- Incidence and Mortality
- Person years of life lost
- Survival rates
- Tobacco and Lung Cancer

# Canadian Cancer Statistics 1988

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## Acknowledgments

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# INTRODUCTION

This is the second of the new annual series of monographs on Canadian Cancer Statistics, produced jointly by the Canadian Cancer Society and Statistics Canada. The first in the series was well received, and the steering committee has attempted to respond to several suggestions for improving the publication. Further comments and suggestions would be welcomed.

The overall objective of the series is to provide health professionals and others having an interest in cancer, with a current overview of the incidence of, and mortality from the commoner types of cancer. Trends in the reported numbers of new cases of cancer and cancer deaths are shown, from 1970 up to the latest year for which complete statistics are available (Figures 2-6). Based on the trends for the corresponding incidence and mortality rates, estimates of the rates for 1988 have been made, and these have been applied to the current population estimates to produce estimated numbers of new cases and deaths (Figure 1, Tables 1-3). The statistical methods used to make these short term projections are described in the appendix.

More detailed listings of the most recent information on the actual numbers of new cases and deaths are given in Tables 4 and 5. It is not practical to produce estimates for the less common sites. This year we have added some statistics on the age distribution of cancer cases and deaths (Figure 8) and of the types of cancer which afflict children (Table 7). The charts of the probability of surviving five years from diagnosis, and of the probability of developing particular forms of cancer have been updated (Figures 7.1, 7.2, and 11).

Further additions to last year's publication compare cancer with other causes of death in Canada (Figure 9), show the trends in the person years of life lost from cancer (Figure 10), and compare Canadian cancer mortality with that in other countries (Table 9, Figures 14.1 and 14.2). Finally, the "pièce de résistance", Figure 12 shows the historical correlation between lung cancer mortality and tobacco consumption.

## CURRENT INCIDENCE AND MORTALITY

It is estimated that close to a hundred thousand new cases of cancer will be diagnosed in 1988, and just over half that number of patients will die from the disease. These are underestimates since cancers of the skin, other than melanoma, are excluded from the estimates for technical reasons. Since the skin is the organ most frequently affected by cancer among Canadians, the number of new cases including skin cancer would be much larger, probably closer to 120,000. However the effect on cancer mortality estimates would be less marked since almost all patients with non-melanoma skin cancer are cured.

About half the new cases and deaths are accounted for by the three most frequent sites. In males, these are lung, prostate and colorectal. In females breast, lung and colorectal cancer account for over half the deaths, and this is true also for new cases if uterine cancer is separated into cervix uteri and corpus uteri, which are really two different diseases.

The ratio of deaths to new cases is a rough measure of how lethal the tumour is. Among the cancer sites listed Table 1, three (melanoma, uterus and bladder) have a deaths/cases ratio below 30 per cent, and three (pancreas, lung and brain) have a ratio 70 per cent or over. For all cancers combined the ratio is 53 per cent. A high ratio indicates that treatment is ineffective and the only hope of controlling the disease is by preventing it. Looking at sites with a high ratio of deaths to cases, the majority of lung cancers could be avoided if tobacco smoking were eliminated, and this might also reduce the incidence of pancreatic cancer. Unfortunately we do not yet know enough about cancer of the brain to be able to prevent it.

Tables 2 and 3 show the estimated numbers of cancer deaths by sex and province. To compare cancer risks, allowance must be made for differences in the size and age structure of the population, and rates so adjusted are also given in these tables.

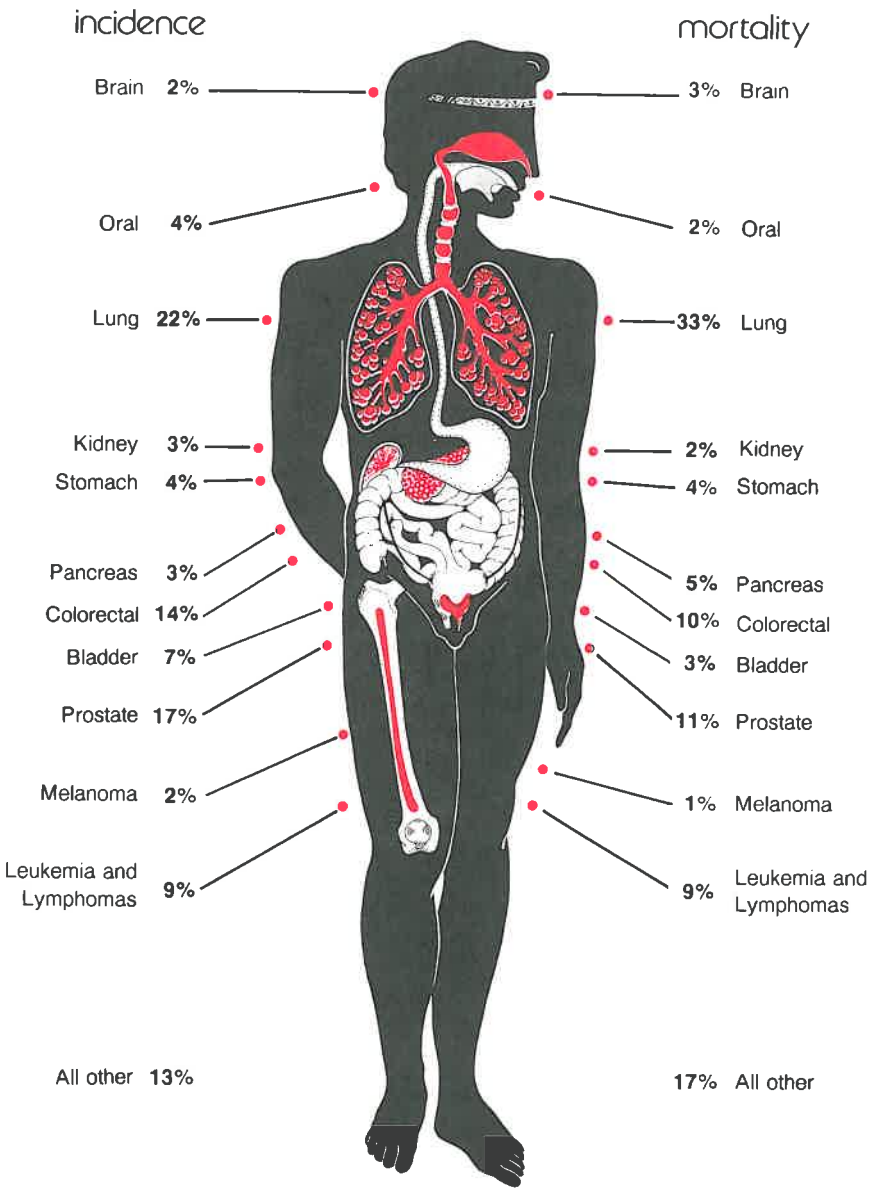
**TABLE 1. Estimated New Cases and Deaths for Major Sites of Cancer, Canada, 1988**

| Site | Number of new cases in 1988 | | | Number of deaths in 1988 | | |
|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female |
| **All cancers**[1] | **96,300** | **50,600** | **45,700** | **50,800** | **28,000** | **22,800** |
| Oral | 2,670 | 1,900 | 770 | 950 | 680 | 270 |
| Stomach | 3,000 | 1,900 | 1,100 | 1,950 | 1,200 | 750 |
| Colorectal | 14,000 | 7,100 | 6,900 | 5,700 | 2,900 | 2,800 |
| Pancreas | 2,700 | 1,400 | 1,300 | 2,600 | 1,400 | 1,200 |
| Lung | 15,400 | 11,200 | 4,200 | 13,400 | 9,300 | 4,100 |
| Melanoma | 2,200 | 1,000 | 1,200 | 500 | 290 | 210 |
| Prostate | 8,400 | 8,400 | ... | 3,000 | 3,000 | ... |
| Breast | 11,500 | .. | 11,500 | 4,600 | .. | 4,600 |
| Uterine | 4,300 | ... | 4,300 | 890 | ... | 890 |
| Ovary | 1,900 | ... | 1,900 | 1,200 | ... | 1,200 |
| Bladder | 4,700 | 3,500 | 1,200 | 1,080 | 760 | 320 |
| Kidney | 2,190 | 1,400 | 790 | 1,000 | 620 | 380 |
| Brain | 1,850 | 1,000 | 850 | 1,300 | 720 | 580 |
| Lymphoma | 5,600 | 3,000 | 2,600 | 2,600 | 1,400 | 1,200 |
| Leukemia | 3,000 | 1,700 | 1,300 | 1,770 | 1,000 | 770 |
| All other sites[1] | 12,890 | 7,100 | 5,790 | 8,260 | 4,730 | 3,530 |

[1] Excludes non–melanoma skin cancer .
**Source:** Health Division, Statistics Canada.
.. figures not available.
... figures not applicable.

Figure 1.1

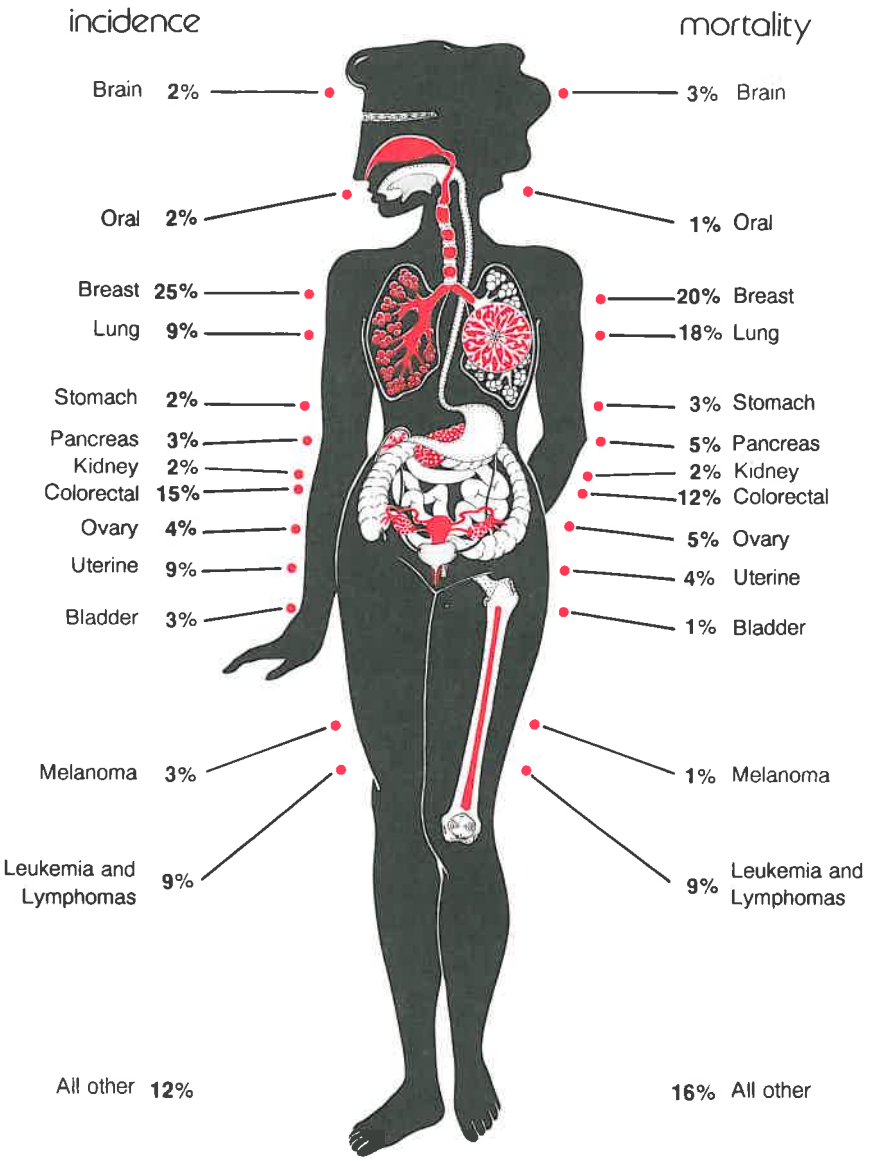
**Per cent Distribution of Cancers by Site,(1) Males, Canada, 1988**




(1) Excluding non-melanoma skin cancer and carcinoma in situ

Figure 1.2

**Per cent Distribution of Cancers by Site,(1) Females, Canada, 1988**




(1) Excluding non-melanoma skin cancer and carcinoma in situ

**TABLE 2. Estimated[1] Deaths and Age-standardized Mortality Rates for Major Sites of Cancer for Males, Canada and Provinces, 1988**

| | All cancers[2] | Oral | Stomach | Colorectal | Pancreas | Lung | Melanoma of skin | Prostate | Bladder | Kidney | Brain | Lymphoma | Leukemia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Estimated Deaths: Males** | | | | | | | | | | | | |
| **Canada[3]** | **28,000** | **680** | **1,200** | **2,900** | **1,400** | **9,300** | **290** | **3,000** | **760** | **620** | **720** | **1,400** | **1,000** |
| Nfld. | 550 | 10 | 50 | 60 | 30 | 170 | 5 | 50 | 15 | 10 | 15 | 20 | 15 |
| P.E.I. | 170 | -- | 5 | 10 | 10 | 50 | -- | 20 | -- | -- | -- | 10 | 5 |
| N.S. | 1,100 | 20 | 40 | 90 | 45 | 380 | 10 | 120 | 30 | 25 | 20 | 50 | 35 |
| N.B. | 820 | 15 | 45 | 90 | 45 | 290 | -- | 80 | 25 | 25 | 20 | 40 | 25 |
| Qué. | 7,700 | 190 | 350 | 760 | 390 | 2,900 | 60 | 740 | 190 | 150 | 200 | 330 | 260 |
| Ont. | 10,200 | 270 | 400 | 1,100 | 480 | 3,300 | 130 | 1,000 | 300 | 230 | 270 | 510 | 380 |
| Man. | 1,300 | 30 | 60 | 150 | 60 | 420 | 10 | 150 | 40 | 30 | 25 | 70 | 50 |
| Sask. | 1,200 | 25 | 60 | 120 | 60 | 350 | 10 | 180 | 25 | 30 | 30 | 60 | 50 |
| Alta. | 1,700 | 35 | 70 | 160 | 90 | 500 | 25 | 200 | 40 | 45 | 50 | 110 | 80 |
| B.C. | 3,300 | 80 | 140 | 320 | 170 | 1,000 | 40 | 400 | 100 | 70 | 100 | 150 | 110 |
| | **Estimated Age-standardized Mortality Rates per 100,000 populations: Males** | | | | | | | | | | | | |
| **Canada** | **170** | **5** | **7** | **18** | **9** | **60** | **2** | **16** | **5** | **4** | **5** | **9** | **7** |
| Nfld. | 164 | 3 | 14 | 18 | 9 | 56 | 2 | 13 | 4 | 3 | 4 | 6 | 4 |
| P.E.I. | 172 | 5 | 6 | 14 | 11 | 62 | 2 | 18 | 4 | 5 | 3 | 11 | 6 |
| N.S. | 182 | 4 | 7 | 15 | 7 | 68 | 2 | 17 | 5 | 4 | 4 | 9 | 7 |
| N.B. | 178 | 3 | 9 | 19 | 9 | 66 | 1 | 17 | 5 | 6 | 5 | 9 | 6 |
| Qué. | 194 | 5 | 8 | 20 | 10 | 77 | 2 | 16 | 5 | 4 | 5 | 9 | 7 |
| Ont. | 166 | 5 | 7 | 19 | 8 | 57 | 2 | 15 | 5 | 4 | 5 | 9 | 7 |
| Man. | 164 | 4 | 7 | 19 | 9 | 55 | 2 | 16 | 5 | 4 | 4 | 9 | 6 |
| Sask. | 150 | 3 | 7 | 15 | 7 | 46 | 2 | 19 | 3 | 4 | 5 | 9 | 7 |
| Alta. | 149 | 4 | 7 | 15 | 8 | 45 | 2 | 16 | 4 | 4 | 4 | 10 | 7 |
| B.C. | 151 | 4 | 6 | 15 | 8 | 48 | 2 | 16 | 4 | 4 | 5 | 7 | 6 |

1 Due to improvements in methods used to produce estimates of deaths and rates for 1988, figures for 1987 and 1988 may not be comparable.
2 Excludes non-melanoma skin cancer.
3 Columns may not add due to rounding.
-- Less than 5 cases.
**Source:** Health Division, Statistics Canada.

## TABLE 3. Estimated[1] Deaths and Age-standardized Mortality Rates for Major Sites of Cancer for Females, Canada and Provinces, 1988

| | All cancers[2] | Oral | Stomach | Colo-rectal | Pan-creas | Lung | Melanoma of skin | Breast | Uterine | Ovary | Bladder | Kidney | Brain | Lym-phoma | Leuk-emia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Estimated Deaths: Females** | | | | | | | | | | | | | | |
| **Canada[3]** | **22,800** | **270** | **750** | **2,800** | **1,200** | **4,100** | **210** | **4,600** | **890** | **1,200** | **320** | **380** | **580** | **1,200** | **770** |
| Nfld. | 390 | 5 | 20 | 60 | 20 | 40 | 5 | 80 | 20 | 15 | 5 | 10 | 10 | 15 | 15 |
| P.E.I. | 130 | -- | -- | 10 | 10 | 15 | -- | 25 | 5 | 5 | -- | -- | -- | 5 | -- |
| N.S. | 890 | 10 | 30 | 100 | 50 | 170 | 10 | 180 | 30 | 45 | 15 | 15 | 15 | 45 | 30 |
| N.B. | 600 | 5 | 25 | 80 | 30 | 100 | -- | 120 | 25 | 20 | 10 | 10 | 15 | 30 | 20 |
| Qué. | 5,900 | 60 | 200 | 760 | 320 | 970 | 40 | 1,200 | 210 | 280 | 90 | 100 | 160 | 300 | 200 |
| Ont. | 8,800 | 110 | 270 | 1,100 | 450 | 1,600 | 80 | 1,800 | 370 | 460 | 130 | 150 | 230 | 450 | 300 |
| Man. | 1,100 | 15 | 40 | 130 | 70 | 190 | 10 | 230 | 50 | 50 | 10 | 20 | 20 | 60 | 30 |
| Sask. | 860 | 10 | 25 | 120 | 50 | 140 | 10 | 160 | 30 | 60 | 10 | 15 | 25 | 45 | 30 |
| Alta. | 1,400 | 15 | 50 | 150 | 90 | 240 | 20 | 270 | 60 | 70 | 15 | 20 | 35 | 80 | 50 |
| B.C. | 2,800 | 30 | 80 | 300 | 150 | 590 | 30 | 500 | 90 | 150 | 35 | 40 | 60 | 140 | 80 |
| | **Estimated Age-standardized Mortality Rates per 100,000 population: Females** | | | | | | | | | | | | | | |
| **Canada** | **108** | **1** | **3** | **12** | **6** | **20** | **1** | **23** | **4** | **6** | **1** | **2** | **4** | **6** | **4** |
| Nfld. | 102 | 1 | 5 | 15 | 6 | 11 | 2 | 19 | 6 | 4 | 1 | 3 | 4 | 5 | 4 |
| P.E.I. | 109 | 3 | 2 | 7 | 7 | 18 | -- | 25 | 6 | 7 | -- | 1 | 4 | 5 | 3 |
| N.S. | 119 | 2 | 4 | 12 | 7 | 22 | 1 | 26 | 4 | 7 | 1 | 2 | 2 | 6 | 4 |
| N.B. | 104 | 1 | 3 | 12 | 5 | 18 | 1 | 24 | 4 | 4 | 2 | 2 | 3 | 5 | 4 |
| Qué. | 106 | 1 | 3 | 14 | 6 | 18 | 1 | 23 | 3 | 6 | 1 | 2 | 4 | 6 | 4 |
| Ont. | 112 | 2 | 3 | 13 | 5 | 21 | 1 | 25 | 5 | 7 | 1 | 2 | 4 | 6 | 4 |
| Man. | 108 | 2 | 3 | 12 | 6 | 19 | 1 | 23 | 5 | 6 | 1 | 2 | 3 | 7 | 3 |
| Sask. | 99 | 1 | 3 | 12 | 5 | 16 | 1 | 20 | 4 | 7 | 1 | 2 | 4 | 5 | 3 |
| Alta. | 103 | 1 | 3 | 11 | 6 | 17 | 2 | 23 | 4 | 5 | 1 | 2 | 3 | 6 | 4 |
| B.C. | 105 | 1 | 3 | 10 | 6 | 22 | 1 | 22 | 4 | 6 | 1 | 1 | 3 | 5 | 3 |

1 Due to improvements in methods used to produce estimates of deaths and rates for 1988, figures for 1987 and 1988 may not be comparable.
2 Excludes non-melanoma skin cancer.
3 Columns may not add due to rounding.
-- Less than 5 cases, or rate less than 0.5.
**Source:** Health Division, Statistics Canada.

## TABLE 4. Actual New Cases by Cancer Site and Sex, Canada[1], 1983

| Site | ICD-9[2] | Total | Male | Female |
|---|---|---|---|---|
| **All cancer sites[3]** | **140-208** | **85,274** | **44,229** | **41,045** |
| **Oral (Buccal cavity and pharynx)** | **140-149** | **2,697** | **1,971** | **726** |
| Lip | 140 | 748 | 641 | 107 |
| Tongue | 141 | 425 | 299 | 126 |
| Salivary gland | 142 | 209 | 124 | 85 |
| Floor of the mouth | 144 | 230 | 159 | 71 |
| Pharynx | 146,147,148 | 598 | 436 | 162 |
| Other and unspecified buccal cavity | 143,145,149 | 487 | 312 | 175 |
| **Digestive organs** | **150-159** | **20,588** | **11,020** | **9,568** |
| Esophagus | 150 | 813 | 580 | 233 |
| Stomach | 151 | 3,038 | 1,953 | 1,085 |
| Small intestine | 152 | 227 | 120 | 107 |
| Large intestine | 153 | 8,264 | 3,894 | 4,370 |
| Rectum | 154 | 4,084 | 2,267 | 1,817 |
| Liver and biliary passages | 155,156 | 1,248 | 617 | 631 |
| Pancreas | 157 | 2,389 | 1,306 | 1,083 |
| Other and unspecified digestive | 158,159 | 525 | 283 | 242 |
| **Respiratory system** | **160-165** | **14,450** | **10,747** | **3,703** |
| Larynx | 161 | 1,116 | 958 | 158 |
| Lung | 162 | 12,895 | 9,491 | 3,404 |
| Other and unspecified respiratory | 160,163, 164,165 | 439 | 298 | 141 |
| **Bone tissue and skin[3]** | **170-172** | **2,688** | **1,310** | **1,378** |
| Bone | 170 | 308 | 174 | 134 |
| Connective tissue | 171 | 612 | 341 | 271 |
| Skin (melanoma) | 172 | 1,768 | 795 | 973 |
| **Breast** | **174,175** | **10,885** | **84** | **10,801** |
| **Genital organs** | **179-187** | **14,180** | **7,731** | **6,449** |
| Cervix uteri | 180 | 1,607 | ... | 1,607 |
| Body of uterus | 182 | 2,556 | ... | 2,556 |
| Ovary | 183 | 1,773 | ... | 1,773 |
| Prostate | 185 | 7,142 | 7,142 | ... |
| Other and unspecified genitals | 179,181,184, 186,187 | 1,102 | 589 | 513 |
| **Urinary organs** | **188-189** | **6,017** | **4,237** | **1,780** |
| Bladder | 188 | 4,026 | 2,989 | 1,037 |
| Kidney and other urinary | 189 | 1,991 | 1,248 | 743 |
| **Eye** | **190** | **201** | **102** | **99** |
| **Brain and central nervous system** | **191-192** | **1,624** | **915** | **709** |
| **Endocrine glands** | **193-194** | **945** | **294** | **651** |
| Thyroid | 193 | 819 | 232 | 587 |
| Other endocrine | 194 | 126 | 62 | 64 |
| **Leukemia** | **204-208** | **2,656** | **1,485** | **1,171** |
| **Other blood and lymph tissues** | **200-203** | **4,765** | **2,568** | **2,197** |
| Hodgkins disease | 201 | 732 | 445 | 287 |
| Multiple myeloma | 203 | 1,068 | 576 | 492 |
| Other lymphomas | 200-202 | 2,965 | 1,547 | 1,418 |
| **All other and unspecified sites** | **195-199** | **3,578** | **1,765** | **1,813** |

1 Canada totals exclude data from Yukon and Northwest Territories.
2 ICD-9 refers to the ninth revision of the International Classification of Diseases.
3 Excludes non-melanoma skin cancer (ICD-9 = 173).
... figures not appropriate or not applicable.
**Source:** Cancer in Canada, 1983. Statistics Canada, Catalogue 82-207.

## TABLE 5. Actual Deaths by Cancer Site and Sex, Canada[1], 1986

| Site | ICD-9[2] | Total | Male | Female |
|---|---|---|---|---|
| **All cancer sites[3]** | **140-208** | **47,243** | **26,053** | **21,190** |
| **Buccal cavity and pharynx (oral)** | **140-149** | **954** | **692** | **262** |
| Lip | 140 | 30 | 29 | 1 |
| Tongue | 141 | 233 | 164 | 69 |
| Salivary gland | 142 | 66 | 38 | 28 |
| Floor of the mouth | 144 | 52 | 41 | 11 |
| Pharynx | 146,147,148 | 266 | 213 | 53 |
| Other and unspecified buccal cavity | 143,145,149 | 307 | 207 | 100 |
| **Digestive organs** | **150-159** | **13,842** | **7,426** | **6,416** |
| Esophagus | 150 | 869 | 603 | 266 |
| Stomach | 151 | 2,206 | 1,351 | 855 |
| Small intestine | 152 | 107 | 57 | 50 |
| Large intestine | 153 | 4,196 | 2,034 | 2,162 |
| Rectum | 154 | 1,382 | 782 | 600 |
| Liver and biliary passages | 155,156 | 1,295 | 661 | 634 |
| Pancreas | 157 | 2,534 | 1,352 | 1,182 |
| Other and unspecified digestive | 158,159 | 1,253 | 586 | 667 |
| **Respiratory system** | **160-165** | **12,440** | **9,038** | **3,402** |
| Larynx | 161 | 455 | 378 | 77 |
| Lung | 162 | 11,812 | 8,543 | 3,269 |
| Other and unspecified respiratory | 160,163, 164, 165 | 173 | 117 | 56 |
| **Bone tissue and skin[3]** | **170-172** | **791** | **457** | **334** |
| Bone | 170 | 158 | 99 | 59 |
| Connective tissue | 171 | 207 | 104 | 103 |
| Skin (melanoma) | 172 | 426 | 254 | 172 |
| **Breast** | **174,175** | **4,358** | **27** | **4,331** |
| **Genital organs** | **179-187** | **4,996** | **2,815** | **2,181** |
| Cervix uteri | 180 | 427 | - | 427 |
| Corpus, endometrium | 182 | 331 | - | 331 |
| Ovary | 183 | 1,122 | - | 1,122 |
| Prostate | 185 | 2,742 | 2,742 | - |
| Other and unspecified genitals | 179,181,184, 186,187 | 374 | 73 | 301 |
| **Urinary organs** | **188-189** | **1,985** | **1,314** | **671** |
| Bladder | 188 | 1,003 | 710 | 293 |
| Kidney and other urinary | 189 | 982 | 604 | 378 |
| **Eye** | **190** | **57** | **27** | **30** |
| **Brain and central nervous system** | **191-192** | **1,204** | **683** | **521** |
| **Endocrine glands** | **193-194** | **183** | **83** | **100** |
| Thyroid | 193 | 104 | 40 | 64 |
| Other endocrine | 194 | 79 | 43 | 36 |
| **Leukemia** | **204-208** | **1,698** | **980** | **718** |
| **Other blood and lymph tissues** | **200-203** | **2,540** | **1,386** | **1,154** |
| Hodgkins disease | 201 | 190 | 117 | 73 |
| Multiple myeloma | 203 | 824 | 442 | 382 |
| Other lymphomas | 200-202 | 1,526 | 827 | 699 |
| **All other and unspecified sites** | **195-199** | **2,195** | **1,125** | **1,070** |

1 Canada totals exclude data from Yukon and Northwest Territories.
2 ICD-9 refers to the ninth revision of the International Classification of Diseases.
3 Excludes non-melanoma skin cancer (ICD-9 = 173).
... figures not appropriate or not applicable.
**Source:** Causes of Death. Vital Statistics Volume IV. Statistics Canada Catalogue 84-203.

## TRENDS IN INCIDENCE AND MORTALITY

Figures 2-6 show the trends in the incidence of, and mortality from the major types of cancer since 1970. The rates for each sex have been adjusted for changes in the age distribution of the population over time. The graphs speak for themselves but, when comparing the magnitudes of the trends for the different types of cancer, the percentage increase per year is a useful summary index (Table 6).

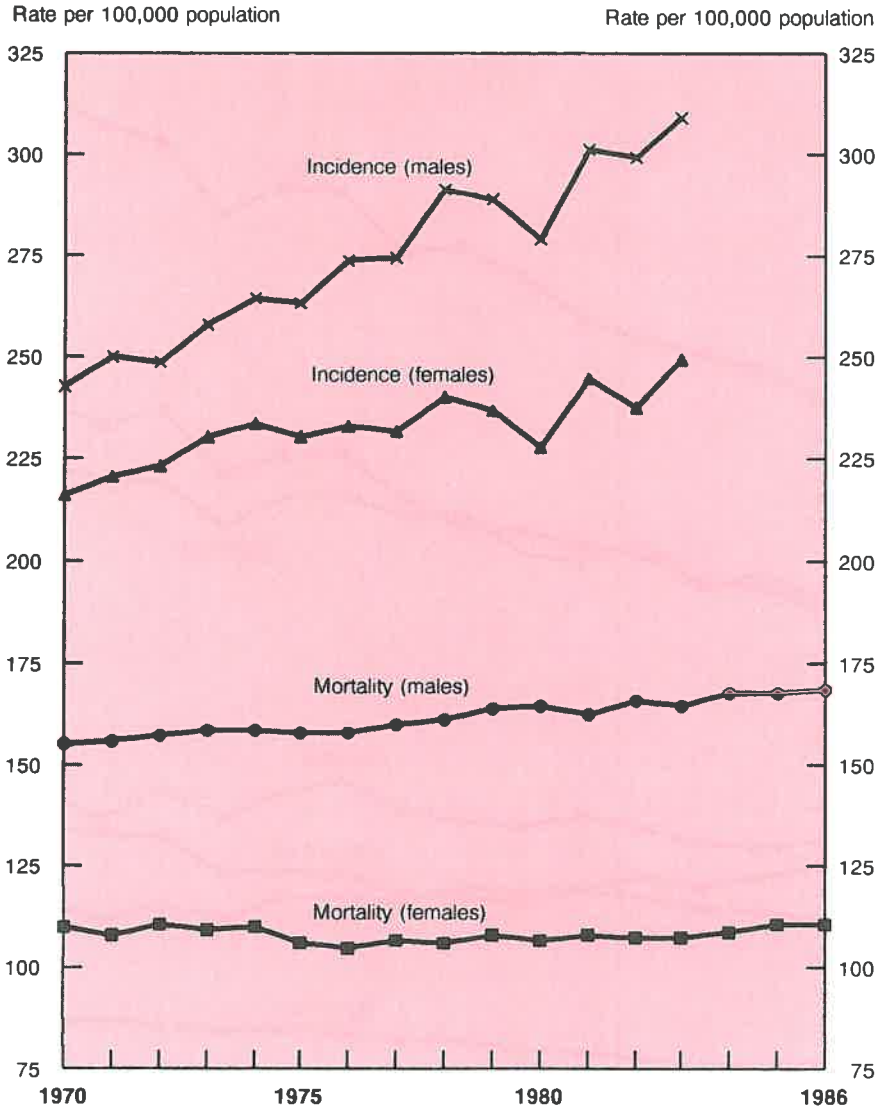
Where both incidence and mortality are increasing (lung, melanoma) or decreasing (stomach, cervix uteri) we can be fairly sure that the trends are due to changes in true incidence. In some cases (stomach, melanoma) the difference in the rates of change between incidence and mortality could be due to improved survival, though better reporting, or a tendency to classify less malignant cases as cancer might also be the explanation. The latter is probably the reason for the apparent increase in incidence with little or no change in mortality (prostate and colorectal in males, lymphoma, leukemia).

A decrease in mortality with little change in incidence is probably due to improved survival (colorectal in females, corpus uteri, ovary). In the case of bladder cancer incidence appears to be increasing and mortality falling, possibly a combination of a true increase in incidence, better reporting and an improvement in survival.

The overall risk of cancer changes very little over the decades, especially among women. In the past this was thought to support a deterministic hypothesis of cancer etiology. This is no longer the accepted view. It is thought that the constancy of risk over time can be explained by an "averaging out" of the various risk factors.

**Figure 2**

**Age-standardized Incidence and Mortality Rates (1,2,3) for All Cancers by Sex, Canada, 1970-1986**




(1) Rates are adjusted to the age distribution of the world population.

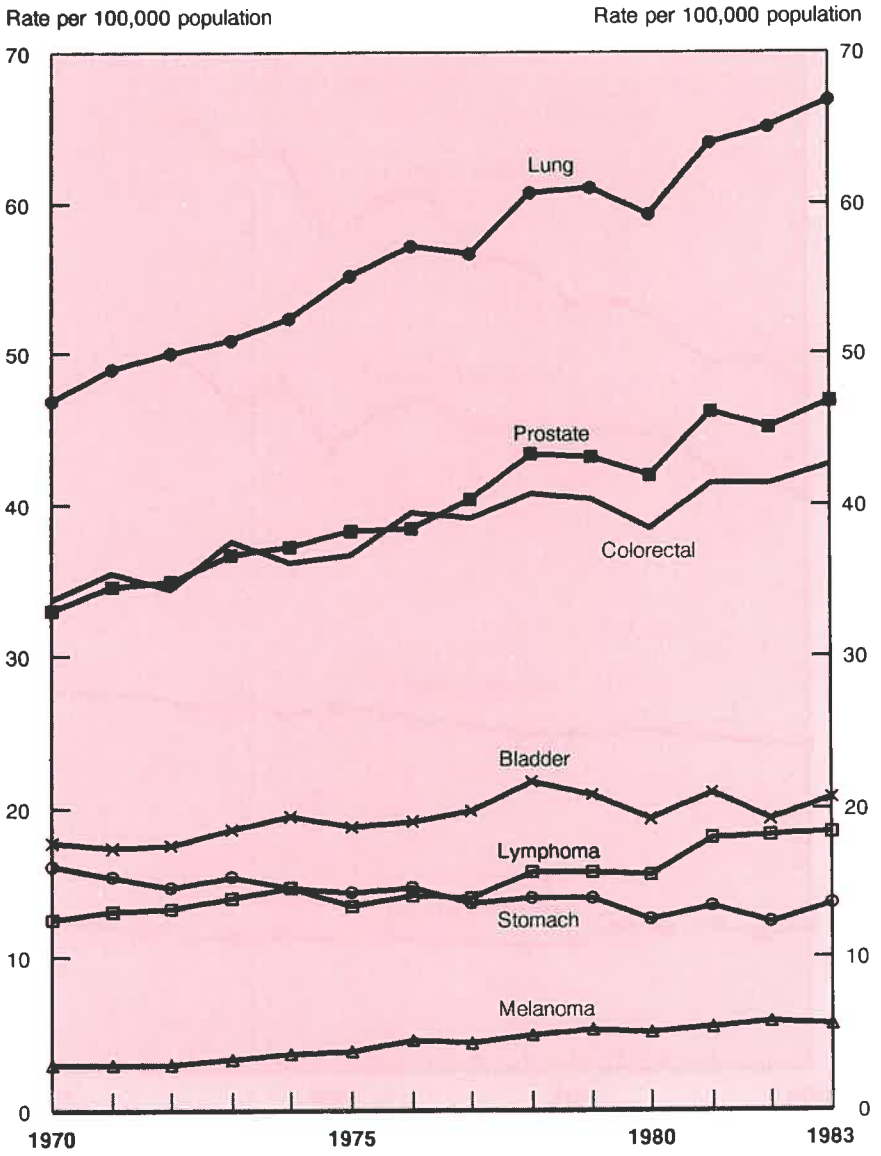
(2) All figures exclude non-melanoma skin cancer.

(3) Incidence rates prior to 1977 have been adjusted for underregistration in one province.

Source: Vital Statistics and Health Status Section, Health Division, Statistics Canada.

**Figure 3**

**Age-standardized Incidence Rates (1,2) for Selected Cancer Sites, Males, Canada, 1970-1983**



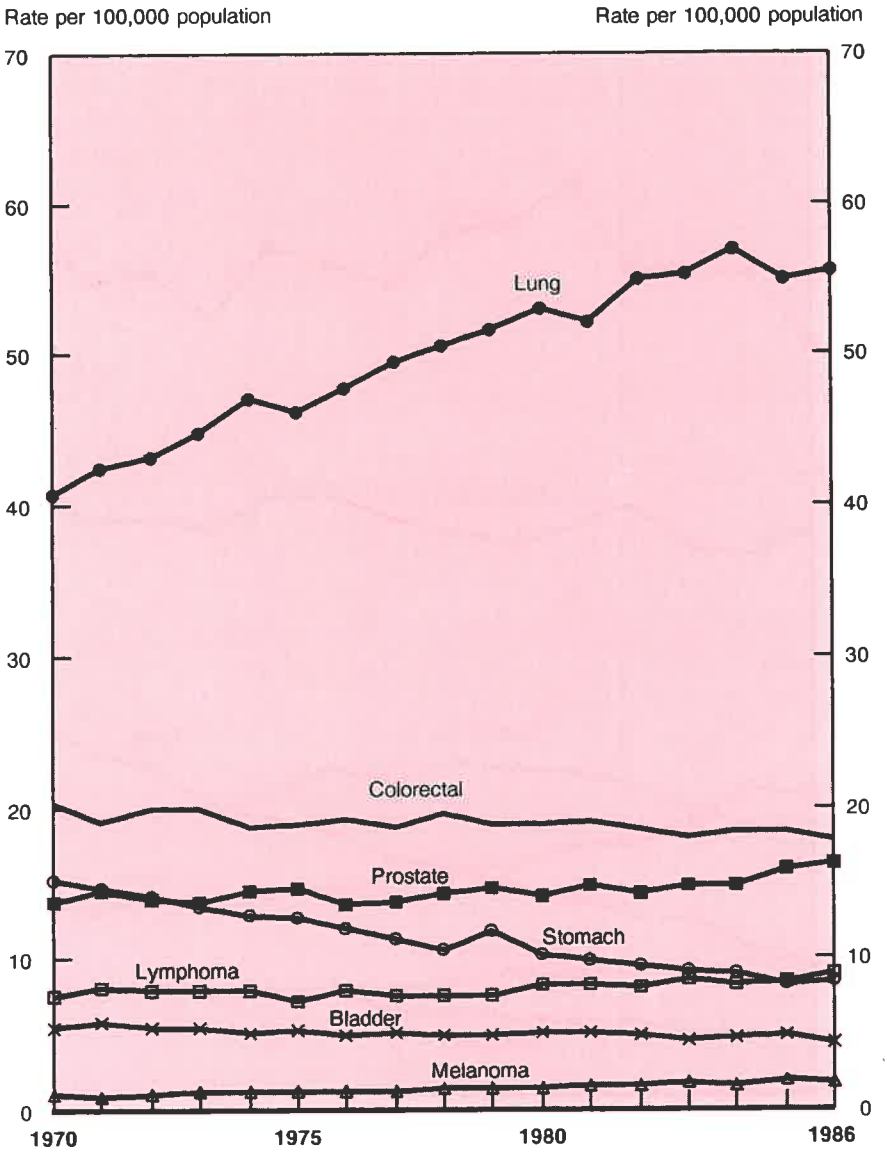

(1) Rates are adjusted to the age distribution of the world population.

(2) Rates prior to 1977 have been adjusted for underregistration in one province.

Source: Vital Statistics and Health Status Section, Health Division, Statistics Canada.

**Figure 4**

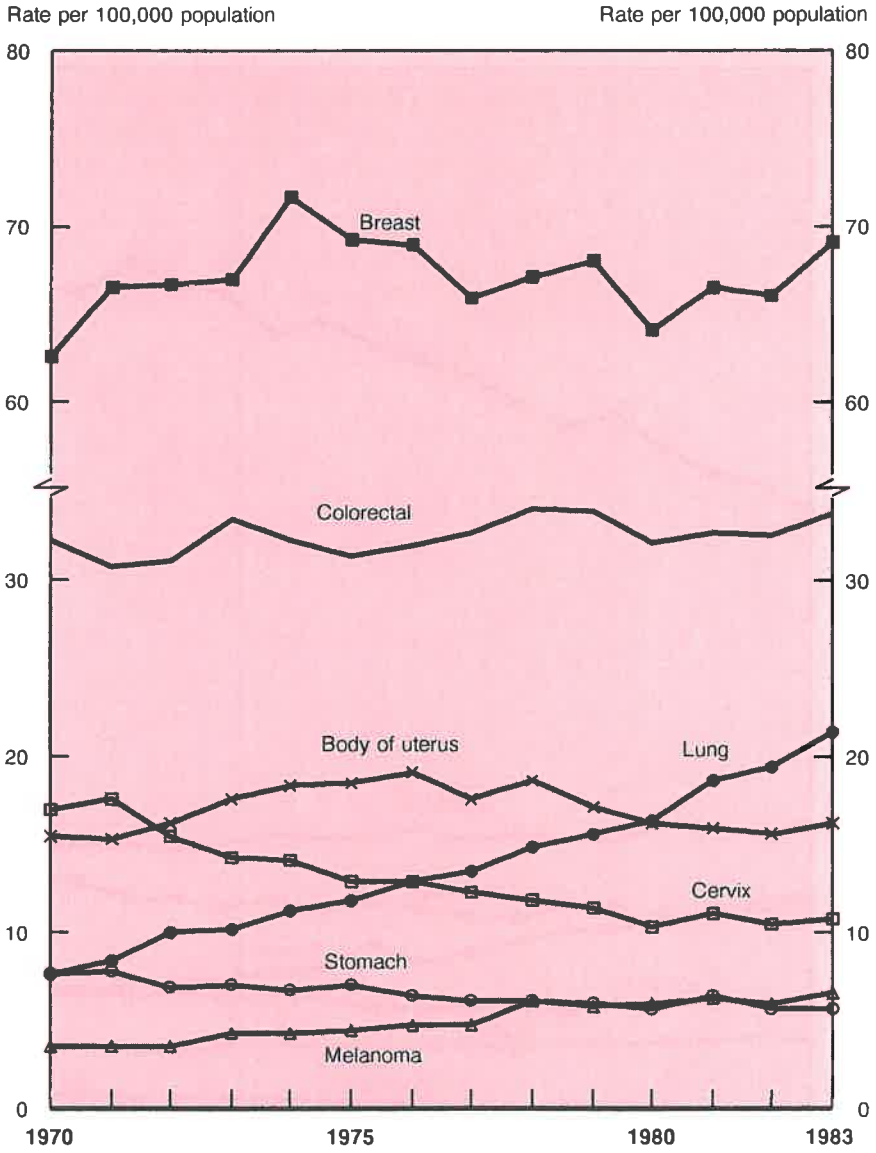
**Age-standardized Mortality Rates (1) for Selected Cancer Sites, Males, Canada, 1970-1986**




(1) Rates are adjusted to the age distribution of the world population.
Source: Vital Statistics and Health Status Section, Health Division, Statistics Canada.

Figure 5

**Age-standardized Incidence Rates (1,2) for Selected Cancer Sites, Females, Canada, 1970-1983**



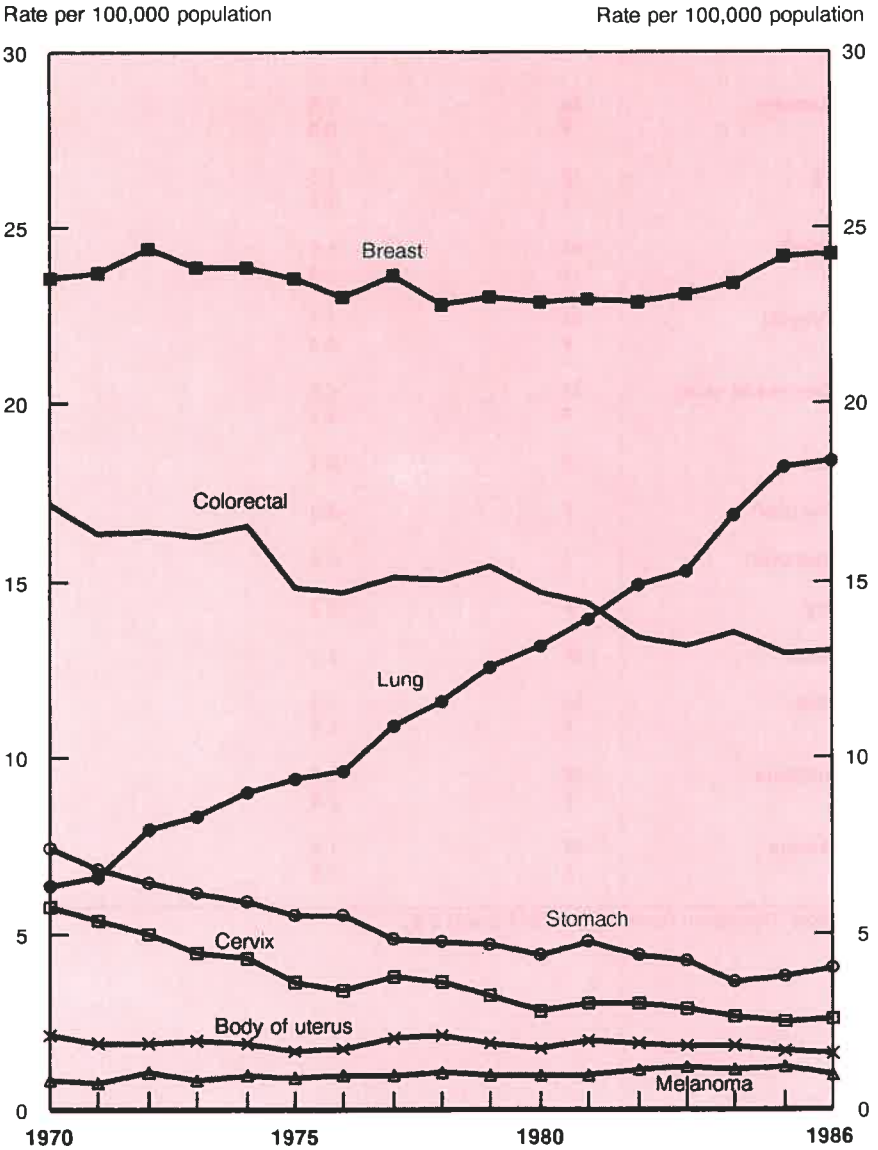

(1) Rates are adjusted to the age distribution of the world population.

(2) Rates prior to 1977 have been adjusted for underregistration in one province.

Source: Vital Statistics and Health Status Section, Health Division, Statistics Canada.

**Figure 6**

**Age-standardized Mortality Rates (1) for Selected Cancer Sites, Females, Canada, 1970-1986**




(1) Rates are adjusted to the age distribution of the world population.

Source: Vital Statistics and Health Status Section, Health Division, Statistics Canada.

**TABLE 6. Annual Per Cent Increase in Cancer Incidence and Mortality Since 1970**

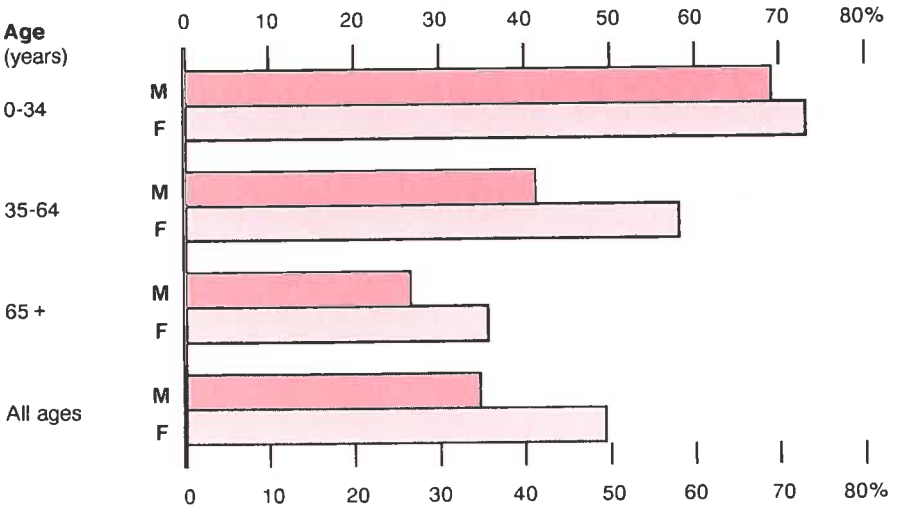
| | | Incidence | Mortality |
|---|---|---|---|
| **All cancers** | **M** | **1.8** | **0.5** |
| | **F** | **0.8** | **0.0** |
| Lung | M | 2.6 | 2.0 |
| | F | 7.4 | 6.7 |
| Stomach | M | -1.6 | -4.3 |
| | F | -2.3 | -4.1 |
| Colorectal | M | 1.7 | -0.6 |
| | F | 0.4 | -1.7 |
| Melanoma of skin | M | 5.8 | 3.8 |
| | F | 5.2 | 1.9 |
| Breast | F | 0.1 | 0.0 |
| Cervix uteri | F | -4.0 | -5.0 |
| Corpus uteri | F | -0.0 | -0.5 |
| Ovary | F | -0.3 | -1.2 |
| Prostate | M | 2.7 | 0.1 |
| Bladder | M | 1.3 | -1.2 |
| | F | 1.5 | -1.6 |
| Lymphoma | M | 2.8 | 0.7 |
| | F | 2.8 | 0.5 |
| Leukemia | M | 1.6 | -0.4 |
| | F | 1.6 | -0.8 |

**Source:** Based on trends shown in Figures 2-6.

## SURVIVAL RATES

The most recent five-year survival rates are shown in Figures 7.1 and 7.2. They are from one province only but they are typical of current North American experience. The rates are "crude" in the sense that deaths from causes other than cancer are not allowed for. Two forms of cancer with a very favourable prognosis, skin and larynx, are not included, but even so it is clear that the outlook is not uniformly depressing, as survival rates are over 40% for most types of cancer. Unfortunately this is not true for some common cancers, such as lung, stomach and pancreas.

**Figure 7.1**
**Five Year Cancer Survival by Age Group and Sex, Cases Diagnosed, 1979-1981**

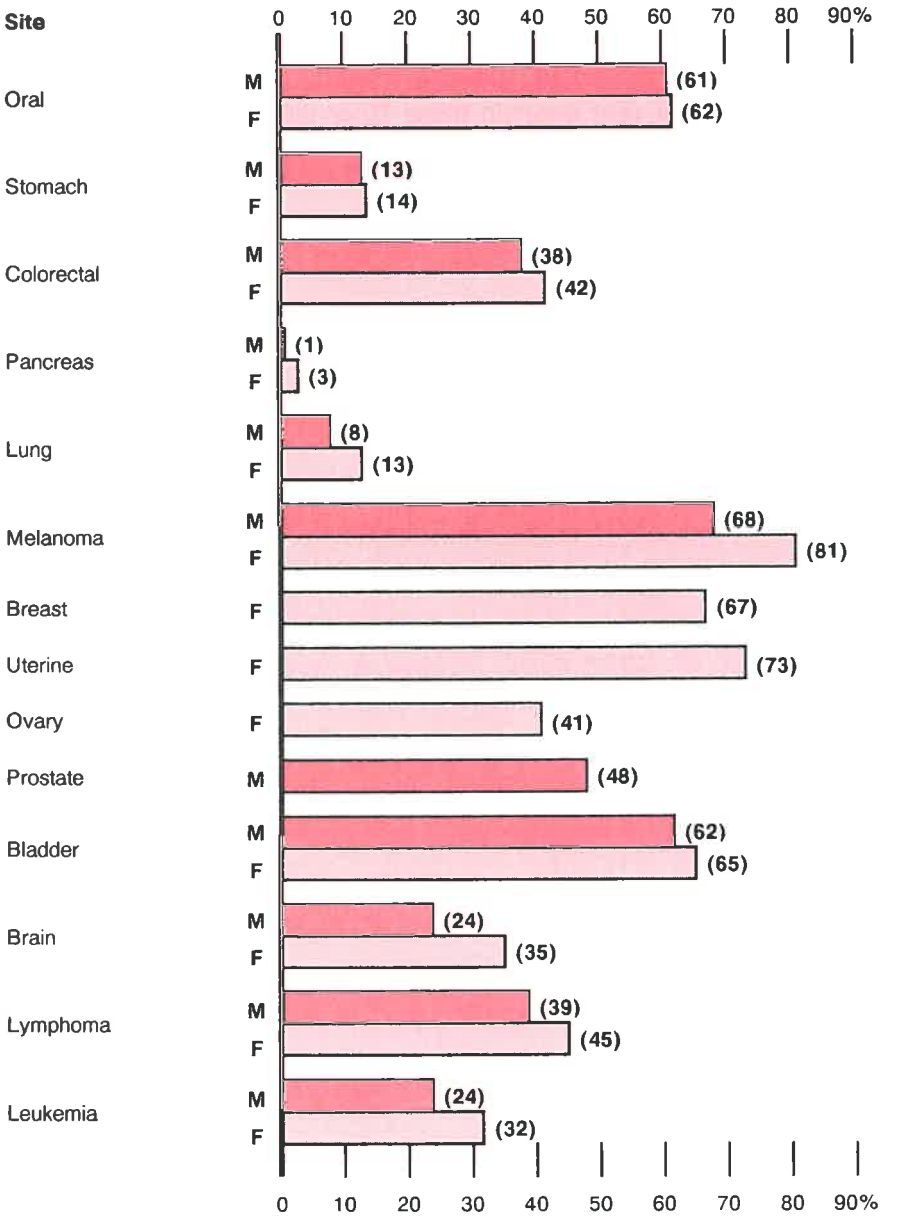



Source: Alberta Cancer Registry.

Figure 7.1 shows the five year survival for all cancers combined, for all ages and for broad age groups. About half the females treated for cancer survived five years, the proportion being considerably less, 35%, in males. This difference in prognosis is due primarily to the greater incidence among males of cancers with low survival rates, such as lung cancer. Survival rates decrease with age. Again this is because the incidence of the more lethal forms of cancer increases with age. Among children and young people the prognosis for some of the commoner forms, such as leukemia, lymphoma and testicular cancer, has been improved markedly by the introduction of new forms of treatment. The male/female differential is most marked in middle age due to the relatively favourable prognosis for female breast cancer.

Figure 7.2

**Five Year Cancer Survival Rates for Selected Sites by Sex, Cases Diagnosed, 1979 -1981**



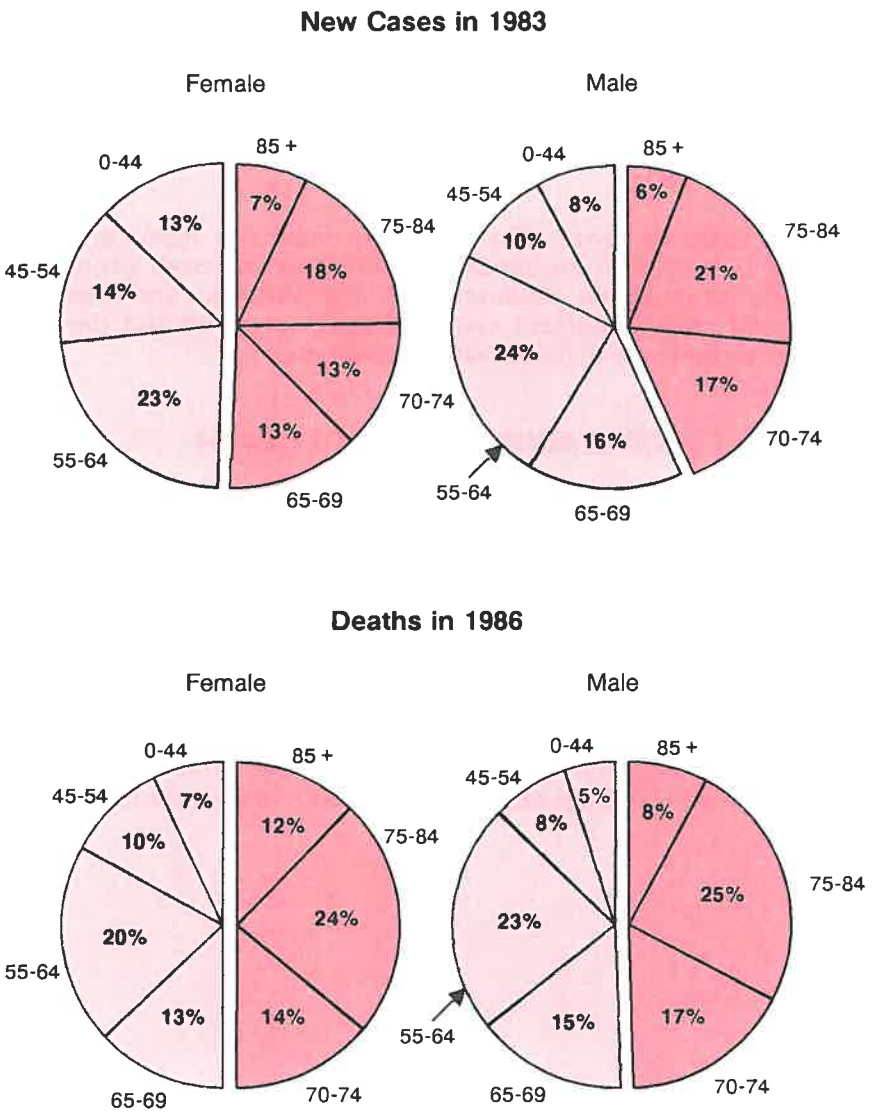

Source: Alberta Cancer Registry.

## AGE AND SEX DISTRIBUTION OF CANCER

Figure 8 shows, for each sex, the proportion of new cancer cases and cancer deaths in each age group. The patterns for deaths among females and for both new cases and deaths among males are very similar: about half occur in the elderly (70 years and older) and only 5 to 8% in people under 45 years of age. Of new cases among females just under 40 per cent occur in those 70 or older. This is due to the relatively high incidence of cancer among women of reproductive age, and generally of the types of cancer associated with a good prognosis.

**Figure 8**

**Percentage Distribution by Age Group and Sex of New Cases of Cancer in 1983 (1) and Cancer Deaths, Canada, 1986 (1)**




(1) Data shown are the most current available.
Source: Health Division, Statistics Canada.

## CANCER IN CHILDHOOD

Table 7 shows that over 800 children develop cancer each year and about a quarter of that number die of the disease. The types of cancer in childhood differ from those in later life. A greater proportion are found in the deeper tissues of the body - brain, bone and bone marrow, lymph glands - and fewer in the skin and the cells lining the internal organs. This probably reflects, to some extent, the differences in the growth rates of the various organs throughout life, but probably also the differences in exposure to agents which cause cancer. Genetic abnormalities are also important for some forms of cancer in childhood.

There is some evidence of a decline in mortality from cancer in childhood, but not in incidence. This indicates improved prognosis, especially for leukemia. However, as Figure 9 shows, cancer remains the second most important cause of death in childhood (beyond infancy), second only to motor vehicle accidents.

## MORTALITY FOR LEADING CAUSES OF DEATH

In 1986 cancer was second only to heart disease in terms of number of deaths in both males and females, accounting for about a quarter of all deaths in both sexes (Figure 9).

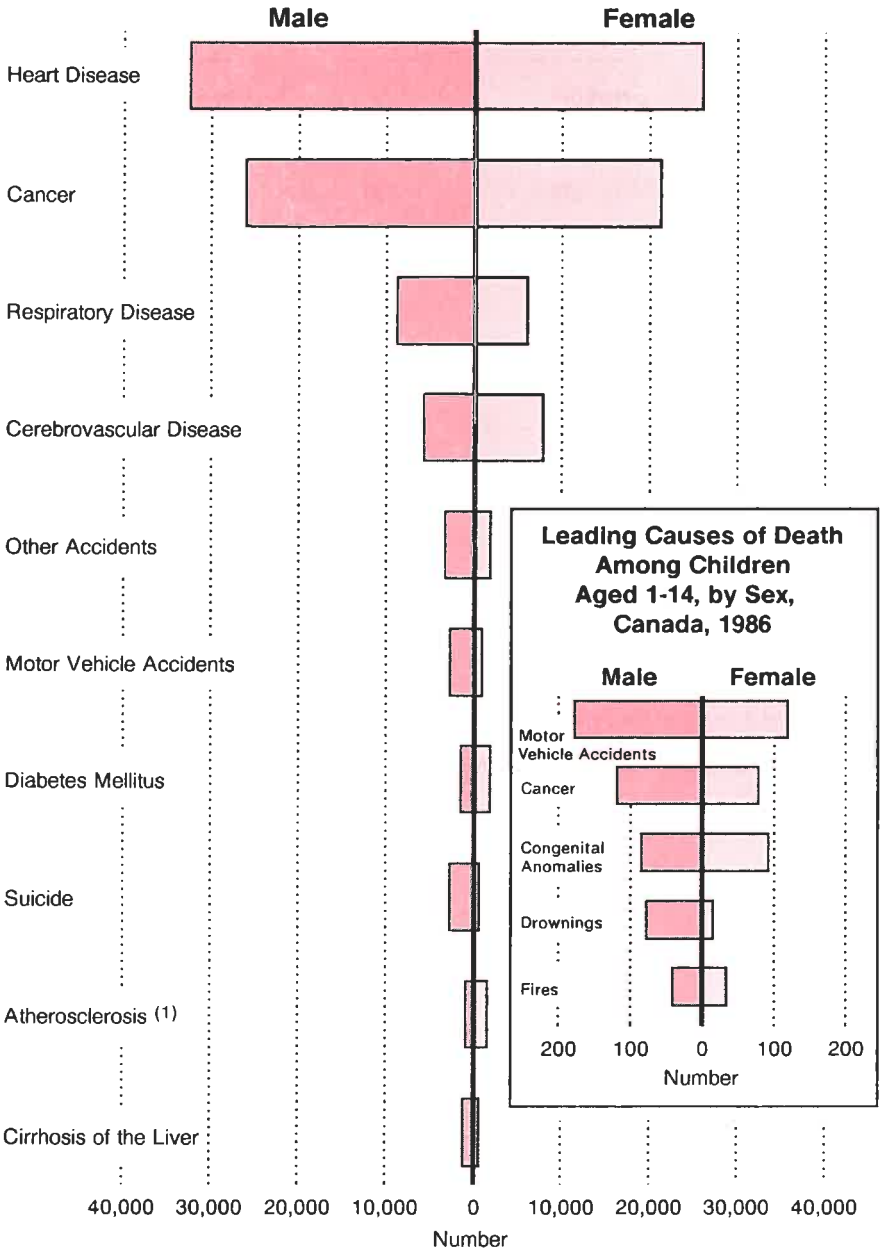
Although there are more male than female cancer deaths, females live longer than males and many of the cancer deaths among females occur at somewhat younger ages, due to cancers of the breast and female genital organs. In consequence, the expected years of life lost due to cancer is a little higher in females (374,590 woman-years) than in males (359,495 man-years). Figure 10 shows that the toll has increased steadily (2.6 per cent per year) in both sexes since 1970.

**TABLE 7. Cancer Incidence and Deaths for Children Under 15, for Leading Sites, Canada[1], 1983 and 1986**

| Cancer sites[2] | New cases in 1983 | | Deaths in 1986 | |
|---|---|---|---|---|
| | Number | Per Cent | Number | Per Cent |
| Leukemia | 276 | 33 | 85 | 31 |
| Brain and other nervous system | 186 | 22 | 56 | 20 |
| Lymphomas | 99 | 12 | 21 | 8 |
| Kidney | 51 | 6 | 3 | 1 |
| Bone | 48 | 6 | 8 | 3 |
| Connective tissue | 35 | 4 | 11 | 4 |
| Adrenal glands | 23 | 3 | 19 | 7 |
| Eye | 21 | 3 | - | - |
| All other cancer | 105 | 12 | 74 | 27 |
| **Total[3,4]** | **844** | **100** | **277** | **100** |

1 Ten Provinces
2 Ranked in order of incidence
3 Excludes non-melanoma skin cancer.
4 Percentage totals may not add due to rounding.
– nil or zero.

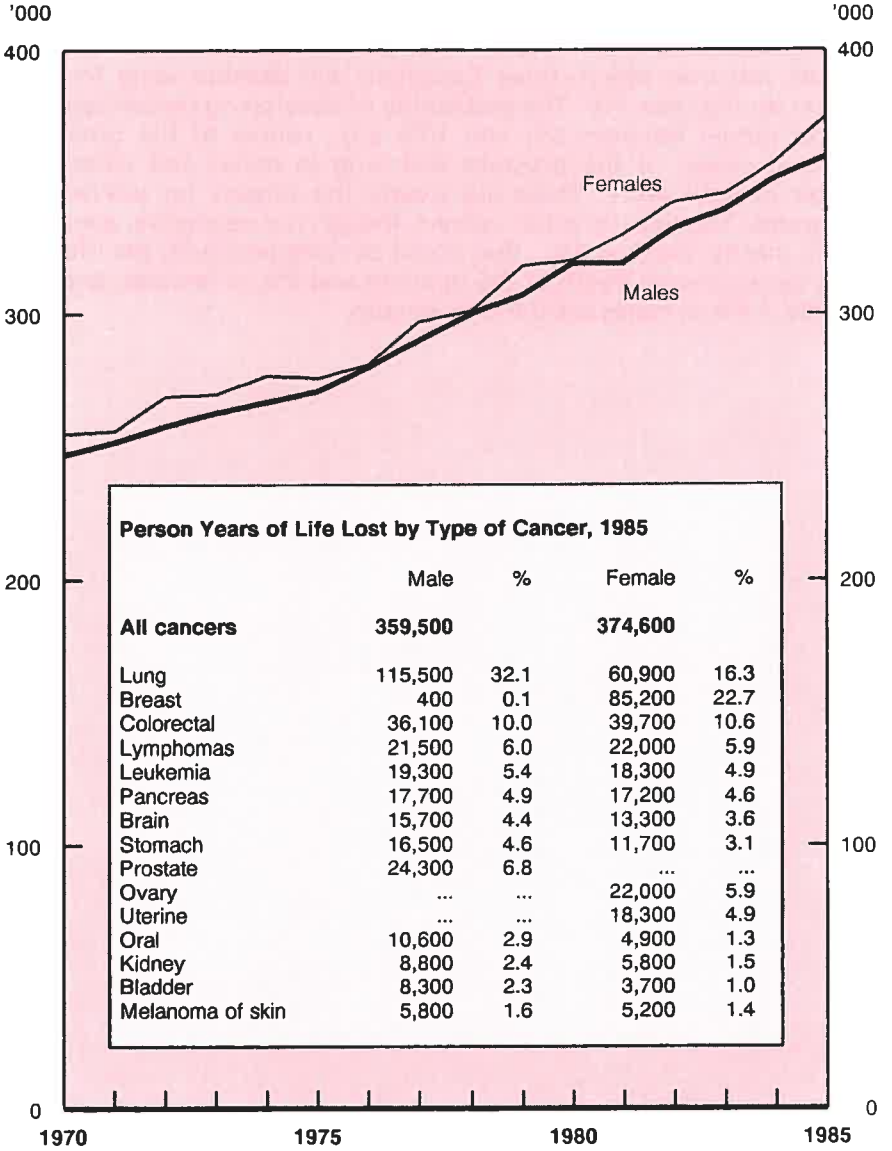
**Figure 9**
**Mortality for Leading Causes of Death, by Sex, Canada, 1986**




(1) Includes atherosclerotic regions other than heart or brain.
Source: Health Division, Statistics Canada.

**Figure 10**

## Person Years of Life Lost from Cancer, (1) Canada, 1970-1985




**Person Years of Life Lost by Type of Cancer, 1985**

| | Male | % | Female | % |
|---|---|---|---|---|
| **All cancers** | **359,500** | | **374,600** | |
| Lung | 115,500 | 32.1 | 60,900 | 16.3 |
| Breast | 400 | 0.1 | 85,200 | 22.7 |
| Colorectal | 36,100 | 10.0 | 39,700 | 10.6 |
| Lymphomas | 21,500 | 6.0 | 22,000 | 5.9 |
| Leukemia | 19,300 | 5.4 | 18,300 | 4.9 |
| Pancreas | 17,700 | 4.9 | 17,200 | 4.6 |
| Brain | 15,700 | 4.4 | 13,300 | 3.6 |
| Stomach | 16,500 | 4.6 | 11,700 | 3.1 |
| Prostate | 24,300 | 6.8 | ... | ... |
| Ovary | ... | ... | 22,000 | 5.9 |
| Uterine | ... | ... | 18,300 | 4.9 |
| Oral | 10,600 | 2.9 | 4,900 | 1.3 |
| Kidney | 8,800 | 2.4 | 5,800 | 1.5 |
| Bladder | 8,300 | 2.3 | 3,700 | 1.0 |
| Melanoma of skin | 5,800 | 1.6 | 5,200 | 1.4 |

(1) Based on life expectancy.
... Figures not applicable.

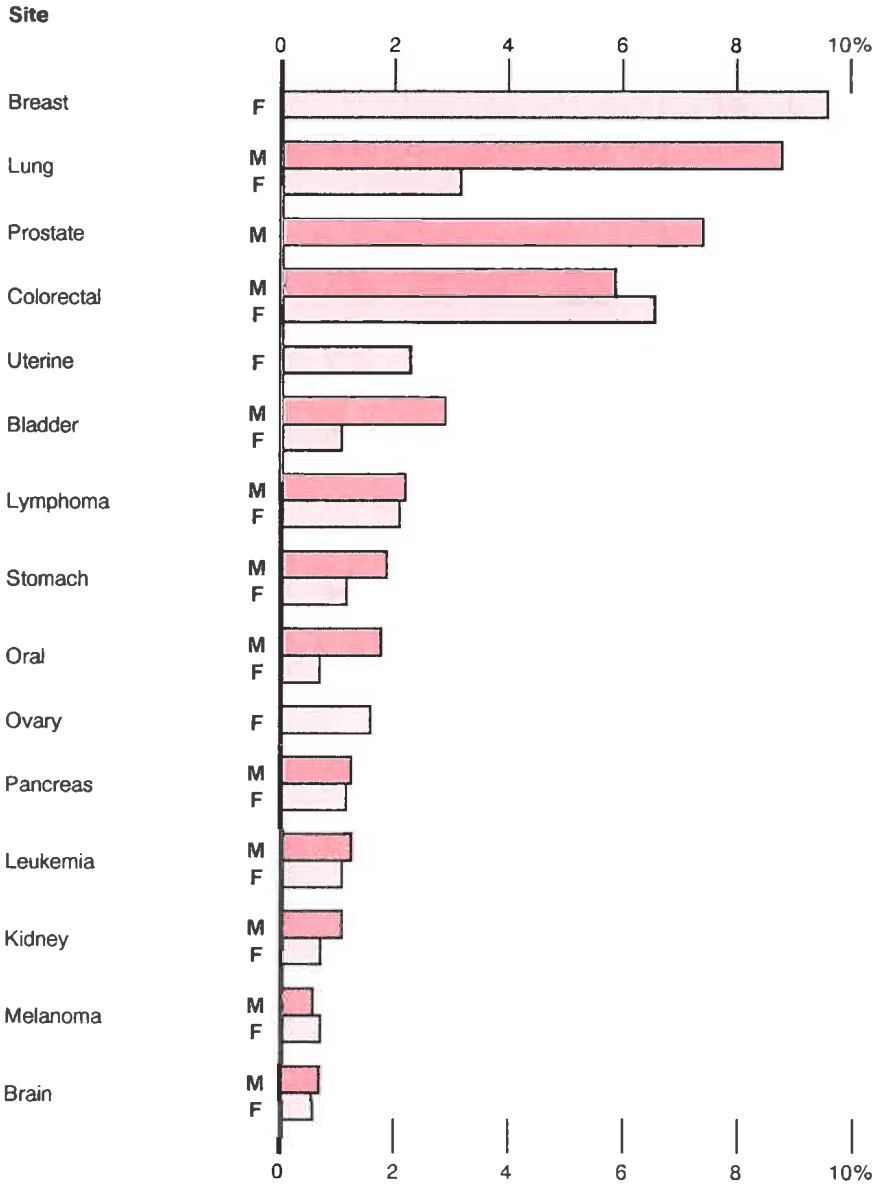
Source: Surveillance and Risk Assessment Division, Health and Welfare Canada.

## LIFETIME PROBABILITY OF DEVELOPING CANCER

Figure 11 and Table 8 show estimates of the probability that an individual Canadian will develop a particular form of cancer, assuming current incidence and mortality rates are maintained. Excluding skin cancer, just over one in three Canadians will develop some form of cancer during their life. The probability of developing certain types of cancer ranges between 5% and 10% e.g., cancer of the breast in females, cancer of the prostate and lung in males and colorectal cancer in both sexes. These are clearly the targets for prevention programs. The risks for other cancers, though not negligible, are quite small, mostly less than 2%. They could be compared with the lifetime risks for accidental death of 6% in males and 4% in females, and, for suicide, 1.4% in males and 0.6% in females.

**Figure 11**

**Probability (in per cent) at Birth of Eventually Developing Cancer at Selected Sites, by Sex, Canada, 1983**




Source: Surveillance and Risk Assessment Division, Health and Welfare Canada.

**TABLE 8. Probability of Developing Cancer of Major Sites by a Given Age for Persons at Selected Ages Previously Undiagnosed with Cancer at that Site, by Sex, Canada, 1983**

| Site | ICD-9[1] | Sex | Birth to age | | | | Age 25 to age | | | Age 50 to age | | Age 75 to age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 25 | 50 | 75 | 90 | 50 | 75 | 90 | 75 | 90 | 90 |
| | | | per cent | | | | | | | | | |
| **All invasive cancer[2]** | **140-208** | **M** | **0.5** | **2.9** | **24.2** | **36.4** | **2.5** | **24.5** | **37.0** | **23.6** | **37.0** | **27.9** |
| | | **F** | **0.4** | **4.7** | **22.6** | **34.8** | **4.4** | **22.6** | **35.0** | **19.4** | **32.6** | **19.9** |
| Oral | 140-149 | M | 0.0 | 0.2 | 1.3 | 1.8 | 0.2 | 1.3 | 1.8 | 1.2 | 1.7 | 0.9 |
| | | F | 0.0 | 0.1 | 0.4 | 0.7 | 0.1 | 0.4 | 0.7 | 0.4 | 0.6 | 0.3 |
| Stomach | 151 | M | 0.0 | 0.1 | 1.1 | 1.9 | 0.1 | 1.1 | 2.0 | 1.1 | 2.0 | 1.6 |
| | | F | 0.0 | 0.1 | 0.5 | 1.2 | 0.1 | 0.5 | 1.3 | 0.5 | 1.2 | 1.0 |
| Colorectal | 153-154 | M | 0.0 | 0.3 | 3.6 | 5.9 | 0.3 | 3.7 | 6.0 | 3.6 | 6.1 | 4.5 |
| | | F | 0.0 | 0.3 | 3.2 | 6.6 | 0.3 | 3.3 | 6.7 | 3.1 | 6.6 | 4.8 |
| Pancreas | 157 | M | 0.0 | 0.1 | 0.8 | 1.3 | 0.1 | 0.8 | 1.3 | 0.8 | 1.3 | 0.9 |
| | | F | 0.0 | 0.0 | 0.5 | 1.2 | 0.0 | 0.6 | 1.2 | 0.5 | 1.2 | 0.9 |
| Lung | 162 | M | 0.0 | 0.4 | 6.1 | 8.8 | 0.4 | 6.3 | 9.0 | 6.3 | 9.1 | 5.1 |
| | | F | 0.0 | 0.3 | 2.3 | 3.2 | 0.3 | 2.4 | 3.2 | 2.2 | 3.0 | 1.2 |
| Malignant melanoma | 172 | M | 0.0 | 0.2 | 0.5 | 0.6 | 0.2 | 0.5 | 0.6 | 0.4 | 0.5 | 0.3 |
| | | F | 0.0 | 0.3 | 0.6 | 0.7 | 0.2 | 0.6 | 0.7 | 0.3 | 0.5 | 0.2 |
| Breast | 174 | F | 0.0 | 1.6 | 6.7 | 9.6 | 1.6 | 6.8 | 9.7 | 5.4 | 8.4 | 4.2 |

| Site | ICD-9[1] | Sex | Birth to age | | | | Age 25 to age | | | Age 50 to age | | Age 75 to age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 25 | 50 | 75 | 90 | 50 | 75 | 90 | 75 | 90 | 90 |
| | | | per cent | | | | | | | | | |
| Cervix | 180 | F | 0.0 | 0.5 | 1.0 | 1.2 | 0.5 | 1.0 | 1.2 | 0.5 | 0.8 | 0.3 |
| Uterus | 182 | F | 0.0 | 0.2 | 1.8 | 2.3 | 0.2 | 1.8 | 2.3 | 1.7 | 2.2 | 0.7 |
| Ovary | 183 | F | 0.0 | 0.3 | 1.1 | 1.6 | 0.2 | 1.1 | 1.6 | 0.9 | 1.4 | 0.6 |
| Prostate | 185 | M | 0.0 | 0.0 | 3.5 | 7.4 | 0.0 | 3.5 | 7.6 | 3.7 | 8.0 | 8.0 |
| Bladder | 188 | M | 0.0 | 0.1 | 1.8 | 2.9 | 0.1 | 1.8 | 3.0 | 1.8 | 3.0 | 2.2 |
| | | F | 0.0 | 0.0 | 0.5 | 1.1 | 0.0 | 0.6 | 1.2 | 0.5 | 1.1 | 0.8 |
| Kidney | 189 | M | 0.0 | 0.1 | 0.8 | 1.1 | 0.1 | 0.8 | 1.1 | 0.7 | 1.1 | 0.6 |
| | | F | 0.0 | 0.1 | 0.4 | 0.7 | 0.0 | 0.4 | 0.7 | 0.4 | 0.7 | 0.4 |
| Brain | 191,192 | M | 0.1 | 0.2 | 0.6 | 0.7 | 0.1 | 0.5 | 0.6 | 0.4 | 0.5 | 0.2 |
| | | F | 0.1 | 0.2 | 0.5 | 0.6 | 0.1 | 0.4 | 0.5 | 0.3 | 0.4 | 0.2 |
| Lymphoma | 200-203 | M | 0.1 | 0.4 | 1.5 | 2.2 | 0.3 | 1.5 | 2.1 | 1.2 | 2.0 | 1.3 |
| | | F | 0.1 | 0.3 | 1.3 | 2.1 | 0.2 | 1.2 | 2.1 | 1.1 | 1.9 | 1.1 |
| Leukemia | 204-208 | M | 0.1 | 0.2 | 0.8 | 1.3 | 0.1 | 0.7 | 1.3 | 0.6 | 1.2 | 1.0 |
| | | F | 0.1 | 0.2 | 0.6 | 1.1 | 0.1 | 0.5 | 1.1 | 0.4 | 1.0 | 0.7 |

1 ICD-9 refers to the ninth revision of the International Classification of Diseases.
2 Excludes non-melanoma skin cancer (ICD-9 = 173).
**Source:** Surveillance and Risk Assessment Division, Health and Welfare Canada.

## TOBACCO CONSUMPTION FROM SMOKING AND MORTALITY FROM LUNG CANCER

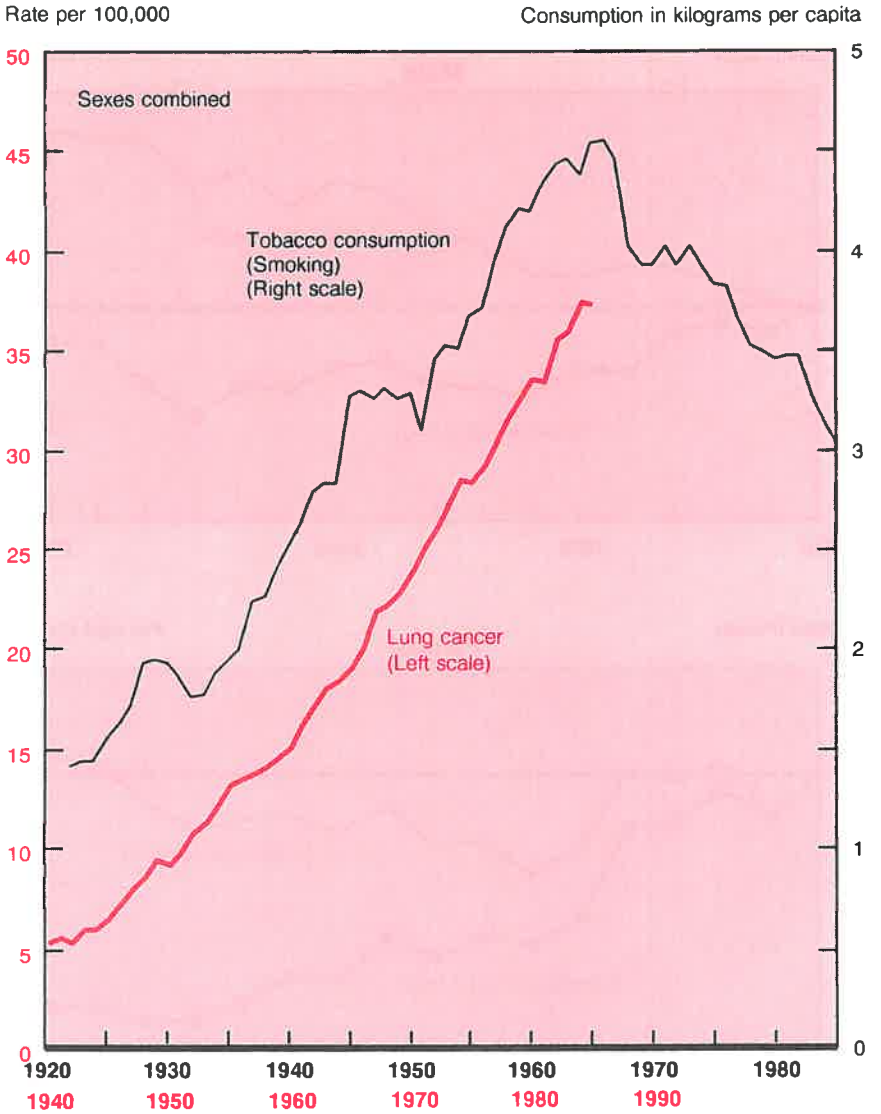
Perhaps the most striking graph in this year's monograph is Figure 12, produced recently by the Bureau of Epidemiology in the Laboratory Centre for Disease Control. Two graphs are overlaid: the per capita consumption of smoking tobacco, and the age-standardized rate of mortality from lung cancer in both sexes. With a twenty year difference between tobacco consumption and mortality, the correspondence between the two curves is striking. Such correlations do not, of course, prove cause and effect, and the overwhelming evidence incriminating tobacco in relation to lung cancer comes from the many detailed studies of individuals. Nevertheless, the similarity of the curves lends support to this conclusion, and to a latent period of about 20 years.

Overall rates for cancer mortality are strongly influenced by lung cancer mortality rates. As shown in Figure 13, age-standardized cancer mortality among males is increasing only slightly, about 8% in 16 years, but if lung cancer is excluded there is a small decrease. In females, although mortality for all cancers has remained fairly stable, if lung cancer is excluded the rates have dropped by about 10 per cent.

It will be interesting to see if the lung cancer curve will track the consumption curve downwards as well as upwards - the good news following the bad news. There is some suggestion in the diagram that this may indeed happen. As was said on another occasion, if it is not the beginning of the end it may well be the end of the beginning. Meanwhile the just war continues.

**Figure 12**

**Tobacco Consumption from Smoking, (1) 1920-1985, and Lung Cancer Mortality Rates, (2) Canada, 1940-1985**



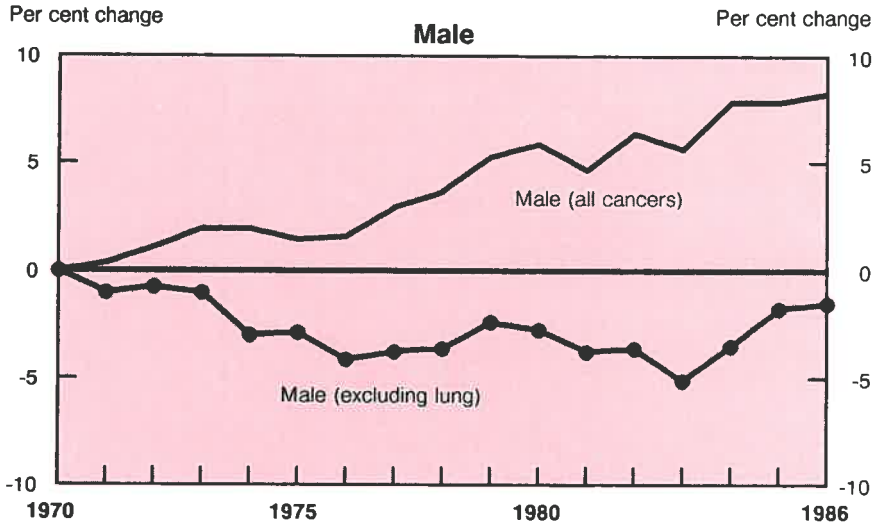

(1) Tobacco consumption from smoking was calculated in kilograms per capita (based on population 15 + ) and excludes snuff and chewing tobacco.

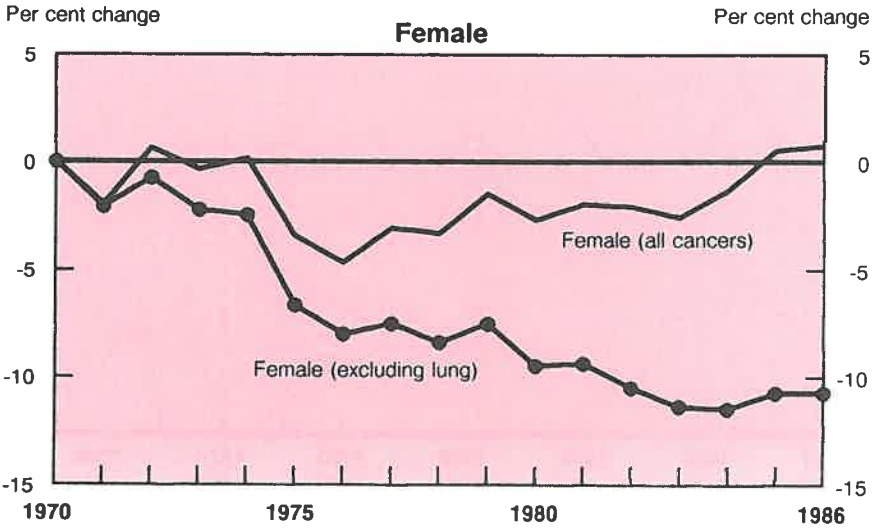
(2) Mortality rates are age-standardized to the 1971 Canadian population, and include deaths for all age groups.

Source: Health Division, Statistics Canada, and Surveillance and Risk Assessment Division, Health and Welfare Canada.

**Figure 13**

**Per Cent Change in Age-standardized Mortality Rates (1,2) by Sex, Including and Excluding Lung Cancer, Canada, 1970-1986**




(1) Rates are adjusted to the age distribution of the world population.

(2) All figures exclude non-melanoma skin cancer.

Source: Vital Statistics and Health Status Section, Health Division, Statistics Canada.

## CANCER MORTALITY: AN INTERNATIONAL COMPARISON

Table 9 gives a selection of the recent cancer mortality rates in different countries, taken from statistics published by the World Health Organization. The rates have been adjusted for differences in age distribution, but other possible artifacts remain, such as differences in medical diagnosis and treatment, or in the coding procedures used to classify the cause of death. Differences in mortality are usually assumed to be due to differences in incidence, but they may also reflect differences in prognosis.

Despite these problems in interpretation, international comparisons of cancer mortality have produced many consistent patterns, raising fruitful avenues of research. Some are seen in this table - the high mortality from oral cancer in French males (believed to be due to alcohol) and in Singapore (reflecting the high incidence of cancer of the nasopharynx in Chinese, cause unknown); high rates of stomach cancer in Eastern Europe (e.g. Hungary, Poland) and in Japan; high lung cancer mortality in Scotland; the high rates for cancer of the uterus (chiefly cervix) in the Caribbean; the low rate for cancer of the breast in Japan.

Canada has average mortality rates for most types of cancer, (Figures 14.1, 14.2) although as we have seen, some interesting differences do occur within Canada.

**TABLE 9. Cancer: An International Comparison. Age-standardized Mortality Rates per 100,000 Population[1] for Selected Sites for 22 Countries, 1980-1984**

| Country | (Year) | All sites | | Oral | | Colorectal | | Lung | | Breast | Uterus | Stomach | | Prostate | Leukemia | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | F | M | F | M | F | M | F | F | F | M | F | M | M | F |
| **Canada** | **(84)** | **167** | **109** | **4.3** | **1.5** | **18** | **14** | **57** | **17** | **24** | **5.4** | **9** | **3** | **15** | **6.6** | **4.1** |
| Argentina | (81) | 194 | 128 | 5.2 | 5.2 | 17 | 13 | 51 | 7 | 25 | 14.6 | 19 | 8 | 14 | 7.0 | 5.0 |
| Australia | (84) | 160 | 102 | 5.0 | 1.5 | 21 | 15 | 47 | 11 | 20 | 5.2 | 9 | 4 | 15 | 6.2 | 3.8 |
| Denmark | (84) | 188 | 142 | 3.4 | 1.3 | 23 | 19 | 56 | 21 | 27 | 9.7 | 10 | 5 | 18 | 6.7 | 4.5 |
| England & Wales | (84) | 188 | 129 | 3.0 | 1.3 | 21 | 15 | 67 | 20 | 29 | 7.6 | 16 | 7 | 14 | 5.7 | 3.5 |
| Finland | (84) | 169 | 95 | 2.1 | 0.9 | 13 | 10 | 58 | 6 | 16 | 4.6 | 16 | 9 | 16 | 6.2 | 4.1 |
| France | (84) | 205 | 93 | 15.4 | 1.2 | 18 | 11 | 45 | 4 | 19 | 7.2 | 11 | 5 | 16 | 6.8 | 4.2 |
| Germany F.R. | (84) | 180 | 113 | 5.0 | 0.9 | 22 | 16 | 49 | 7 | 22 | 7.6 | 18 | 9 | 16 | 5.7 | 3.9 |
| Greece | (84) | 143 | 80 | 1.7 | 0.6 | 6 | 5 | 47 | 6 | 15 | 5.1 | 11 | 6 | 7 | 6.5 | 4.3 |
| Hungary | (84) | 227 | 128 | 10.5 | 1.6 | 26 | 18 | 69 | 12 | 20 | 12.7 | 28 | 12 | 16 | 7.3 | 4.7 |
| Ireland | (83) | 168 | 124 | 4.3 | 1.2 | 21 | 17 | 51 | 18 | 26 | 6.3 | 15 | 8 | 16 | 5.0 | 3.2 |
| Italy | (81) | 182 | 99 | 6.1 | 0.9 | 14 | 10 | 53 | 6 | 20 | 8.4 | 22 | 11 | 10 | 6.8 | 4.4 |
| Japan | (84) | 150 | 82 | 2.1 | 0.7 | 13 | 9 | 28 | 8 | 6 | 5.4 | 43 | 20 | 3 | 4.5 | 3.1 |
| Netherlands | (84) | 200 | 108 | 2.2 | 0.7 | 18 | 14 | 78 | 8 | 26 | 5.5 | 16 | 6 | 17 | 5.6 | 3.6 |

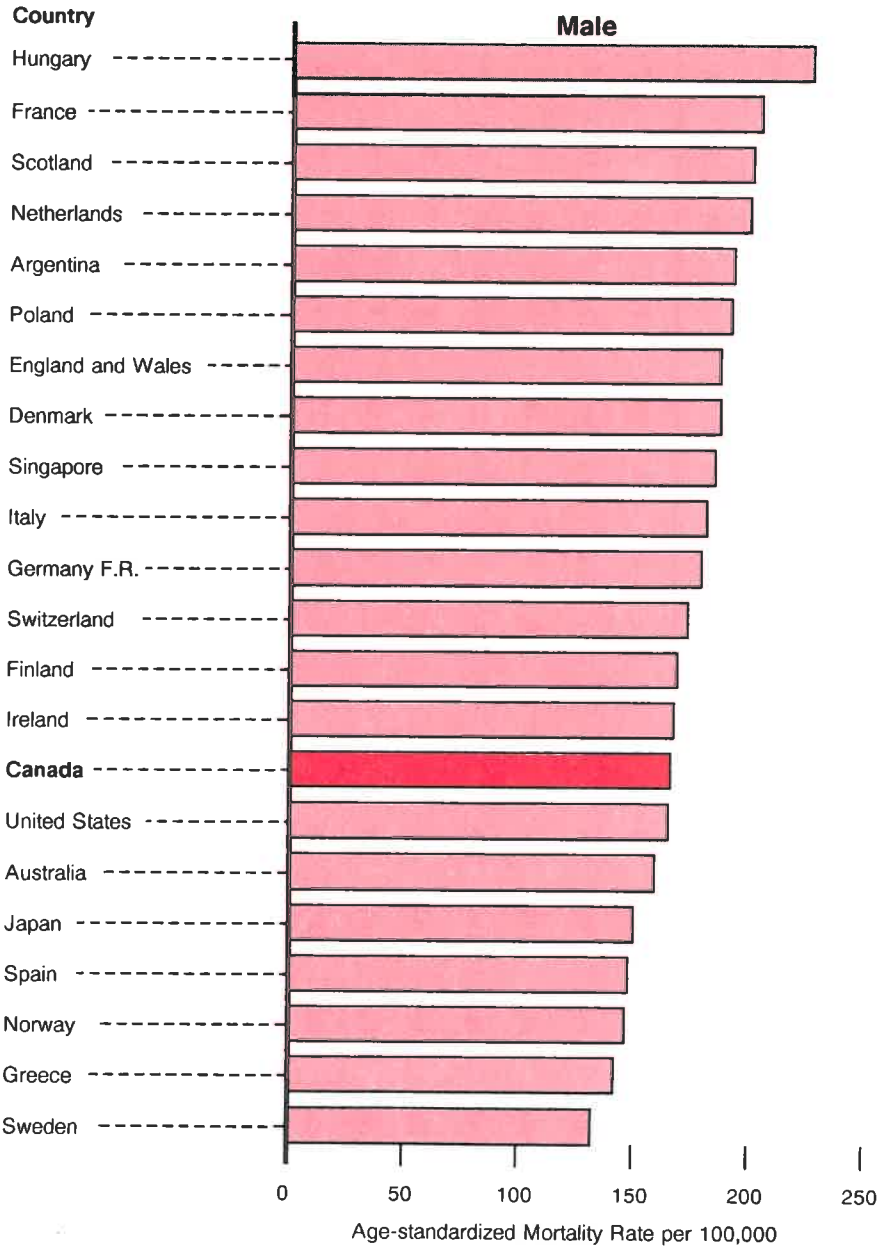
**TABLE 9. Cancer: An International Comparison. Age-standardized Mortality Rates per 100,000 Population[1] for Selected Sites for 22 Countries, 1980-1984** – Concluded

| Country | (Year) | All sites | | Oral | | Colorectal | | Lung | | Breast | Uterus | Stomach | | Prostate | Leukemia | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | F | M | F | M | F | M | F | F | F | M | F | M | M | F |
| Norway | (84) | 147 | 103 | 3.2 | 1.2 | 19 | 14 | 29 | 8 | 18 | 6.6 | 13 | 7 | 20 | 6.2 | 3.3 |
| Poland | (84) | 193 | 108 | 5.4 | 1.0 | 13 | 10 | 64 | 8 | 15 | 12.8 | 28 | 11 | 9 | 5.6 | 3.8 |
| Scotland | (84) | 202 | 139 | 3.4 | 1.4 | 21 | 16 | 81 | 27 | 28 | 8.7 | 14 | 8 | 5 | 4.7 | 3.2 |
| Singapore | (84) | 185 | 104 | 16.9 | 5.4 | 16 | 14 | 55 | 18 | 11 | 10.6 | 21 | 11 | 4 | 4.6 | 2.6 |
| Spain | (80) | 148 | 82 | 4.1 | 0.6 | 10 | 7 | 33 | 4 | 14 | 6.7 | 19 | 9 | 12 | 4.6 | 3.3 |
| Sweden | (84) | 133 | 101 | 2.7 | 1.0 | 15 | 12 | 25 | 8 | 18 | 5.6 | 10 | 5 | 18 | 5.1 | 3.5 |
| Switzerland | (84) | 174 | 105 | 6.5 | 1.1 | 18 | 12 | 47 | 6 | 25 | 7.0 | 11 | 6 | 20 | 6.3 | 4.4 |
| United States | (83) | 166 | 110 | 4.2 | 1.5 | 18 | 13 | 57 | 20 | 22 | 5.9 | 6 | 3 | 15 | 6.6 | 4.1 |

[1] Age-standardized to the world population.
**Source:** World Health Statistics Annual 1985-1986.

**Figure 14.1**

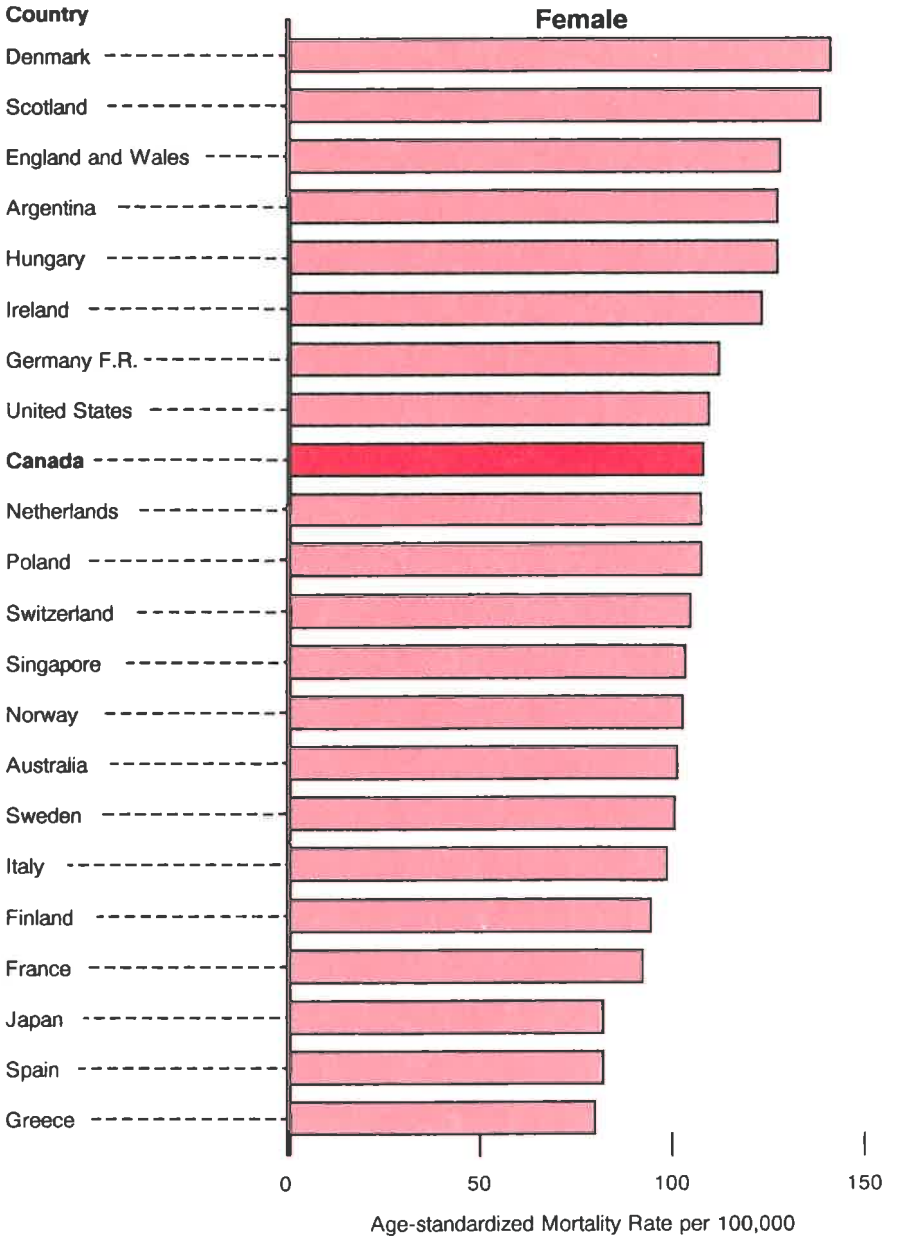
**Cancer Mortality in Selected Countries by Sex (All Cancers, Male)**




Source: Table 9

**Figure 14.2**

## Cancer Mortality in Selected Countries by Sex (All Cancers, Female)




Source: Table 9

# METHODOLOGICAL APPENDIX

## Data Sources

The data used to estimate 1988 cancer incidence and mortality and to present actual data to 1983 for cancer incidence and to 1986 for mortality were obtained from three sources: mortality data files (1970-1986), and the National Cancer Incidence Reporting System (1970-1983), both maintained by the Vital Statistics and Health Status Section, Statistics Canada(1,2), and aggregate data on cancer incidence by age and sex were provided by the Ontario Cancer Treatment and Research Foundation for 1970-1983. Records for all cancers (except non-melanoma skin cancer) and major cancer sites were extracted from these data bases for males and females for the 10 provinces. Canada totals were then determined as the sum of the 10 provinces. The ninth revision of the International Classification of Diseases or ICD-9(3), was used to classify records into the following categories: oral, 140-149; stomach, 151; colorectal, 153-154; pancreas, 157; lung, 162; breast, 174; uterine, 179-182; ovary, 183; bladder, 188; kidney, 189; brain, 191-192; lymphoma, 200-203; leukemia, 204-208; and all cancers, 140- 208 (excluding 173, non-melanoma skin cancer).

Crude incidence and mortality rates for each province, site, sex and year were computed by dividing the number of cases by the corresponding population figures. Population figures were taken from censal, intercensal and postcensal estimates for 1970-1986, and projections for 1987 and 1988.

## Calculation of Estimates

The number of cancer deaths in 1988 was estimated by fitting regression models to the provincial and Canadian crude mortality rates for each sex and site. Some changes to the regression models used in the 1987 report were implemented. For the 1988 production cycle, year-squared terms were used only for regressions for all cancer sites (male and female), breast cancer (female) and prostate cancer, while an exponential model was used for female lung cancer(4). For all other sites, a linear model was used with year as the only independent variable. Estimated 1988 mortality rates were then multiplied by the 1988 population figures to arrive at the estimated number of deaths.

Cancer incidence counts for Canada in 1988 were estimated in a similar manner, although only linear models were used, and Quebec data were handled separately. Linear regressions were used for Canada minus Quebec, while regression models for Quebec included an additional parameter to account for under-registration known to

have occurred prior to 1977. Estimated 1988 incidence rates were then multiplied by the 1988 population figures to arrive at the estimated number of cases. Estimates for Canada were computed as the sum of the estimate for Quebec and that for Canada minus Quebec.

The 1970-1983 cancer incidence data and the 1970-1986 cancer mortality data were age-standardized according to the World population(5). Linear regression was then applied to the age-standardized mortality rates (ASMR) for Canada and each province for each site and sex, using year as the independent variable, to find estimated 1988 ASMRs. Age-standardized incidence rates presented in figures 2-6 were adjusted prior to 1977 to account for under-registration in Quebec.

The coefficient of variation (C.V.) was computed to indicate the precision of each estimate; this value is available upon request to Health Division of Statistics Canada. Readers are cautioned that estimates of 30 cases or less (or rates based on estimates of 30 cases or less) tend to be relatively less precise than the more sizeable estimates.

Further, due to changes described above in the methodology for producing estimates of cancer deaths, estimates in the 1987 and 1988 reports may not be directly comparable.

More detailed information on these methods and the reliability of the estimates can be found in technical papers available from Health Division, Statistics Canada(4,6).

### Cancer Survival

Survival data were provided by the Alberta Cancer Registry based on new cancer cases diagnosed between 1979 and 1981. Crude five-year survival rates were calculated as a percentage of cases surviving five years following the diagnosis of cancer. Survival data presented in the 1988 report are considered to be more accurate then those in the 1987 report as a result of death clearance of the Alberta Cancer Registry at Statistics Canada.

**Lifetime Probability of Developing Cancer**

Probabilities were calculated based on the age and sex-specific cancer incidence rates for Canada in 1981, using methodology based on Zdeb(7) and Seidman(8). As noted by Seidman(8), the life table procedures used assume that the rates of cancer incidence for various age groups in a given chronological period will prevail throughout the future life-time of a person as he advances in age. Since these may not be the rates which will prevail at the time a given age is attained, the probabilities should be regarded only as approximations of the actual ones.

**Potential Years of Life Lost**

This indicator was calculated by obtaining deaths for ages 1, 1-4, 5-9,...,90 + , and life expectancy at birth for ages 1,5,10,...,80,85,90. The PYLL can be seen as the total number of years of life lost obtained by multiplying for each age group the number of actual deaths by the life expectancy of survivors (9).

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(1) Statistics Canada Catalogue 82-207 "Cancer in Canada" (Annual).

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