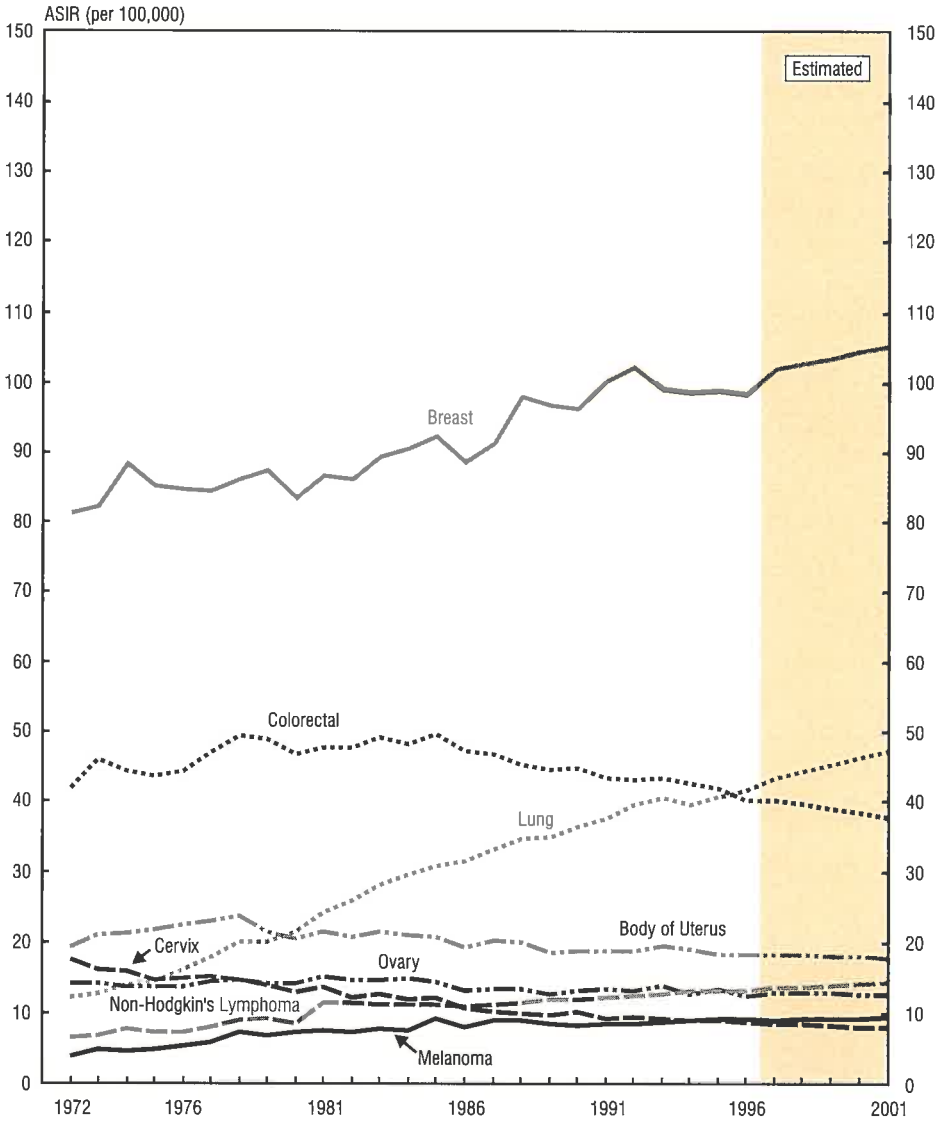


Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 7.2 for data points.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 4.1

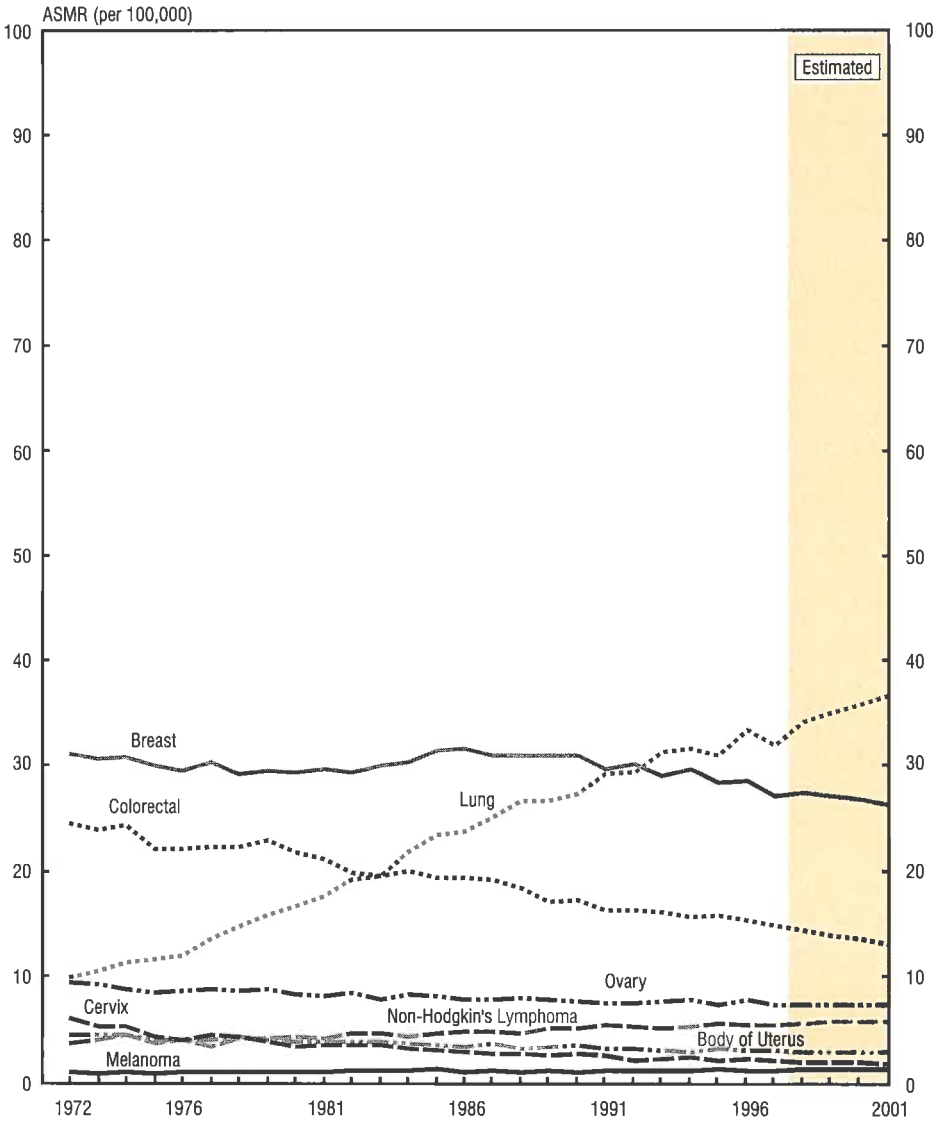
Age-Standardized Incidence Rates (ASIR) for Selected Cancer Sites, Females, Canada, 1972-2001



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 8.1 for data points.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 4.2
Age-Standardized Mortality Rates (ASMR) for Selected Cancer Sites, Females, Canada, 1972-2001



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See Table 8.2 for data points.

Source: Cancer Bureau, CCDPC, Health Canada

Table 7.1

Age-Standardized Incidence Rates for Selected Cancer Sites, Males, Canada, 1972-2001

Year	Rate per 100,000							
	All Cancers	Prostate	Lung	Colorectal	Bladder	Non-Hodgkin's Lymphoma	Melanoma	Stomach
1972	338.3	56.7	64.5	47.8	24.5	8.6	3.5	21.1
1973	355.8	60.4	66.9	52.6	25.6	9.5	4.1	22.5
1974	359.8	60.0	69.0	50.8	26.4	10.1	4.5	21.1
1975	357.7	61.7	73.1	51.2	24.8	9.7	4.7	21.0
1976	371.9	62.1	75.7	55.3	25.1	10.1	5.1	21.2
1977	391.4	67.9	78.6	56.4	28.0	10.5	5.5	20.1
1978	417.2	74.0	85.1	59.4	30.6	12.5	6.4	20.9
1979	409.8	72.0	83.9	58.5	30.6	12.4	6.8	20.8
1980	406.1	71.4	83.2	57.3	29.2	11.6	7.0	19.0
1981	442.1	78.5	91.2	61.6	32.5	14.7	7.0	20.5
1982	440.7	77.8	92.6	61.9	30.3	15.6	7.5	18.7
1983	448.4	79.6	95.2	63.0	30.8	14.9	7.6	20.4
1984	450.0	80.9	97.1	64.0	31.7	14.9	7.5	18.4
1985	449.8	85.0	93.2	65.4	30.2	15.7	8.7	18.0
1986	451.9	86.1	96.4	63.8	30.6	16.0	9.0	18.0
1987	456.3	89.5	95.0	64.0	30.8	16.6	9.6	17.4
1988	458.4	90.4	95.5	63.7	30.3	17.0	10.4	17.0
1989	451.5	91.8	93.6	62.1	27.9	16.7	9.3	16.8
1990	457.6	99.8	92.7	62.2	27.2	17.7	10.1	15.8
1991	469.0	112.3	90.7	62.3	27.5	17.4	9.1	15.6
1992	480.1	125.2	90.3	63.3	27.0	17.9	10.6	14.5
1993	493.5	140.1	91.8	61.2	27.2	18.8	10.4	14.3
1994	476.3	128.7	86.7	62.0	26.1	18.7	10.8	14.0
1995	454.8	110.9	84.7	60.8	25.7	18.9	11.3	13.3
1996	445.7	109.3	82.1	60.0	24.1	19.0	11.1	13.6
1997*	447.7	..	82.7	60.2	24.0	19.6	11.3	12.6
1998*	446.9	..	81.3	59.9	23.4	19.9	11.5	12.1
1999*	446.1	..	80.0	59.5	22.8	20.2	11.7	11.6
2000*	445.3	..	78.6	59.2	22.2	20.5	11.8	11.1
2001*	444.5	118.2	77.3	58.8	21.6	20.8	12.0	10.6

.. Estimates not provided. Please refer to *Appendix II: Methods* for further details.

* Estimated rates

Note: The rate for prostate cancer was estimated based on data years 1980-1989. Please refer to *Appendix II: Methods* for further details. Rates exclude non-melanoma skin cancer (ICD-9 173) and are standardized to the age distribution of the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Table 7.2

Age-Standardized Mortality Rates for Selected Cancer Sites, Males, Canada, 1972-2001

Year	Rate per 100,000							
	All Cancers	Lung	Prostate	Colorectal	Non-Hodgkin's Lymphoma	Stomach	Bladder	Melanoma
1972	228.2	58.7	25.2	30.1	5.6	21.2	9.1	1.4
1973	230.6	60.7	25.0	30.2	5.6	20.2	9.0	1.5
1974	229.2	63.9	25.9	28.0	5.9	19.4	8.5	1.6
1975	230.4	63.7	26.8	28.7	5.6	19.1	8.8	1.7
1976	230.2	65.8	24.7	29.3	6.0	18.2	8.3	1.5
1977	233.5	68.5	24.6	28.2	5.9	17.0	8.4	1.5
1978	236.3	70.1	26.1	30.2	5.9	16.1	8.4	1.9
1979	239.3	71.7	26.7	28.6	5.9	18.0	8.1	1.7
1980	240.7	74.0	25.7	28.9	7.0	15.5	8.6	1.7
1981	239.2	73.2	27.1	29.2	6.9	15.3	8.6	2.1
1982	243.5	77.4	26.0	28.2	6.8	14.6	8.4	2.1
1983	242.9	78.4	26.7	27.7	7.2	14.3	7.8	2.3
1984	247.8	80.2	27.4	28.3	7.0	13.9	8.1	2.1
1985	249.0	78.0	28.9	28.6	7.1	13.0	8.6	2.6
1986	249.0	79.0	29.4	27.2	7.7	13.1	7.4	2.3
1987	248.2	78.6	29.4	27.5	7.1	12.9	7.9	2.0
1988	254.7	81.3	30.7	27.6	7.8	12.8	8.3	2.2
1989	249.5	81.1	29.7	26.8	7.7	12.3	7.8	2.6
1990	246.4	79.5	30.1	25.7	7.9	11.3	7.5	2.6
1991	247.2	78.8	31.2	25.1	8.1	10.3	7.7	2.6
1992	244.6	77.5	31.0	25.9	8.1	10.7	6.9	2.6
1993	242.6	77.9	31.0	24.7	7.7	9.7	7.4	2.4
1994	241.6	75.5	30.7	25.0	8.4	9.7	7.6	2.7
1995	238.7	73.2	31.0	25.1	8.4	9.6	7.2	2.8
1996	236.2	72.9	29.0	24.3	8.4	9.4	7.2	2.6
1997	229.5	69.9	28.4	23.5	8.6	8.9	7.4	2.8
1998*	232.5	71.3	29.8	23.5	8.6	8.3	7.1	2.8
1999*	230.8	70.4	29.8	23.1	8.7	7.9	7.1	2.9
2000*	229.0	69.5	29.8	22.8	8.8	7.5	7.0	3.0
2001*	227.2	68.6	29.7	22.5	8.9	7.1	6.9	3.0

* Estimated rates

Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Table 8.1

Age-Standardized Incidence Rates for Selected Cancer Sites, Females, Canada, 1972-2001

Year	Rate per 100,000									
	All Cancers	Breast	Lung	Colorectal	Body of Uterus	Non-Hodgkin's Lymphoma	Ovary	Melanoma	Cervix	Stomach
1972	280.2	81.2	12.5	42.0	19.5	6.9	14.3	4.1	17.8	10.1
1973	291.6	82.2	12.9	46.2	21.2	7.2	14.4	5.2	16.3	10.6
1974	294.9	88.2	14.0	44.4	21.5	8.1	13.8	5.0	16.1	9.9
1975	290.2	85.1	14.7	43.7	21.8	7.5	13.7	5.1	14.9	10.4
1976	294.9	84.6	16.3	44.6	22.7	7.5	13.9	5.6	15.2	9.3
1977	306.0	84.4	17.9	47.2	23.0	8.3	14.5	6.1	15.4	9.3
1978	319.3	86.1	20.1	49.5	23.9	9.2	14.9	7.6	14.7	9.5
1979	313.8	87.3	20.3	49.1	21.7	9.6	14.5	7.1	14.2	9.2
1980	305.5	83.3	21.7	46.8	20.8	8.8	14.4	7.5	13.0	8.6
1981	328.1	86.5	24.3	47.8	21.6	11.6	15.4	7.8	13.9	9.8
1982	321.0	86.0	25.9	48.0	21.0	11.7	14.7	7.5	12.3	8.7
1983	332.8	89.3	28.3	49.4	21.6	11.5	14.9	8.0	12.9	8.7
1984	329.5	90.3	29.6	48.3	21.2	11.3	15.0	7.7	12.2	8.1
1985	335.5	92.2	30.9	49.8	20.8	11.4	14.6	9.5	12.3	8.0
1986	324.9	88.6	31.6	47.4	19.5	11.3	13.3	8.3	10.9	8.3
1987	330.7	91.1	33.2	46.9	20.5	11.5	13.7	9.3	10.4	8.0
1988	336.0	97.8	34.8	45.4	20.1	11.7	13.6	9.2	10.2	7.2
1989	330.0	96.4	35.0	44.7	18.7	12.2	13.0	8.6	10.0	7.2
1990	333.2	96.0	36.5	45.0	19.0	12.1	13.4	8.5	10.4	6.9
1991	337.1	100.1	37.7	43.5	18.9	12.4	13.6	8.8	9.6	6.4
1992	341.0	102.0	39.6	43.4	18.9	12.7	13.5	8.7	9.6	6.5
1993	340.3	98.9	40.6	43.5	19.6	12.9	14.1	9.0	9.5	6.3
1994	337.0	98.6	39.6	42.7	19.3	13.4	12.8	9.1	9.3	6.2
1995	337.1	98.6	40.8	42.0	18.6	13.3	13.6	9.4	9.3	6.0
1996	334.6	98.3	41.9	40.4	18.5	13.3	12.6	9.5	9.1	5.9
1997*	340.2	101.8	43.4	40.4	18.5	13.7	13.1	9.4	8.9	5.5
1998*	341.1	102.6	44.4	39.8	18.4	14.0	13.1	9.4	8.7	5.3
1999*	342.0	103.4	45.4	39.2	18.3	14.2	13.0	9.5	8.5	5.1
2000*	343.0	104.2	46.4	38.6	18.2	14.4	13.0	9.6	8.4	4.8
2001*	343.9	105.1	47.4	38.0	18.1	14.6	12.9	9.6	8.2	4.6

* Estimated rates

Note: Rates exclude non-melanoma skin cancer (ICD-9 173) and are standardized to the age distribution of the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Table 8.2

Age-Standardized Mortality Rates for Selected Cancer Sites, Females, Canada, 1972-2001

Year	Rate per 100,000									
	All Cancers	Lung	Breast	Colorectal	Ovary	Non-Hodgkin's Lymphoma	Stomach	Body of Uterus	Cervix	Melanoma
1972	152.9	10.2	31.4	24.8	9.8	4.1	9.9	4.7	6.4	1.3
1973	152.1	10.9	31.0	24.3	9.7	4.3	9.6	4.8	5.6	1.1
1974	152.5	11.7	31.1	24.7	9.1	4.8	9.0	4.7	5.6	1.3
1975	147.3	12.1	30.3	22.4	8.9	4.0	8.8	4.3	4.7	1.2
1976	146.0	12.4	29.9	22.5	9.1	4.4	8.5	4.4	4.4	1.3
1977	147.1	13.9	30.6	22.7	9.1	3.8	7.4	4.4	4.8	1.3
1978	147.6	15.0	29.5	22.7	9.0	4.5	7.4	4.6	4.7	1.3
1979	150.2	16.3	29.8	23.3	9.1	4.4	7.2	4.3	4.2	1.2
1980	148.4	17.1	29.7	22.2	8.6	4.6	6.8	4.2	3.7	1.2
1981	149.0	17.9	30.1	21.6	8.5	4.5	7.5	4.1	3.9	1.3
1982	149.3	19.5	29.7	20.3	8.8	4.9	6.7	4.1	3.9	1.5
1983	149.4	19.9	30.4	19.9	8.2	4.9	6.5	4.2	3.9	1.5
1984	151.8	22.2	30.7	20.4	8.7	4.7	5.7	4.0	3.5	1.5
1985	154.8	23.8	31.8	19.8	8.5	5.0	6.0	3.8	3.3	1.6
1986	154.3	24.0	32.0	19.7	8.2	5.1	6.1	3.6	3.2	1.3
1987	154.0	25.3	31.3	19.6	8.2	5.2	5.7	4.1	3.0	1.5
1988	155.3	26.9	31.4	18.8	8.4	5.0	5.1	3.6	3.0	1.3
1989	153.0	27.0	31.2	17.6	8.1	5.5	5.5	3.7	2.9	1.4
1990	153.0	27.6	31.3	17.7	8.1	5.5	5.0	3.9	3.0	1.2
1991	153.5	29.5	30.1	16.8	7.8	5.7	4.9	3.5	2.8	1.4
1992	153.1	29.6	30.4	16.6	7.8	5.5	4.9	3.5	2.4	1.5
1993	154.8	31.7	29.4	16.6	8.0	5.5	4.5	3.4	2.6	1.5
1994	155.0	31.9	30.0	16.1	8.1	5.7	4.5	3.2	2.7	1.5
1995	151.8	31.3	28.7	16.2	7.7	5.9	4.6	3.6	2.4	1.6
1996	155.1	33.6	28.9	15.7	8.2	5.8	4.4	3.4	2.6	1.5
1997	148.7	32.3	27.4	15.2	7.6	5.7	3.9	3.4	2.4	1.5
1998*	151.9	34.5	27.8	14.7	7.8	6.0	3.9	3.3	2.3	1.5
1999*	151.7	35.4	27.4	14.3	7.7	6.0	3.7	3.2	2.3	1.6
2000*	151.5	36.2	27.0	13.9	7.7	6.1	3.6	3.2	2.2	1.6
2001*	151.2	37.0	26.7	13.6	7.6	6.2	3.4	3.1	2.1	1.6

* Estimated rates

Note: Rates are standardized to the age distribution of the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Table 9

Average Annual Percent Change (AAPC) in Age-Standardized Incidence (1989-1996) and Mortality (1989-1997) Rates for Selected Cancer Sites, Canada

	AAPC in Incidence 1989-1996		AAPC in Mortality 1989-1997	
	Males	Females	Males	Females
All Cancers	**-0.1**	**0.2**	**-0.9****	**-0.1**
Oral	-2.7**	-1.0	-2.3**	-1.3
Stomach	-3.1**	-2.6**	-3.3**	-3.2**
Colorectal	-0.5	-1.3**	-1.2**	-1.7**
Pancreas	-0.9*	0.5	-1.3**	0.2
Larynx	-2.2*	-2.3	-2.3**	-1.3
Lung	-1.8**	2.4**	-1.7**	2.5**
Melanoma	2.7**	1.6**	0.8	2.0
Female Breast	–	0.2	–	-1.4**
Body of Uterus	–	-0.1	–	-1.4*
Cervix	–	-1.6**	–	-2.1*
Ovary	–	-0.3	–	-0.3
Prostate	2.7	–	-0.5	–
Testis	0.4	–	-2.3	–
Bladder	-1.7**	-1.5*	-0.7	-1.0
Kidney	-0.1	0.7	-0.2	-0.8
Brain	0.4	0.2	-0.2	-0.8
Thyroid	3.8*	5.4**	-3.2*	1.2
Non-Hodgkin's Lymphoma	1.8**	1.5**	1.2**	0.8*
Hodgkin's Disease	-0.8	-1.2	-5.5**	-5.4*
Multiple Myeloma	-0.4	-0.5	0.4	0.4
Leukemia	-0.5	-0.4	-0.6	-1.4*

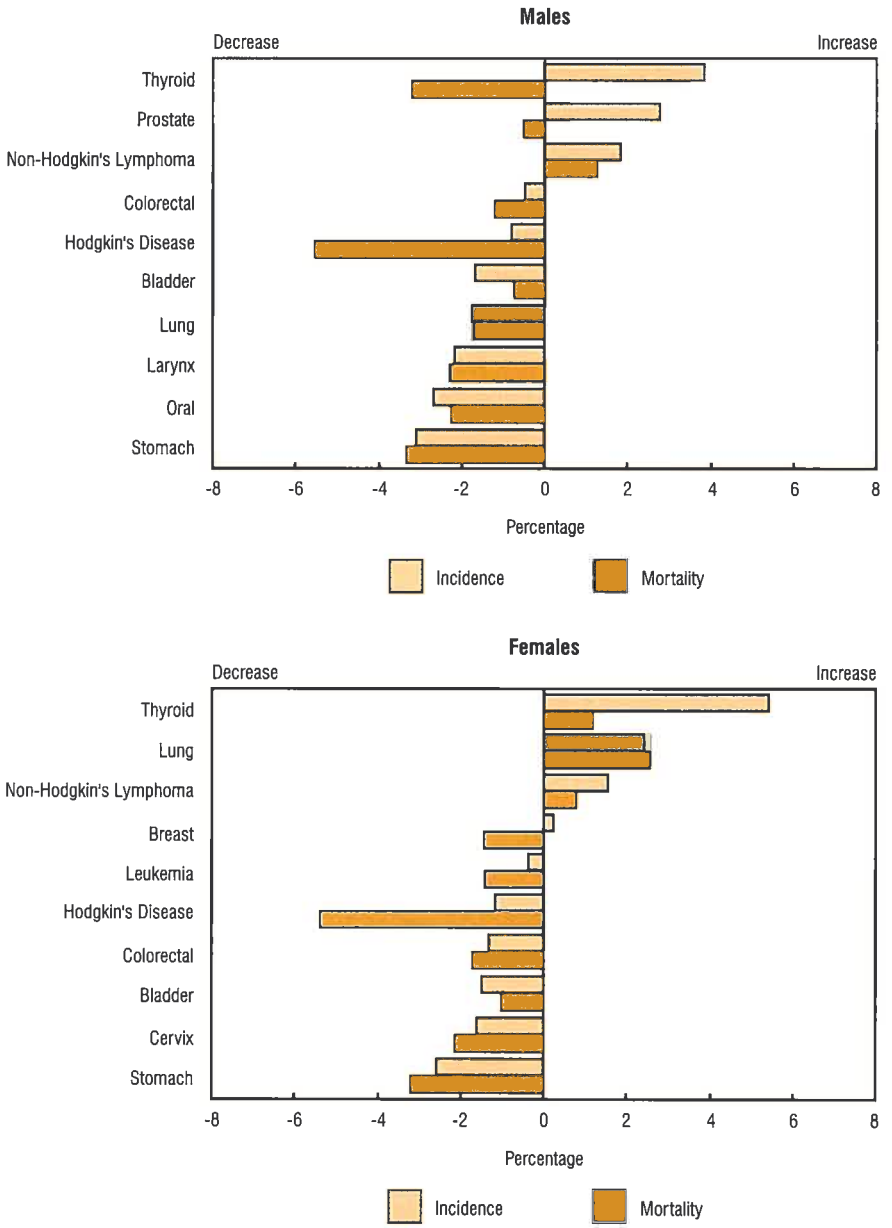
– Not applicable
* Significant at p = 0.05
** Significant at p = 0.01

Note: Average Annual Percent Change is calculated assuming a log linear model; incidence rates exclude non-melanoma skin cancer (ICD-9 173).

Source: Cancer Bureau, CCDPC, Health Canada

Figure 5

Average Annual Percent Change (AAPC) in Age-Standardized Incidence (1989-1996) and Mortality (1989-1997) Rates for Selected Cancer Sites, Canada

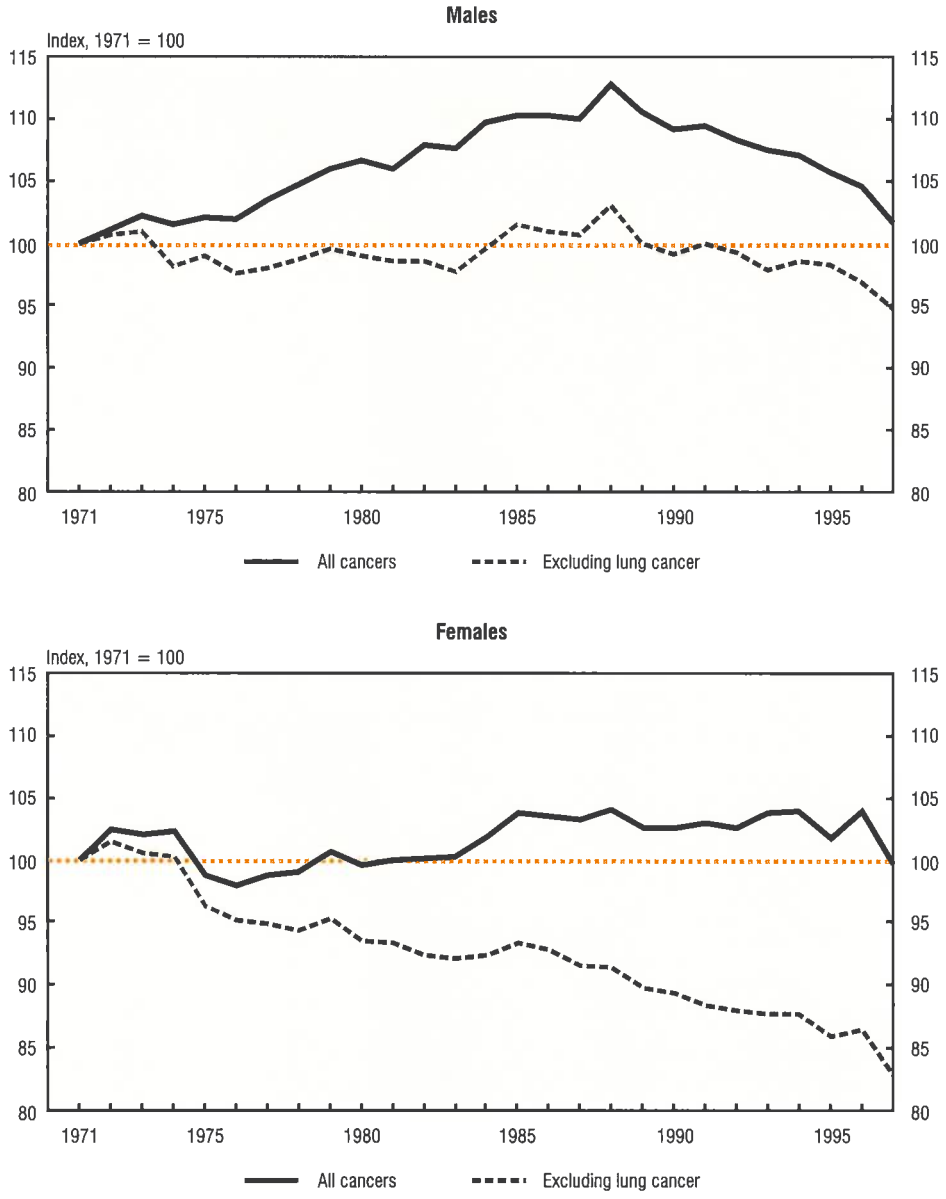


Note: See Table 9 for percent change for all sites. Sites are ranked in decreasing order of percent change in incidence.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 6

Index of Age-Standardized Mortality Rates Including and Excluding Lung Cancer, Canada, 1971-1997



Note: Rates are standardized to the age distribution of the 1991 Canadian population. See also the *Glossary* and *Appendix II: Methods*.

Source: Cancer Bureau, CCDPC, Health Canada

AGE AND GENDER DISTRIBUTION OF CANCER

This section shows estimates for 2001 by 10-year age groups for all sites combined (Table 10) and for the four leading types of cancer (Table 11). Cancer is primarily a disease of the elderly. Estimates for 2001 shown in Table 10 indicate that 60,900 (45%) of new cases and 38,500 (59%) of cancer deaths occur in Canadians aged 70 years or more, while an additional 32,400 (24%) new cases and 14,300 (22%) deaths occur in those aged 60-69. By contrast, just 1% of new cases and only 0.3% of deaths occur prior to age 20. Estimates for leading sites for people aged 20 or more presented in Table 11 show that close to 50% or more of all newly diagnosed cancers of the lung, prostate, colon and rectum occur among Canadians aged 70 or more. This is especially true for prostate cancer, with 61% of cases (and 84% of deaths) occurring in men over 70. In the case of breast cancer, 23% of cases occur in women under age 50, 46% occur in women aged 50 to 69 and 32% in women aged 70 and over.

Trends in age-standardized rates of incidence and mortality since 1971 for all cancers are plotted by four age groups with actual and estimated rates (Figure 7). Since 1981, absolute increases in cancer incidence rates have occurred primarily in Canadians aged 50 or over, and this trend has been stronger among men than among women. The gender difference is almost certainly due to the rapid increases observed in prostate cancer.

Most encouraging is the fairly steady decline in mortality that has occurred since 1988 among both men and women in all age groups under 70 years. Mortality rates have generally declined substantially since 1970 among Canadians aged 0-19 with more moderate declines in the 20-49 age group. Among 50-69 year-old men and women, decreases in mortality rates have occurred primarily since the late 1980s.

Age-specific rates of cancer incidence and mortality by five-year age groups are plotted using actual data for cancer incidence in 1996 and mortality in 1997, the most recent years for which complete data are available (Figure 8). Cancer incidence and mortality increase substantially with age in both sexes with 18 times as many new cases occurring in those over 80-years old than among those under 20, despite an 88% drop in population. Although incidence rates were somewhat higher among women than men between 20 and 54 years of age, for all other age groups incidence was higher among men. This is due to the higher incidence of cancers of the breast and genital organs in women of reproductive age, and the higher incidence of most types of cancer in older men. Mortality rates were higher among men than women for all age groups with the exception of Canadians aged 35-49.

Table 10
Distribution by Age Group and Gender, Canada, 2001

Age Group	Population (000s) 2001 Estimates			New Cases 2001 Estimates			Deaths 2001 Estimates		
	Total	M	F	Total	M	F	Total	M	F
0-19	7,916	4,060	3,856	1,300	690	610	210	110	95
20-29	4,181	2,125	2,057	1,650	750	880	240	130	110
30-39	4,907	2,473	2,434	4,600	1,800	2,800	830	350	490
40-49	5,062	2,527	2,535	11,600	4,000	7,700	3,300	1,450	1,900
50-59	3,745	1,857	1,888	21,600	9,500	12,000	7,900	4,100	3,900
60-69	2,431	1,180	1,251	32,400	18,500	13,900	14,300	8,300	6,000
70-79	1,826	802	1,024	38,100	22,100	16,000	20,600	11,600	9,000
80+	981	329	652	22,800	11,300	11,500	17,900	8,600	9,200
All Ages	**31,050**	**15,353**	**15,697**	**134,100**	**68,600**	**65,400**	**65,300**	**34,600**	**30,700**

Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details. 2001 population projections were provided by the Census and Demographics Branch, Statistics Canada.

Source: Cancer Bureau, CCDPC, Health Canada

Table 11

Distribution by Selected Cancer Site, Age Group and Gender, Canada, 2001

Age Group	Lung			Colorectal			Prostate	Breast
	Total	M	F	Total	M	F	M	F
New Cases								
20-29	25	15	10	35	20	20	–	70
30-39	210	95	110	230	120	110	–	880
40-49	1,100	470	630	960	510	450	110	3,500
50-59	3,300	1,700	1,550	2,500	1,450	1,050	1,500	4,800
60-69	6,200	3,700	2,500	4,200	2,600	1,600	5,300	4,100
70-79	7,100	4,200	2,800	5,400	3,000	2,400	7,200	3,900
80+	3,400	1,900	1,500	3,800	1,550	2,200	3,600	2,300
Ages 20+	**21,200**	**12,100**	**9,200**	**17,200**	**9,300**	**7,900**	**17,800**	**19,500**
Deaths								
20-29	5	5	5	10	5	5	–	10
30-39	110	40	70	60	30	30	–	150
40-49	740	330	410	250	130	120	25	600
50-59	2,300	1,250	1,050	740	430	300	120	940
60-69	4,900	3,000	1,900	1,300	840	480	560	950
70-79	6,400	4,000	2,400	1,950	1,150	820	1,500	1,350
80+	3,600	2,100	1,500	2,100	860	1,200	2,100	1,500
Ages 20+	**18,000**	**10,700**	**7,400**	**6,400**	**3,400**	**3,000**	**4,300**	**5,500**

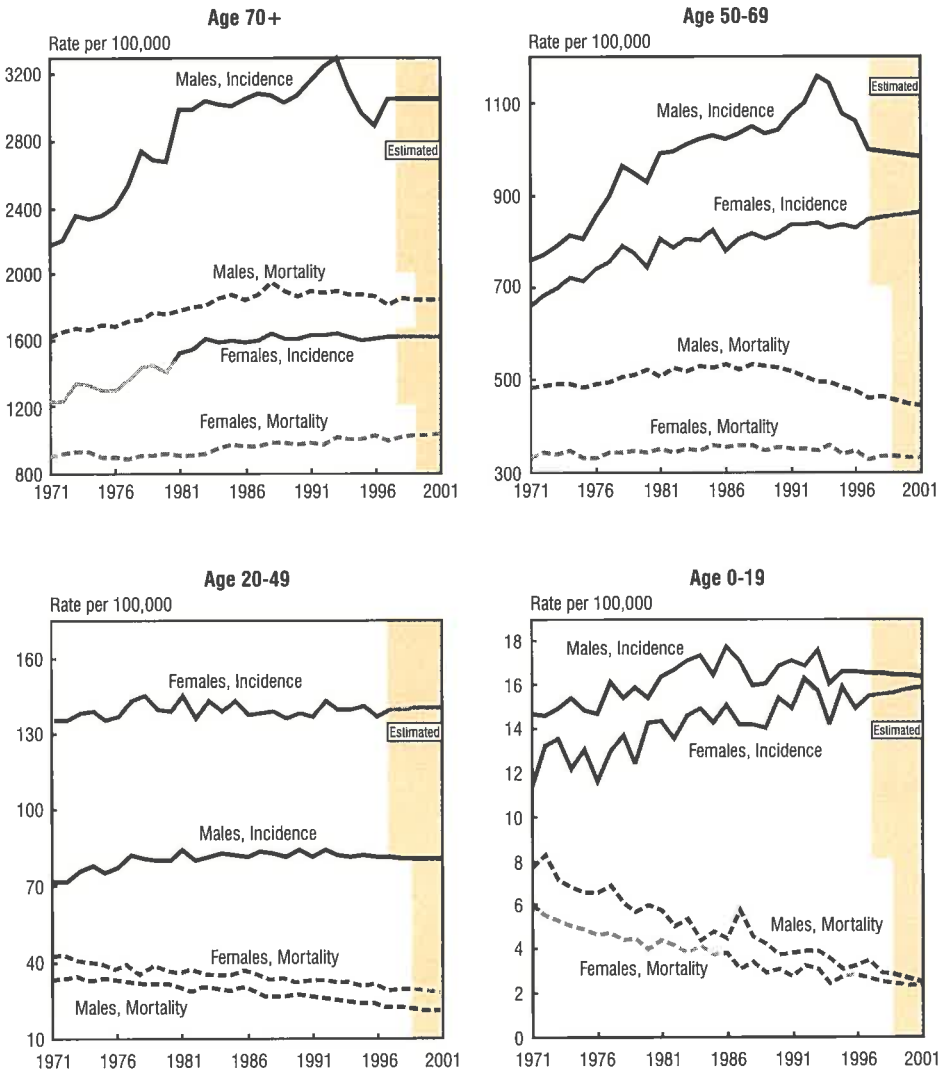
– Fewer than 5 cases.

Note: Figures exclude non-melanoma skin cancer (ICD-9 173). Total of rounded numbers may not equal rounded total number. Please refer to *Appendix II: Methods* for further details.

Source: Cancer Bureau, CCDPC, Health Canada

Figure 7

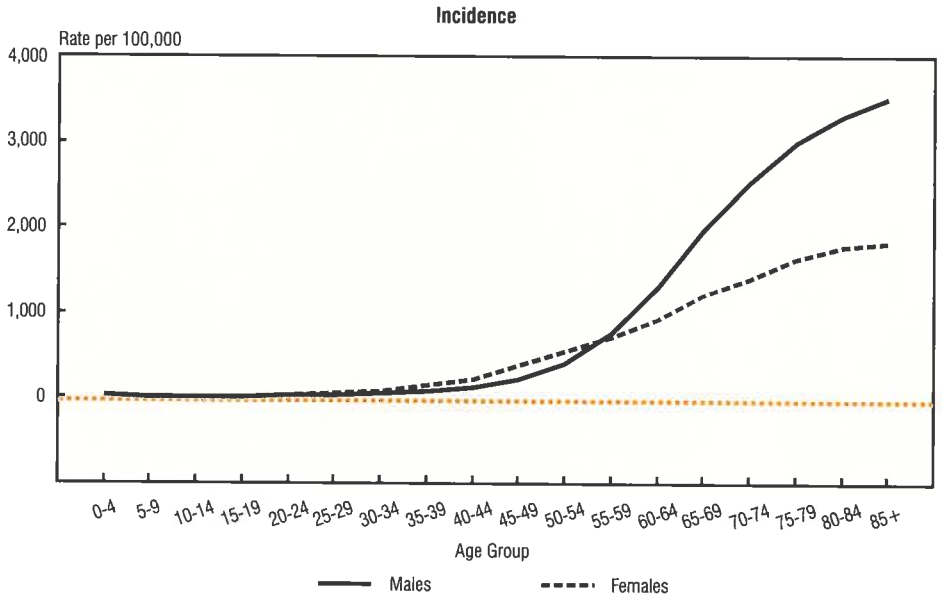
Age-Standardized Incidence and Mortality Rates by Broad Age Group, All Cancers, Canada, 1971-2001

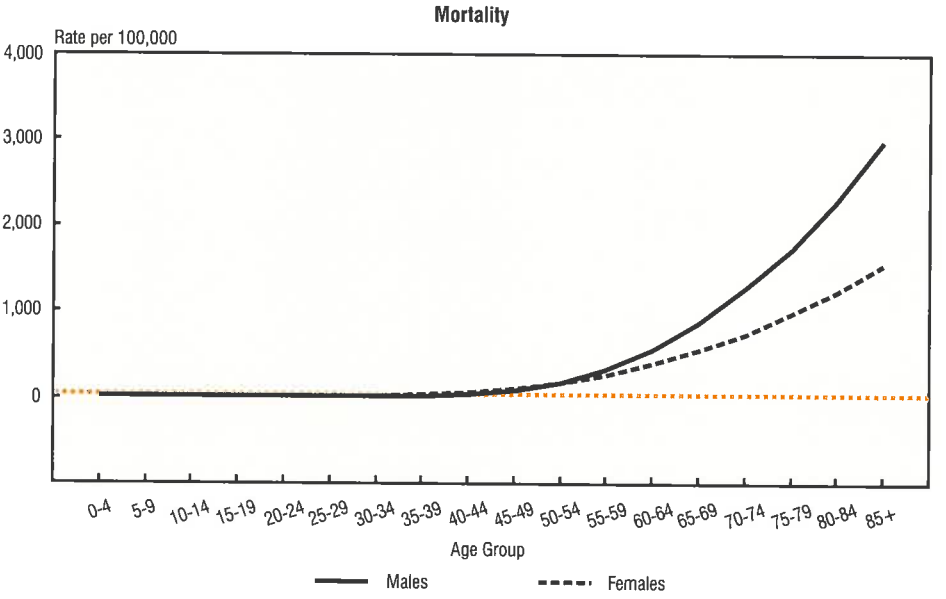


Note: Incidence figures exclude non-melanoma skin cancer (ICD-9 173).
Source: Cancer Bureau, CCDPC, Health Canada

Figure 8

Age-Specific Incidence (1996) and Mortality (1997) Rates for All Cancers by Gender, Canada





Note: Incidence rates exclude non-melanoma skin cancer (ICD-9 173).
Source: Cancer Bureau, CCDPC, Health Canada

PROBABILITY OF DEVELOPING/DYING FROM CANCER

Table 12 presents the probability (expressed as a percentage) of Canadians developing the more common cancers within specific decades of age, as well as the lifetime probability of developing, or dying from, one of these cancers. The calculation of these probabilities models the occurrence of cancer in a hypothetical cohort. For example, if a cohort of 1,000 men of age 50 is followed until the end of age 59, 56 of them, or 5.6% (1 in 18), will develop some type of cancer within this 10-year period; this percentage therefore describes the risk of a 50-year-old man developing some type of cancer before age 60. Similarly, a 60-year-old woman has a 9.9% (1 in 10) chance of developing some type of cancer before age 70. For the lifetime probability of developing cancer, the data are presented both as the probability (expressed as a percentage) of developing cancer and as the inverse of that probability. For example, men have a lifetime probability of 0.4 (40%) of developing cancer, while the inverse of that probability is 2.5. Thus, approximately 2 of every 5 men are expected to develop cancer of some site during life. Similarly, 1 in 2.8 women (slightly more than one of every 3 women) will develop cancer during life. One in 3.7 men and 1 in 4.5 women (i.e. more than 1 in 4 and 1 in 5 respectively) will die of cancer.

Although Table 12 displays numbers that are precise to one decimal place, the following discussion will use approximations derived from these numbers to discuss highlights of the table.

During their lifetimes, 1 in 9.5 women are expected to develop breast cancer, the most common cancer (excluding non-melanoma skin cancer) to afflict women, and 1 in 26 women are expected to die from it. One in 18 women will develop colorectal cancer, but only 1 in 39 will die from it. One in 19 will develop lung cancer, and 1 in 22 will die from this disease, making it the most likely cause of cancer death in Canadian women. Over their lifetimes, 1 in 9 men will develop prostate cancer, but only 1 in 27.5 will die from it. One in 11 men will develop lung cancer, and 1 in 12 will die from this condition. Lung cancer is thus by far the leading cause of cancer deaths in Canadian men.

The probability of developing cancer within the next 10 years gives a useful indication of the short-term risk of cancer. Although the lifetime risk of developing breast cancer is 10.6% (1 in 9.5), and although the risk increases with age, the chance of a 60-year-old woman developing breast cancer before age 70 is only 3% (1 in 33); this figure may be more meaningful than the lifetime probability statistic for a 60-year-old woman contemplating her risk of breast cancer. Table 12 shows how steeply the risk of developing prostate cancer rises with age. A man has very little probability of developing prostate cancer by age 50. However, a 70-year-old man has a 6.3% (1 in 16) chance of developing prostate cancer by age 80; this percentage represents the highest risk for either men or women of developing a specific cancer in any decade of life.

The decrease in the probability of very old persons (80-89) developing, or dying from, many cancers, in contrast to the general increasing risk with increasing age, is due to the increase in the probability of death from other causes at a very advanced age.

Table 12

Probability of Developing Cancer by Age, and Lifetime Probability of Developing and Dying from Cancer, Canada

	Probability (%) of Developing Cancer in next 10 years by age group						Lifetime Probability (%) of: Developing		Dying	
	30-39	40-49	50-59	60-69	70-79	80-89	%	One in:	%	One in:
Male										
All Cancers	**0.7**	**1.6**	**5.6**	**14.2**	**20.9**	**17.6**	**40.0**	**2.5**	**26.7**	**3.7**
Prostate	–	0.1	1.0	4.1	6.3	4.9	11.2	8.9	3.6	27.5
Lung	–	0.2	1.1	3.1	4.4	3.3	8.8	11.4	8.1	12.4
Colorectal	0.1	0.2	0.8	2.0	3.1	2.7	6.3	15.9	2.8	36.2
Lymphoma	0.1	0.2	0.4	0.7	1.0	0.9	2.7	37.6	1.5	66.2
Bladder	–	0.1	0.3	0.7	1.3	1.3	2.6	38.8	0.9	108.8
Kidney	–	0.1	0.3	0.5	0.6	0.5	1.5	66.7	0.7	148.8
Oral	–	0.1	0.3	0.5	0.6	0.4	1.5	67.6	0.5	182.1
Stomach	–	0.1	0.2	0.4	0.7	0.7	1.5	69.0	1.0	96.2
Leukemia	–	0.1	0.1	0.3	0.6	0.6	1.4	73.0	0.9	110.9
Pancreas	–	–	0.1	0.4	0.5	0.5	1.1	87.7	1.2	87.0
Melanoma	0.1	0.1	0.2	0.3	0.3	0.3	1.0	97.1	0.3	335.6
Female										
All Cancers	**1.1**	**2.9**	**6.0**	**9.9**	**13.3**	**11.0**	**35.5**	**2.8**	**22.2**	**4.5**
Breast	0.4	1.3	2.3	3.0	3.2	2.2	10.6	9.4	3.9	25.8
Colorectal	–	0.2	0.6	1.2	2.2	2.3	5.5	18.2	2.5	39.4
Lung	–	0.2	0.8	1.7	2.1	1.2	5.3	19.0	4.5	22.4
Lymphoma	0.1	0.1	0.3	0.5	0.8	0.7	2.3	44.2	1.3	76.9
Body of Uterus	–	0.1	0.5	0.7	0.7	0.5	2.2	46.3	0.5	188.0
Ovary	0.1	0.1	0.3	0.4	0.5	0.3	1.5	69.0	1.1	94.3
Pancreas	–	–	0.1	0.3	0.5	0.5	1.2	84.7	1.3	79.4
Leukemia	–	0.1	0.1	0.2	0.3	0.4	1.0	98.0	0.7	137.0
Kidney	–	0.1	0.2	0.3	0.3	0.3	1.0	103.1	0.4	250.0
Melanoma	0.1	0.1	0.2	0.2	0.2	0.2	0.9	106.4	0.2	487.8
Bladder	–	–	0.1	0.2	0.3	0.4	0.9	116.3	0.4	258.4
Stomach	–	–	0.1	0.2	0.3	0.4	0.8	122.0	0.7	153.8
Cervix	0.1	0.2	0.1	0.2	0.2	0.1	0.8	123.5	0.3	350.9
Oral	–	–	0.1	0.2	0.2	0.2	0.6	163.9	0.3	374.5

– Value less than 0.05

Note: The probability of developing cancer is calculated based on age- and gender-specific cancer incidence and mortality rates for Canada in 1996 and on the abridged life tables based on 1995-1997 all cause mortality rates.The probability of dying from cancer represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 1997. See *Appendix II: Methods* for details.

Source: Cancer Bureau, CCDPC, Health Canada

POTENTIAL YEARS OF LIFE LOST DUE TO CANCER

Figure 9 shows the rank order of the 12 leading causes of potential years of life lost (PYLL) in Canada in 1997. This illustrates that cancer was the leading cause of PYLL for men and women: 894,000 potential years were lost as a result of cancer (Table 13), representing 29% of the PYLL resulting from all causes of death. Lung cancer was responsible for 233,000 PYLL, representing 26% of the premature mortality caused by cancer. Diseases of the heart were the second leading cause. Among children aged 0-19, cancer ranked as the sixth leading cause of PYLL after perinatal causes, congenital anomalies, motor vehicle accidents, other accidents and suicide. The total PYLL due to cancer deaths in children aged 0-19 in 1997 was 17,200 years.

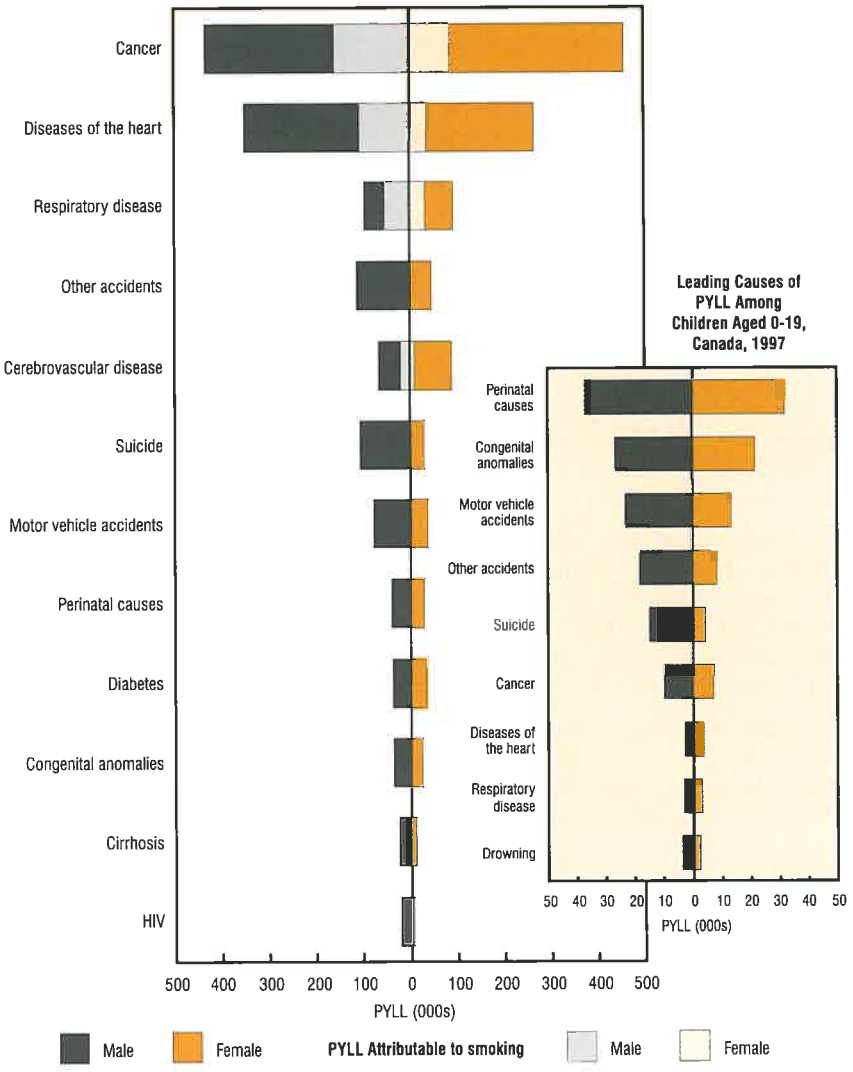
The PYLL due to various types of cancer are presented in Table 13. For men in 1997, the three leading cancers were lung, colorectal and prostate, accounting for 48% of the PYLL due to cancer. The three leading cancers for women were lung, breast and colorectal, accounting for 52% of PYLL due to cancer. The ranking by relative importance of these cancers for men and women with respect to potential years of life lost has been consistent in recent years. For women, however, the PYLL due to lung cancer, which is slightly greater than for breast cancer, reflects the high rates of lung cancer mortality in women aged 50-79. Among men, although prostate cancer is more common than lung cancer, the PYLL due to lung cancer is four times that due to prostate cancer, reflecting higher mortality rates for lung cancer and the younger age at which men develop and die from this disease.

The premature mortality is higher for cancers that are more common, have an earlier age of onset, and more quickly lead to death. With regard to the most common cancers for women and men, the PYLL from breast cancer (95,000) far exceed the PYLL for prostate cancer (33,000), reflecting the relatively young age at which women die from breast cancer. In contrast, the PYLL for Hodgkin's disease, at 4,000, reflects a cancer that is less common and relatively curable.

Although the number of men who die from cancer each year exceeds the number of women, the PYLL for women (459,000) is slightly higher than that for men (434,000). This is because women generally live longer than men, and some of the deaths due to female cancers occur at younger ages.

The use of tobacco products is the single most important cause of preventable, premature cancer deaths. In addition, many deaths from other diseases also occur because of smoking (Figure 9). Among men, smoking is responsible for about one-third of PYLL due to all cancers, about one-quarter of PYLL due to diseases of the heart, and about half of PYLL due to respiratory disease. Among women, smoking is responsible for about one-fifth of PYLL due to all cancers.

Figure 9
Leading Causes of Potential Years of Life Lost (PYLL), Canada, 1997



Note: Figures are ranked in order of total PYLL for both genders combined and are calculated based on life expectancy. Count and percentage totals may not add due to rounding and to the exclusion of other sites. Childhood cancers are also included within the relevant sites. Smoking attributable PYLL are based on relative risk estimates from follow up of CPS-II cohort and 1996 Canadian smoking prevalence estimates. See *Appendix II: Methods* for details.

Source: Cancer Bureau, CCDPC, Health Canada

Table 13

Potential Years of Life Lost Due to Cancer, Canada, 1997

	Potential Years of Life Lost (PYLL)					
	Total		Males		Females	
	Years	%	Years	%	Years	%
ALL CAUSES	3,052,000	–	1,655,000	–	1,398,000	–
All Cancers	894,000	100	434,000	100	459,000	100
Childhood Cancer (Ages 0-19)	17,200	1.9	9,400	2.2	7,700	1.7
Cancer Site						
Lung	233,000	26.0	132,000	30.4	100,000	21.9
Breast	95,000	10.6	–	–	95,000	20.7
Colorectal	84,000	9.5	43,000	9.9	42,000	9.0
Pancreas	40,000	4.5	19,000	4.3	21,000	4.6
Non-Hodgkin's Lymphoma	37,000	4.2	20,000	4.5	18,000	3.9
Leukemia	35,000	3.9	18,000	4.2	16,000	3.5
Brain	34,000	3.8	19,000	4.4	15,000	3.3
Prostate	33,000	3.7	33,000	7.5	–	–
Stomach	27,000	3.0	17,000	3.8	11,000	2.3
Ovary	25,000	2.8	–	–	25,000	5.4
Kidney	19,000	2.2	12,000	2.8	7,000	1.6
Oral	17,000	1.9	11,000	2.6	5,000	1.2
Multiple Myeloma	14,000	1.6	7,000	1.7	7,000	1.4
Bladder	15,000	1.7	10,000	2.3	5,000	1.0
Melanoma	13,000	1.5	8,000	1.8	5,000	1.1
Cervix	11,000	1.2	–	–	11,000	2.3
Body of Uterus	9,000	1.1	–	–	9,000	2.1
Larynx	7,000	0.8	6,000	1.3	1,000	0.3
Hodgkin's Disease	4,000	0.4	2,000	0.5	2,000	0.3
Testis	1,000	0.1	1,000	0.2	–	–

– Not applicable

Note: Figures are ranked in order of total PYLL for both sexes combined and are calculated based on life expectancy. Count and percentage totals may not add because of rounding and to the exclusion of other sites. Childhood cancers are also included within the relevant sites.

Source: Cancer Bureau, CCDPC, Health Canada

CANCER IN CHILDREN AGED 0-19 YEARS

Table 14 shows the number of new cases of cancer with age-standardized incidence rates (1992-1996) and the number of deaths due to cancer with age-standardized mortality rates (1993-1997) for Canadian children aged 0-19. For these periods, cancer was diagnosed in an average of 1,266 children every year, and 249 died each year from their disease. Leukemia accounted for 26% of new cases and 32% of deaths due to cancer in children, and remains the most common of the childhood cancers. Cancers of the brain and spinal cord, the second most common group of childhood cancers, constituted approximately 17% of new cases and 24% of deaths, and lymphomas accounted for 16% of new cases and 8% of deaths.

An indicator of disease prognosis is provided by the ratio of the number of deaths to the number of cases and can be calculated using the data available from Table 14. The deaths to cases ratio for all childhood cancers combined was approximately 0.20. The highest ratios (> 0.27) were found in children with liver (hepatic) cancer, tumours of the sympathetic nervous systems, particularly neuroblastoma, tumours of bone, and tumours of the brain and spinal cord. The high ratio for neuroblastoma reflects the advanced stage at which this disease is frequently diagnosed. Soft tissue sarcomas (0.26), particularly rhabdomyosarcoma (0.31), also have a relatively poor prognosis. The ratio for acute non-lymphocytic leukemia (0.39) was much higher than that observed for acute lymphocytic leukemia (0.13), resulting in a relatively high overall ratio for leukemia. Although the lymphomas have a relatively good prognosis overall, Hodgkin's disease (0.04) has a very low death to cases ratio compared with non-Hodgkin's lymphoma (0.19). The low ratios observed for retinoblastoma and germ cell tumours indicate the low fatality associated with these tumours.

The low death rates for acute lymphocytic leukemia, Hodgkin's disease and germ cell tumours reflect the major advances made in treating these cancers over 30 years. Since the early 1950s, mortality rates for childhood cancer have declined by more than 50%, with most of the improvement occurring after 1970. Improved survival has been particularly dramatic for the most common childhood neoplasm, acute lymphocytic leukemia, as well as for lymphomas and kidney cancer. Although essentially no one survived childhood leukemia 40 years ago,[10] currently, approximately 80% of Canadian children and teenagers with acute lymphoblastic leukemia are alive five years after diagnosis.[11] The improvement in childhood cancer survival relative to that of most adults with cancer reflects biological differences in cancer in adults as compared to children, as well as in treatment approaches. The success of clinical trials in identifying new agents and treatment modalities has been significant; a much larger proportion of children than adults with cancer participate in therapeutic trials. As well, a shift towards multidisciplinary care has improved overall outcomes and decreased morbidity.

Table 14

New Cases and Age-Standardized Incidence Rates (1992-1996), and Deaths and Age-Standardized Mortality Rates (1993-1997), by Histologic Cell Type for Children Aged 0-19 Years, Canada

Diagnostic Group[1]	New cases (1992-1996)[2]		ASIR per 1,000,000 per year	Deaths (1993-1997)		ASMR per 1,000,000 per year	Deaths/ Cases Ratio
	Number	%		Number	%		
Leukemia	**1,644**	**26.0**	**41.48**	**393**	**31.5**	**10.71**	**0.24**
Acute lymphocytic	1,281	20.2	32.25	170	13.6	4.55	0.13
Acute non-lymphocytic	279	4.4	7.08	108	8.7	2.83	0.39
Lymphoma	**1,014**	**16.0**	**25.62**	**102**	**8.2**	**3.77**	**0.10**
Hodgkin's disease	589	9.3	14.88	21	1.7	0.96	0.04
Non-Hodgkin's lymphoma	412	6.5	10.40	80	6.4	2.81	0.19
Brain and Spinal	**1,076**	**17.0**	**27.20**	**300**	**24.1**	**6.76**	**0.28**
Ependymoma	92	1.5	2.32	35	2.8	0.58	0.38
Astrocytoma	551	8.7	13.93	82	6.6	2.29	0.15
Primitive neuroectodermal	250	3.9	6.32	74	5.9	1.55	0.30
Sympathetic Nervous System	**349**	**5.5**	**9.01**	**103**	**8.3**	**1.43**	**0.30**
Neuroblastoma	337	5.3	8.71	103	8.3	1.43	0.31
Retinoblastoma	**128**	**2.0**	**3.28**	**0**	**0.0**	**0.00**	**0.00**
Renal Tumours	**280**	**4.4**	**7.07**	**32**	**2.6**	**0.74**	**0.11**
Wilm's tumour	254	4.0	6.41	25	2.0	0.49	0.10
Hepatic Tumours	**75**	**1.2**	**1.91**	**28**	**2.3**	**0.61**	**0.37**
Bone	**341**	**5.4**	**8.61**	**113**	**9.1**	**4.36**	**0.33**
Osteosarcoma	188	3.0	4.74	66	5.3	2.64	0.35
Ewing's sarcoma	109	1.7	2.75	43	3.5	1.66	0.39
Soft Tissue	**432**	**6.8**	**10.95**	**114**	**9.2**	**3.23**	**0.26**
Rhabdomyosarcoma	203	3.2	5.13	62	5.0	1.63	0.31
Fibrosarcoma	64	1.0	1.64	10	0.8	0.32	0.16
Germ Cell and Other Gonadal	**403**	**6.4**	**10.22**	**14**	**1.1**	**0.53**	**0.03**
Gonadal germ cell tumours	260	4.1	6.59	1	0.1	0.01	0.00
Carcinoma	**504**	**8.0**	**12.76**	**28**	**2.3**	**1.19**	**0.06**
Thyroid	216	3.4	5.46	0	0.0	0.00	0.00
Melanoma	133	2.1	3.37	10	0.8	0.43	0.08
Other Cancers	**84**	**1.3**	**2.16**	**19**	**1.5**	**0.57**	**0.23**
Total (5 years)	**6,330**	**100.0**	**160.26**	**1,246**	**100.0**	**33.89**	**0.20**
Average Per Year	**1,266**			**249**			

[1] Only major subcategories within each group are included. Acute lymphocytic includes all lymphoid, approximately 99% are acute. Non-Hodgkin's lymphomas include Burkitt's lymphoma and unspecified lymphomas. The neuroblastoma category includes ganglioneuroblastoma; Wilm's tumour includes rhabdoid and clear cell sarcoma; rhabdomyosarcoma includes embryonal sarcoma, and fibrosarcoma includes other fibromatous neoplasms.

[2] Data are shown for the most recent five-year period available and exclude non-melanoma skin cancer (ICD-9 173) and in-situ carcinomas (ICD-9 230-234). Data are grouped according to the International Classification Scheme for Childhood Cancer, World Health Organization (1996). Rates are age-standardized to the 1991 Canadian population and due to disease rarity are expressed **per million per year**.

Source: Cancer Bureau, CCDPC, Health Canada and Health Statistics Division, Statistics Canada

Incidence and Mortality Patterns and Trends

Colorectal cancer is an important disease among men and women in Canada, as it is the third most common cancer and the third most common cause of death from cancer for both men and women. In 2001, 9,300 new cases and 3,400 deaths among men are expected, and 7,900 new cases and 3,000 deaths among women (as reported earlier in this monograph – Table 1 and Figure 1). When both genders are considered together, colorectal cancer ranks as the second most frequent cause of cancer deaths among Canadians (Figure 10.1). Only lung cancer is more common in terms of the number of cancer deaths. Thus, colorectal cancer is responsible for more deaths that are not due primarily to tobacco use than any other type of cancer.

Figures 10.2 and 10.3 show that age-standardized incidence and mortality *rates* have been declining since 1985. However, because of the growth and aging of the population, the *number* of new cases has continued to rise steadily and significantly among both men and women. Mortality rates (age-standardized) have decreased steadily, resulting in an overall decline of almost one-quarter among men since 1972, and by almost one-half among women. Incidence rates (age-standardized) among men peaked in 1985 and since then have dropped by 8% (Table 7.1). Among women, incidence rates also peaked in 1985 and since then have dropped by 19% (Table 8.1).

Incidence Patterns at Specific Locations in the Colon and Rectum

Distinct patterns in incidence are detectable when rates are calculated for disease located in specific parts of the colon and rectum. Incidence rates for cancer in the proximal colon (the part closer to the origin), distal colon (closer to the end), and rectum are plotted in Figure 10.4 (adapted from a paper by Gibbons, Waters and Mao[12]). Colorectal cancer occurs most frequently in the proximal colon, followed by the rectum, and least in the distal colon. For each specific location, incidence rates were consistently lower for women than men. Among women, incidence rates declined gradually from 1984 to 1995 for cancers located in the rectum and distal colon, whereas rates of disease in the proximal colon remained stable. Rates were more stable among men than women in the past 15 years, as incidence was stable for disease in the proximal colon and rectum, and there was only a slight decrease in rates of cancer in the distal colon.

Incidence Patterns by Age and Province

As age increases, the percentage of cases with a tumour in the proximal colon also increases (Figure 10.5 – e.g. for women, from 31% in the 40-49 age group, to 42% at ages 80+), whereas the percentage with a rectal tumour declines. The overall patterns were similar for women and men; however, the change with age in the relative contribution of proximal and rectal tumours was greater for women than men. In contrast, the percentage with distal tumours remained stable in men, at about 24% of all tumours across all age groups, whereas distal tumours were less frequent in older than younger women. Figure 10.5 also shows that in men younger than 80 years, and in women under age 60, the rectum is the most common subsite. After age 60 proximal subsite is the predominant site in women. When the patterns depicted in Figures 10.4 and 10.5 are considered together, they indicate that the apparent increase in the relative frequency of cancers in the proximal colon is due to a decreased contribution at the other subsites, rather than to an increased incidence of proximal disease. Nevertheless, the frequency of proximal tumours in older men and women is a factor to be considered in decisions about preferred screening methods in the elderly.

Colorectal cancer is more common among the elderly with the highest probability of developing colorectal cancer occurring among those in their 70s (Figure 10.6). Whereas Figure 10.5 compares percentages within each age group, Figure 10.6 demonstrates how colorectal cancer risk increases with age. Similar to other cancers (Table 12), the probability of developing colorectal cancer in the next decade increases with age. For men and women in their 70s, the probability of developing the disease in the next 10 years is 2%-3%, which is about 10 times greater than the risk for individuals in their 40s (0.2%). Figure 10.7 provides additional detail on how annual incidence and mortality rates increase with age, in both men and women. Trends depicted in Figure 10.7 also indicate that among men, there have been recent declines in annual incidence and mortality rates, but only in the older age groups. In contrast, among women the rates have declined in each age group.

The variation in colorectal cancer rates among provinces is shown in Figure 10.8, which includes data from the earlier section on *Geographic Patterns of Cancer Occurrence* (Tables 4 and 6). Generally, incidence rates are slightly higher in eastern provinces than western provinces, for both men and women. An east-west gradient is not as apparent in mortality rates, although British Columbia and Alberta also have the lowest rates in the country. Several factors must be taken into consideration when interpreting inter-provincial differences, as outlined in the section on *Geographic Patterns*.

Implications for Colorectal Cancer Control Programs

These patterns and trends have several interpretations and important implications. First, these data demonstrate that colorectal cancer is a serious disease that is responsible for a significant component of the cancer burden in Canada.

The reasons for the overall trends in incidence and mortality rates are not known with certainty, but likely arise as a combined effect of true changes in the disease, and improvements in how the disease is detected. Improvements in treatment could also influence mortality rates, but they could not impact incidence rates. Since the mid-1980s, the similarities in the trends in incidence and mortality rates suggest that a large part of the mortality rate decline is likely due to reductions in disease incidence. Similarly, the greater decline in mortality rates for women than men, arose at least in part because the decline in incidence was greater among women than men. Similar gender-specific patterns have also been seen in the United States,[13] and it has been suggested that these may be due to changes in exposures to risk factors (e.g. diet, exogenous hormones, physical activity)[14] or prevention programs that benefited women more than men.

The differences in colorectal cancer trends between men and women, are mostly due to incidence trends for cancers in the rectum and distal colon, since the declines in rates at these sites were greater among women than men, and greater than in the proximal colon. It should also be noted that throughout the process of collecting and analyzing these data, careful consideration is given to data quality issues; however, even though it is sometimes difficult for doctors and cancer registries to assign diagnoses and subsites with certainty, this would be an unlikely explanation for the observed patterns and trends (e.g. by gender, age and subsite). The specific patterns provide clues to the underlying causes, and help to form hypotheses to be tested in further research. In particular, a potential explanation for the observed trends is that disease was prevented, particularly among women in whom risk was reduced in all age groups, and especially for cancers of the rectum and distal colon.

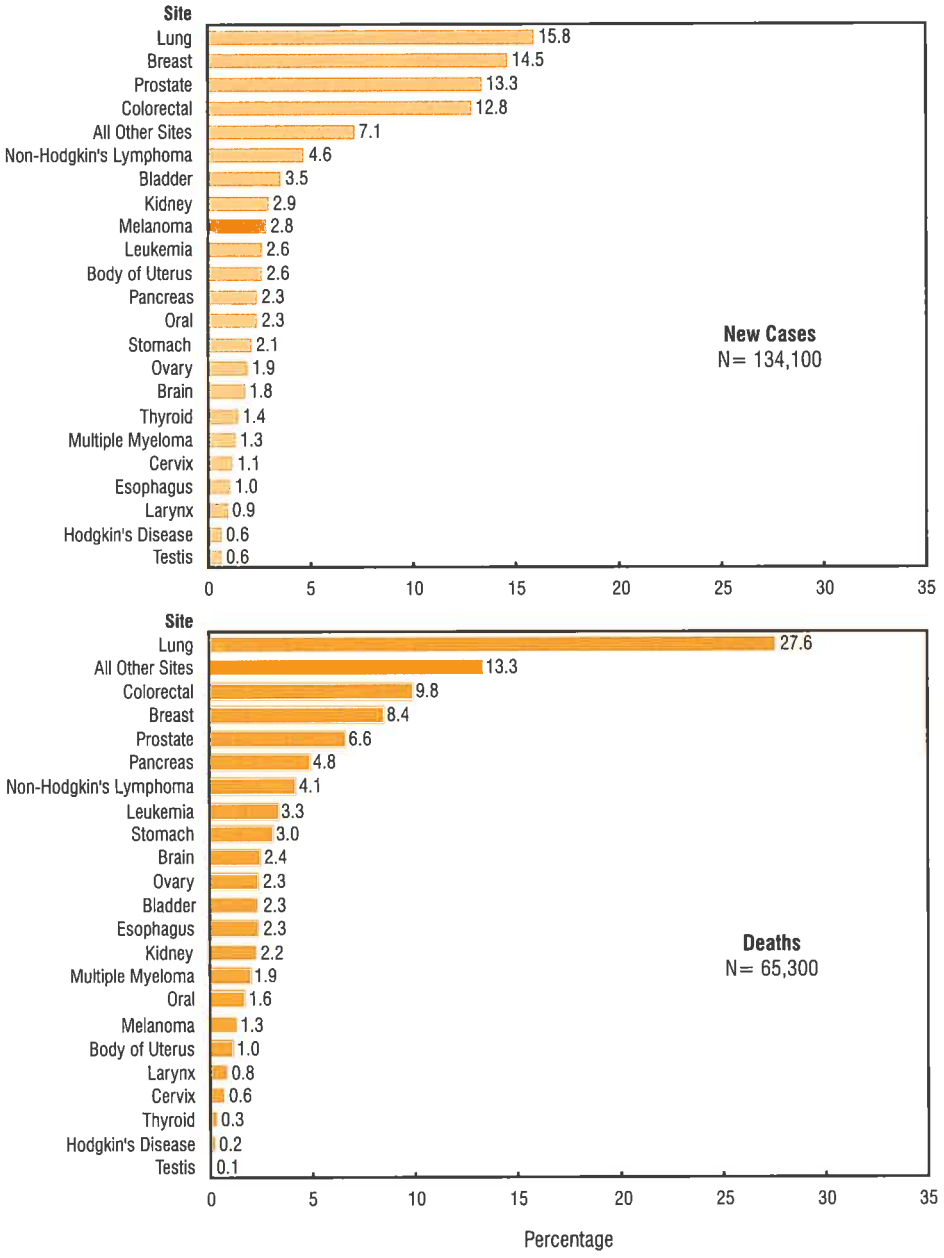
Part of the reduction in colorectal cancer incidence rates (and subsequently mortality rates) may have been due to changes in exposures to risk factors. It has been proposed that cancers occurring at different subsites may have different underlying causes, and in particular that the distal colon may be more sensitive to the effects of external risk factors.[15] Many Canadians have modified their diet over the past 20 years (e.g. reduced fat intake from meat), thus diet is an example of a change in risk factor exposures that may be partly responsible for the observed trends, and that may have benefited women more than men. In addition, recent research[16] has suggested that non-steroidal anti-inflammatory drugs are protective against colorectal cancer. It is possible that the prevalence of use of these medications in the last two decades may have contributed to incidence declines.

Consideration should also be given to whether the observed decrease in rates may have been due to early detection or to screening for disease. Early detection procedures for colorectal cancer include the fecal occult blood test (a test that detects blood in the stool), which has been shown in randomized trials to yield a mortality reduction of about 20% in people over 50[17]; scoping procedures that allow direct visualization of the colon (sigmoidoscopy, colonoscopy); and an indirect procedure involving x-rays and barium enema. The intent of these procedures, as screening tools, would be to detect cancer at an early stage when it can be treated more effectively. An important feature of colorectal cancer is that there are precancerous polyps or lesions that, if detected, can be removed, which, in turn would result in a reduction of mortality and possibly incidence rates. Although there is no evidence from randomized controlled trials, published evaluations of sigmoidoscopy have shown benefits in reducing incidence[18] and mortality[19]; however, it must be noted that this procedure will detect disease only in the distal colon and rectum. Although colonoscopy and barium enema will detect tumours throughout the colon, their overall effectiveness is not known, as controlled trials have not been completed. Early detection or screening may have contributed to the recent incidence and mortality trends in Canada; however, this does not account for the differences between men and women. Thus, further research that addresses these questions is still required.

Several other important questions need to be addressed in research on colorectal cancer screening in Canada. What resources are needed? What are the complication rates from the testing that is required in healthy people? What health benefits can be achieved in our populations? For this reason, colorectal cancer screening, like breast and cervical screening, would be best addressed in the context of coordinated cancer control programs, such as those that have been established in several parts of the country.

Figure 10.1

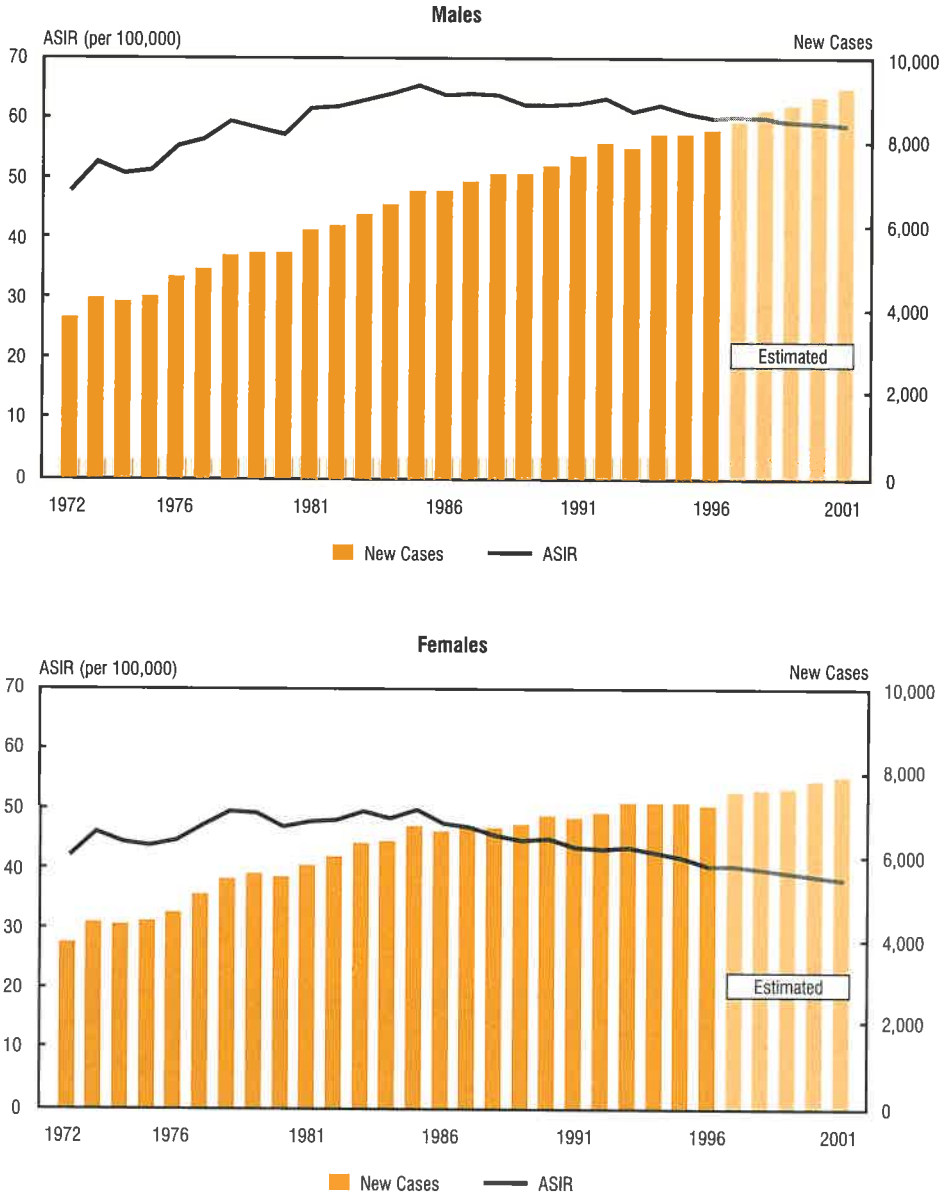
Percentage Distribution of Estimated New Cases and Deaths for Selected Cancer Sites, Canada, 2001



Note: Incidence figures exclude an estimated 70,000 new cases of non-melanoma skin cancer (ICD-9 173).
Source: Cancer Bureau, CCDPC, Health Canada

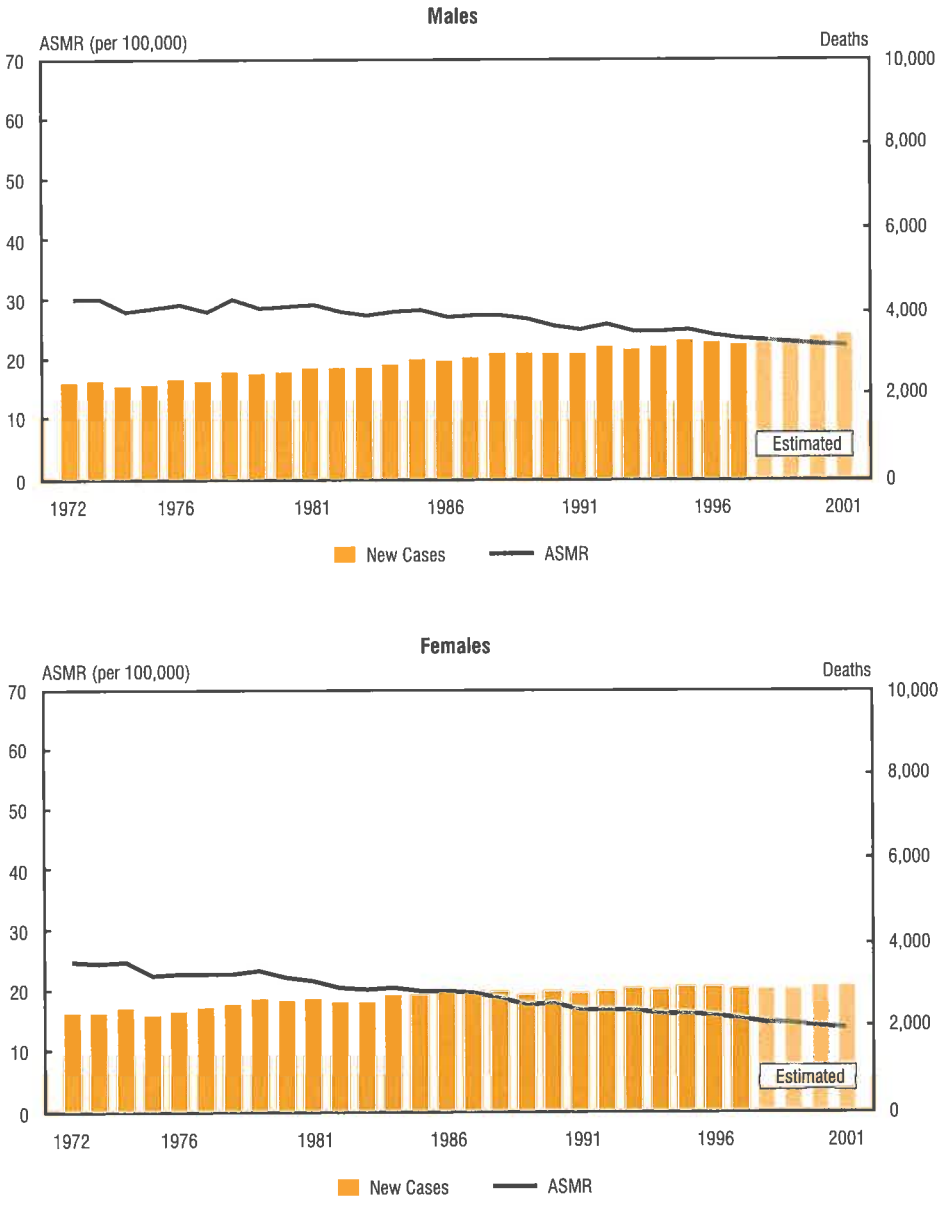
Figure 10.2

New Cases and Age-Standardized Incidence Rates (ASIR) for Colorectal Cancer, Canada, 1972-2001



Note: Rates are standardized to the 1991 Canadian population.
Source: Cancer Bureau, CCDPC, Health Canada

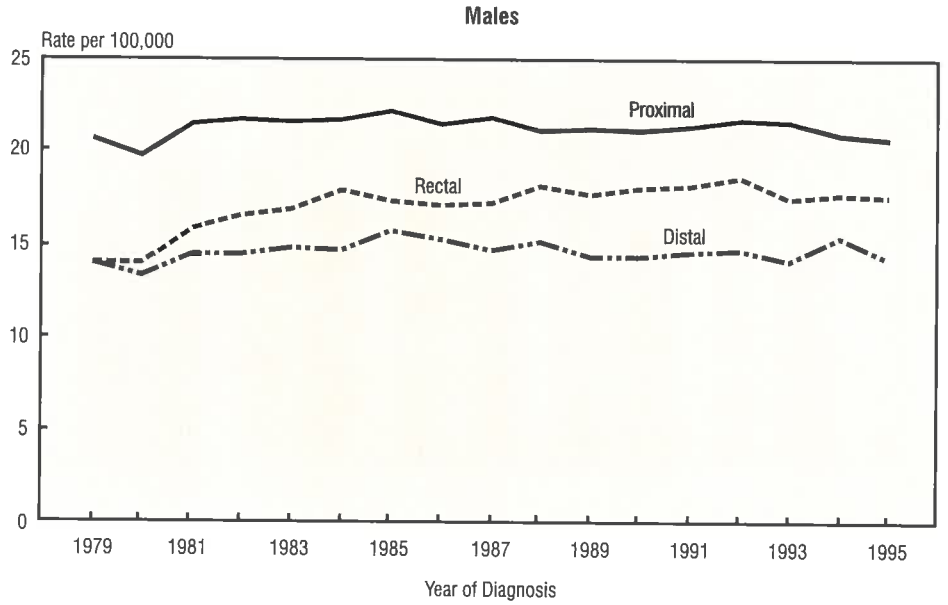
Figure 10.3
Deaths and Age-Standardized Mortality Rates (ASMR) for Colorectal Cancer, Canada, 1972-2001

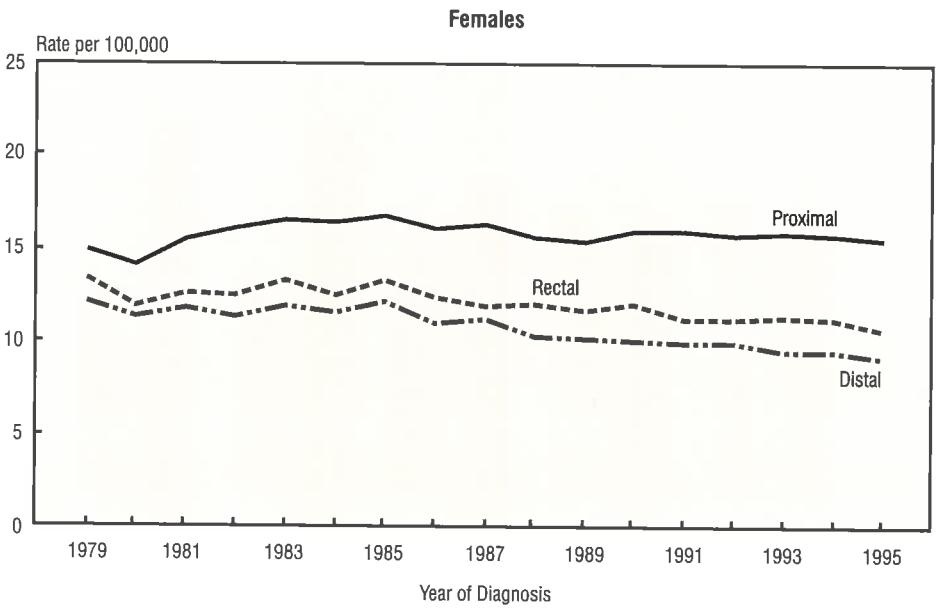


Note: Rates are standardized to the 1991 Canadian population.
Source: Cancer Bureau, CCDPC, Health Canada

Figure 10.4

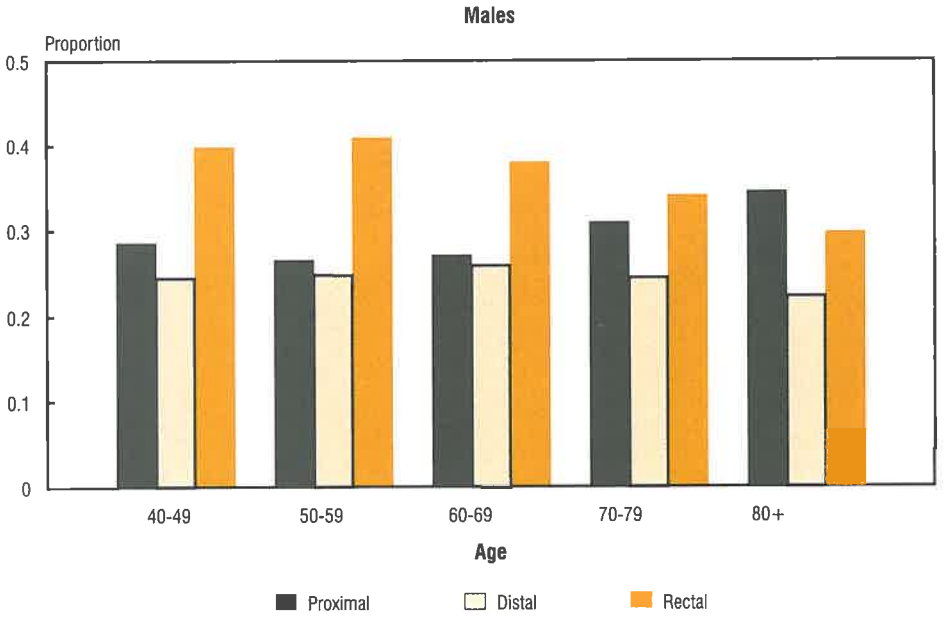
Age-Standardized Incidence Rates for Colorectal Cancers by Subsite and Gender, Canada, 1979-1995

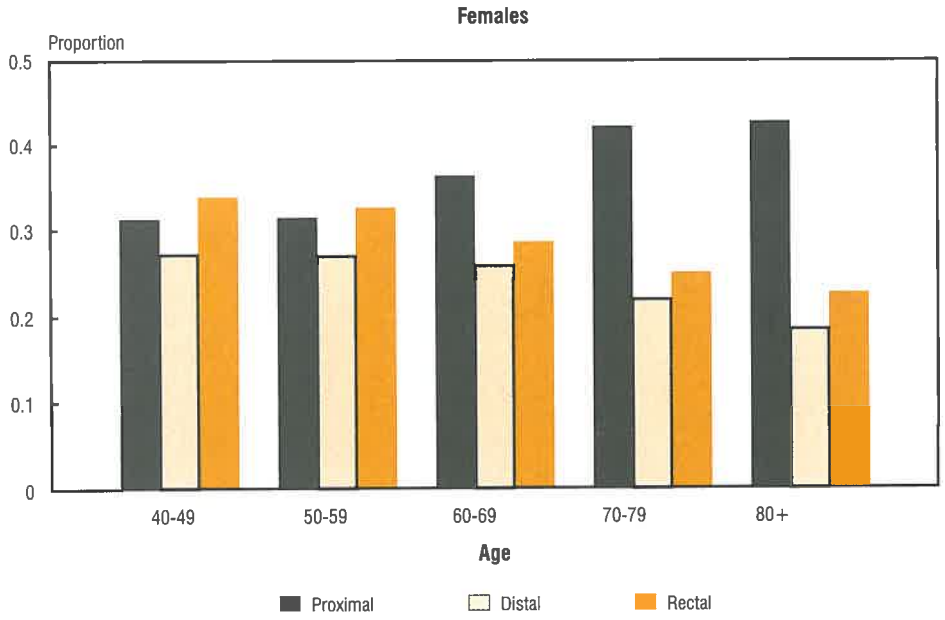




Source: Cancer Bureau, CCDPC, Health Canada

Figure 10.5
Colorectal Cancer Incidence Subsites, by Age Group, Canada, 1991-1995

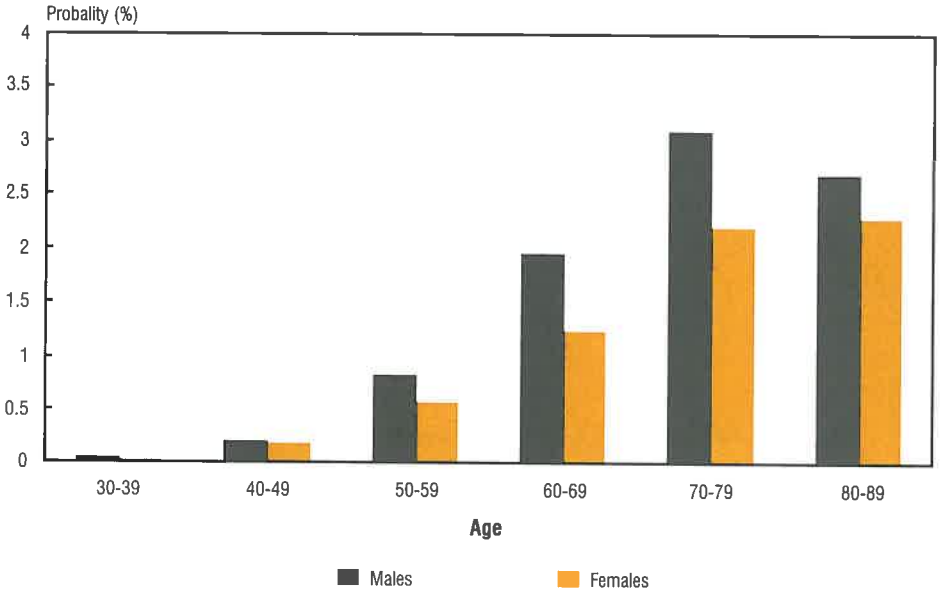




Source: Cancer Bureau, CCDPC, Health Canada

Figure 10.6

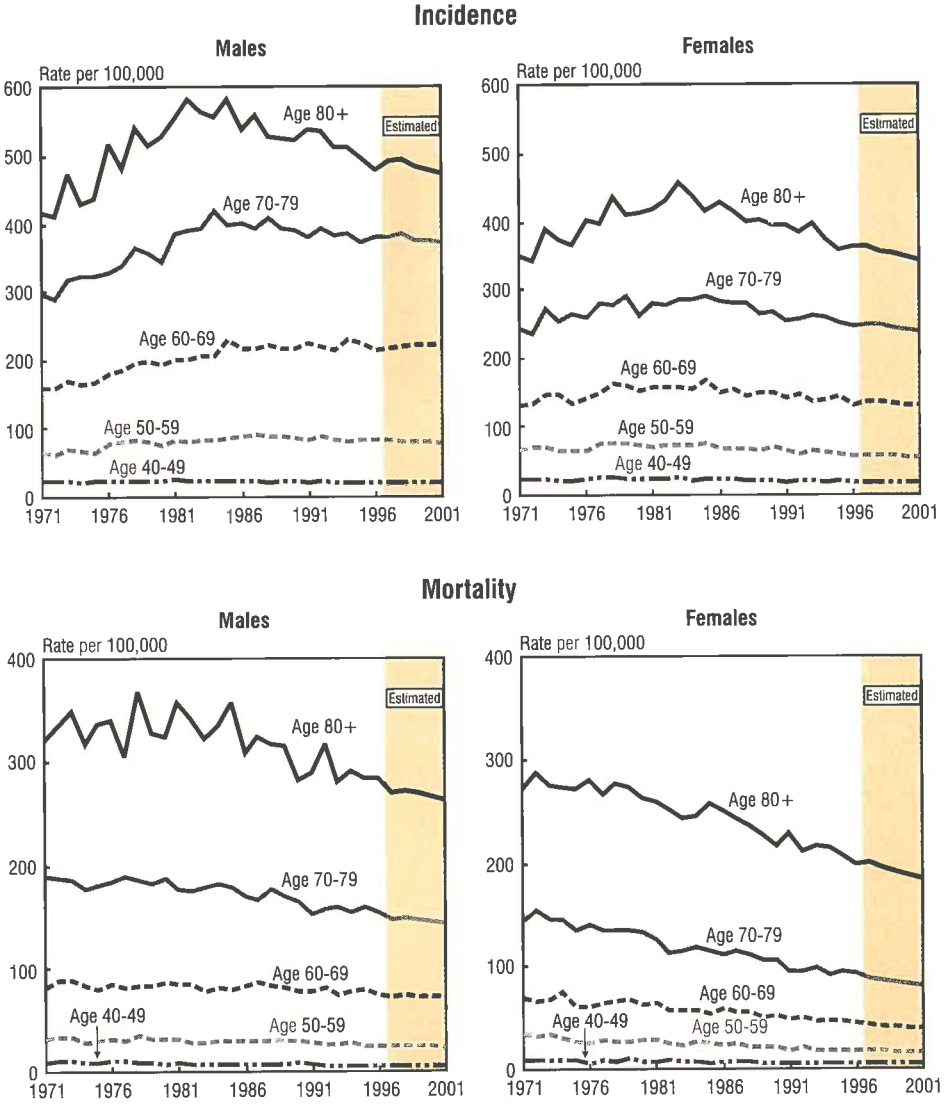
Probability (%) of Developing Colorectal Cancer in the Next 10 Years by Age, Canada



Source: Cancer Bureau, CCDPC, Health Canada

Figure 10.7

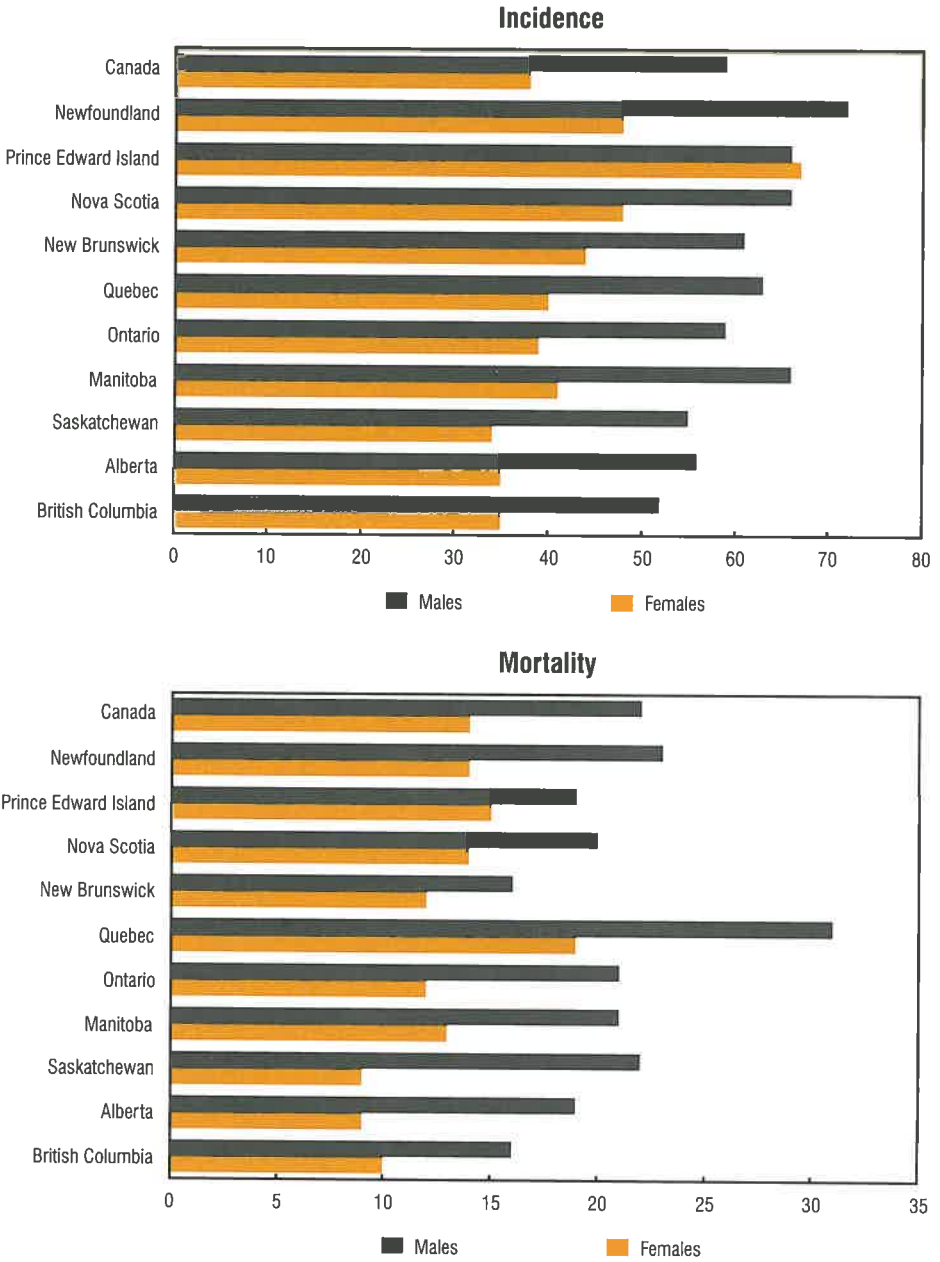
Age-Specific Incidence and Mortality Rates, Colorectal Cancers, Canada, 1971-2001



Source: Cancer Bureau, CCDPC, Health Canada

Figure 10.8

Estimated Age-Standardized Colorectal Cancer Rates per 100,000, by Province, Canada, 2001



Source: Cancer Bureau, CCDPC, Health Canada

GLOSSARY

Age — The age of the patient (in completed years) at the time of diagnosis or death.

ICD-9 — The Ninth Revision of the International Classification of Diseases.[20]

Incidence — The number of new cases of a given type of cancer diagnosed during the year. The basic unit of reporting is a new case of cancer rather than an individual patient.

Mortality — The number of deaths attributed to a particular type of cancer that occurred during the year. Included are deaths of patients diagnosed in earlier years, persons with a new diagnosis during the year, and patients for whom a diagnosis of cancer is made only after death.

Province/ Territory — For cancer incidence and mortality data, this is the province/territory of the patient's permanent residence at time of diagnosis or death, which may or may not correspond to the province/territory in which the new case of cancer or the cancer death was registered.

Incidence and Mortality Rates

Crude rate — The number of new cases of cancer or cancer deaths during the year, expressed as a rate per 100,000 persons in the population.

Age-specific rate — The number of new cases of cancer or cancer deaths during the year, expressed as a rate per 100,000 persons in a given age group.

Age-standardized rate — The number of new cases of cancer or cancer 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.

Index of age-standardized rates — The age-standardized rate of the base year, 1971, is set at 100. Index values for subsequent years are derived by multiplying the age-standardized rate for the year by 100 and then dividing by the 1971 rate.

Site Definitions:

Cancer data presented in this monograph are classified according to the following site groupings, except where otherwise noted.

Site	ICD-9	Site	ICD-9
Oral	140-149	Prostate	185
Esophagus/Oesophagus	150	Testis	186
Stomach	151	Bladder	188
Colorectal	153-154	Kidney	189
Pancreas	157	Brain	191-192
Larynx	161	Thyroid	193
Lung	162	Lymphoma	200-203
Melanoma	172	Hodgkin's Disease	201
Female Breast	174	Multiple Myeloma	203
Cervix	180	Non-Hodgkin's Lymphoma	200,202
Body of Uterus	179,182	Leukemia	204-208
Ovary	183	All Cancers excluding Lung	140-208 excluding 173,162
		All Other Cancers	All sites between 150-199 not listed above
All Cancers	**140-208 excluding 173**		

1991 Canadian Population/World Standard Population:

The population used to standardize rates had the following age distribution.

Population			Population			Population		
Age Group	Canadian	World Standard	Age Group	Canadian	World Standard	Age Group	Canadian	World Standard
0-4	6,946.4	12,000	30-34	9,240.0	6,000	60-64	4,232.6	4,000
5-9	6,945.4	10,000	35-39	8,338.8	6,000	65-69	3,857.0	3,000
10-14	6,803.4	9,000	40-44	7,606.3	6,000	70-74	2,965.9	2,000
15-19	6,849.5	9,000	45-49	5,953.6	6,000	75-79	2,212.7	1,000
20-24	7,501.6	8,000	50-54	4,764.9	5,000	80-84	1,359.5	500
25-29	8,994.4	8,000	55-59	4,404.1	4,000	85+	1,023.7	500
						TOTAL		100,000

Source: The Canadian population distribution is based on the final post-censal estimates of the July 1, 1991 Canadian population, adjusted for census undercoverage. The World Standard Population is used in *Cancer Incidence in Five Continents*.[4]

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

The focus of this monograph is on current year estimates that are obtained by analyzing actual data and making short-term projections using statistical techniques (see *Appendix II*). For users who require *actual data* rather than current year *estimates*, the tables in this Appendix provide a summary of actual incidence and mortality statistics based on the most recently available data for the nation. These data represent the most recent year in the long series of data that was used to derive the current year estimates.

Appendix Tables 1 and 2 list the actual number of new cases (1996) and deaths (1997) that occurred in Canada, and specify the ICD-9 codes used to define each diagnostic group. Given the reliability of these actual counts, it is feasible to examine the frequency of additional cancer types, thus Appendix Tables 1 and 2 list a larger number of cancer types than the previous tables. Appendix Tables 3 to 6 list actual values for incidence and mortality counts and rates for major cancer types, by province and territory.

In addition to the explanations and discussion provided earlier in the monograph, several other points should be noted. As noted in Appendix Tables 3-6 of this Appendix, because of the small populations of the Territories, it was only feasible to provide summaries (5-year average) for the most common cancers. The Appendix Tables also indicate that between provinces there was some variation in the years for which data were available (as of July 2000 when these analyses began). Furthermore, the data sources are dynamic files that are routinely updated as new data become available. Users who require more current, actual data for Canada may contact the Cancer Bureau at Health Canada or Statistics Canada, Health Statistics Division. The most up-to-date data for individual provinces can be obtained by contacting the provincial cancer registries (see section *For Further Information*).

APPENDIX I: ACTUAL DATA FOR NEW CASES AND DEATHS

Table 1

Actual Data for New Cases of Cancer by Site and Gender, Canada, 1996

Site	ICD-9	Total	Males	Females
All cancer sites	**140-208**	**118,528**	**61,473**	**57,055**
Oral (buccal cavity and pharynx)	**140-149**	**2,980**	**2,097**	**883**
Lip	140	514	409	105
Tongue	141	631	448	183
Salivary Gland	142	298	169	129
Floor of Mouth	144	213	160	53
Pharynx	146,147,148	806	594	212
Other and Unspecified	143,145,149	518	317	201
Digestive organs	**150-159**	**25,302**	**13,833**	**11,469**
Esophagus	150	1,175	805	370
Stomach	151	2,929	1,864	1,065
Small Intestine	152	330	191	139
Large Intestine	153	10,278	5,159	5,119
Rectum	154	5,174	3,088	2,086
Liver and Biliary Passages	155,156	1,801	1,008	793
Pancreas	157	2,937	1,433	1,504
Other and Unspecified	158,159	678	285	393
Respiratory system	**160-165**	**20,297**	**12,752**	**7,545**
Larynx	161	1,198	982	216
Lung	162	18,437	11,308	7,129
Other and Unspecified	160,163,164,165	662	462	200
Bone tissue and skin	**170-172**	**4,168**	**2,148**	**2,020**
Bone	170	291	159	132
Connective Tissue	171	738	395	343
Skin (melanoma)	172	3,139	1,594	1,545
Breast	**174,175**	**16,669**	**118**	**16,551**
Genital organs	**179-187**	**22,788**	**15,619**	**7,169**
Cervix	180	1,444	–	1,444
Body of Uterus	182	3,026	–	3,026
Ovary	183	2,116	–	2,116
Prostate	185	14,771	14,771	–
Other and Unspecified	179,181,184,186,187	1,431	848	583
Urinary organs	**188-189**	**7,812**	**5,333**	**2,479**
Bladder	188	4,396	3,266	1,130
Kidney and Other Urinary	189	3,416	2,067	1,349
Eye	**190**	**272**	**153**	**119**
Brain and central nervous system	**191-192**	**2,128**	**1,202**	**926**
Endocrine glands	**193-194**	**1,719**	**459**	**1,260**
Thyroid	193	1,587	388	1,199
Other Endocrine	194	132	71	61
Leukemia	**204-208**	**3,276**	**1,863**	**1,413**
Other blood and lymph tissues	**200-203**	**7,143**	**3,918**	**3,225**
Hodgkin's Disease	201	789	438	351
Multiple Myeloma	203	1,389	768	621
Non-Hodgkin's Lymphoma	200, 202	4,965	2,712	2,253
All other and unspecified sites	**195-199**	**3,974**	**1,978**	**1,996**

– Not applicable

Note: ICD-9 refers to the Ninth Revision of the International Classification of Diseases. Figures exclude non-melanoma skin cancer (ICD-9 173). Further information is available at: http://www.hc-sc.gc.ca/hpb/lcdc/webmap (select cancer button).

Source: Cancer Bureau, CCDPC, Health Canada

Table 2

Actual Data for Cancer Deaths by Site and Gender, Canada, 1997

Site	ICD-9	Total	Males	Females
All cancer sites	**140-208**	**58,703**	**31,555**	**27,148**
Oral (buccal cavity and pharynx)	**140-149**	**1,026**	**705**	**321**
Lip	140	14	10	4
Tongue	141	243	167	76
Salivary Gland	142	81	49	32
Floor of Mouth	144	40	29	11
Pharynx	146,147,148	293	205	88
Other and Unspecified	143,145,149	355	245	110
Digestive organs	**150-159**	**15,643**	**8,595**	**7,048**
Esophagus	150	1,280	940	340
Stomach	151	1,963	1,225	738
Small Intestine	152	129	69	60
Large Intestine	153	4,749	2,418	2,331
Rectum	154	1,353	798	555
Liver and Biliary Passages	155,156	1,663	939	724
Pancreas	157	2,847	1,375	1,472
Other and Unspecified	158,159	1,659	831	828
Respiratory system	**160-165**	**16,102**	**10,236**	**5,866**
Larynx	161	475	394	81
Lung	162	15,439	9,726	5,713
Other and Unspecified	160,163-165	188	116	72
Bone tissue and skin	**170-172**	**1,125**	**642**	**483**
Bone	170	135	82	53
Connective Tissue	171	325	160	165
Skin (melanoma)	172	665	400	265
Breast	**174,175**	**4,984**	**38**	**4,946**
Genital organs	**179-187**	**6,209**	**3,677**	**2,532**
Cervix	180	417	–	417
Body of Uterus	182	319	–	319
Ovary	183	1,362	–	1,362
Prostate	185	3,622	3,622	–
Other and Unspecified	179,181,184,186,187	489	55	434
Urinary organs	**188-189**	**2,660**	**1,779**	**881**
Bladder	188	1,368	960	408
Kidney and Other Urinary	189	1,292	819	473
Eye	**190**	**33**	**22**	**11**
Brain and central nervous system	**191-192**	**1,448**	**819**	**629**
Endocrine glands	**193-194**	**208**	**76**	**132**
Thyroid	193	138	41	97
Other Endocrine	194	70	35	35
Leukemia	**204-208**	**1,973**	**1,096**	**877**
Other blood and lymph tissues	**200-203**	**3,442**	**1,870**	**1,572**
Hodgkin's Disease	201	133	83	50
Multiple Myeloma	203	1,050	575	475
Non-Hodgkin's Lymphoma	200, 202	2,259	1,212	1,047
All other and unspecified sites	**173,195-199**	**3,850**	**2,000**	**1,850**

– Not applicable

Note: ICD-9 refers to the Ninth Revision of the International Classification of Diseases.

Source: Cancer Bureau, CCDPC, Health Canada

Table 3

Actual Data for New Cases for Major Cancer Sites by Gender and Geographic Region, Most Recent Year,[1] Canada

	New Cases												
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**61,500**	**980**	**330**	**2,200**	**1,800**	**15,400**	**23,100**	**2,700**	**2,400**	**4,900**	**8,100**	**30**	**35**	**20**
Prostate	14,800	250	85	580	550	2,700	5,800	730	620	1,400	2,400	5	5	–
Lung	11,300	150	70	370	350	3,500	3,900	450	380	750	1,250	5	5	10
Colorectal	8,200	180	55	290	240	2,100	3,200	420	310	680	1,050	5	10	5
Bladder	3,300	15	15	150	50	1,100	1,050	100	160	120	330	–	–	–
Non-Hodgkin's Lymphoma	2,700	45	10	80	75	690	1,000	140	110	220	370	–	5	–
Oral	2,100	70	10	55	45	500	840	90	75	150	230	–	–	5
Kidney	2,100	40	10	90	45	510	780	90	80	160	240	–	–	–
Stomach	1,850	55	5	45	60	530	630	70	60	120	220	–	–	–
Leukemia	1,850	15	10	35	45	470	760	70	100	170	210	–	–	–
Melanoma	1,600	15	5	65	50	210	690	65	50	150	280	–	–	–
Pancreas	1,450	5	5	40	55	390	490	50	45	120	180	–	–	–
Brain	1,200	15	5	35	40	330	430	40	40	95	140	–	–	–
Larynx	980	20	5	40	25	340	340	35	35	65	95	–	–	–
Multiple Myeloma	770	15	5	25	25	210	290	35	25	60	95	–	–	–
Females														
All Cancers	**57,100**	**880**	**330**	**2,000**	**1,600**	**14,500**	**21,600**	**2,400**	**2,000**	**4,800**	**7,600**	**30**	**35**	**15**
Breast	16,600	260	110	580	460	4,200	6,200	700	600	1,400	2,400	10	10	–
Colorectal	7,200	160	55	300	230	1,850	2,700	320	250	540	910	–	5	–
Lung	7,100	75	40	290	230	1,900	2,600	330	230	550	1,000	5	5	5
Body of Uterus	3,100	50	15	95	90	700	1,250	140	100	320	430	–	–	–
Non-Hodgkin's Lymphoma	2,300	30	5	55	70	590	840	100	85	180	340	–	–	–
Ovary	2,100	30	10	60	50	600	790	75	80	190	260	–	–	–
Melanoma	1,550	25	15	65	55	210	680	55	60	170	230	–	–	–
Pancreas	1,500	10	10	45	40	410	540	70	50	110	200	–	–	–
Cervix	1,450	35	10	40	45	320	590	60	60	150	190	–	–	–
Leukemia	1,400	15	5	35	25	350	590	70	50	120	150	–	–	–
Kidney	1,350	20	10	50	50	360	480	50	50	120	120	–	–	–
Thyroid	1,200	10	–	15	20	260	550	40	30	140	120	–	–	–
Bladder	1,150	5	–	60	20	360	380	35	60	45	120	–	–	–
Stomach	1,050	35	–	40	25	280	390	35	35	75	130	–	–	–
Brain	930	10	5	30	20	280	360	30	25	70	100	–	–	–
Oral	880	10	10	30	15	170	390	40	30	80	120	–	–	–
Multiple Myeloma	620	5	5	20	20	180	240	25	25	45	70	–	–	–

– Fewer than 5 cases

[1] 1996 for Canada, Quebec, Ontario; 1997 for Nova Scotia, Saskatchewan; 1998 for Newfoundland, Prince Edward Island, New Brunswick, Manitoba, Alberta, British Columbia; 1994-1998 average for Yukon, Northwest Territories, Nunavut

Note: Total of rounded numbers may not equal rounded total number, and an average is used for the territories. Counts exclude cases of non-melanoma skin cancer (ICD-9 173).

Source: Cancer Bureau, CCDPC, Health Canada

Table 4

Actual Age-Standardized Incidence Rates for Major Cancer Sites by Gender and Geographic Region, Most Recent Year,[1] Canada

	Rate per 100,000													
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**446**	**375**	**475**	**469**	**486**	**466**	**445**	**466**	**431**	**407**	**403**	**328**	**343**	**423**
Prostate	109	100	127	127	150	85	114	128	112	120	119	77	40	–
Lung	82	58	101	81	94	106	75	79	69	63	62	71	69	180
Colorectal	60	70	76	63	64	64	61	73	57	58	53	32	88	78
Bladder	24	5	21	33	13	34	21	18	28	10	17	–	–	–
Non-Hodgkin's Lymphoma	19	16	13	16	20	20	19	24	22	17	18	–	24	–
Oral	15	27	10	12	11	15	16	15	14	12	11	–	–	33
Kidney	15	15	17	19	12	15	15	15	15	12	12	–	–	–
Stomach	14	21	9	10	16	16	12	12	11	10	11	–	–	–
Leukemia	14	7	13	7	12	15	15	13	19	14	10	–	–	–
Melanoma	11	5	10	14	14	6	13	11	10	11	13	–	–	–
Pancreas	10	3	10	9	15	12	10	9	8	10	9	–	–	–
Brain	8	6	5	7	11	9	8	7	7	7	7	–	–	–
Larynx	7	8	9	8	7	10	6	6	6	5	5	–	–	–
Multiple Myeloma	6	6	4	6	7	7	6	6	5	5	5	–	–	–
Females														
All Cancers	**335**	**294**	**405**	**346**	**346**	**335**	**337**	**345**	**323**	**333**	**321**	**320**	**338**	**414**
Breast	98	86	137	104	102	98	98	104	100	99	102	94	83	–
Lung	42	26	51	51	49	44	40	47	35	40	43	46	62	199
Colorectal	40	52	62	48	49	41	41	43	36	37	36	–	58	–
Body of Uterus	19	17	16	18	20	16	20	21	17	23	18	–	–	–
Ovary	13	10	13	10	11	14	12	11	12	13	11	–	–	–
Non-Hodgkin's Lymphoma	13	11	9	9	15	14	13	15	14	13	14	–	–	–
Melanoma	10	8	18	12	12	5	11	9	11	12	10	–	–	–
Cervix	9	12	12	8	11	8	10	10	12	10	9	–	–	–
Pancreas	8	3	10	7	9	9	8	9	7	8	8	–	–	–
Thyroid	8	4	–	3	5	7	9	7	6	10	5	–	–	–
Kidney	8	7	11	8	10	8	8	7	7	8	5	–	–	–
Leukemia	8	4	10	6	5	8	9	10	8	8	6	–	–	–
Stomach	6	11	–	6	5	6	6	5	5	5	5	–	–	–
Bladder	6	2	–	10	4	8	6	4	9	3	5	–	–	–
Brain	6	4	6	6	5	7	6	5	4	5	4	–	–	–
Oral	5	4	12	5	3	4	6	6	4	6	5	–	–	–
Multiple Myeloma	3	2	5	3	4	4	4	3	4	3	3	–	–	–

– Age-standardized incidence rate is based on less than 5 cases per year

[1] 1996 for Canada, Quebec, Ontario; 1997 for Nova Scotia, Saskatchewan; 1998 for Newfoundland, Prince Edward Island, New Brunswick, Manitoba, Alberta, British Columbia; 1994-1998 average for Yukon, Northwest Territories, Nunavut

Note: Rates exclude non-melanoma skin cancer (ICD-9 173) and are adjusted to the age distribution of the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

Table 5

Actual Data for Deaths for Major Cancer Sites by Gender and Geographic Region, Canada, 1997[1]

	New Cases												
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**31,600**	**630**	**160**	**1,150**	**910**	**8,700**	**11,300**	**1,250**	**1,200**	**2,300**	**3,900**	**20**	**20**	**15**
Lung	9,700	210	45	360	320	3,200	3,200	340	280	620	1,150	5	5	5
Prostate	3,600	75	20	140	100	770	1,300	170	230	320	470	–	–	–
Colorectal	3,200	50	10	90	70	990	1,200	120	130	210	340	–	–	–
Pancreas	1,400	20	10	50	35	370	490	50	40	120	190	–	–	–
Stomach	1,250	45	5	45	30	390	420	45	45	80	130	–	–	–
Non-Hodgkin's Lymphoma	1,200	10	5	50	40	280	430	80	45	95	180	–	–	–
Leukemia	1,100	15	5	30	25	270	430	45	50	95	130	–	–	–
Bladder	960	15	5	40	25	230	350	45	50	60	140	–	–	–
Brain	820	20	–	20	20	240	270	30	30	65	120	–	–	–
Kidney	820	15	5	30	30	210	290	45	25	65	110	–	–	–
Oral	710	15	5	30	20	190	260	30	15	45	90	–	–	–
Multiple Myeloma	580	5	5	20	20	150	210	25	20	35	70	–	–	–
Melanoma	400	5	–	20	10	75	180	15	15	35	50	–	–	–
Larynx	390	5	–	20	15	160	110	10	10	15	45	–	–	–
Females														
All Cancers	**27,100**	**460**	**110**	**1,100**	**720**	**7,300**	**9,800**	**1,200**	**960**	**2,000**	**3,500**	**15**	**15**	**10**
Lung	5,7600	60	30	250	140	1,600	1,950	250	180	420	820	5	5	5
Breast	4,900	80	15	180	120	1,350	1,850	220	160	390	600	–	–	–
Colorectal	2,900	65	15	95	70	920	1,000	120	110	160	340	–	5	–
Pancreas	1,450	20	5	55	50	380	530	55	50	140	180	–	–	–
Ovary	1,350	25	5	45	25	330	520	55	65	95	200	–	–	–
Non-Hodgkin's Lymphoma	1,050	10	5	40	35	240	430	50	40	65	130	–	–	–
Leukemia	800	20	5	30	25	200	340	40	35	70	110	–	–	–
Stomach	740	30	–	25	15	240	230	30	30	55	85	–	–	–
Body of Uterus	630	5	–	25	20	210	210	25	15	45	75	–	–	–
Brain	630	15	–	35	15	190	200	20	25	55	75	–	–	–
Multiple Myeloma	480	10	–	15	15	130	160	15	20	50	55	–	–	–
Kidney	470	5	–	25	20	140	150	20	20	35	60	–	–	–
Cervix	420	10	–	20	5	90	160	15	15	35	55	–	–	–
Bladder	410	10	–	20	15	100	130	25	20	30	60	–	–	–
Oral	320	–	–	15	5	75	120	15	10	20	50	–	–	–
Melanoma	270	5	5	10	15	40	120	15	5	20	45	–	–	–

– Fewer than 5 cases

[1] 1993-1997 average for Yukon, Northwest Territories, Nunavut

Note: Total of rounded numbers may not equal rounded total number, and an average is used for the territories.

Source: Cancer Bureau, CCDPC, Health Canada

Table 6

Actual Age-Standardized Mortality Rates for Major Cancer Sites by Gender and Geographic Region, Canada, 1997[1]

	Rate per 100,000													
	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nu.
Males														
All Cancers	**230**	**256**	**237**	**254**	**251**	**267**	**220**	**219**	**209**	**203**	**204**	**257**	**212**	**356**
Lung	70	83	68	78	88	96	61	59	51	55	59	80	68	160
Prostate	28	35	31	32	30	27	28	29	38	31	26	–	–	–
Colorectal	23	20	18	19	19	31	23	21	23	19	18	–	–	–
Pancreas	10	8	12	11	9	11	9	9	7	11	10	–	–	–
Stomach	9	18	9	9	8	12	8	8	8	7	6	–	–	–
Non-Hodgkin's Lymphoma	9	4	6	10	11	8	8	14	8	8	9	–	–	–
Leukemia	8	5	7	7	7	8	8	8	9	8	7	–	–	–
Bladder	7	7	6	9	6	8	7	8	8	6	7	–	–	–
Brain	6	8	–	5	5	7	5	6	6	5	6	–	–	–
Kidney	6	6	9	7	8	6	6	8	4	5	5	–	–	–
Oral	5	5	8	6	6	6	5	5	3	4	4	–	–	–
Multiple Myeloma	4	3	9	5	6	4	4	4	4	3	4	–	–	–
Larynx	3	3	–	4	4	5	2	2	2	1	2	–	–	–
Melanoma	3	2	–	4	3	2	3	3	3	3	3	–	–	–
Females														
All Cancers	**149**	**152**	**126**	**178**	**151**	**158**	**142**	**158**	**138**	**145**	**144**	**188**	**204**	**253**
Lung	32	21	35	42	31	36	29	36	28	31	34	49	55	133
Breast	27	26	22	30	25	29	27	31	23	27	25	–	–	–
Colorectal	15	20	14	15	14	19	14	14	14	12	13	–	34	–
Pancreas	8	8	7	8	10	8	8	7	7	10	7	–	–	–
Ovary	8	9	3	8	6	7	8	7	9	7	8	–	–	–
Non-Hodgkin's Lymphoma	6	3	4	7	7	5	6	7	6	5	5	–	–	–
Leukemia	5	6	4	5	5	4	5	6	5	5	4	–	–	–
Stomach	4	9	–	3	3	5	3	3	4	4	3	–	–	–
Brain	4	5	–	6	3	4	3	3	4	4	3	–	–	–
Body of Uterus	3	2	–	4	4	4	3	3	2	3	3	–	–	–
Multiple Myeloma	3	3	–	3	3	3	2	2	3	4	2	–	–	–
Kidney	3	2	–	4	4	3	2	3	3	3	2	–	–	–
Oral	2	1	–	3	2	2	2	2	2	1	2	–	–	–
Cervix	2	3	–	4	1	2	3	3	3	2	2	–	–	–
Bladder	2	3	–	3	2	2	2	3	2	2	2	–	–	–
Melanoma	1	2	3	1	2	1	2	2	1	1	2	–	–	–

– Age-standardized mortality rate is based on less than 5 cases per year

[1] 1993-1997 average for Yukon, Northwest Territories, Nunavut

Note: Rates are adjusted to the age distribution of the 1991 Canadian population.

Source: Cancer Bureau, CCDPC, Health Canada

APPENDIX II: METHODS

Data Sources and Processing

The actual cancer incidence and mortality data used in this monograph were obtained from three sources: mortality data files (1950-1997),[21] the National Cancer Incidence Reporting System (NCIRS, 1969-1991),[1] and the Canadian Cancer Registry (CCR, 1992-1998).[1] The Health Statistics Division at Statistics Canada maintains all these databases.

Actual mortality data were available for all the provinces and territories for the period 1969 to 1997. By contrast, actual cancer incidence data at the Canadian level were available for the period 1969-1996. In addition, 1997 incidence data were available for all provinces except Ontario and Quebec. Data for Newfoundland, Prince Edward Island, New Brunswick, Manitoba, Alberta, British Columbia, the Yukon Territory, the Northwest Territories and Nunavut were available to 1998.

Records from each province were extracted and then classified by gender, age group and selected cancer sites as defined in the *Glossary*. Canada totals for selected sites were then determined as the sum of the 10 provinces and three territories.

Population figures for Canada, the provinces and the territories were taken from intercensal estimates for the period 1971 to 1995,[22-24] from postcensal estimates for the period 1996-1998,[24] and from the Scenario 2 population projections for 1999 and 2000.[25] The population estimates from 1971 to 1998 and the population projections include non-permanent residents as part of the population. In addition, adjustments are made for net census undercoverage and returning Canadians, and the reference date for the annual estimates is July 1 instead of June 1. The population projections incorporate assumptions of natural increase, immigration and internal migration, which closely reflect the Canadian reality. These assumptions are regularly updated to take into account the most recent changes.

Incidence and mortality estimates for 2001 were extrapolated from models that were fitted to a subset of the data described above. The data series were selected so that they begin in 1986 for both incidence and mortality. This allows consistency between the mortality and incidence estimates and ensures that the estimates accurately account for current trends. For mortality estimates, data from 1986 to 1997 were used. For incidence estimates, data from 1986 to the latest year of available data were used.

Actual incidence and mortality rates for each province/territory, gender, site and year were computed by dividing the number of cases by the corresponding provincial/territorial population figures. These rates were computed for the "under 45" and the "45 and over" age groups separately. In order to study the age distributions for all cancers and for the leading types of cancer (lung, colorectal, prostate and breast), age-specific rates were computed for the age groups 0-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80 years and over.

Age-standardized incidence and mortality rates for each site were calculated using the age distribution of the 1991 Canadian population. The World Standard Population[4] was used in publications prior to 1995. It was replaced because it is much younger than the 1991 Canadian population. Consequently, estimates of age-standardized rates prior to 1995 are not comparable with later estimates.

Commencing with the 2000 edition of *Canadian Cancer Statistics*, the Northwest Territories represents a different geographic area than in the past. Its geographic boundaries were redrawn, reducing the land area representing the Northwest Territories,

and a new territory named Nunavut was incorporated from these annexed lands.[26] Estimates for the area formerly representing the Northwest Territories were split by the proportion of cases/deaths for each of the new areas. The proportions were calculated using five years of data from each area.

For all cancers, even those with poor survival such as pancreas and lung, the annual number of incident cases is expected to be similar to or larger than the number of deaths. However, there are situations where the number of deaths either observed or projected is larger than the corresponding number of new cases. In the case of Newfoundland, this is caused by the Registry not receiving information on all death certificates with mention of cancer, which results in an underestimate of the number of cases for the years used to generate the estimates. The Newfoundland Registry is now receiving information in order to register these cases, so this difference will eventually disappear.

Incidence Estimates (New Cases) for 2001

The number of new cases was estimated for each age group, cancer site and gender by fitting Poisson regression models to the provincial and territorial yearly values. The assumption underlying Poisson regression is that the annual incidence counts are independent Poisson random variables with a mean equal to the product of the population size for a particular year and the (true) annual incidence rate. For each province and territory, age group, gender and site, a separate model for crude incidence rates was used, with year as the only independent variable. The estimates for 2001 were obtained by multiplying the extrapolated crude incidence rates with the demographic projections for the same year. Since longer data series for some provinces were available, estimates for Canada were computed as the sum of the estimates for the provinces and territories.

Occasionally, when the original data show large fluctuations, it has been impossible to obtain results of satisfactory precision from the model. For these exceptions, new cases for 2001 were estimated (after consultation with the provinces) by a five-year average of the most recent available data or by the estimate provided by the province: Prince Edward Island (male — prostate, female — lung); Nova Scotia (male — prostate, colorectal, bladder, melanoma, female — colorectal, bladder, melanoma); New Brunswick (male — prostate, non-Hodgkin's lymphoma, bladder, female — colorectal, body of uterus, ovary, pancreas, thyroid, kidney, stomach, bladder, leukemia); Quebec (male — prostate); Ontario (male — kidney, female — breast, ovary, thyroid); Manitoba (male — prostate, melanoma, female — lung, melanoma); Saskatchewan (male — prostate, female — colorectal); and British Columbia (male — prostate).

Again, prostate cancer presented a special challenge this year because there was evidence that the recent increase in incidence due to early detection would continue no longer. For those provinces that were able to provide actual incidence data up to 1998, these counts of new cases in most instances showed a rapid decline after having reached a peak in 1993. A linear model using the most recently available data going back to 1986 would not fit such data well or offer acceptable 2001 predictions. However, more reasonable predictions of 2001 incidence counts were obtained by fitting a linear model to data from 1980-1989. Actual data from 1990 were therefore considered to be a "blip" in an otherwise smooth trend, caused by an increase in the use of earlier detection and screening techniques. Incidence counts of prostate cancer in the United States, where a similar "blip" occurred earlier, showed that after the peak was reached the decline period lasted only a few years, and then the earlier trend continued.[7] A similar situation is therefore expected for Canada.

APPENDIX II: METHODS

The estimates of incidence counts for "all cancers" were computed as the sum of the estimated prostate cancer cases (using data from 1980-1989) plus the estimate of "all cancers less prostate" using the standard linear model (based on data from 1986 onwards).

Mortality Estimates (Deaths) for 2001

The number of deaths was estimated for each age group, site and gender using a method similar to that used for incidence. For each province and territory, a linear model was used for death rates, with year as the only independent variable. Mortality counts by cancer site for Canada were obtained from the estimates of the provincial and territorial counts.

In cases where the original data show large fluctuations, it has been impossible to obtain results of satisfactory precision from the model. For these exceptions, deaths for 2001 were estimated (after consultation with the provinces) by a five-year average of the most recent available data or the estimate provided by the province: New Brunswick (male — melanoma, stomach, female — lung, pancreas, non-Hodgkin's lymphoma, cervix, bladder); and Manitoba (male — kidney, female — lung, ovary)

Estimated Age-Standardized Incidence Rates (ASIRs) and Mortality Rates (ASMRs) for 2001

Incidence and mortality rates were generally estimated using weighted least squares regression, with **some exceptions as noted below**. Weights were taken as the inverse of the estimated variances of the actual age-standardized rates. Variances were calculated under the assumption that the age-specific counts used in the computation of the age-standardized rates follow independent Poisson distributions. Regressions were performed for Canada and each province or territory for each site and gender using a linear model, with year as the only independent variable.

Again, in cases where the original data show large fluctuations, it has been impossible to obtain from the model results of satisfactory precision. For these reasons, annual age-standardized mortality rates for 2001 were estimated by actual age-standardized mortality rates calculated over a five-year period for: Newfoundland (male — testis, female — thyroid); Prince Edward Island (female — bladder and stomach); Nova Scotia (male — Hodgkin's disease, female — Hodgkin's disease); New Brunswick (male — Hodgkin's disease, melanoma, stomach, female — lung, pancreas, non-Hodgkin's lymphoma, cervix, thyroid); Ontario (male — Hodgkin's disease); Manitoba (male — testis and Hodgkin's disease, female — Hodgkin's disease); and British Columbia (male — Hodgkin's disease). Similarly, annual age-standardized incidence rates for 2001 were estimated by actual age-standardized incidence rates calculated over a five-year period for: Newfoundland (male — bladder, female — bladder); Nova Scotia (male — colorectal, bladder, female — colorectal, bladder); New Brunswick (male — non-Hodgkin's lymphoma, Hodgkin's disease, bladder, female — colorectal, body of uterus, ovary, pancreas, thyroid, kidney, stomach, bladder, leukemia); Ontario (female — breast, ovary, thyroid); Manitoba (male — melanoma, female — lung, melanoma); and Alberta (male — bladder, female — bladder).

As was the case with incidence count estimates, prostate cancer was more difficult to estimate this year. For those provinces that were able to provide actual incidence data beyond 1996, most showed a strong decline in their age-standardized incidence rates after a peak was reached in 1993. A linear model in each province/territory using the

most recently available data going back to 1986 would not fit these data well or offer acceptable 2001 predictions. More satisfactory predictions, however, resulted from keeping a linear model fitted for each province/territory to the actual 1980-1989 data. This is similar to the methodology used to estimate prostate cancer incidence counts.

Accuracy and Precision of Estimates

The accuracy of an estimate relates to the question of bias: whether or not an estimate is targeting the value of interest. The precision of an estimate refers to the fact that any estimate has a certain variability to it; one cannot "know" an estimate exactly, and therefore the estimate serves only to provide insight into the real unknown value of interest.

The standard error and coefficient of variation, as well as the confidence interval, are calculated to evaluate the precision of each estimate. The standard error is an estimate of the extent to which an estimate will vary, while the coefficient of variation relates this variation to the actual size of the quantity being estimated. Confidence intervals use the standard error to create a range of plausible values for the quantity being estimated. These values are available upon request from the Centre for Chronic Disease Prevention and Control, Health Canada. Together, these quality measures assess the precision (or imprecision) of a particular estimate but not the accuracy of the estimate. Note that any estimates are subject to error, and the degree of precision depends primarily on the number of observed cases and population size for each site-gender-province combination, while the accuracy is related to the adequacy of the model used in the estimation process.

Because of changes and improvements in the cancer incidence data provided by the provinces, as well as changes in the population estimates and the methodology for producing the estimates of cancer incidence and deaths, estimates in the 2001 report may not be directly comparable with those published in previous years. More detailed information on these methods can be found in technical papers available from Statistics Canada.[27, 28]

Estimates of incidence and mortality have been rounded as follows: counts between 0 and 99 to the nearest 5, counts between 100 and 999 to the nearest 10, counts between 1000 and 1999 to the nearest 50 and counts greater or equal to 2000 to the nearest 100. Percentages, age-standardized and age-specific rates were rounded to the nearest tenth except in Tables 4 and 6, where space restrictions forced rounding to the nearest whole number. Age and gender specific counts/rates are combined prior to rounding, so it is possible that totals in the tables do not appear to add up. However, any of these discrepancies must be within the precision of the rounding units described above.

Average Annual Percent Change (AAPC) in Cancer Incidence and Mortality

The AAPC values were calculated for each site by fitting a model that assumed a constant rate of change in the ASIRs or ASMRs, that is, a linear model applied to the ASIRs and ASMRs after logarithmic transformation. The estimated slope resulting from that fit was then transformed back to represent a percentage increase or decrease. Data from 1989 to 1996 were used for incidence and from 1989 to 1997 for mortality. These series were long enough to create estimates of AAPCs that were both reliable and current.

Estimates of Non-Melanoma Skin Cancer for 2001 in Canada

The pathology laboratories in British Columbia send all diagnostic reports of non-melanoma skin cancer to the provincial registry. It is assumed that non-melanoma skin cancer is under-reported to some extent. The age- and gender-specific incidence rates in British Columbia for 1985-1994 (in 20-year age groups) have been projected to the current year and applied to the Canadian population estimates to generate a minimal estimate of the number of cases for Canada as a whole.

Probability of Developing/Dying from Cancer

Probabilities were calculated based on the age- and gender-specific cancer incidence and mortality rates for Canada in 1996, and life tables based on 1995-1997 all-cause mortality rates. The methodology used was that of Zdeb[29] and Seidman et al.[30] The life table procedures used assumed that the rate of cancer incidence for various age groups in a given chronological period will prevail throughout the future lifetime of a person as he/she advances in age. Since these may not be the rates that will prevail at the time a given age is attained, the probabilities should be regarded only as approximations of the actual ones.

The probability of dying from cancer represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large in 1997. The indicator was calculated by determining the proportion of deaths attributed to specific types of cancer for each gender and age group, multiplying this proportion by the corresponding number of deaths in the life table and summing the life table deaths over all gender and age groups to obtain the probability of dying from each cause.

The Total Number of New Cases or Deaths, Showing the Contribution of Change in Cancer Risk, Population Growth and Change in Population Age-Structure

Figures 2.3 and 2.4 display the determinants of increases in incidence and mortality for males and females respectively. All three series plotted on each graph refer to data from 1971 as the baseline. The upper most series is a plot of the annual Canadian cancer cases/deaths observed or projected. The next to upper most series is an estimate of the cancer events expected if the age distribution of the 1971 population were held constant through time. The next to baseline series is an estimate of the expected number of cases/deaths assuming a population constant in both magnitude and distribution from 1971 to the current year.

In preparation of a more rigorous presentation of how these series were computed, let $P_{i,t}$ represent the gender specific total population in Canada for year t, where i = M for males or i = F for females. That is, $P_{F,1971}$ represents the total 1971 Canadian female population. Next let $ASR_{i,t}$ denote the all cancers, gender specific, age-standardized incidence/mortality rate with reference population being the 1971 Canadian population of the gender corresponding to i, which is either i = M for males or i = F for females. For example, $ASR_{F,2001}$ is the age-standardized rate for Canadian females in the year 2001.

Upper most series: The annual number of Canadian cancer cases/deaths of gender i for a given year, t say.

Next to upper most: Total population for year t times the age-standardized rate for year t or, in symbols, $P_{i,t}ASR_{i,t}$.

Next to baseline: Total 1971 population times the age-standardized rate for year t or, in symbols, $P_{i,1971}ASR_{i,t}$.

Baseline: The observed number of Canadian cancer cases/deaths for gender i that occurred in 1971.

Potential Years of Life Lost (PYLL)

The indicator was calculated by obtaining deaths for ages <1, 1-4, 5-9, . . . 90+ for Canada in 1997, and life expectancy at the midpoints of the age groups. The PYLL is the total number of years of life lost obtained by multiplying, for each age group, the number of deaths by the life expectancy of survivors.[31]

Population Attributable Risk (PAR)

Population attributable risk (PAR) estimates used in the PYLL calculations were performed by combining mortality data, smoking prevalence and relative risk estimates by gender, age and disease. Smoking prevalence was estimated using Statistics Canada's General Social Survey,[32] while relative risk estimates were obtained using SAMMEC II.[33]

Smoking-attributable mortality (SAM) was calculated[34] for disease components with known elevated relative risks within the specific disease range. SAM was estimated as the product of the smoking-attributable fraction (SAF) and the number of deaths in each gender, age group, and disease component. SAF was calculated as follows:

$$SAF = ([P_0 + P_1 (RR_1) + P_2 (RR_2)] - 1) / [P_0 + P_i (RR_1) + P_2 (RR_2)] ,$$

where P_0 , P_1 and P_2 denote never, current and former smoking prevalence respectively, and RR_1 and RR_2 denote relative risk estimates for current and former smokers respectively. PAR was then calculated as the total SAM divided by the total number of deaths for each gender, age, and disease grouping.

REFERENCES

1. Gaudette LA, Lee J. *Cancer incidence in Canada, 1969-1993*. Ottawa: Health Statistics Division, Statistics Canada. Catalogue 82-566-XPB. Occasional, 1997.
2. Le ND, Marrett LD, Robson DL, Semenciw RM et al. *Canadian cancer incidence atlas*. Ottawa: Minister of Supply and Services Canada, 1995.
3. Chen VW, Howe H, Wu XC et al. (eds.). *Cancer in North America, 1993-1997. Volume one: incidence, volume two: mortality*. Sacramento, CA: North American Association of Central Cancer Registries, April 2000.
4. Parkin DM, Muir CS, Whelan SL, Gao Y et al. (eds.). *Cancer incidence in five continents. Volume VII*. Lyon: IARC Scientific Publication No. 143, International Agency for Research on Cancer, 1997.
5. Levy IG, Gibbons L, Collins JP. *Prostate cancer trends in Canada: rising incidence or increased detection?* Can Med Assoc J 1993;149:617-24.
6. Levy I. *Prostate cancer: the epidemiologic perspective*. In: Fradet Y, Meyer F (eds.). *Canadian Workshop on Screening for Prostate Cancer proceedings, March 24-27; Québec City*. Can J Oncology 1994;(4 Suppl 1):4-7.
7. Wingo PA, Landis S, Ries LAG. *An adjustment to the 1997 estimate for new prostate cancer cases*. Cancer 1997;47:239-42.
8. Canadian Task Force on the Periodic Health Examination. *Periodic health examination, 1991 update: 3. Secondary prevention of prostate cancer*. Can Med Assoc J 1991;145(5):413-28.
9. Gaudette LA, Gao RN, Wysockei M et al. *Update on breast cancer mortality, 1995*. Health Reports 1997;9(1):31-4.
10. MacKay EN, Sellers AH. *A statistical survey of leukemia in Ontario and the Ontario Cancer Foundation clinics, 1938-1958*. Can Med Assoc J 1967;96:1626-35.
11. Ries LAG, Smith MA, Gurney JG et al. (eds.). *Cancer incidence and survival among children and adolescents: United States SEER Program 1975-1995*. Bethesda, MD: National Cancer Institute, SEER Program. NIH Pub. No. 99-4649, 1999.
12. Gibbons L, Waters C, Mao Y et al. *Trends in colorectal cancer incidence and mortality*. Health Reports 2001;12(2):41-55.
13. Troisi RJ, Freedman AN, Devesa SS. *Incidence of colorectal carcinoma in the US – an update of trends by gender, race, age, subsite and stage – 1975-1994*. Cancer 1999;85:1670-6.
14. De Cosse JJ, Ngoi SS, Jacobsen JS et al. *Gender and colorectal cancer*. Eur J Cancer Prev 1993;2:105-15.
15. Bufill J. *Colorectal cancer: evidence for distinct genetic categories based on proximal or distal tumour location*. Ann Med 1990;113:779-88.
16. Reddy BS, HIrose Y, Lubet R et al. *Chemoprevention of colon cancer by specific Cyclooxygenase-2 Inhibitor, Celecoxib, administered during different stages of carcinogenesis*. Cancer Res 2000;60:293-97.

REFERENCES

17. Towler B, Irwig L, Gasziou P et al. *A systematic review of the effects of screening for colorectal cancer using the fecal occult blood test, hemoccult.* BMJ 1998;317:559-65.

18. Gilbertson V. *Proctosigmoidoscopy and polypectomy in reducing the incidence of rectal cancer.* Cancer 1984;34:936-9.

19. Newcomb P, Norfleet R, Storer B et al. *Screening sigmoidoscopy and colorectal cancer mortality.* J Natl Cancer Inst. 1992;84:1572-5.

20. World Health Organization. *International classification of diseases.* 1975 revision. Volumes 1 and 2, Geneva, 1977.

21. Statistics Canada. *Causes of death.* Ottawa: Health Statistics Division, Catalogue 84F208XPB, 1999.

22. Statistics Canada. *Revised annual estimates of population by sex and age group, Canada and the provinces, 1921-1971.* Ottawa: Demography Division, Catalogue 91-512, Occasional, 1973.

23. Statistics Canada. *Revised intercensal population and family estimates, July 1, 1971-1991.* Ottawa: Demography Division, Catalogue 91-537, Occasional, 1994.

24. Statistics Canada. *Annual demographic statistics.* Demography Division, Catalogue 91-213-XPB, Annual, 1999.

25. Statistics Canada. *CANSIM Matrix 6900.* Ottawa, 1999.

26. Statistics Canada. *Standard geographical classification (SGC) Supplement – Nunavut.* Ottawa: Geography Division, 1997.

27. Morin C. *Rapport méthodologique: Estimation de l'incidence du cancer et des décès causés par le cancer pour les années 1990 et 1991 au Canada.* Ottawa: Social Survey Methods Division, Statistics Canada, 1993.

28. Atwell K. *Methodology report: the production of cancer mortality and incidence estimates for Canada.* Ottawa: Social Survey Methods Division, Statistics Canada, 1992.

29. Zdeb MS. *The probability of developing cancer.* Am J Epidemiol 1977;106:6-16.

30. Seidman H, Silverberg BS, Bodden A. *Probabilities of eventually developing and dying of cancer. Risk among persons previously undiagnosed with cancer.* CA - A Cancer Journal for Clinicians 1978;28:33-46.

31. Peron Y, Stromenger C. *Demographic and health indicators.* Ottawa: Statistics Canada, Catalogue 82-543E, 1985:182-189, 155-157.

32. Statistics Canada. *General Social Survey, Cycle 11*, 1996. Ottawa, 1996.

33. Shultz JM, Novotony TE, Rice DP. *Quantifying the disease impact of cigarette smoking with Sammec II software.* Public Health Rep 1991;106(3):326-33.

34. Illing EM, Kaiserman MJ. *Mortality attributable to tobacco use in Canada and its regions, 1991.* Can J Public Health 1995;86(4):257-65.

Questions About Cancer?

Call the Canadian Cancer Society's
Cancer Information Service

1-888-939-3333

Monday to Friday: 9 a.m. to 6 p.m.

Distributed by:

Canadian Cancer Society
Société canadienne du cancer

111-142