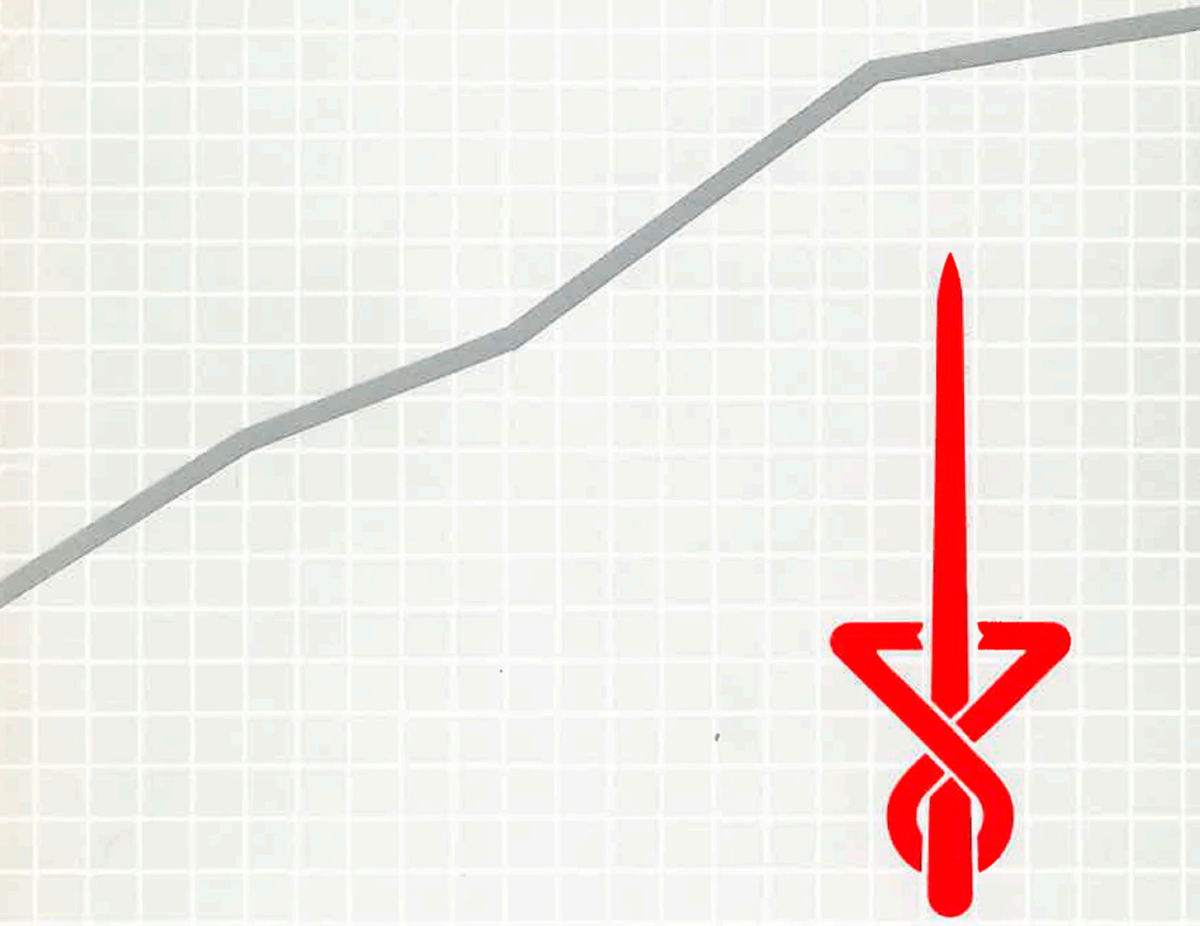
Canadian Cancer Statistics 1990



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Provincial Cancer Registries
National Cancer Institute of Canada

Canadian Cancer Statistics 1990

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TABLE OF CONTENTS

Table

TABLE OF CONTENTS – Continued

TABLE OF CONTENTS – Concluded

INTRODUCTION

This monograph is published by the National Cancer Institute of Canada in collaboration with the Canadian Centre for Health Information (within Statistics Canada) and Health and Welfare Canada. The series began in 1987 and its development has benefitted considerably from readers' comments and suggestions. The latter are much appreciated by the Steering Committee and further ideas for improvement will be welcome.

The main purpose of the publication is to provide health professionals, and others having an interest in cancer, with an overview of the current incidence of, and mortality from the commoner types of cancer, at the provincial, national and international level. This forms the regular "core" of the monograph. In addition, and usually in response to requests, special topics are included. This year's special topics are the trends in cancer of the breast and female genital organs, Hodgkin's disease and cancer of the testis; cancer mortality by income level; the economic burden of cancer in relation to other diseases; and cancer control.

Information on cancer incidence and mortality comes from the provincial cancer registries and offices of vital statistics who send their data to Statistics Canada for compilation at the national level. To overcome the resulting time lag current estimates are made by projecting forward the available rates and applying them to the intercensal estimates of population. This is more complicated than it sounds, due to changes in the way the information is collected as well as the inherent statistical problem of estimating trends in time series. How these difficulties have been surmounted is described in Methodologic Appendix. The important point to emphasize here is that the figures for 1990 are estimates, not actual data.

CURRENT INCIDENCE AND MORTALITY

Three measures of the numerical importance of the different types of cancer are described in this section. The most fundamental, in the sense that the others are a consequence of it, is the incidence of new cases, stated as the number per year or the rate per 100,000 population at risk. Cancer is one of the few categories of disease for which we have reasonable estimates of incidence, thanks to the provincial cancer registries, whose joint efforts are brought together into the National Cancer Incidence Reporting System. At the international level a similar aggregation is achieved by the International Agency for Research on Cancer, which produces the series Cancer Incidence in Five Continents. An important point to notice is that the aim is to count all new cases of cancer, not patients developing cancer for the first time. Although the cancer registries try to work to the same definitions of what is a new case, and to use the same procedures to identify new cases, uniformity is not always achieved. This is a particular problem in relation to cancers of the skin, other than melanoma, where recurrence is common and many cases are treated in doctors' offices with no biopsy being taken. For this reason non-melanotic skin cancer is excluded from the tables.

The second of the measures of importance is mortality, stated as the number of deaths per year or the rate per 100,000 at risk. These data are obtained from the provincial registrars of vital statistics, collated nationally and published by Statistics Canada, and aggregated internationally by the World Health Organization. The deaths are those which are attributed to some form of cancer, based on the statement of cause of death by the certifying physician. Again, every attempt is made to standardize data collection and coding but some lack of uniformity over time and between different jurisdictions is inevitable. Precision of diagnosis is also more of a problem with death certificates than with cancer registrations.

The third source of cancer statistics at the national level is the abstract made for each separation (discharge alive or death) from every major hospital in Canada. These data are also collected provincially and collated by Statistics Canada, and maintaining uniformity of procedures is a problem here too. Since not all cases of cancer are admitted to hospital, and some are admitted more than once, the numbers of separations do not measure incidence directly. However, separations, and the bed-days associated with them, do provide some measure of disease burden (Table 8).

Another important characteristic of disease is the case-fatality associated with it, i.e. the proportion of cases who die. For acute diseases this is usually easily measured, but less so for cancer where the course of the disease can be prolonged. The ratio of deaths to new cases is an approximate measure of case-fatality, and is available at the national level. A more accurate measure is the proportion of cases who survive five years (see Figures 8, 9 Table 10). Such statistics are not yet collected nationally.

Table 1 gives the estimated numbers of new cases of cancer and cancer deaths which will occur in Canada during the current year. Even excluding the approximately 43,000 cases of non-melanotic skin cancer, the total number of new cases is expected to exceed 100,000, with just over half that number of cancer deaths. The numbers of cases and deaths both increase by about 3 per

TABLE 1. Estimated New Cases and Deaths for Major Sites of Cancer, Canada, 1990

Site	Estimated number of new cases in 1990			Estimated number of deaths in 1990			Deaths/Cases ratio[1]		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
All cancers[2]	**104,000**	**54,600**	**49,200**	**54,500**	**29,900**	**24,600**	**0.52**	**0.55**	**0.50**
Oral	2,920	2,100	820	980	700	280	0.34	0.33	0.34
Stomach	2,950	1,850	1,100	2,010	1,250	760	0.68	0.68	0.69
Colorectal	15,100	7,700	7,400	5,700	3,000	2,900	0.39	0.39	0.39
Pancreas	2,750	1,400	1,350	2,700	1,400	1,300	0.98	1.00	0.96
Lung	17,300	11,800	5,500	14,200	9,800	4,400	0.82	0.83	0.80
Melanoma	2,600	1,200	1,400	520	300	220	0.20	0.25	0.16
Female breast	13,400	...	13,400	4,900	...	4,900	0.37	...	0.37
Cervix	1,400	...	1,400	380	...	380	0.27	...	0.27
Uterus (Body)	3,100	...	3,100	560	...	560	0.18	...	0.18
Ovary	1,900	...	1,900	1,200	...	1,200	0.63	...	0.63
Prostate	10,300	10,300	...	3,300	3,300	...	0.32	0.32	...
Bladder	5,000	3,700	1,300	1,140	800	340	0.23	0.22	0.26
Kidney	2,530	1,550	980	1,090	670	420	0.43	0.43	0.43
Brain	1,970	1,100	870	1,370	760	610	0.70	0.69	0.70
Lymphoma	5,800	3,100	2,700	2,700	1,450	1,250	0.47	0.47	0.46
Leukemia	2,950	1,700	1,250	1,860	1,050	810	0.63	0.62	0.65
All other sites[2]	11,830	7,100	4,730	9,690	5,420	4,270	0.82	0.76	0.90

[1] *Based on estimates.*
[2] *Totals exclude an estimated 43,000 cases of non-melanoma skin cancer.*
... *not applicable.*
Source: *Tables 2 – 5.*

cent annually so that the ratio remains about the same. Fifty-three per cent of the new cases are in males, but the death/case ratio is slightly higher for males than for females so a somewhat higher proportion (55%) of cancer deaths are males. This difference in overall prognosis is due to the fact that the male/female ratio of cases is greater for some types of cancer which have a poorer prognosis, e.g. stomach and lung.

Cancer is not a single disease; it is a pathological process of uncontrolled growth following a change, or series of changes, in the genome of a single cell. With the exception of those arising in the cells which form blood and lymph cells, where the origin is difficult to determine, cancers are classified by the organ in which the cellular mutation takes place. In fact the majority of cancers arise in the sheets of cells which form the surface of the organs and their connecting glands (carcinomas), only a few from the bones, muscles and connective tissues (sarcomas). This is probably in part due to the more frequent contact of these surfaces with chemical carcinogens, but also to the rate at which surface cells divide, since cancer does not occur in cells which do not divide, such as the nerve cells of adults (brain cancer occurs in the supporting tissues, not in the nerve cells themselves).

The most frequent form of cancer among Canadians is non-melanotic skin cancer, but Table 1 shows that, after excluding skin cancer, more than half the new cases in males occur in three sites – lung, prostate and large bowel. Similarly over half the new cases in females occur in three sites – breast, large bowel and lung. The same sites account for over half the cancer deaths in males and almost half the cancer deaths in females.

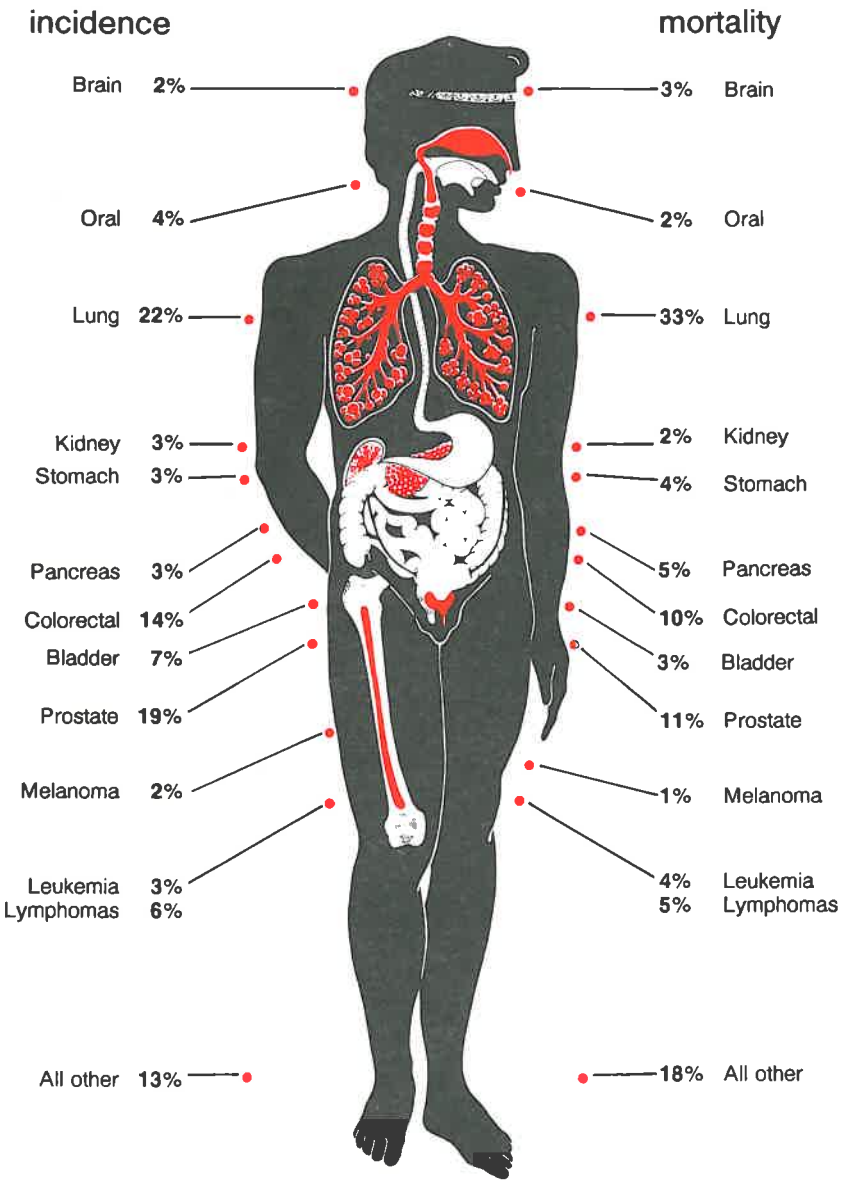
As seen in Tables 2 – 5, the pattern of dominance of these sites is present in every province, although the ranking in males varies due to longitudinal gradients in the incidence of two of them, lung and prostate. After adjustment for differences in age distribution, the incidence of cancer of the lung in males increases westward from Newfoundland to a maximum in Quebec and then declines towards the Pacific, while the incidence of prostate cancer increases gradually from East to West. The gradient in the incidence of cancer of the lung is seen also in the age-adjusted mortality rates, and is probably a true incidence pattern reflecting regional differences in cigarette smoking, but the trend in the incidence of prostate cancer is not seen in the mortality rates, and may be due to differences in diagnostic criteria.

Tables 6 and 7 show the actual numbers of new cases and deaths in the latest years for which they are available at the national level. The site breakdown is more detailed than in Tables 1 – 5. An interesting feature of Table 6 is the ratio of male to female cases for sites other than breast and genital tract. The Canadian population is equally divided between the sexes so that the ratio of the number of cases is the same as that of the crude rates. The female population is somewhat older on average than the male, but despite this there are more male than female cases reported for most cancer sites, the exceptions being large intestine (colon), liver and biliary passages, melanoma of skin and thyroid. Why these particular sites are more common in females is not known. One possible single explanation might be the higher secretion and subsequent excretion of estrogens in females. Among the other cancer sites the male/female ratio is greater than five for cancers of the lip and larynx, and over two for tongue, mouth, pharynx, esophagus, lung and bladder. Tobacco

use in its various forms is implicated in all these types of cancer, alcohol also in cancers of the upper alimentary tract and larynx, sunlight in cancer of the lip, and some occupational exposures in cancers of the larynx, lung and bladder. The higher incidence in males is thus readily explained.

Statistics on hospital in-patient treatment for cancer in 1986 are shown in Table 8. Cancer accounts for 5.1% of all spells of hospital treatment ("separation") and 7.7% of all days stay in hospital; the average duration of a spell is 17.6 days for cancer compared with 11.7 days for all diagnoses. From the point of view of assessing the burden on the health care system due to cancer it is interesting to look at the ratios of days of in-patient treatment to registered new cases. On average, each cancer case consumes 38 days, but there is considerable variation in this ratio, which is low for cancers of the eye (17), endocrine glands (22) bone and connective tissue (24) and female breast (24), and high for leukemia (46), digestive organs (47) and brain (84). This variation is due, primarily, to differences in the type of treatment (some sites can be treated as out-patients), and to differences in the rate of recurrence and need for terminal care.

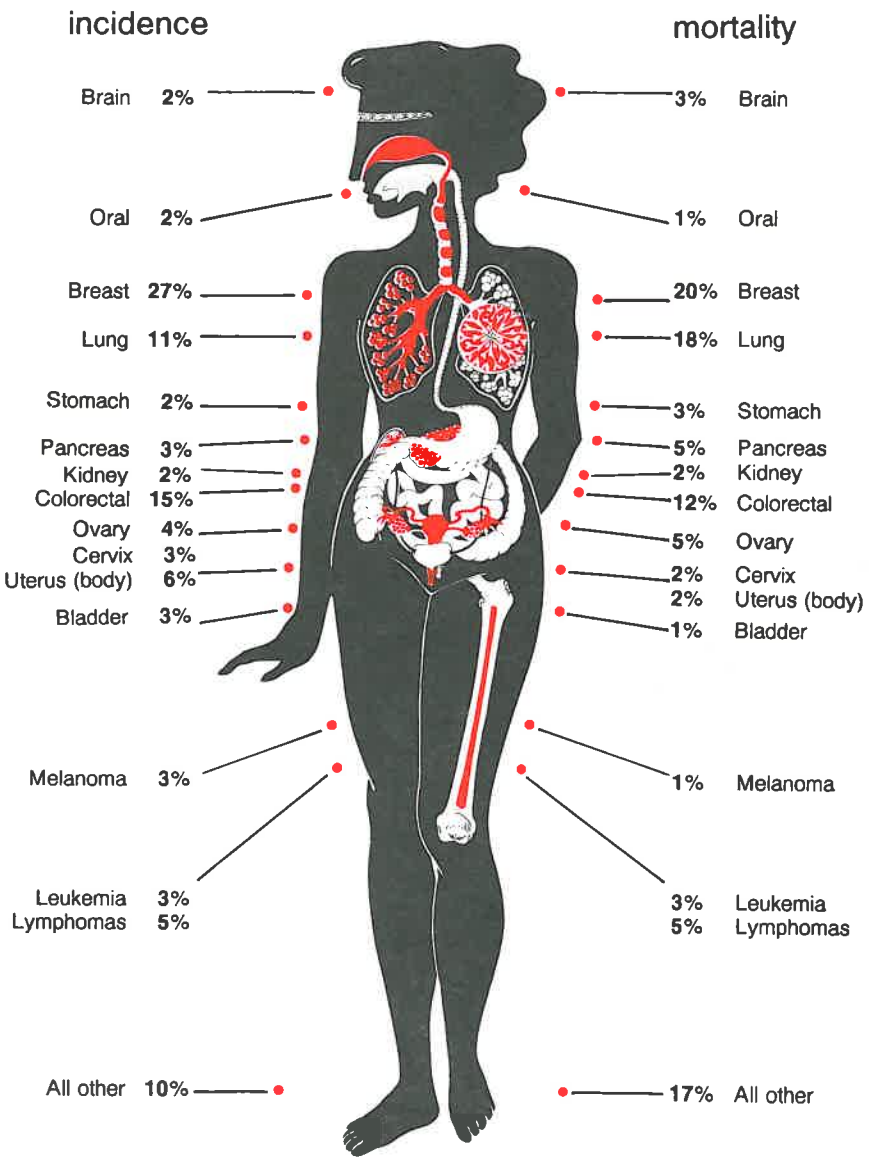
Figure 1.1
Estimated Cancers by Site, Males, Canada, 1990



Note: *Excluding non-melanoma skin cancer and carcinoma in situ.*

Figure 1.2

Estimated Cancers by Site, Females, Canada, 1990



Note: *Excluding non-melanoma skin cancer and carcinoma in situ.*

TABLE 2. Estimated New Cases and Age-standardized Incidence Rates for Major Sites of Cancer for Males, Canada and Provinces, 1990

	All cancers[1,2,3]	Oral	Stomach	Colorectal	Pancreas	Lung	Melanoma of skin	Prostate	Bladder	Kidney	Brain	Lymphoma	Leukemia
Estimated New Cases: Males[4]													
CANADA	**54,000**	**2,100**	**1,850**	**7,700**	**1,400**	**11,800**	**1,200**	**10,300**	**3,700**	**1,550**	**1,100**	**3,100**	**1,700**
Nfld.	830	50	55	140	20	180	10	130	60	30	15	35	15
P.E.I.	310	15	10	40	10	90	5	40	20	10	5	15	10
N.S.	1,750	60	65	270	40	460	40	410	130	50	30	95	35
N.B.	1,450	40	60	210	45	440	20	270	100	50	20	80	35
Que.	14,300	520	590	1,950	370	3,800	130	2,200	980	430	280	750	410
Ont.	20,700	810	590	3,000	490	3,900	620	3,600	1,550	550	460	1,250	740
Man.	2,500	120	85	380	65	460	45	590	150	65	40	140	70
Sask.	2,400	110	80	320	70	430	45	420	160	70	40	130	85
Alta.	3,800	150	120	480	110	670	90	800	220	120	70	230	120
B.C.	6,500	240	200	910	170	1,400	210	1,850	300	180	130	350	160
Estimated Age-standardized Incidence Rates per 100,000 population: Males													
CANADA	**339**	**13**	**11**	**48**	**8**	**77**	**8**	**55**	**23**	**10**	**8**	**20**	**11**
Nfld.	271	9	17	49	6	67	2	36	19	10	5	12	5
P.E.I.	357	16	11	45	12	86	6	48	22	14	3	21	7
N.S.	302	11	11	46	6	74	7	44	21	9	6	17	6
N.B.	336	10	13	49	10	91	5	52	22	11	5	19	8
Que.	357	13	14	49	9	96	3	54	24	11	8	19	11
Ont.	341	13	9	49	8	70	11	53	25	10	9	22	13
Man.	323	17	10	49	8	70	6	56	19	9	6	20	10
Sask.	324	17	11	44	9	62	7	62	21	11	7	20	13
Alta.	308	13	10	42	10	58	7	62	19	10	6	20	10
B.C.	315	12	9	44	8	62	12	70	15	9	7	18	9

1 *Excludes non-melanoma skin cancer.*
2 *Columns may not add due to rounding.*
3 *Due to changes and improvements in source data and methodology, the 1990 estimates may not be directly comparable to the figures published in previous years. Please refer to methodological appendix for further details.*
4 *These estimates may vary from actual figures by about 5 to 15 percent. Provincial cancer registries may be contacted for the most current actual data.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

TABLE 3. Estimated New Cases and Age-standardized Incidence Rates for Major Sites of Cancer for Females, Canada and Provinces, 1990

	All cancers[1,2,3]	Oral	Stomach	Colorectal	Pancreas	Lung	Melanoma of skin	Breast	Cervix	Body of uterus	Ovary	Bladder	Kidney	Brain	Lymphoma	Leukemia
Estimated New Cases: Females[4]																
CANADA	**49,200**	**820**	**1,100**	**7,400**	**1,350**	**5,500**	**1,400**	**13,400**	**1,300**	**3,100**	**1,900**	**1,300**	**1,000**	**870**	**2,700**	**1,250**
Nfld.	670	10	30	140	15	45	15	180	40	35	20	15	20	15	30	10
P.E.I.	270	--	5	40	10	20	10	55	10	15	15	5	5	5	15	10
N.S.	1,550	20	35	250	40	210	50	520	40	90	60	45	30	25	80	25
N.B.	1,200	20	30	210	35	130	30	360	35	65	45	30	25	15	65	30
Que.	12,400	130	340	1,950	380	1,250	140	3,400	270	810	410	360	300	200	690	300
Ont.	19,400	380	390	2,900	480	2,200	670	4,900	490	1,250	800	530	350	410	1,100	590
Man.	2,500	40	50	350	70	280	55	550	65	170	85	55	45	30	140	50
Sask.	1,850	35	40	270	65	200	60	540	35	100	85	55	45	35	110	55
Alta.	3,500	65	80	440	110	370	110	1,050	110	210	160	75	80	55	170	90
B.C.	5,800	110	120	840	150	790	240	1,800	130	330	240	110	110	90	280	110
Estimated Age-standardized Incidence Rates per 100,000 Population: Females																
CANADA	**257**	**4**	**4**	**34**	**6**	**28**	**8**	**72**	**6**	**17**	**11**	**6**	**5**	**6**	**14**	**7**
Nfld.	209	2	7	41	4	14	4	53	12	12	6	4	6	5	10	3
P.E.I.	261	1	3	31	7	19	7	71	5	20	14	3	3	1	13	7
N.S.	232	3	4	32	6	28	9	66	6	13	10	6	5	4	12	3
N.B.	227	4	4	36	6	25	6	65	4	14	10	6	5	2	11	5
Que.	245	3	6	35	7	28	3	73	5	16	8	6	6	4	13	6
Ont.	269	5	4	35	6	29	11	71	7	18	12	7	5	7	16	8
Man.	295	4	4	34	7	31	8	78	9	20	10	5	5	4	16	6
Sask.	249	4	4	30	6	26	9	72	6	13	12	6	5	5	15	7
Alta.	248	5	5	30	7	25	8	70	8	16	12	5	6	4	12	7
B.C.	250	5	4	31	5	32	12	75	5	14	11	4	5	5	12	5

1 *Excludes non-melanoma skin cancer.*
2 *Columns may not add due to rounding.*
3 *Due to changes and improvements in source data and methodology, the 1990 estimates may not be directly comparable to the figures published in previous years. Please refer to methodological appendix for further details.*
4 *These estimates may vary from actual figures by about 5 to 15 percent. Provincial cancer registries may be contacted for the most current actual data.*
-- *less than 5 cases, or estimated ASIR less than 0.5.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

TABLE 4. Estimated Deaths and Age-standardized Mortality Rates for Major Sites of Cancer for Males, Canada and Provinces, 1990

	All cancers[1,2,3]	Oral	Stomach	Colorectal	Pancreas	Lung	Melanoma of skin	Prostate	Bladder	Kidney	Brain	Lymphoma	Leukemia
Estimated Deaths: Males													
CANADA	**29,900**	**700**	**1,250**	**3,000**	**1,400**	**9,800**	**300**	**3,300**	**800**	**670**	**760**	**1,450**	**1,050**
Nfld.	550	5	45	55	30	180	5	50	15	10	15	20	15
P.E.I.	180	5	5	10	10	65	--	25	5	5	5	10	5
N.S.	1,100	20	45	95	45	350	10	120	30	25	25	50	40
N.B.	850	15	45	85	40	310	5	85	25	25	20	40	25
Que.	8,300	200	360	820	400	3,100	60	810	200	170	210	350	270
Ont.	11,100	290	430	1,200	500	3,500	130	1,200	320	250	290	550	410
Man.	1,300	30	60	160	65	380	10	170	40	30	20	70	50
Sask.	1,200	20	55	120	55	340	10	180	30	30	30	65	55
Alta.	1,900	40	75	170	90	530	25	240	45	45	50	110	80
B.C.	3,400	75	140	310	170	1,050	40	450	100	75	100	160	110
Estimated Age-standardized Mortality Rates per 100,000 Population: Males													
CANADA	**173**	**5**	**7**	**18**	**8**	**58**	**2**	**16**	**5**	**4**	**5**	**9**	**7**
Nfld.	167	2	14	17	9	56	1	13	4	3	5	6	4
P.E.I.	175	2	6	10	11	72	1	18	2	4	1	8	5
N.S.	184	4	8	16	7	56	2	17	5	4	4	8	7
N.B.	181	3	9	18	8	66	--	16	5	5	5	9	5
Que.	199	5	9	20	10	77	2	17	5	4	6	9	7
Ont.	170	5	7	19	8	54	2	16	5	4	5	9	7
Man.	167	4	8	19	8	49	2	17	4	4	3	9	6
Sask.	152	3	7	15	7	46	1	19	4	4	5	9	8
Alta.	149	3	7	15	8	41	2	17	4	4	4	9	7
B.C.	150	4	6	14	8	45	2	17	4	4	6	8	5

1 *Excludes non-melanoma skin cancer; columns may not add due to rounding.*
2 *Estimates are calculated by extrapolating trends in cancer mortality as reported by provincial agencies.*
3 *Due to changes in methodology, the 1990 estimates may not be directly comparable to the figures published in previous years. Please refer to methodological appendix for further details.*
-- *less than 5 cases, or estimated ASMR less than 0.5.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

TABLE 5. Estimated Deaths and Age-standardized Mortality Rates for Major Sites of Cancer for Females, Canada and Provinces, 1990

	All cancers[1,2,3]	Oral	Stomach	Colorectal	Pancreas	Lung	Melanoma of skin	Breast	Cervix	Body of uterus	Ovary	Bladder	Kidney	Brain	Lymphoma	Leukemia
Estimated Deaths: Females																
CANADA	**24,600**	**280**	**760**	**2,900**	**1,300**	**4,500**	**220**	**4,900**	**380**	**560**	**1,200**	**340**	**420**	**610**	**1,250**	**810**
Nfld.	380	5	20	55	20	35	5	70	10	10	15	5	10	10	15	10
P.E.I.	110	--	5	10	10	15	--	20	5	--	5	--	--	5	5	5
N.S.	930	10	30	90	50	160	10	190	15	15	40	10	15	20	40	30
N.B.	630	5	25	65	35	95	5	130	10	15	25	10	10	15	30	20
Que.	6,500	65	210	830	350	1,150	40	1,300	70	170	290	100	110	170	330	220
Ont.	9,500	120	270	1,150	480	1,800	90	1,950	170	210	490	140	160	240	490	320
Man.	1,100	10	40	140	65	190	10	220	20	25	55	15	20	20	65	30
Sask.	870	10	25	110	50	140	10	160	10	20	55	15	15	25	45	30
Alta.	1,600	20	50	160	95	280	20	340	25	35	75	15	30	35	90	60
B.C.	3,000	30	80	300	160	620	30	540	35	65	160	35	45	65	140	80
Estimated Age-standardized Mortality Rates per 100,000 Population: Females																
CANADA	**110**	**1**	**3**	**12**	**6**	**21**	**1**	**24**	**2**	**2**	**6**	**1**	**2**	**4**	**6**	**4**
Nfld.	103	1	5	15	5	12	1	18	4	2	4	1	2	4	5	2
P.E.I.	97	1	3	7	6	14	--	23	3	1	7	--	1	3	4	2
N.S.	121	1	4	9	6	24	1	27	3	2	5	1	2	3	5	4
N.B.	105	1	4	9	5	20	1	24	2	2	4	1	2	2	5	3
Que.	109	1	3	14	6	20	1	23	1	3	6	1	2	4	6	4
Ont.	114	2	3	12	5	22	1	25	2	2	6	1	2	4	6	4
Man.	111	1	3	12	6	21	--	23	3	2	6	1	2	2	6	3
Sask.	100	1	3	12	5	18	1	20	2	2	7	1	2	3	5	3
Alta.	106	1	3	10	6	19	1	24	2	2	6	1	2	3	6	4
B.C.	107	1	3	10	6	24	1	22	2	2	7	1	2	3	5	3

1 *Excludes non-melanoma skin cancer; columns may not add due to rounding.*
2 *Estimates are calculated by extrapolating trends in cancer mortality as reported by provincial agencies.*
3 *Due to changes in methodology, the 1990 estimates may not be directly comparable to the figures published in previous years. Please refer to methodological appendix for further details.*
-- *less than 5 cases, or estimated ASMR less than 0.5.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

TABLE 6. Actual New Cases by Cancer Site and Sex, Canada, 1985

Site	ICD-9[1]	Total	Male	Female
All cancer sites[2]	**140-208**	**90,997**	**47,024**	**43,973**
Oral (Buccal cavity and pharynx)	**140-149**	**2,779**	**2,006**	**773**
Lip	140	728	617	111
Tongue	141	431	285	146
Salivary gland	142	205	113	92
Floor of the mouth	144	224	147	77
Pharynx	146,147,148	629	482	147
Other and unspecified	143,145,149	562	362	200
Digestive organs	**150-159**	**21,909**	**11,673**	**10,236**
Esophagus	150	886	604	282
Stomach	151	2,910	1,833	1,077
Small intestine	152	238	123	115
Large intestine	153	9,124	4,400	4,724
Rectum	154	4,319	2,404	1,915
Liver and biliary passages	155,156	1,366	670	696
Pancreas	157	2,469	1,332	1,137
Other and unspecified	158,159	597	307	290
Respiratory system	**160-165**	**15,441**	**11,139**	**4,302**
Larynx	161	1,164	973	191
Lung	162	13,811	9,853	3,958
Other and unspecified	160,163,164, 165	466	313	153
Bone tissue and skin[2]	**170-172**	**3,061**	**1,495**	**1,566**
Bone	170	273	162	111
Connective tissue	171	584	324	260
Skin (melanoma)	172	2,204	1,009	1,195
Breast	**174,175**	**11,926**	**81**	**11,845**
Genital organs	**179-187**	**15,571**	**8,868**	**6,703**
Cervix uteri	180	1,665	...	1,665
Corpus uteri	182	2,620	...	2,620
Ovary	183	1,869	...	1,869
Prostate	185	8,212	8,212	...
Other and unspecified	179,181,184, 186,187	1,205	656	549
Urinary organs	**188-189**	**6,480**	**4,473**	**2,007**
Bladder	188	4,208	3,103	1,105
Kidney and other urinary	189	2,272	1,370	902
Eye	**190**	**199**	**104**	**95**
Brain and central nervous system	**191-192**	**1,716**	**935**	**781**
Endocrine glands	**193-194**	**1,040**	**294**	**746**
Thyroid	193	892	214	678
Other endocrine	194	148	80	68
Leukemia	**204-208**	**2,637**	**1,559**	**1,078**
Other blood and lymph tissues	**200-203**	**5,130**	**2,806**	**2,324**
Hodgkins disease	201	792	481	311
Multiple myeloma	203	1,144	605	539
Other lymphomas	200-202	3,194	1,720	1,474
All other and unspecified sites	**195-199**	**3,108**	**1,591**	**1,517**

1 *ICD-9 refers to the ninth revision of the International Classification of Diseases.*
2 *Excludes non-melanoma skin cancer (ICD-9 173).*
... *figures not appropriate or not applicable.*
Source: *Cancer in Canada, Standard Table 41018, Canadian Centre for Health Information Statistics Canada.*

TABLE 7. Actual Deaths by Cancer Site and Sex, Canada[1], 1988

Site	ICD-9[2]	Total	Male	Female
All cancer sites[3]	**140-208**	**50,613**	**28,006**	**22,607**
Oral (Buccal cavity and pharynx)	**140-149**	**930**	**679**	**251**
Lip	140	25	22	3
Tongue	141	221	158	63
Salivary gland	142	55	33	22
Floor of the mouth	144	35	28	7
Pharynx	146,147,148	281	216	65
Other and unspecified	143,145,149	313	222	91
Digestive organs	**150-159**	**14,249**	**7,801**	**6,448**
Esophagus	150	990	710	280
Stomach	151	2,130	1,371	759
Small intestine	152	115	56	59
Large intestine	153	4,434	2,193	2,241
Rectum	154	1,360	803	557
Liver and biliary passages	155,156	1,349	707	642
Pancreas	157	2,517	1,308	1,209
Other and unspecified	158,159	1,354	653	701
Respiratory system	**160-165**	**13,839**	**9,806**	**4,033**
Larynx	161	502	420	82
Lung	162	13,104	9,239	3,865
Other and unspecified	160,163, 164,165	233	147	86
Bone tissue and skin[3]	**170-172**	**832**	**478**	**354**
Bone	170	145	85	60
Connective tissue	171	238	133	105
Skin (melanoma)	172	449	260	189
Breast	**174,175**	**4,513**	**33**	**4,480**
Genital organs	**179-187**	**5,398**	**3,120**	**2,278**
Cervix uteri	180	418	...	418
Corpus uteri	182	317	...	317
Ovary	183	1,210	...	1,210
Prostate	185	3,037	3,037	..
Other and unspecified	179,181,184, 186,187	416	83	333
Urinary organs	**188-189**	**2,327**	**1,523**	**804**
Bladder	188	1,206	844	362
Kidney and other urinary	189	1,121	679	442
Eye	**190**	**60**	**40**	**20**
Brain and central nervous system	**191-192**	**1,343**	**754**	**589**
Endocrine glands	**193-194**	**158**	**69**	**89**
Thyroid	193	83	21	62
Other endocrine	194	75	48	27
Leukemia	**204-208**	**1,853**	**1,041**	**812**
Other blood and lymph tissues	**200-203**	**2,613**	**1,413**	**1,200**
Hodgkins disease	201	165	98	67
Multiple myeloma	203	831	421	410
Other lymphomas	200-202	1,617	894	723
All other and unspecified sites	**195-199**	**2,498**	**1,249**	**1,249**

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" Standard Table 41030, Canadian Centre for Health Information, Statistics Canada.*

TABLE 8. Hospital Separations with a Diagnosis of Cancer, Canada,[1] 1986[2]

Site of cancer	No. of separations		Total days stay[4]	
	Male	Female	Male	Female
All separations	**1,531,263**	**2,122,427**	**18,308,640**	**24,465,204**
All cancer sites,[3]	**97,427**	**90,397**	**1,682,222**	**1,625,882**
Oral (Buccal cavity and pharynx)	**3,186**	**1,220**	**55,759**	**22,670**
Lip	320	58	2,606	895
Tongue	626	298	11,358	5,304
Salivary gland	201	152	2,732	1,941
Floor of the mouth	279	125	6,235	2,402
Pharynx	1,036	291	17,974	5,076
Other and unspecified	724	296	14,854	7,052
Digestive organs	**19,778**	**16,504**	**400,030**	**586,025**
Esophagus	1,505	666	29,228	14,507
Stomach	3,149	1,804	64,285	44,164
Small intestine	205	202	4,185	4,499
Large intestine	6,112	6,411	120,945	150,056
Rectum	4,702	3,697	98,981	85,707
Liver and biliary passages	1,273	1,169	25,177	28,095
Pancreas	2,331	1,993	48,041	46,499
Other and unspecified	501	562	9,188	12,500
Respiratory system	**22,106**	**8,778**	**386,987**	**164,192**
Larynx	1,944	387	33,859	7,704
Lung	19,543	8,082	343,995	151,410
Other and unspecified	619	309	9,133	5,078
Bone tissue and skin(2)	**2,143**	**1,896**	**29,789**	**31,456**
Bone	591	445	9,755	8,706
Connective tissue	706	623	9,917	11,270
Skin (melanoma)	846	828	10,117	11,480
Breast	**104**	**18,367**	**1,434**	**266,246**
Genital organs	**16,071**	**15,380**	**262,712**	**190,332**
Cervix uteri	...	3,487	...	44,040
Corpus uteri	...	4,389	...	50,626
Ovary	...	6,263	...	71,801
Prostate	14,748	...	251,137	–
Other and unspecified	1,323	1,241	11,575	23,865
Urinary organs	**11,045**	**4,427**	**134,044**	**67,222**
Bladder	8,783	2,925	92,897	35,006
Kidney and other urinary	2,262	1,502	41,147	52,216
Eye	**163**	**166**	**1,810**	**1,668**
Brain and central nervous system	**2,493**	**1,990**	**68,664**	**75,434**
Endocrine glands	**627**	**1,177**	**8,798**	**12,895**
Thyroid	418	1,036	4,229	9,974
Other endocrine	209	141	4,569	2,921
Leukemia	**3,831**	**2,875**	**62,115**	**60,262**
Other blood and lymph tissues	**6,497**	**5,649**	**100,691**	**106,928**
Hodgkins disease	1,215	898	11,628	9,467
Multiple myeloma	1,565	1,445	30,757	36,705
Other lymphomas	3,717	3,306	58,306	60,756
All other and unspecified sites	**9,383**	**11,968**	**169,409**	**240,552**

1 *Canada totals exclude Yukon and Northwest Territories.*
2 *The year 1986 refers to fiscal year ending March 31, 1986.*
3 *Excludes non-melanoma skin cancer (ICD-9 173).*
4 *Average days stay can be calculated by dividing the total days by the number of separations.*
... *not applicable.*
Source: *"Hospital Morbidity" Standard Table 41017, Canadian Centre for Health Information, Statistics Canada.*

TRENDS IN INCIDENCE AND MORTALITY

The recent trends in the incidence of, and mortality from, the major types of cancer are shown graphically in Figures 2 – 7, and summarized numerically in Table 9. In each case, the rates have been adjusted to allow for changes in the age distribution of the population over time.

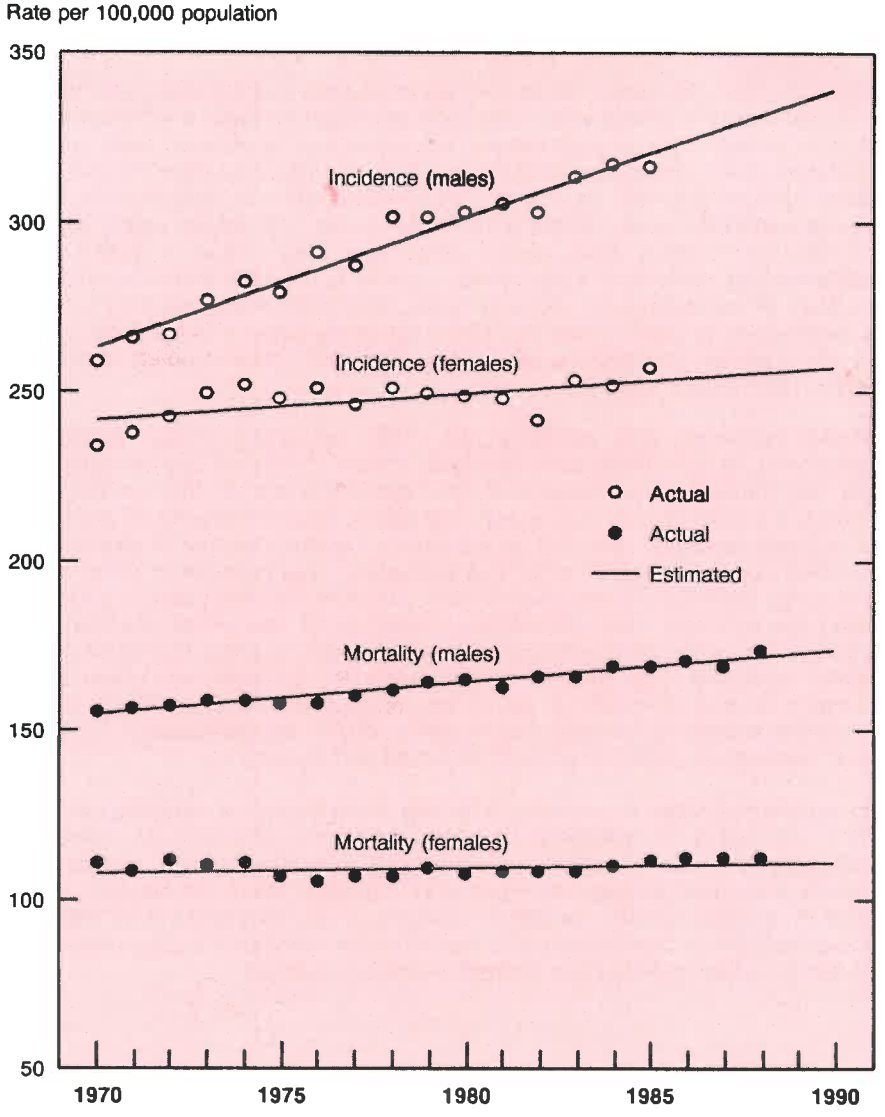
Figure 2 shows the trends for all cancers combined and the data from 1970 to the most recent available year have been projected to 1990. It is obvious that, at least at this level of aggregation, the projection is likely to hold up. The incidence of all cancer is increasing steadily in males (just over 1% per year) and in females also, but not so fast. The levelling off of mortality rates in males can be explained by the stable rates for lung cancer in recent years, while in females the mortality from cancer other than lung cancer is falling. Both incidence and mortality of lung cancer continue to increase in females (Figures 6 and 7). In males however, the lung cancer incidence rate shows the first signs of levelling off or decline with the 1985 rate being below that for 1984 (Figure 4); this parallels the levelling off of mortality rates already noted during the period 1982-1988 (Figure 5).

Where incidence and mortality are both increasing (lung, melanoma, lymphoma), or both decreasing (stomach, cervix, ovary) we can be fairly sure that the trends reflect changes in the true incidence of the disease. The increased incidence of cancer of the lung can be explained easily by the trends in cigarette smoking, and that in melanoma by the increase in exposure to sunshine due to increased nudity and sunbathing. The increase in lymphoma is less easily explained; some studies have indicated that exposure to pesticides might be involved. The decreasing incidence of cancer of the cervix is generally attributed to improved hygiene and, more recently, the effect of pap smear screening. The reason for the gratifying decrease in cancer of the stomach is also unknown. It has been suggested that it could be due to increased availability of fresh and frozen food and the consequent decline in older methods of preservation such as salting and pickling.

An apparent increase in incidence with little or no change in mortality (prostate, male colorectal) is probably due to increased detection of borderline malignancies, while a decrease in mortality with little change in incidence (female colorectal, corpus uteri) probably indicates improved survival. In the case of bladder cancer, incidence appears to be increasing and mortality falling, possibly a combination of a true increase in incidence (associated with smoking), better reporting and an improvement in survival.

Figure 2

Age-standardized Incidence and Mortality Rates for All Cancers, Canada

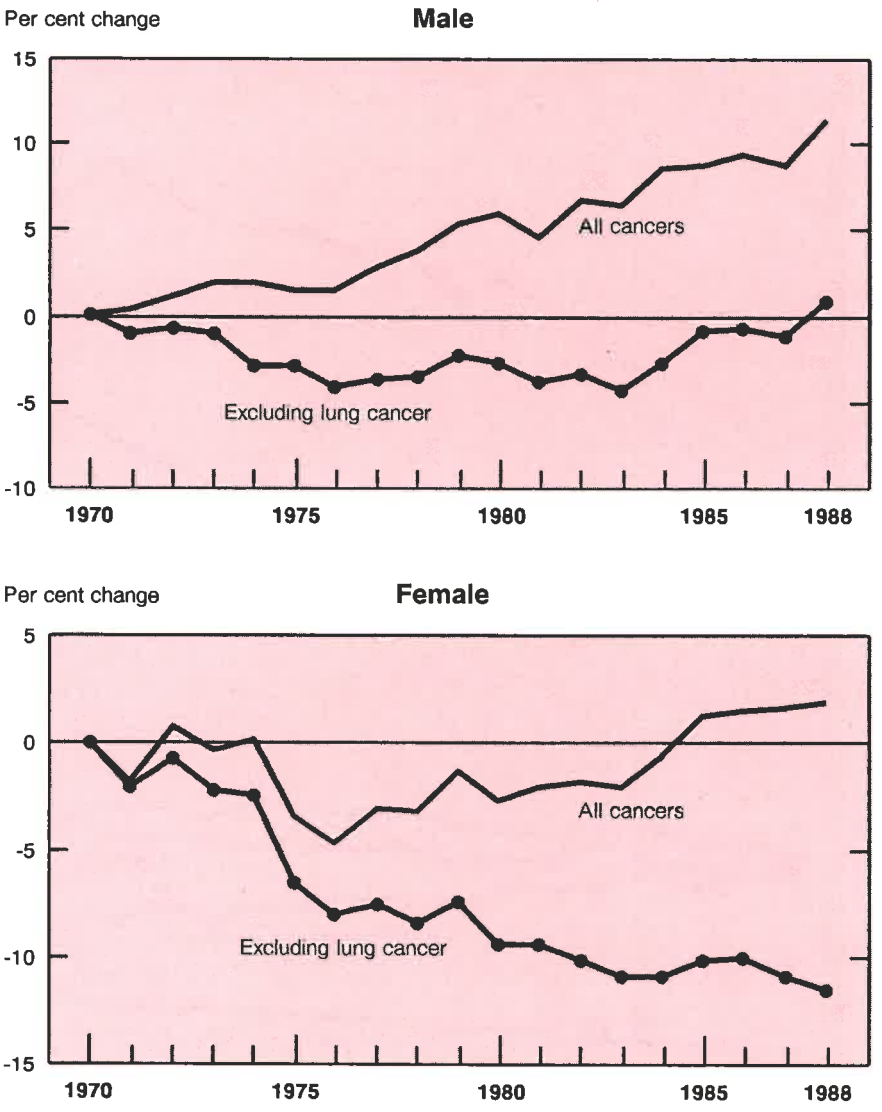


Note: *Rates are adjusted to the age distribution of the world population; all figures exclude non-melanoma skin cancer; and incidence rates prior to 1981 have been adjusted for underregistration in one province.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 3

Per Cent Change in Age-standardized Mortality Rates by Sex, Including and Excluding Lung Cancer, Canada

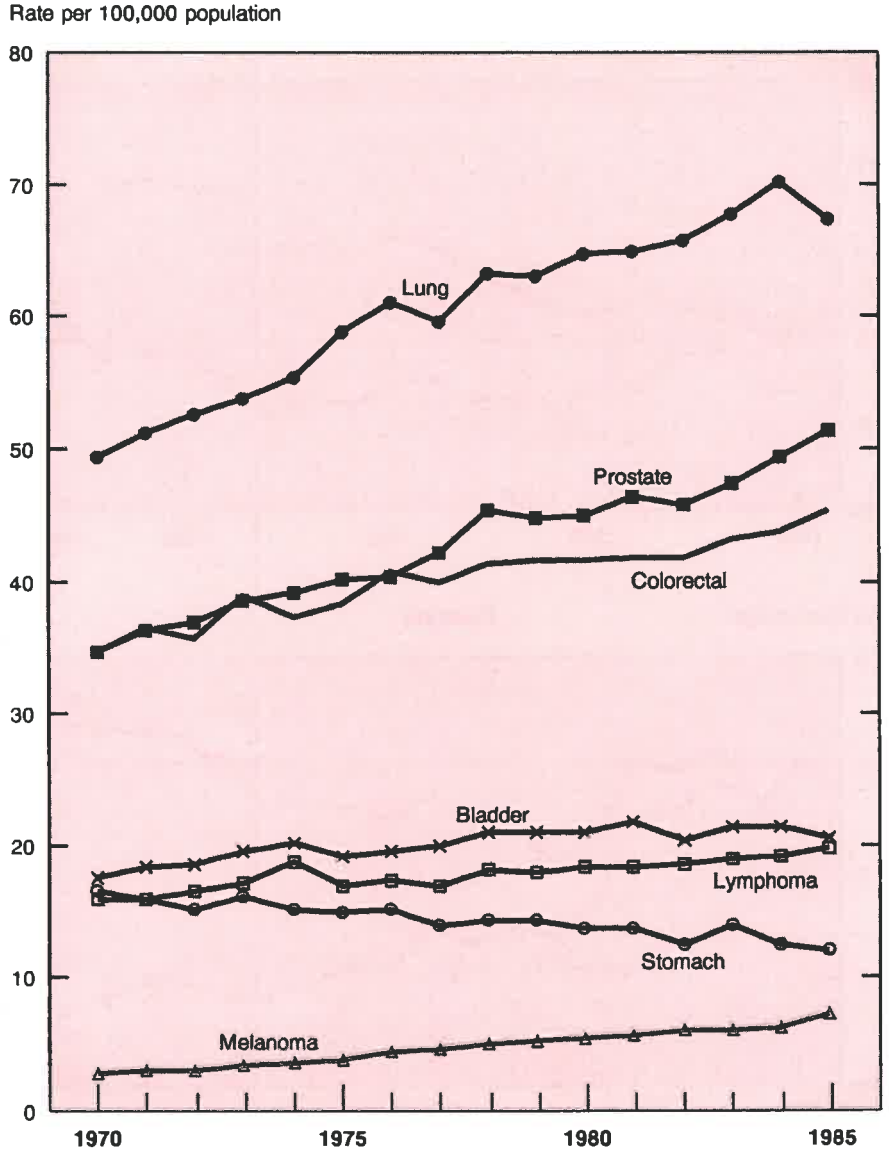


Note: *Rates are adjusted to the age distribution of the world population; all figures exclude non-melanoma skin cancer.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 4

Age-standardized Incidence Rates for Selected Cancer Sites, Males, Canada

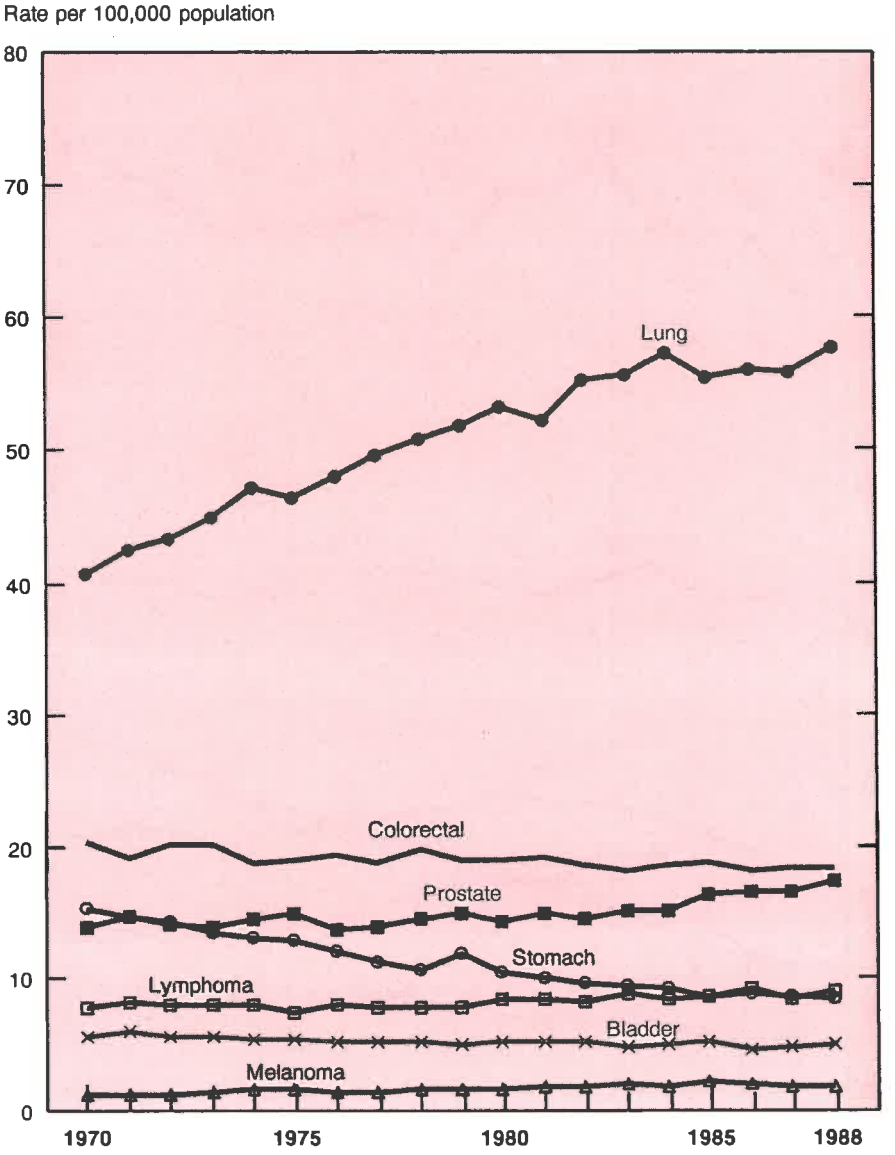


Note: *Rates are adjusted to the age distribution of the world population; rates prior to 1981 have been adjusted for underregistration in one province.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 5

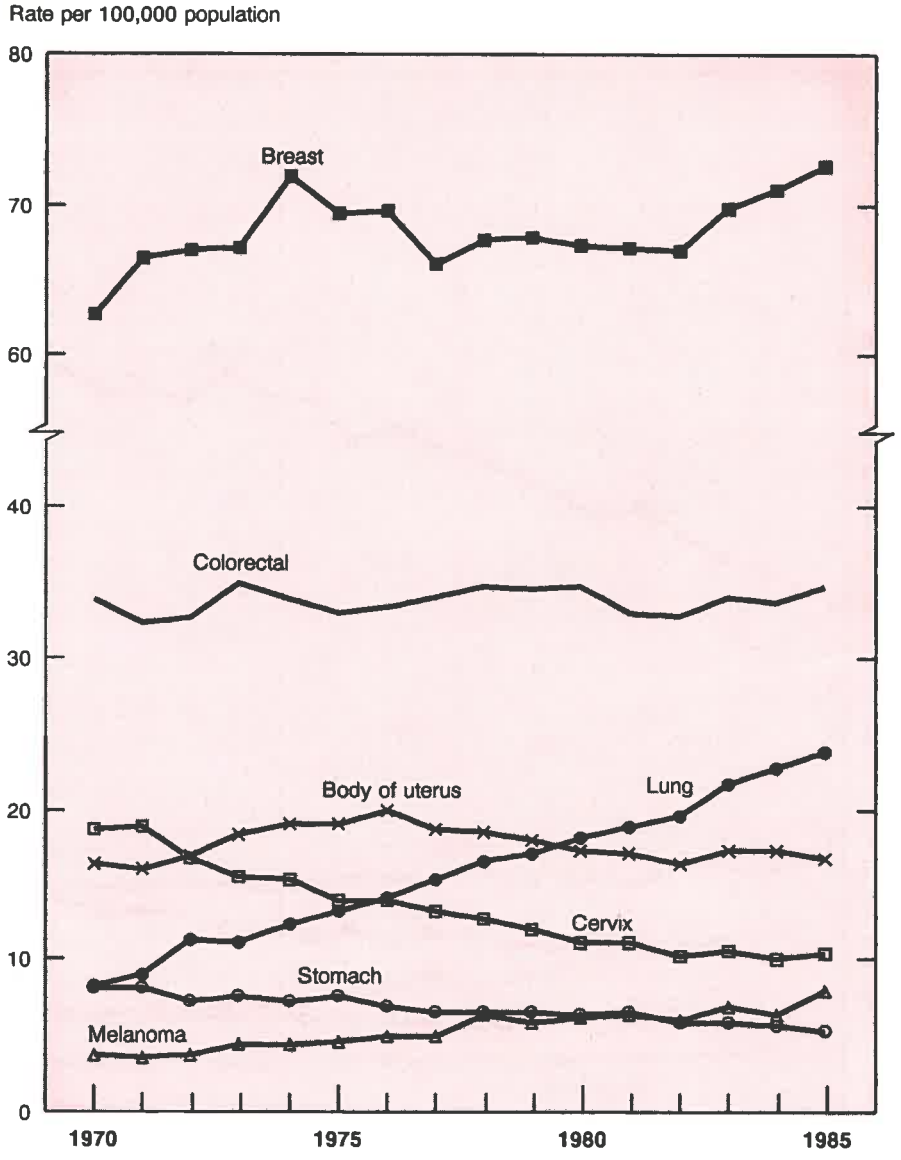
Age-standardized Mortality Rates for Selected Cancer Sites, Males, Canada



Note: *Rates are adjusted to the age distribution of the world population.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 6

Age-standardized Incidence Rates for Selected Cancer Sites, Females, Canada

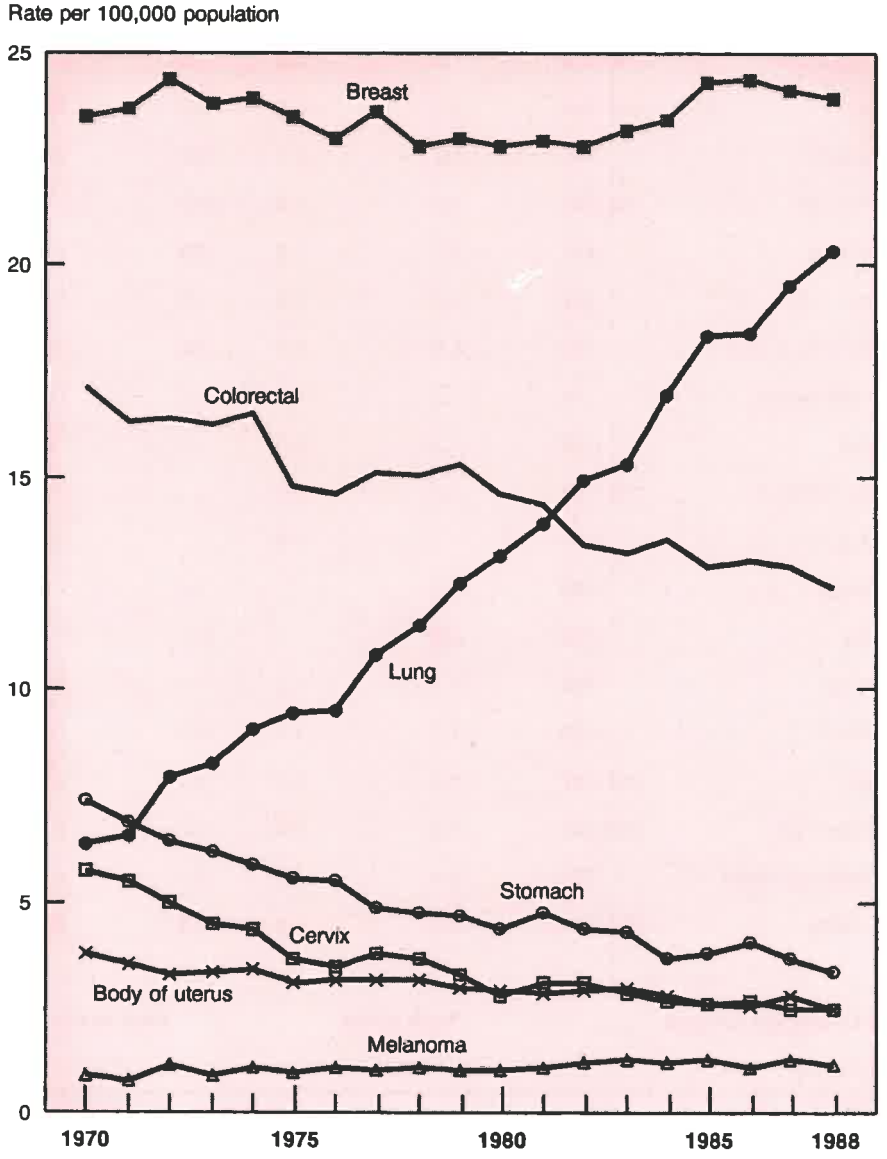


Note: *Rates are adjusted to the age distribution of the world population; rates prior to 1981 have been adjusted for underregistration in one province.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 7

Age-standardized Mortality Rates for Selected Cancer Sites, Females, Canada



Note: *Rates are adjusted to the age distribution of the world population.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

TABLE 9. Average Annual Per Cent[1] Change in Age-standardized Rates of Cancer, Canada, 1970 -

	ICD-9[2]	Incidence 1970-1985		Mortality 1970-1988	
		Male	Female	Male	Female
All Cancers[3]	**140-208[3]**	**1.3**	**0.3**	**0.6**	**0.1**
Oral	140-149	-1.0	-0.8	0.2	0.3
Stomach	151	-1.8	-2.7	-3.4	-3.9
Colorectal	153,154	1.5	0.2	-0.5	-1.6
Pancreas	157	-1.2	0.6	-0.5	0.4
Lung	162	2.2	7.0	1.9	6.7
Melanoma of skin	172	6.3	5.2	3.3	1.8
Female breast	174	...	0.4	...	0.0
Cervix	180	...	-4.3	...	-4.6
Body of Uterus	179, 182	...	-0.2	...	-1.9
Ovary	183	...	-1.4	...	-1.1
Prostate	185	2.4	...	1.0	...
Testis	186	2.6	...	-5.6	...
Bladder	188	1.1	1.2	-1.0	-1.5
Kidney	189	1.7	1.7	0.5	0.4
Brain	191-192	1.3	0.6	0.5	0.7
Lymphomas	200-203	1.2	0.6	0.7	0.5
Hodgkin's Disease	201	0.4	0.2	-5.1	-5.7
Leukemia	204-208	-0.3	-0.8	-0.3	-0.8

All Childhood cancers	**Both sexes**	**Both sexes**
(age 0-14)	1.2	-3.4

1 *Average annual per cent change is calculated assuming a log linear model.*
2 *ICD-9 refers to the ninth revision of the International Classification of Diseases.*
3 *Excludes non-melanoma skin cancer (ICD-9 173).*
... *not applicable.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

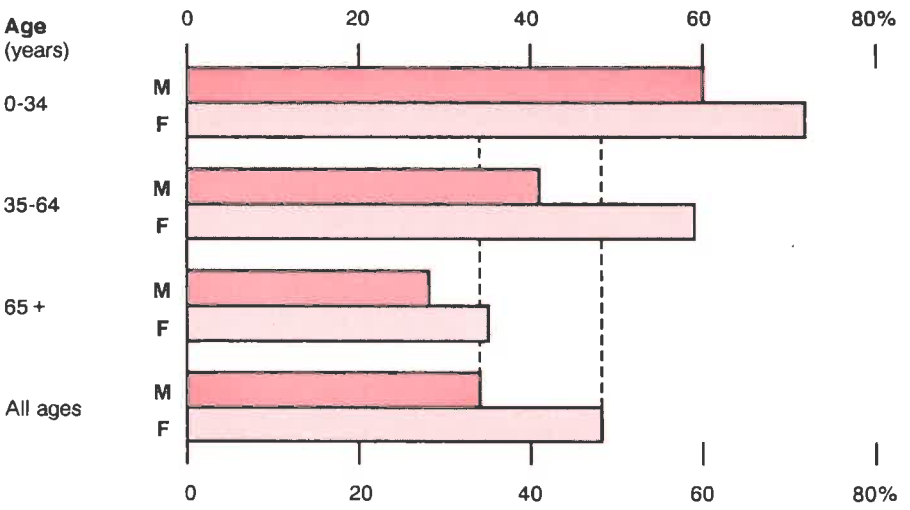
SURVIVAL RATES

Currently it is not possible to determine the survival of all cancer patients in Canada, though it is hoped that such statistics will be available in the near future. Survival rates are available from some provincial cancer registries, and this year we have used the data from the Province of Saskatchewan.

Figure 8 shows the actual proportion of all cases of cancer surviving five years after diagnosis during the years 1970-1986. These are called crude five year survival rates since no adjustment has been made for deaths not due to cancer. It is important to note that non-melanotic skin cancers are excluded – if they were included the rates would be much greater since virtually all skin cancer cases survive. About half the females treated for cancer survive five years, but only about a third of males. This difference in prognosis is due primarily to the greater incidence among males of cancers with very low survival rates such as lung cancer.

Figure 8

Crude Five Year Cancer Survival by Age Group and Sex, Saskatchewan, 1970-1986



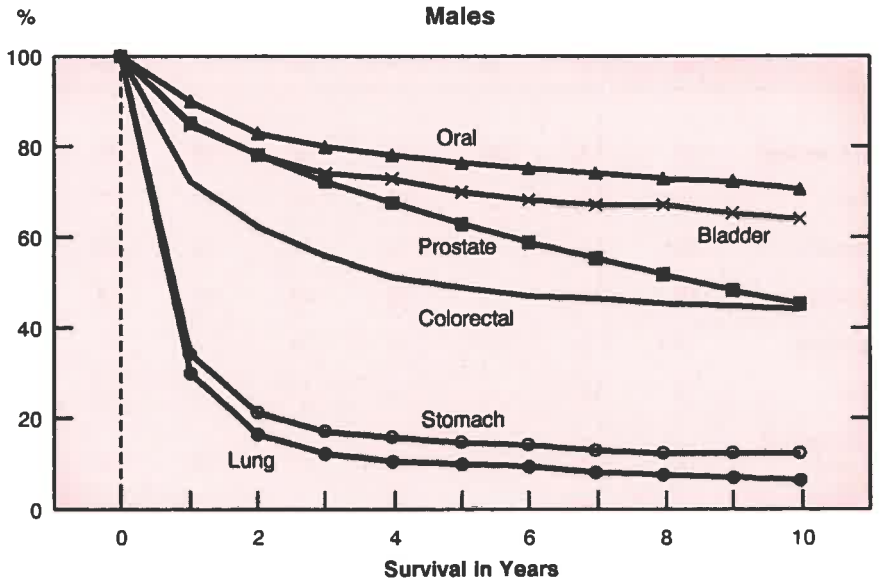
Source: *Saskatchewan Cancer Registry, and Disease Surveillance and Risk Assessment Division, Health and Welfare, Canada.*

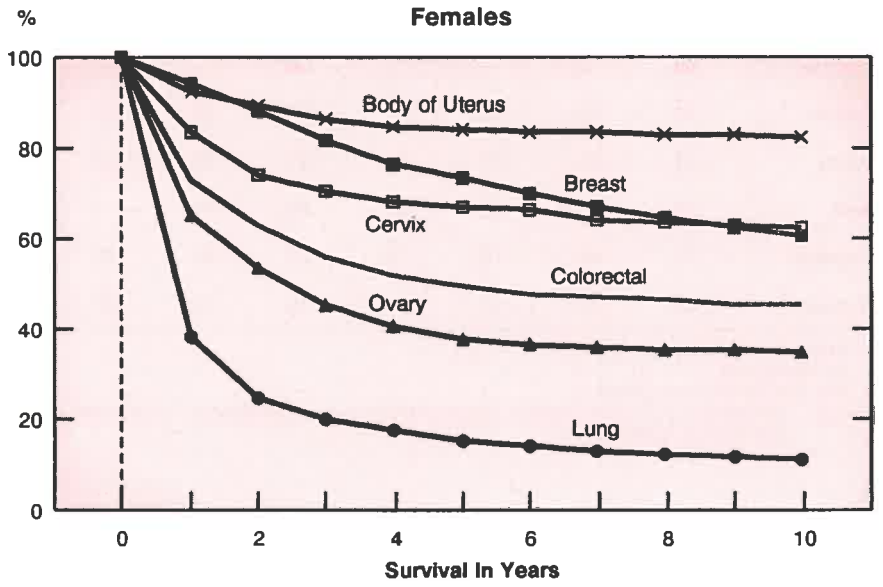
Survival rates decrease with age. Part of this is due to the increase with age of the risk of dying from causes other than cancer. The top row of Table 10, which gives the corresponding relative survival rates, shows that survival decreases with age in each sex even after the adjustment for differences in general mortality. Some of this residual age difference is due to the high proportion of lethal tumours, such as stomach, pancreas and lung in older age groups. Table 10 also demonstrates that the poorer prognosis for males for all cancers combined is seen also for relative survival, and therefore is not due to the sex differential in general mortality. Instead poorer prognosis in males must be due to the difference in the mix of tumours within the sexes, since there is no consistent male-female trend for the separate cancer sites. An exception is oral cancer, where survival is lower for females than males. This is because among males lip cancer forms a greater proportion of the oral cancers, and the prognosis for lip cancer is much better than for cancer within the mouth and pharynx.

Figure 9 shows that, for many of the common forms of cancer, the proportion of cases surviving following treatment, after adjustment for other causes of death, falls steeply in the first few years and then flattens out after about five years. It is for this reason that five year survival is taken as a criterion of "cure", although it is seen that relative survival continues to decline slowly. A different pattern is seen for prostatic and breast cancer, where the survival curve falls more gradually but without any tendency to plateau, the risk of recurrence and death continuing well into the second decade. The reason for this is not known but both types of cancer arise in glandular cells, some of which respond to hormonal influences.

Figure 9

Relative Cancer Survival Rates in Males and Females, for Major Sites, Saskatchewan, 1970-86





Source: *Saskatchewan Cancer Registry and Surveillance and Risk Assessment Division, Health and Welfare Canada.*

Table 10. Five Year Relative Survival Rates for Selected Cancer Sites in Saskatchewan by Age Group at Diagnosis and Sex, 1970-86

Site	Five year relative survival (%)							
	All ages		0-35 years		35-64 years		65 +	
	M	F	M	F	M	F	M	F
All Cancers[1]	**41**	**53**	**61**	**72**	**43**	**59**	**37**	**44**
Oral	77	63	82	82	76	67	77	58
Stomach	14	17	--	11	17	14	13	19
Colorectal	49	49	73	62	52	52	46	47
Pancreas	2	3	--	--	4	3	1	3
Lung	9	15	--	--	11	17	8	12
Melanoma of skin	74	83	68	91	77	89	72	65
Female breast	...	73	...	68	...	74	...	73
Cervix	...	66	...	85	...	67	...	46
Body of uterus	...	84	...	77	...	92	...	70
Ovary	...	37	...	86	...	40	...	22
Prostate	63	...	--	...	66	...	62	...
Bladder	70	70	92	--	80	82	63	61
Kidney	41	43	57	73	47	50	34	34
Brain	25	25	49	57	20	18	1	3
Lymphoid	43	46	72	76	47	55	26	29
Leukemia	35	38	31	39	44	38	29	37

[1] *excludes non-melanoma skin.*
... *not applicable.*
-- *less than 10 cases in category.*
Source: *Saskatchewan Cancer Registry, and Surveillance and Risk Assessment Division, Health and Welfare Canada.*

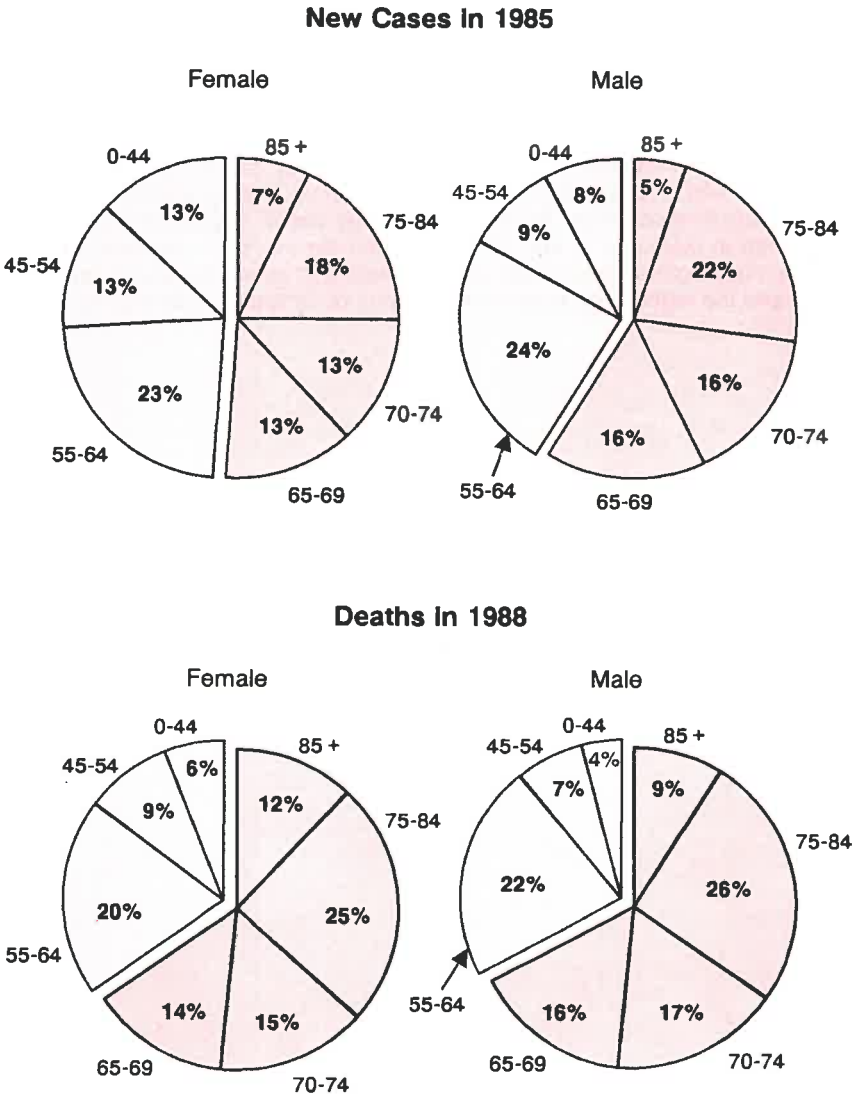
AGE AND SEX DISTRIBUTION OF CANCER

The "pie charts" in Figure 10 show that about two thirds of cancer deaths in both sexes and a similar proportion of new cases in males occur in the elderly (65 years and older); comparable figures for those under 45 years of age are 4% to 8%. This pattern is somewhat different for new cases in females, only half of which occur in those 65 and older because of the high incidence of cancer of the breast and genital organs in women of reproductive age, tumours with a reasonably good prognosis.

Age-specific rates of cancer incidence and mortality are graphed in Figure 11. Cancer incidence rises steeply with age in both sexes. The relationship is not quite exponential with age, in fact for many types of cancer incidence rises exponentially with the logarithm of age, an empirical finding which has led to much theoretical speculation. As we have already noted, incidence is higher in females than in males up to age 55, after which the sex ratio changes. This is due to the high incidence of cancer of the breast and genital organs in younger females, and the higher incidence of most types of cancer in older males.

Figure 10

Percentage Distribution by Age Group and Sex of New Cases of Cancer in 1985 and Cancer Deaths, Canada, 1988

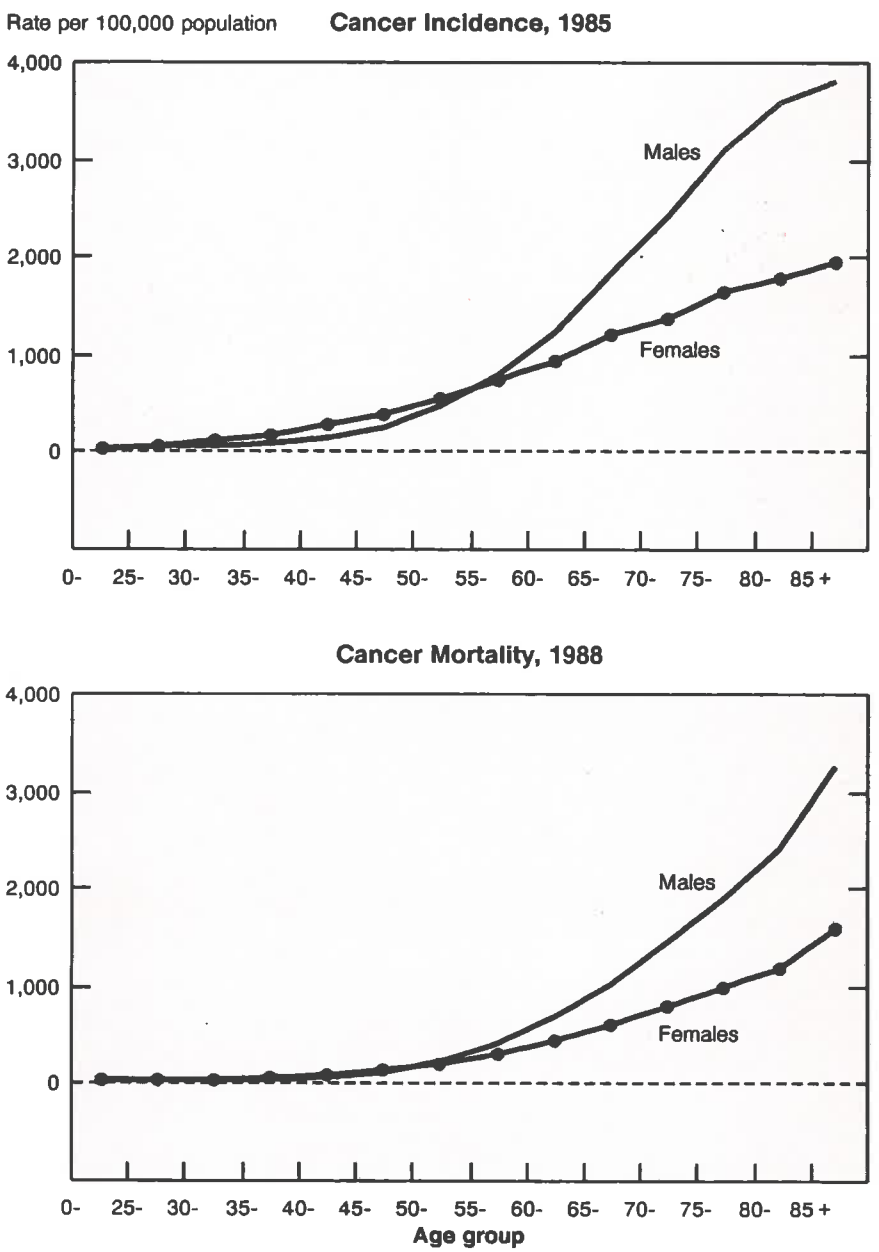


Note: *Data shown are the most current available.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 11

Age-specific Rates for Cancer Incidence and Mortality, Canada



***Source**: Canadian Centre for Health Information, Statistics Canada.*

CANCER IN CHILDHOOD

Table 11 shows that close to a thousand children in Canada develop cancer each year and about a quarter of that number die of the disease. The resulting suffering and anguish goes beyond statistics, but cancer in childhood is a rare event. The probability of developing cancer in the first 25 years of life is 0.5%, compared with 4% (on average) between age 25 and 50, and 22% between age 50 and 75. Cancer is rarely found at birth, but the incidence increases sharply during the first year to a maximum of about 20 per 100,000 and then declines gradually to about 10 per 100,000 at ages 5 to 14.

The types of cancer seen in childhood differ from those in later life. A greater proportion are found in the deep 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 important for some forms of cancer in childhood, but several environmental exposures have been incriminated – prenatal exposure to hormones, prenatal and postnatal irradiation, for example. Other possible risk factors have been suggested – viral infection, exposure to magnetic fields, exposure of the parent or child to various chemicals – but further studies are needed to establish these relationships.

The usual classification of cancer by the organ affected is not appropriate for childhood cancer, where the same form of cancer can arise in different parts of the body. Table 12 shows the results of a recent international study of the incidence of childhood cancer by cell type, published by the International Agency for Research on Cancer. Data from the cancer registries in the Western and Atlantic Provinces of Canada were included in the study. As seen in the

TABLE 11. New Cases and Deaths for Leading Sites of Cancer for Children Aged 0-14, Canada, 1985 and 1988

Cancer sites[1]	New cases in 1985		Deaths in 1988	
	Number	Per Cent	Number	Per Cent
All cancers[2,3]	**816**	**100.0**	**218**	**100.0**
Leukemia	273	33.5	75	34.4
Brain and other nervous system	163	20.0	64	29.4
Lymphomas	92	11.2	11	5.0
Kidney	53	6.5	4	1.8
Connective tissue	36	4.4	8	3.7
Bone	28	3.4	15	6.9
Adrenal glands	25	3.1	23	10.6
Eye	17	2.1	2	0.9
All other cancers	**129**	**15.8**	**16**	**7.3**

1 Ranked in order of number of incidence cases.
2 Excludes non-melanoma skin cancer (ICD-9 173).
3 Percentage totals may not add due to rounding.
Source: *Canadian Centre for Health Information, Statistics Canada.*

first two columns of the table, the total incidence per 100,000 among the 20 registries listed ranges between 9 and 17 in boys and between 6 and 13 in girls. The Canadian rates lie towards the upper end of these ranges.

The international variation is, in general, less than that for the cancers of adult life, where tenfold and higher ranges are common. A male/female incidence ratio of 1.1 to 1.3 is a fairly consistent feature in the table, across both places and cell types. Three types of cancer together account for over half the incidence in childhood – leukemia, brain tumours and lymphoma. The remainder is divided between categories with incidence of 1 per 100,000 or less.

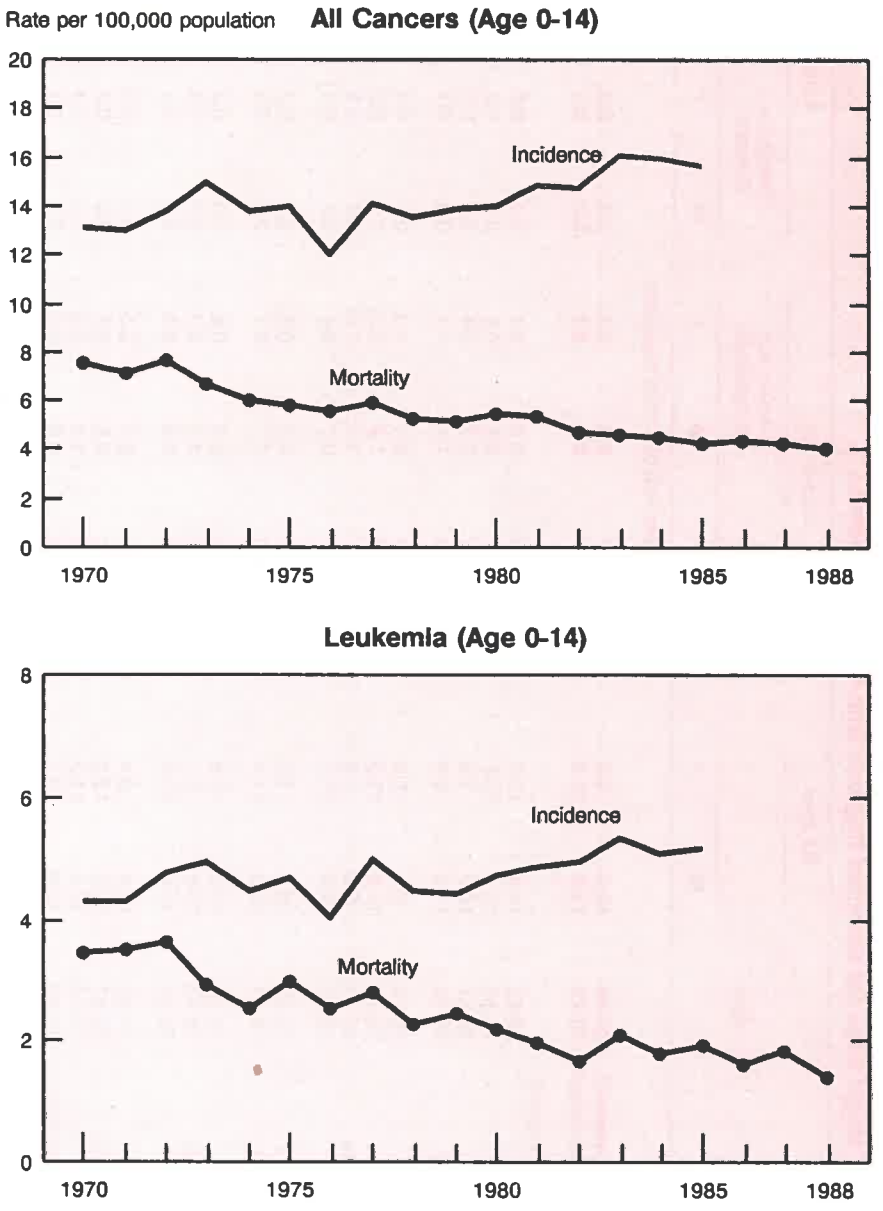
As shown in Figure 12 the incidence of cancer in childhood is increasing slowly over time, but mortality is falling. This is the case for leukemia, but is also true for some other forms of childhood cancer, lymphoma for example. In fact the prognosis for cancer in childhood is generally quite favourable. Canadian survival data are not available, but the following statistics from Germany, have been kindly provided by Professor J. Michaelis of the University of Mainz Childhood Cancer registry:

Diagnosis	Estimated Percentage Surviving	
	3 years	5 years
Hodgkin's disease	97	95
Histiocytosis X	88	85
Germ cell tumours	86	84
Wilm's tumour	84	84
Acute lymphoblastic leukemia	82	77
Non-Hodgkin's lymphoma	78	76
Osteosarcoma	69	65
Rhabdomyosarcoma	64	56
Ewing's sarcoma	64	56
Central nervous system tumours	60	54
Neuroblastoma	57	52
Acute myeloblastic leukemia	47	43
All diagnoses	**73**	**69**

There is hope that the prognosis for one of the more lethal tumours in infancy, neuroblastoma, might be improved. In the majority of such tumours, which arise in the cells which form the sympathetic nervous system, substances are excreted in the urine which can be detected chemically. A system for collecting infants' urine already exists in Quebec, as part of the provincial program for surveillance of congenital metabolic disorders. The University of Minnesota, in collaboration with the four Quebec medical schools, have begun a program of screening for neuroblastoma. It is hoped that this project, which is funded by the U.S. National Cancer Institute, will confirm the suggestion from studies in Japan that early detection of neuroblastoma will reduce the mortality from the disease.

Figure 12

Trends in Incidence and Mortality Rates for Childhood Cancer in Canada



Note: *Rates are standardized to the World Population.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

TABLE 12. Cancer in Children 0-14 Years: An International Comparison. Age-standardized[1] Incidence Rates for Major Sites for Selected Regions with Cancer Registries

Country	Year	All sites		Leukemias				Lymphomas			
				Acute lymphocytic		Acute non-lymphocytic		Hodgkin's Disease		Non-Hodgkin lymphoma	
		M	F	M	F	M	F	M	F	M	F
		Rates per 100,000 child population									
CANADA											
Atlantic Provinces[2]	**70-79**	**10.3**	**9.0**	**2.1**	**1.7**	**0.4**	**0.3**	**0.4**	**0.2**	**0.7**	**0.3**
Western Provinces[3]	**70-79**	**14.9**	**11.9**	**3.3**	**2.7**	**0.5**	**0.4**	**0.5**	**0.4**	**0.9**	**1.3**
U.S.A. (SEER Program)											
White	73-82	14.4	12.7	3.6	3.0	0.6	0.7	0.7	0.6	0.7	0.3
Black	73-82	10.7	10.8	1.4	1.5	0.4	0.6	0.8	0.2	0.4	0.2
Cuba	70-81	10.3	7.9	1.5	1.2	0.3	0.4	0.7	0.3	2.0	1.0
China-Shanghai	72-79	11.5	9.9	2.0	1.6	1.4	1.1	0.3	0.1	0.7	0.3
India-Bombay	70-79	8.6	5.5	1.3	0.9	0.4	0.3	0.7	0.1	0.7	0.2
Israel-Jews	70-79	14.9	11.9	2.1	2.0	1.0	0.3	0.9	0.6	1.7	0.6
Japan-Kanagawa	75-79	9.8	8.5	1.8	1.7	1.2	1.0	0.1	0.5	0.1	0.2
Denmark	78-82	14.4	11.1	3.4	2.6	0.7	0.4	0.4	0.4	0.4	0.2
Finland	70-79	15.0	11.8	3.0	2.2	0.6	0.5	0.3	0.2	0.8	0.5
Germany (GDR)	76-80	13.3	11.4	2.5	2.3	0.7	0.7	0.8	0.5	1.0	0.5
Norway	70-79	13.8	10.6	2.4	2.0	0.8	0.8	0.3	0.2	0.5	0.2
Poland (Warsaw)	70-79	10.8	8.7	3.7	0.1	0.3	0.2	0.4	0.3	0.3	0.2
Sweden	70-82	15.0	13.0	2.8	2.6	0.5	0.5	0.5	0.1	0.9	0.4
U.K. Scotland	71-80	11.4	9.4	4.2	2.6	0.7	0.5	0.6	0.2	0.7	0.3
Australia (N.S.W.)	72-82	15.3	12.2	4.2	3.4	0.8	0.8	0.6	0.2	1.0	0.3
New Zealand	70-79	17.4	11.2	1.9	0.6	1.3	1.2	1.0	0.4	1.4	0.6
U.K. - England Wales	71-80	12.0	9.7	3.4	2.6	0.6	0.6	0.5	0.3	0.8	0.3
Italy	67-81	15.7	12.5	3.4	2.5	0.6	0.4	0.8	0.5	1.0	0.4

Country	Brain and Spinal Cord				Sympathetic Nervous System		Eye		Kidney	
	Astrocytoma		Medulloblastoma		Neuroblastoma		Retinoblastoma		Wilm's tumour	
	M	F	M	F	M	F	M	F	M	F
	Rates per 100,000 child population									
CANADA										
Atlantic Provinces[2]	**0.7**	**0.5**	**0.4**	**0.3**	**0.8**	**0.6**	**0.2**	**0.2**	**0.7**	**0.6**
Western Provinces[3]	**1.3**	**1.2**	**0.6**	**0.4**	**1.1**	**1.0**	**0.5**	**0.4**	**0.8**	**0.7**
U.S.A. (SEER Program)										
White	1.2	1.2	0.7	0.4	1.3	1.2	0.4	0.4	0.8	1.0
Black	0.9	0.9	0.5	0.5	1.0	1.1	0.5	0.6	1.0	1.2
Cuba	0.3	0.3	0.3	0.2	0.6	0.4	0.4	0.4	0.5	0.5
China-Shanghai	0.3	0.3	0.2	0.2	0.5	0.4	0.3	0.3	0.1	0.0
India-Bombay	0.3	0.3	0.2	0.1	0.4	0.2	0.6	0.4	0.4	0.4
Israel-Jews	0.8	0.8	0.6	0.6	1.5	1.0	0.3	0.3	0.6	0.7
Japan-Kanagawa	0.4	0.5	0.3	0.3	0.8	0.6	0.3	0.2	0.2	0.1
Denmark	1.1	1.2	0.6	0.3	0.9	1.0	0.2	0.2	0.7	0.8
Finland	0.0	0.0	0.7	0.3	0.9	0.9	0.6	0.3	1.1	0.9
Germany (GDR)	1.0	1.0	0.7	0.4	1.0	0.7	0.3	0.4	0.7	0.8
Norway	1.1	1.3	0.6	0.2	0.7	0.7	0.4	0.3	0.9	0.6
Poland (Warsaw)	0.2	0.4	0.5	0.1	0.9	0.5	0.9	0.1	0.8	0.9
Sweden	1.5	1.6	0.8	0.5	1.0	0.8	0.5	0.5	0.9	1.0
U.K. Scotland	0.9	0.9	0.6	0.5	0.9	0.6	0.4	0.3	0.8	0.6
Australia (N.S.W.)	0.9	1.1	0.8	0.4	1.1	0.9	0.4	0.5	0.7	0.8
New Zealand	0.7	0.2	1.3	0.7	1.7	1.0	0.4	0.8	1.0	0.8
U.K. - England/Wales	0.9	0.9	0.6	0.4	0.8	0.6	0.3	0.4	0.7	0.8
Italy	1.0	0.6	0.8	0.5	1.2	1.0	0.4	0.4	0.7	0.8

[1] *Rates are age-standardized to the world child population.*
[2] *New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland.*
[3] *Manitoba, Saskatchewan, Alberta, British Columbia.*
Source: *"International Incidence of Childhood Cancer", International Agency for Research on Cancer.*

MORTALITY FOR LEADING CAUSES OF DEATHS

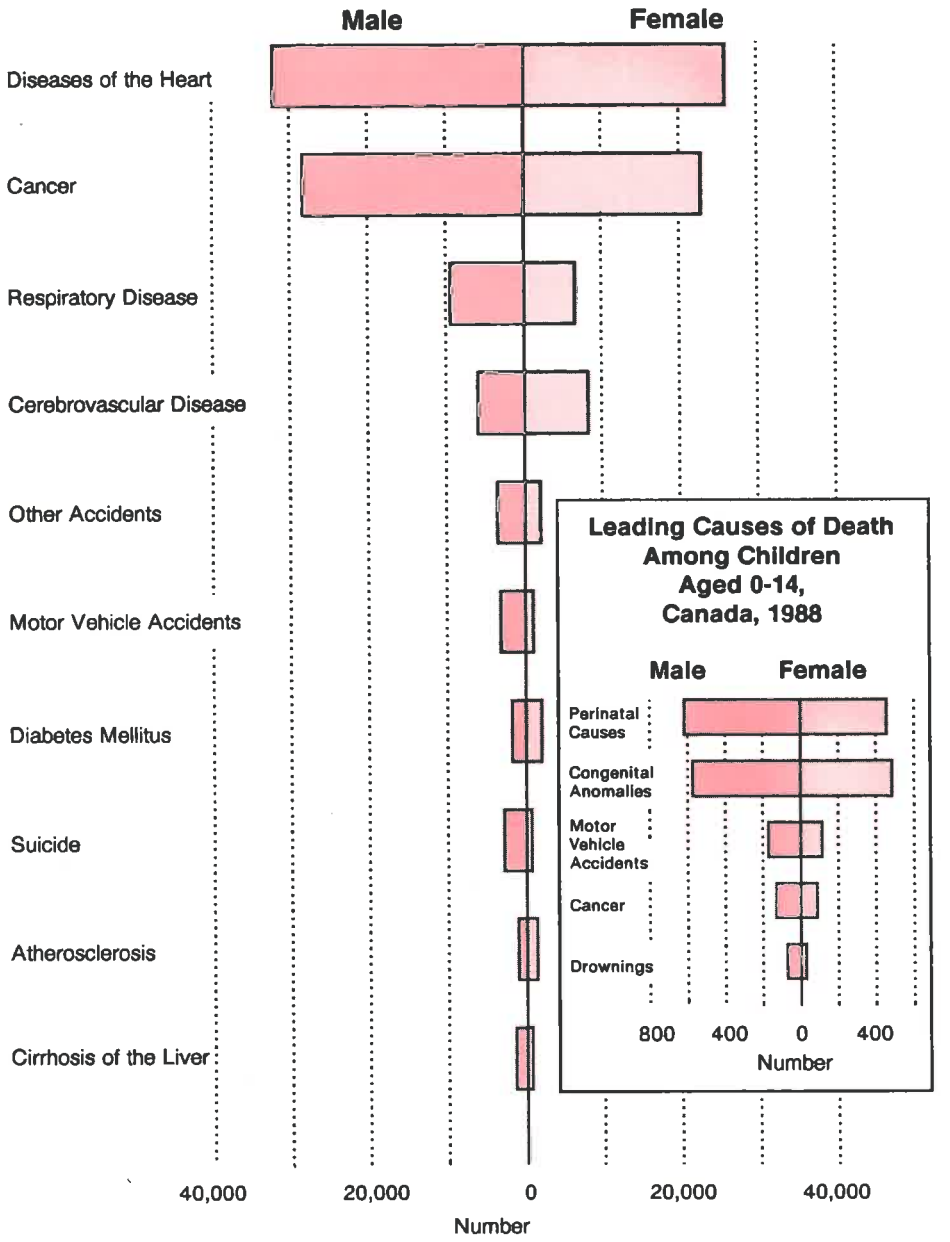
PERSON YEARS OF LIFE LOST DUE TO CANCER

In 1988, cancer was second only to diseases of the heart in terms of the number of deaths in both males and females, accounting for about a quarter of all deaths in both sexes (Figure 13).

Table 13 shows estimates for the lifetime probability of dying from cancer, as well as the person-years of life lost due to cancer. The latter is calculated by subtracting the age at death of each victim from the expectation of life at that age, and adding over all cancer deaths in a given year. The toll of three quarters of a million expected years of life lost each year is enormous. Lung, breast and colorectal cancer account for about half of it.

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 person-years of life lost due to cancer is a little higher in females (387,000 person-years) than in males (371,000 person-years). Figure 14 shows that the toll has increased steadily (2.6 per cent per year) in both sexes since 1970.

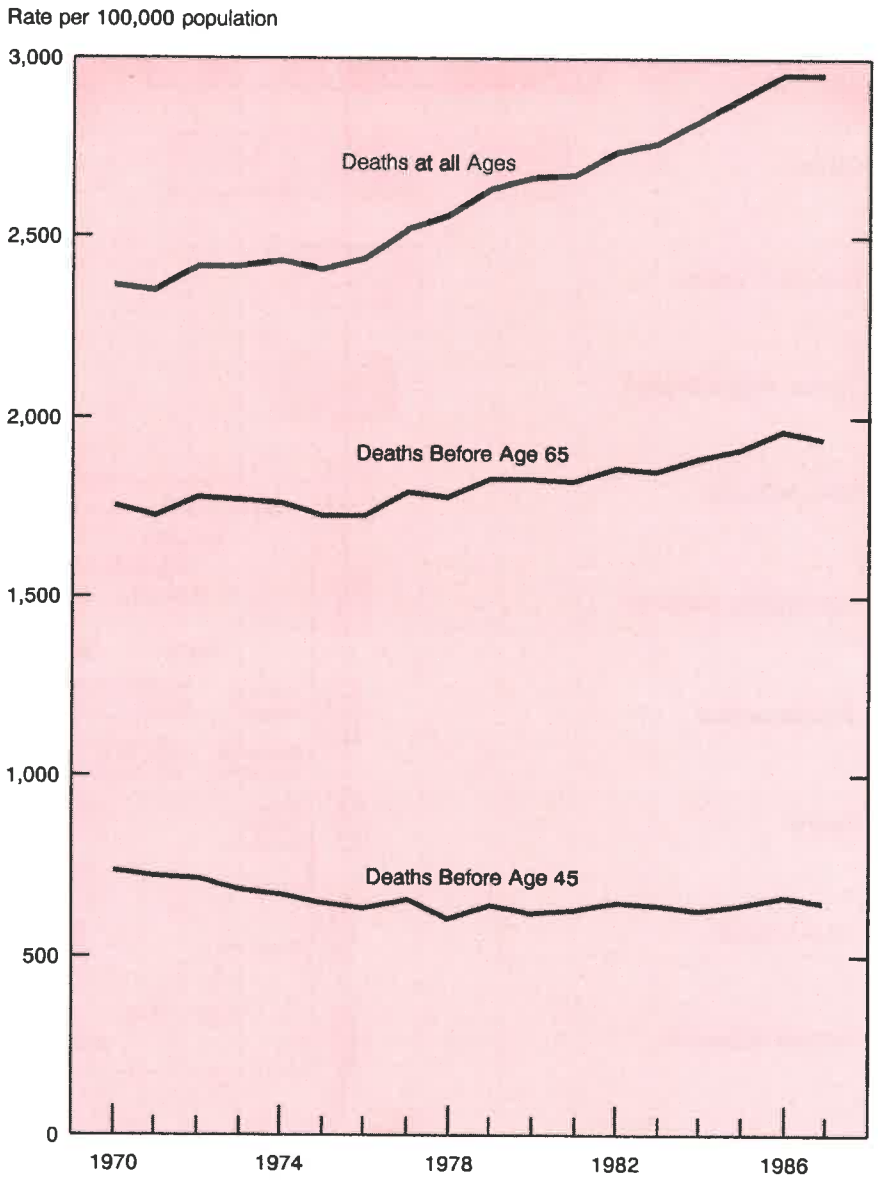
Figure 13
Leading Causes of Death, Canada, 1988



Note: *Atherosclerosis includes atherosclerotic regions other than heart or brain.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 14

Person Years of Life Lost from Cancer, Canada 1970-87



Note: *Based on life expectancy; for deaths before 45 (or 65), includes years of life lost based on life expectancy.*

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

TABLE 13. Person Years of Life Lost and Lifetime Probability of Death from Cancer in Canada, 1987

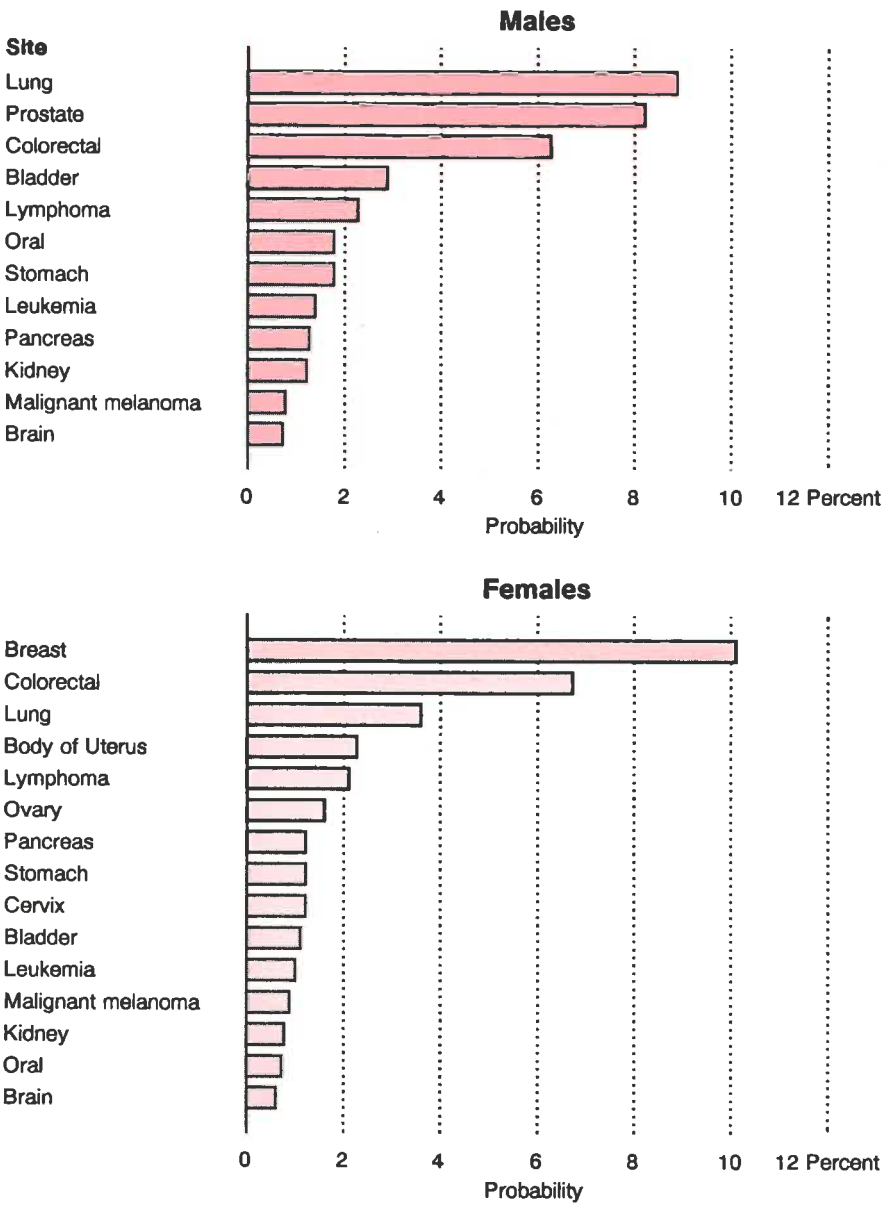
	Person years of life lost[1,2]						Lifetime probability of death (%)	
	Total[3]		Males		Females		Male	Female
	Years	%	Years	%	Years	%		
All cancers	**758,000**	**100.0**	**371,000**	**100.0**	**387,000**	**100.0**	**25.7**	**21.8**
Lung	188,000	24.8	121,000	32.5	67,000	17.3	8.1	3.3
Female breast	88,000	11.6	...	...	88,000	22.8	...	4.0
Colorectal	78,000	10.3	37,000	10.0	41,000	10.7	2.9	3.1
Lymphomas	40,000	5.3	21,000	5.6	19,000	5.0	1.2	1.2
Pancreas	37,000	4.9	18,000	4.9	19,000	4.8	1.3	1.3
Leukemia	34,000	4.5	19,000	5.2	15,000	4.0	1.0	0.8
Brain	31,000	4.1	17,000	4.5	14,000	3.6	0.6	0.5
Stomach	29,000	3.8	17,000	4.7	12,000	3.1	1.4	0.9
Prostate	26,000	3.4	26,000	7.0	...	...	3.2	...
Ovary	22,000	2.9	...	...	22,000	5.6	...	1.1
Kidney	17,000	2.2	10,000	2.7	7,000	1.9	0.6	0.4
Oral	14,000	1.8	10,000	2.8	4,000	1.2	0.6	0.3
Bladder	11,000	1.5	8,000	2.0	3,000	0.9	0.9	0.4
Melanoma	10,000	1.3	5,000	1.4	5,000	1.3	0.2	0.2
Cervix	10,000	1.3	...	...	10,000	2.5	..	0.4
Larynx	8,000	1.1	6,000	1.5	2,000	0.4	0.4	0.1
Body of uterus	6,000	0.8	...	...	6,000	1.5	..	0.4
Testis	2,000	0.3	2,000	0.5	...	...	..	...

1 *Ranked in order of total PYLL for both sexes combined.*
2 *Based on life expectancy.*
3 *Totals may not add due to rounding.*
... not applicable.
Source: *Surveillance and Risk Assessment Division, Health and Welfare Canada.*

LIFETIME PROBABILITY OF DEVELOPING CANCER

Figure 15 shows 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, 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 15
Probability at Birth of Developing Cancer, Canada, 1985



Note: *Probability is calculated from birth to age 90.*

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

CANCER OF THE FEMALE BREAST AND GENITAL ORGANS – RECENT TRENDS

As one of this year's special topics we focus on the trends in the incidence and mortality from cancer of the female breast and genital organs for three age groups: young adults (25-44), "middle aged" (45-64), and "elderly" (65 and over). As these are rather broad age groups the rates have been standardized within each group. As we have seen, these types of cancer are of particular importance since they impinge heavily on women in middle life. For two of them, breast and cervix uteri, there is evidence that early detection can reduce mortality.

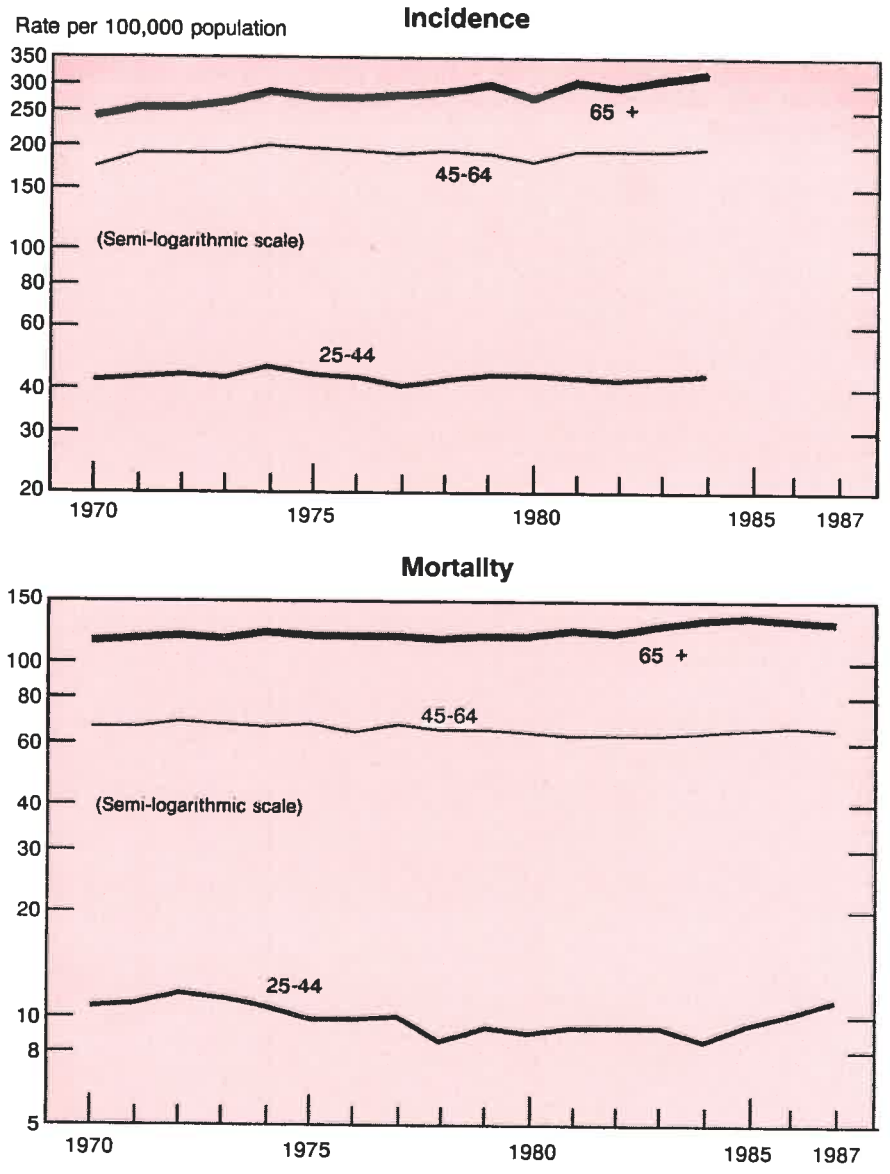
Of the four sites included in Figures 16-19 – breast, ovary, cervix uteri, and corpus uteri – breast cancer is the most frequent by an order of magnitude. Among the elderly the incidence of breast cancer has increased by about 20 per cent over the fifteen years 1970 – 84, and mortality has also increased, but not so steeply. In contrast incidence and mortality have remained the same for middle-aged and young adult women. The apparent increased incidence among the elderly may be a reporting artifact, but it would be consistent with the reduced fertility experienced by women during the depression, in particular their later age at first pregnancy. Using the same argument one would expect to see a fall in the incidence among the middle aged, who were mothers during the post-war "baby boom", but these age groups are possibly too broad to show subtle cohort effects. The trends for cancer of the ovary are noticeably similar to those for breast cancer, except that they show more variability due to smaller numbers. As ovarian and breast cancer are related in the same way to fertility, this similarity is not surprising. However, there does seem to be a slight downward trend in mortality at younger ages, though not in incidence, This may reflect an improvement in prognosis rather than in incidence.

Cancers of the two parts of the uterus – cervix (neck) and corpus (body) – have very different epidemiological patterns. In the past, unfortunately, they were not distinguished very well in mortality stastistics, so that trends are sometimes difficult to interpret. Also, the data on the incidence of cancer of the cervix have some problems due to the introduction of pap smear programs, as there is some tendency to classify the pre-invasive lesions detected on screening as cases of cancer. Mortality rates for cancer of the cervix in women over 45 declined gradually from 1958 to 1968, (not shown) somewhat more steeply between 1968 and 1978, and subsequently levelled out. A similar but, less obvious, pattern is seen for the age group 25-44. Incidence rates are available since 1970, and show a decline during the 1970's followed by a levelling out, as in the mortality rates, but with some evidence of an increase in the youngest age group in more recent rates. These trends would be consistent with a gradual decline in incidence in the post-war period, accelerated following the introduction of screening programs during the 1960's with a resumption of the slower decline as the maximum effect of screening was reached in the late 1970's. The recent upward trend in incidence at ages 25-44 may be an artifact, or may reflect increased promiscuity at younger ages, since the risk factors for cervical cancer are early age at first sexual intercourse and number of sexual partners.

Mortality from cancer of the corpus uteri is fairly stable, with perhaps a slight downward trend in the middle age group. Incidence rates in the middle age group increased in the early 1970's and subsequently declined, with some indication of a rather later increase at older ages. This pattern suggests a cohort phenomenon which might be explained by the increased use of estrogens for menopausal symptoms in the 1950s and 1960s, with fewer women being so treated in the 1970s as the relationship with uterine cancer became known. The absence of such a pattern in the mortality data would not contradict this, since the uterine tumours associated with estrogen use are relatively benign.

Figure 16

Female Breast Cancer: Incidence and Mortality Rates by Age Group, Canada, 1970-1987

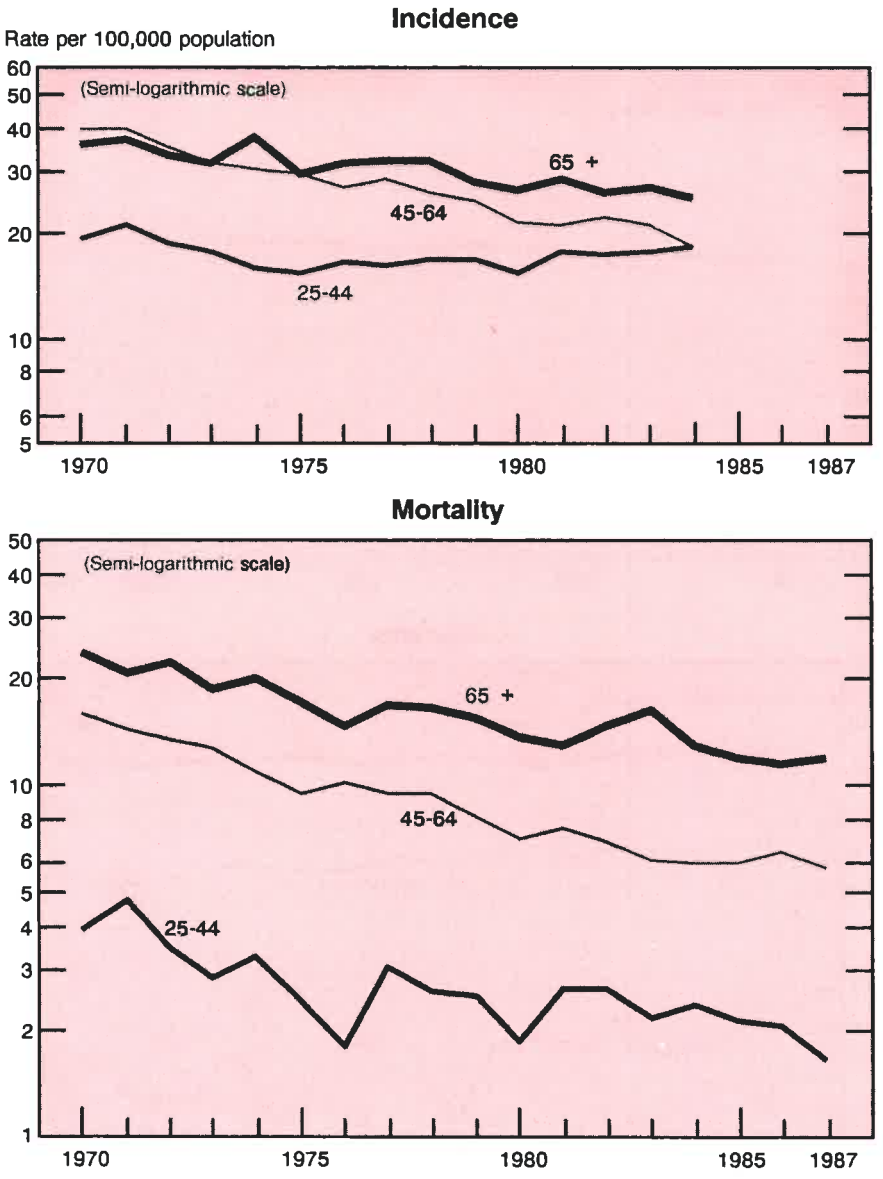


Note: *Adjusted to the World Standard Population.*

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

Figure 17

Cervical Cancer: Incidence and Mortality Rates by Age Group, Canada, 1970-1987

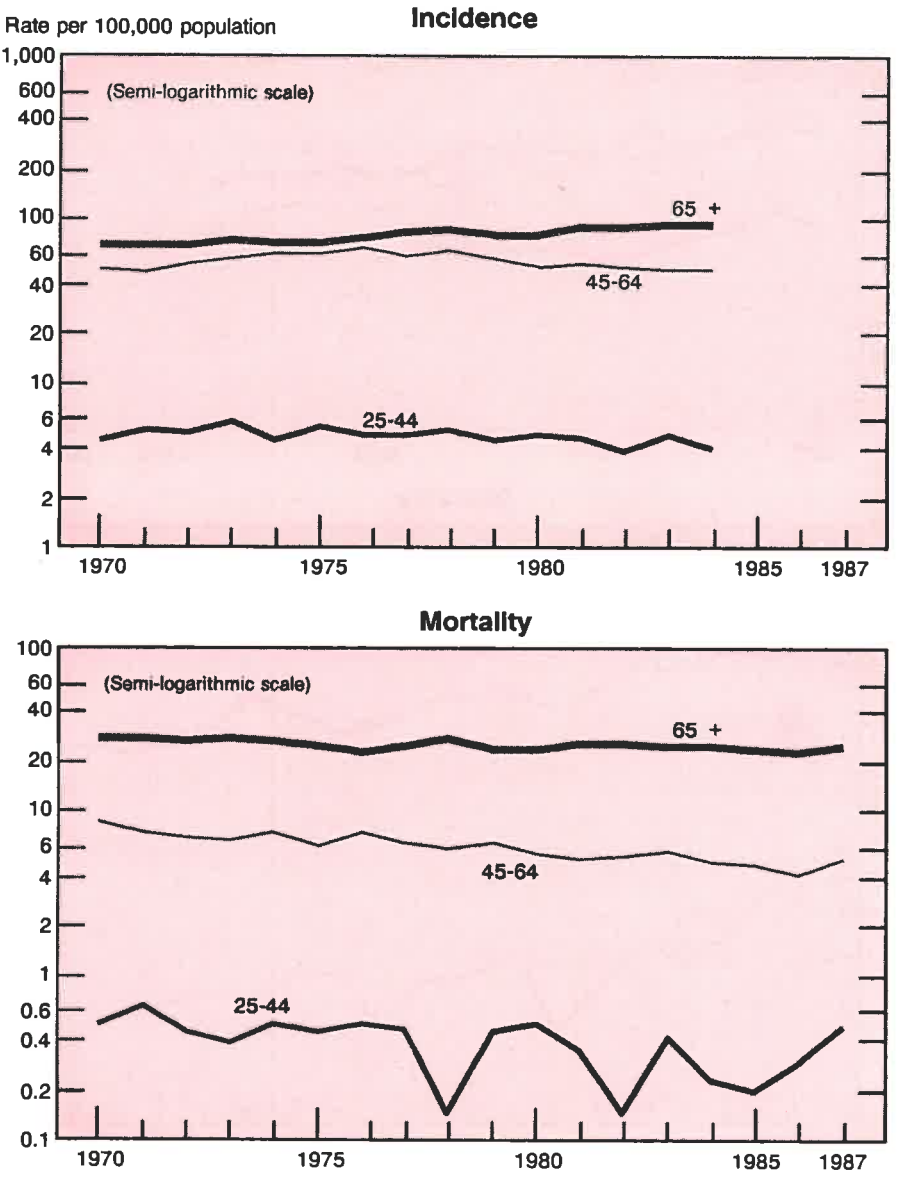


Note: *Adjusted to the World Standard Population*

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

Figure 18

Cancer of the Uterine Body: Incidence and Mortality Rates by Age Group, Canada, 1970-1987

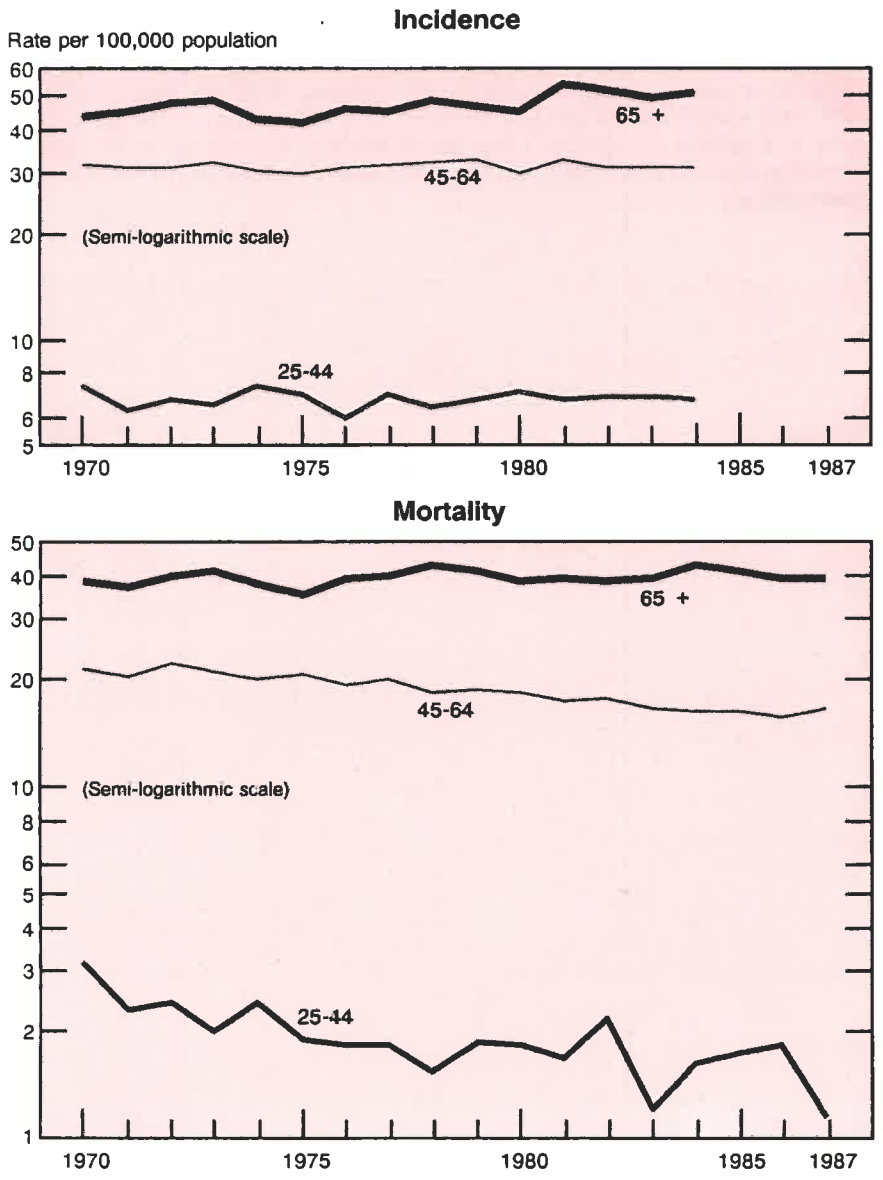


Note: *Adjusted to the World Standard Population.*

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

Figure 19

Cancer of the Ovary: Incidence and Mortality Rates by Age Group, Canada, 1970-1987



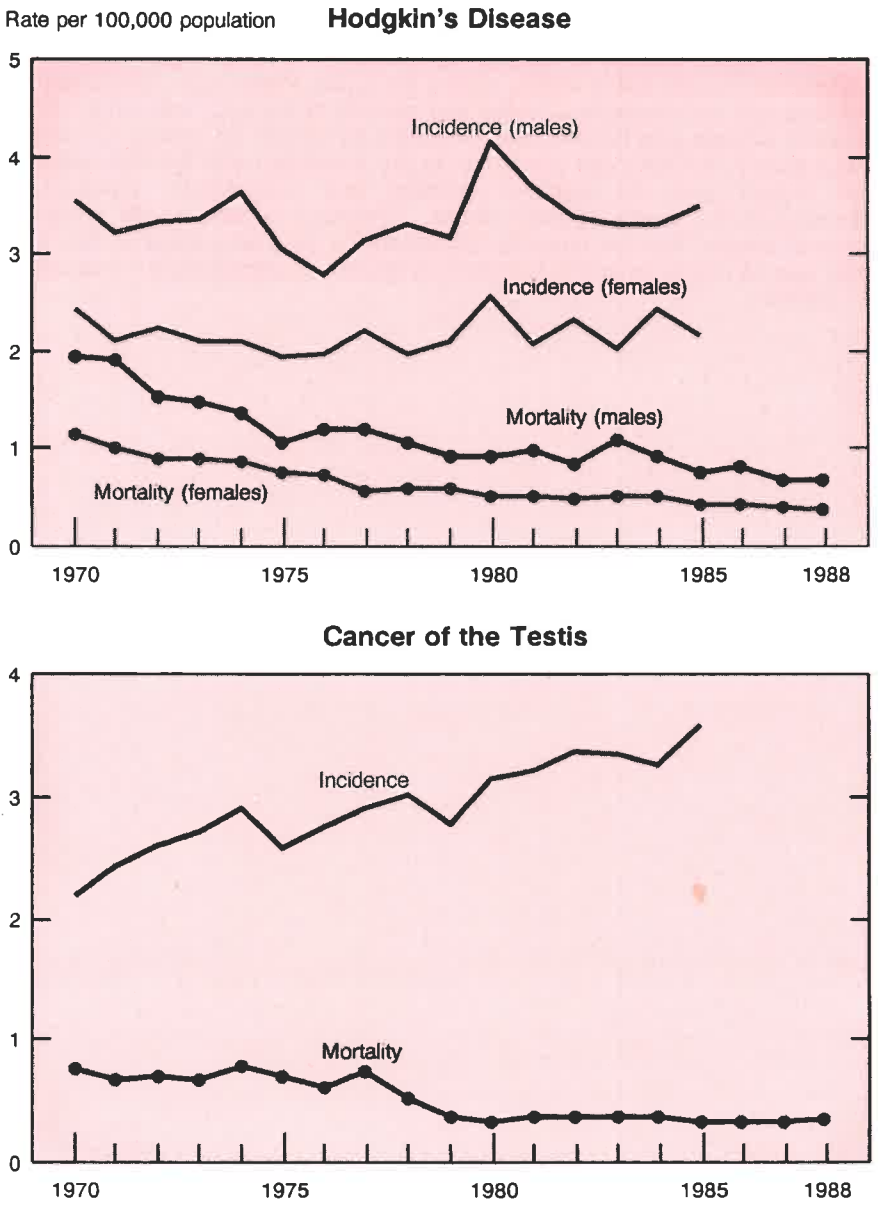
Note: *Adjusted to the World Standard Population*

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

HODGKIN'S DISEASE AND CANCER OF THE TESTIS

Figure 20 illustrates the results of the improvements in the treatment of certain types of cancer affecting primarily younger people. The changes in childhood cancer and, in particular, childhood leukemia, have been mentioned above. For Hodgkin's disease the incidence is fairly stable but mortality is declining steadily, consistent with improved therapy. The incidence rate for testicular cancer is increasing steadily, but again the mortality is falling, especially since 1977. The reason for the increased incidence is not known – it may be due partly to changes in reporting. The recent decline in mortality, in the face of increasing incidence, is due almost certainly to the introduction of new forms of chemotherapy.

Figure 20
Trends in Cancer Incidence and Mortality Rates in Canada



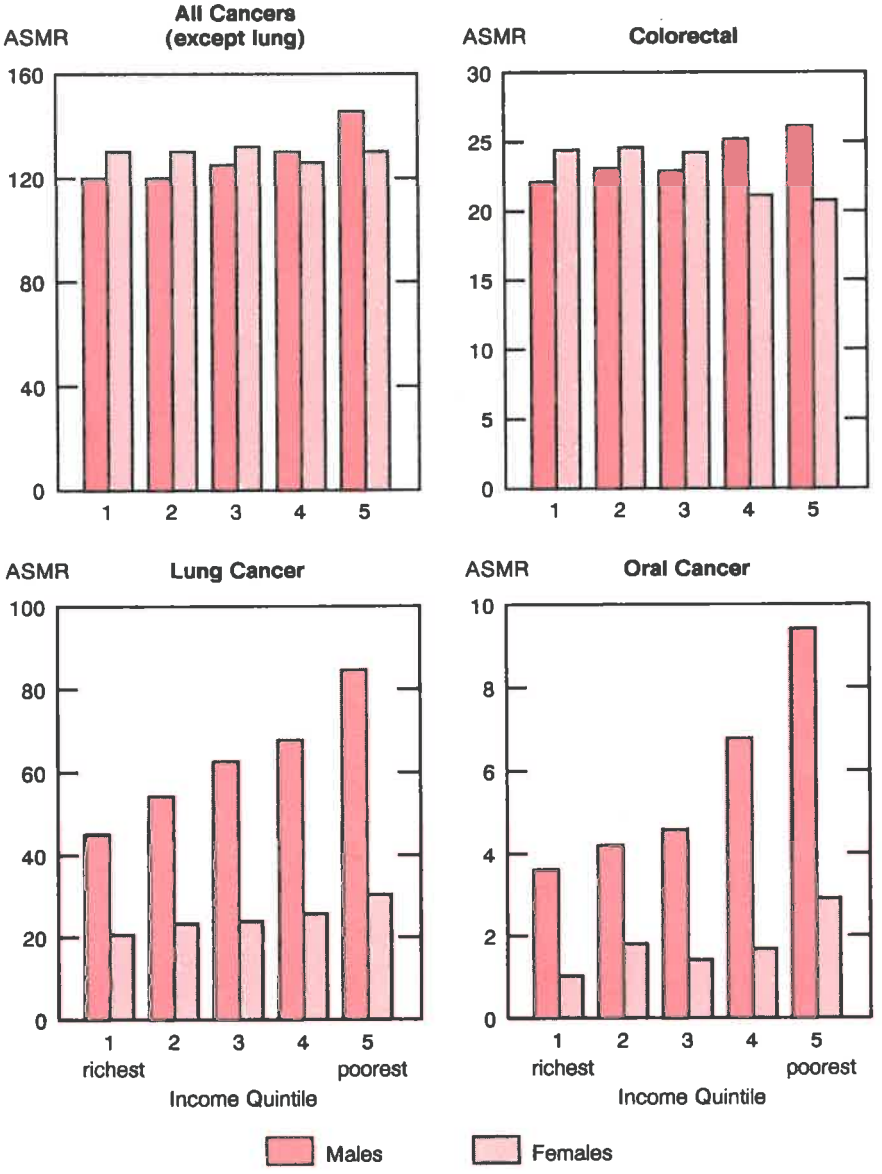
Note: *Rates are standardized to the World Population.*
Source: *Canadian Centre for Health Information, Statistics Canada.*

CANCER MORTALITY BY INCOME QUINTILE

Figures 21 and 22 show the relationship between income and the mortality from some types of cancer. The estimates come from an "ecological" study of mortality in Canadian urban areas, the areas being ranked by average income and grouped into quintiles from 1 (highest) to 5 (lowest), and the standardized mortality rate calculated for each group of areas. The only types of cancer for which a clear relationship exists, among the types shown here, are cancers of the lung and buccal cavity in males and cancers of the lung and cervix among females, in each type the mortality increasing as income decreases. The trends in cancers of the lung and buccal cavity are consistent with the distribution of risk factors such as smoking, drinking and occupational exposure to carcinogens by socio-economic status. Smoking is also a risk factor for cervical cancer, but the mortality differential by income quintile in this case may well be due to other risk factors or to the lack of participation in Pap smear programs.

Figure 21

Cancer Mortality by Income Quintile for Selected Sites, Urban Canada 1986

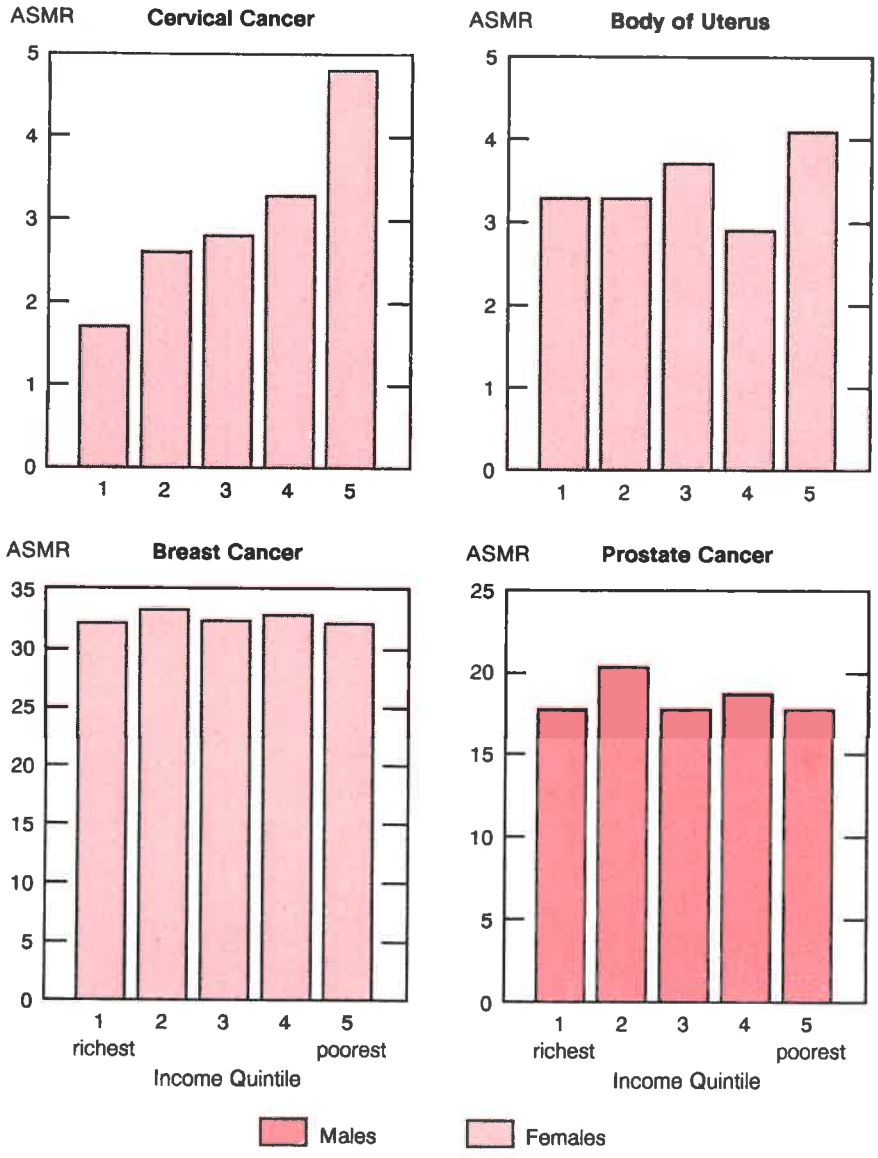


Note: *ASMR is age-standardized mortality rate per 100,000 population adjusted by the 1986 non-institutional population for 25 CMA's.*

Source: *Canadian Centre for Health Information, Statistics Canada.*

Figure 22

Cancer Mortality by Income Quintile for Selected Sex-Specific Sites, Urban Canada, 1986



Note: *ASMR is age-standardized mortality rate per 100,000 population adjusted to the 1986 non-institutional population for 25 CMA's.*

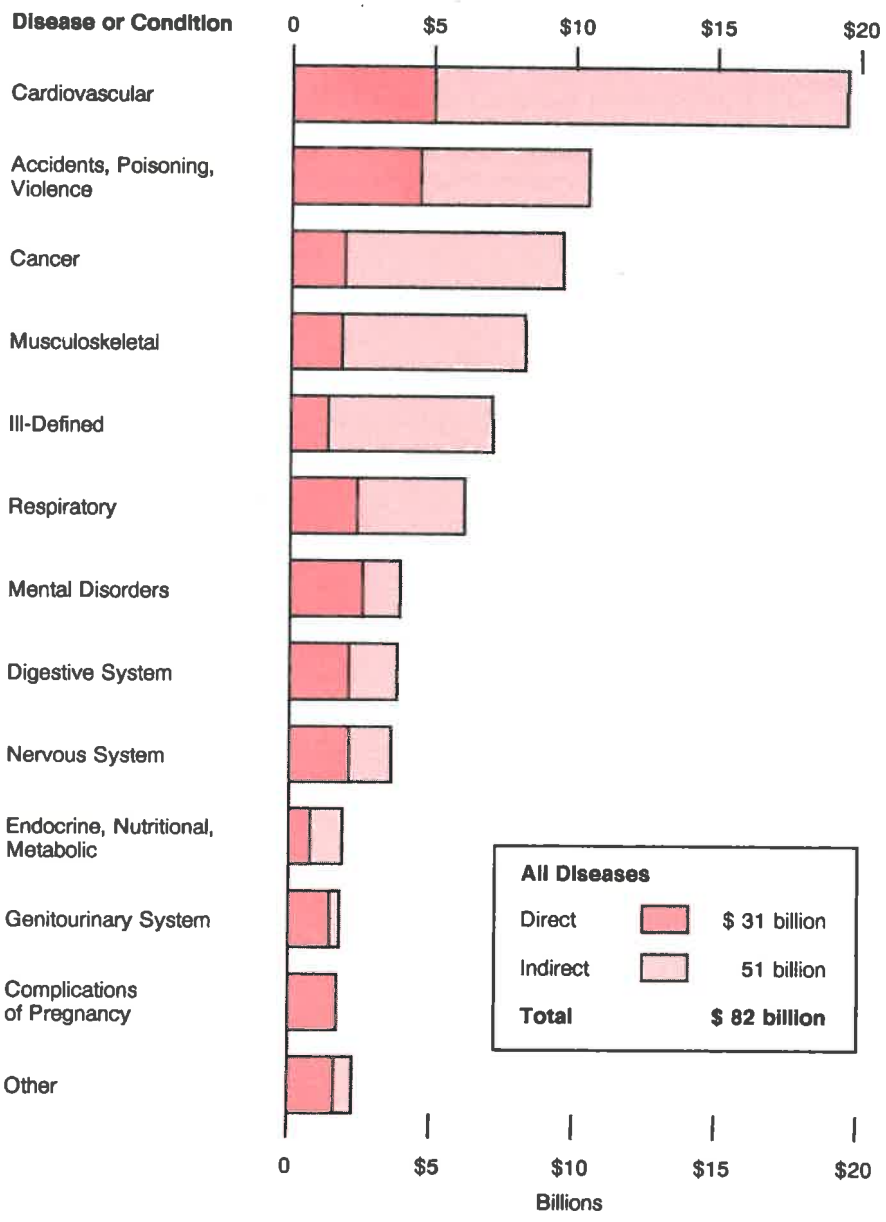
Source: *Canadian Centre for Health Information, Statistics Canada.*

ECONOMIC COST OF ILLNESS IN CANADA

Figure 23 summarizes the results of a large and complex study (see Appendix for details) of the costs of disease in Canada, the diseases grouped according to the chapters of the International Classification of Diseases. The total cost of 82 billion dollars per year is divided into two components, the direct costs of treatment and the indirect cost due to disability and premature death. Cancer accounts for 12 per cent ($9.6 billion) of the total cost of illness, made up of 6 per cent ($1.9 billion) of the direct cost, and 15 per cent ($7.6 billion) of the indirect cost. Among the groups of diseases cancer ranks third in terms of total cost (below circulatory disease, and accidental or violent deaths), second in terms of indirect cost (exceeded only by circulatory disease), but seventh in terms of direct costs.

Figure 23

Economic Cost of Illness Showing Direct and Indirect Costs, Canada, 1986



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

CANCER CONTROL

The concept of "controlling" a disease has its roots in the management of communicable diseases such as tuberculosis. Within a defined community, the preventive and therapeutic resources are marshalled into a combined effort to reduce the mortality and morbidity produced by the disease. With the upsurge in non-communicable diseases such as cardiovascular disease and cancer during the past half century the idea of using a similar approach has gained ground. In Canada, the move towards cancer control began with the creation of provincial organizations to provide cancer treatment, first in Saskatchewan and spreading to all other provinces except Quebec. British Columbia took the lead in extending the role of such agencies to include early detection of cancer of the cervix, with cancer control specifically included in the mandate of the agency. More recently Alberta and Ontario have taken similar steps. Provincial cancer agencies, however, do not have the sole responsibility for cancer, and the efforts to deal with it are very fragmented. The advocates of "cancer control" wish to remedy this situation by establishing national goals and mechanisms to achieve them.

In the United States the National Cancer Institute (NCI), a federal government agency, published quantified objectives to reduce significantly the mortality rate from cancer. The objectives were listed under three headings – prevention, screening and treatment. The targets identified for prevention programs were smoking and diet, those for screening cancers of the breast and cervix. For treatment, the target was to transfer the results of research into practice. Although the practicality of achieving some of the goals was disputed, there is no doubt that the NCI report created a renewed interest in cancer control, not only in the United States. The National Cancer Institute of Canada (a research agency supported by the Canadian Cancer Society and not part of government) has formed an Advisory Committee on Cancer Control to develop priorities in that area. The Canadian Cancer Society itself has taken the lead in bringing together all the organizations involved in the treatment of cancer to develop coordinated programs ("Cancer 2000").

The following summary of the potential role of primary prevention, secondary prevention (early detection) and treatment in the control of cancer reflects the findings of these reports. With respect to primary prevention, the major causal factors which are susceptible to control and the cancers which they influence are: tobacco for cancers of the lung, mouth, larynx, oesophagus, bladder, kidney and pancreas; sunlight for skin cancer including melanoma; and excessive alcohol consumption for cancer of the esophagus and larynx. High fat intake is associated with cancers of the colon, rectum, breast, endometrium and prostate, while low intake of fibre-containing foods is associated with cancers of the colon and rectum. Whether these associations are causal is presently uncertain but a "prudent" diet would include less fat and more vegetables. Certain sexual practices (early onset of sexual activity, many sexual partners) are known to predispose to cancer of the cervix. With the exception of sunlight, environmental factors play only a minor role in the cancer problem; most of these items involve industrial exposures: uranium and gold for lung cancer; asbestos for cancer of the pleura; nickel for cancer of the nasopharynx; and vinyl chloride for cancer of the liver. Cancer can be caused by drugs and X-rays, but many of these are unavoidable.

It is now well known that there are two cancers for which the use of early detection techniques can lead to decreased mortality: mammography, with or without physical examination for cancer of the breast; and Pap smear for cancer of the cervix. Special programs of early detection are indicated for certain familiar forms of cancer and for those suffering from diseases which pre-dispose to cancer.

As indicated earlier (see Figures 12, 20), as a result of improvements in treatment, a major enhancement of survival has occurred in Hodgkin's disease, acute lymphatic leukemia in childhood and testicular cancer. Furthermore, improvements in therapy are likely responsible for the fall in mortality which has occurred in recent years with respect to colorectal cancer in females and cancers of the ovary and corpus uteri. In contrast, for a number of common cancers, mortality rates remain unchanged, e.g., for cancer of the breast, or continue to increase, e.g., for cancer of the lung, in both males and females and for cancer of the prostate. As emphasized in the U.S. document it is important to ensure that new treatments, whose efficacy has been established by rigorous trials, be adopted widely as soon as possible. Nevertheless it is clear that for some time to come there will continue to be a need for supportive care for many patients with cancer, and this component of cancer control, in its widest sense, should not be neglected.

METHODOLOGICAL APPENDIX

Data Sources and Processing

The cancer incidence and mortality data used in the presentation of actual levels and rates (to 1985 for incidence and to 1988 for mortality) and in the estimation of 1990 mortality levels and rates were obtained from three sources: mortality data files (1970-1988) and the National Cancer Incidence Reporting System (1970-1985), both maintained by the Health Status Section, Statistics Canada (1,2), and aggregate data on cancer incidence by age and sex (1970-1986) provided by the Ontario Cancer Treatment and Research Foundation. For the estimation of 1990 incidence levels and rates, these sources were supplemented by preliminary cancer incidence data extracted from the original provincial data tapes for 1986 and 1987 for British Columbia, Alberta, Saskatchewan, Manitoba, Quebec, Nova Scotia and Newfoundland. Records for each of the ten provinces and for both sexes were extracted from these data bases. Descriptions of the collection and processing mechanisms used in creating these data bases and discussion of quality issues are given in (1),(2), and (3).

Records were then classified for these data (and all other data presented in this report, except where noted), using the ninth revision of the International Classification of Diseases or ICD-9(4), into the following categories: oral, 140-149; stomach, 151; colorectal, 153-154; pancreas, 157; lung, 162; melanoma, 172; breast, 174; cervix, 180; body of uterus, 179, 182; ovary, 183; prostate, 185; bladder, 188; kidney, 189; brain, 191-192; lymphoma, 200-203; leukemia, 204-208 and all cancers, 140-208 (excluding 173, non-melanoma skin cancer). Canada totals for each category were then determined as the sum of the 10 provinces.

Population figures for Canada and the provinces were taken from censal, inter-censal, and post-censal estimates for 1970-1989 and from population projections for 1990.

Calculation of Estimates of New Cases and Deaths (Tables 1-5, Figures 1 – 7)

Crude incidence and mortality rates for each province, sex, site, and year were computed by dividing the number of cases by the corresponding population figures. Age-standardized incidence and mortality rates were calculated using a World population(5).

Cancer mortality counts in 1990 for each site and sex of interest were estimated by maximum likelihood fitting of models, to the provincial and Canadian yearly values. The yearly counts were assumed to follow independent Poisson distributions, with mean values being a product of yearly population sizes and yearly death rates. For all sites, except those noted below, a linear model for death rates, with year as the only independent variable, was used. Year-squared terms were also included for "all cancers", lung, prostate and breast cancer. For cervical cancer and stomach cancer, a linear model for the log transformation of death rates was used. A further adjustment to the estimated death counts was made to have the provincial values sum to the Canadian figure.

Cancer incidence counts in 1990 for each site and sex of interest were estimated in a manner similar to that used for mortality. Outside Quebec, a linear model for incidence rates, with year as the only independent variable, was used for all sites. Exceptions were: lung, prostate and breast cancer, where a year-squared term was also included. For Quebec an additional parameter was included in the linear model to account respectively for underregistration and overregistration, which was known to have occurred.

For Quebec, this parameter was assumed to have been a fixed proportion of the true number of cases prior to 1977; also data for 1977 to 1980 inclusive were not used in the model calculations because of erratic registration patterns during that period. A model was not fitted to the Canadian data; to take advantage of the longer data series available for some provinces, estimates for Canada were computed as the sum of the estimates for each province.

Age-standardized incidence rates (ASIRs) and **mortality rates (ASMRs)** for 1990 were estimated using weighted linear regression. The weights were taken as the inverse of the estimated variances of the age-standardized rates. The variances were calculated under the assumption that the age-specific counts employed in the computation of the age-standardized rates followed independent Poisson distributions. Regressions were performed for Canada and each province for each site and sex, using year as the independent variable. For the Quebec ASIRs, regressions also included an additional parameter to account for the period of underregistration (Quebec data for 1977 to 1980 were also not used in the model calculations). Canadian ASIRs (presented in Figures 2-6) were adjusted to account for the estimated underregistration in Quebec until 1976, while from 1977 to 1980, they were adjusted as if the incidence counts for Quebec had been replaced by the estimated values from the linear models for those years.

Accuracy and precision: The standard error and coefficient of variation were computed to indicate the precision of each estimate; these values are available upon request to the Health Status Section of Statistics Canada. Readers are reminded that estimates are subject to error and that the degree of precision depends on the adequacy of the model, as well as the number of observed cases and population size in each site – sex – province domain.

Due to changes and improvements to the cancer incidence data provided by the provinces, and the changes in the methodology for producing the estimates of cancer incidence and deaths, estimates in the 1990 report may not be directly comparable to those published in previous years. More detailed information on these methods can be found in technical papers available from Health Status Section, Statistics Canada(6,7).

Average Annual Per Cent Increase in Cancer Incidence and Mortality (Table 9)

The values are calculated by fitting a model which assumes a constant rate of growth to the ASIRs or ASMRs, that is, the linear model on the log transformed rates. The resulting slope of that model is then transformed back to represent a percentage increase or decrease (by taking its inverse log and subtracting 100%).

Cancer Survival (Table 10, Figures 8 and 9)

Survival data provided by the Saskatchewan Cancer Registry for new cases diagnosed between 1970 and 1986 were analyzed to determine relative survival rates for from one up to ten years after diagnosis. Relative survival rates were calculated by adjusting the crude survival for the normal life expectancy of the Saskatchewan population of the same age and sex for the same time period(8).

Lifetime Probability of Developing Cancer (Figure 15)

Probabilities were calculated based on the age- and sex-specific cancer incidence rates for Canada in 1985, using methodology based on Zdeb(9) and Seidman(10). As noted by Seidman 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.

Person Years of Life Lost (Table 13, Figure 14)

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(11).

Life Time Probability of Death from Cancer (Table 13)

This probability represents the proportion of persons dying from cancer in a cohort subjected to the mortality conditions prevailing in the population at large(12). This indicator was calculated by determining the proportion of deaths attributed to specific types of cancer for each sex and at each age, then multiplying this proportion by the corresponding number of deaths in the life table, summing the life table deaths over all sex and age groups, and finally dividing by the number of survivors at birth to obtain the probability of dying from each cause.

Cancer Mortality by Income Quintile (Figures 21 and 22)

Income Quintiles were determined by allocating census tracts (CTs) within 25 Census Metropolitan Areas (CMAs) into one of five quintiles from 1 = richest to 5 = poorest based on incidence of low income reported for each CT according to the 1986 census. Mortality data by cause, age and sex were tabulated across all CTs within each quintile; age-standardized mortality rates were then calculated adjusted to the 1986 non-institutional Census population for 25 CMAs.

Economic cost of cancer (Figure 23)

Economic costs of cancer are measured in terms of direct and indirect costs. Direct costs are the expenditures in drugs, medical care, hospital care, research, pension, unemployment insurance benefits and compensation. Indirect costs are the present value of future earnings lost due to premature death, and the value of time lost due to long-term and short-term disability to perform normal activities. Despite controversy over the indirect cost estimation, the human capital approach is still the most plausible method available up to this date for estimating indirect costs.

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FOR FURTHER INFORMATION

Further information on cancer incidence, mortality and hospital morbidity is published by Statistics Canada. Analytical articles appear regularly in Health Reports, Statistics Canada, Catalogue 82-003, Quarterly; detailed Standard Tables are also available upon request to Statistics Canada reference centres or the Canadian Centre for Health Information.

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