ABSTRACT

INDEX

CHAPTER 1

Cancer incidence and mortality, 1999; incidence and mortality trends, 1977-99

INCIDENCE

A. Males (Table 1)

A total of 3,883 cancers was diagnosed in males in 1999, 63% of them, cancers of the prostate (24%), large bowel (colon/rectum) (14%), lung (12%) and skin (melanoma) (8%), and lymphomas (4%). This was similar to the 1998 total, despite reductions for cancers of the prostate and lung, due to a compensating increase of 3% for other cancers in aggregate.[1]

Between 1977-80 and 1993-96, the age-standardized incidence (World Population) for all cancer sites combined increased by 28%, mostly due to increases for cancers of the prostate, skin (melanoma) and large bowel (colon/rectum) (Table 3).[2] Meanwhile, increases also were evident for cancers of the lip, liver, pleura, connective and other soft tissue, testis and kidney, and for lymphomas and leukaemias.

A plateau in incidence (all sites) was suggested for 1997-99, however, partly due to an offsetting reduction in incidence of diagnosed prostate cancers of about 13% since 1993-96 (Table 3). This followed a 130% increase for these cancers between 1977-80 and 1993-96, which mostly was attributed to increased detection through prostate-specific antigen and allied testing.[3]

The age-standardized incidence of skin cancer (melanoma) was only marginally (3%) higher in 1997-99 than for 1993-96 (Table 3). This followed a 124% increase between 1977-80 and 1993-96, which likely reflected both a real increase and increased detection.[3,4] The suggestion of an emerging plateau is reassuring and may be a result of the long-standing promotion of sun protection.[3] This also may account for the 10% reduction in lip-cancer incidence between 1985-88 and 1997-99, which was a reversal in trend following a 54% increase during 1977-88 (Table 3).

A plateau in the incidence of large-bowel (colon/rectum) cancer also is evident, subsequent to a 30% increase between 1977-80 and 1993-96 that was attributed mostly to dietary factors and increased detection (Table 3).[3] Randomized trials have indicated that biennial population screening can reduce mortality rates from these cancers by 15-20%.[5-7] The Australian Health Technology Advisory Committee of the National Health and Medical Research Council has recommended pilot and feasibility studies of population screening in Australia.[8]

The incidence of liver cancer continued to rise, such that the age-standardized rate for 1997-99 was 69% higher than for the 1977-80 baseline (Table 3). Liver-cancer incidence is elevated in many migrant populations from Asia.[3] Increased numbers of these migrants would explain - at least in part - the increased incidence in males. Hepatitis B and C infections, exposure to aflatoxins in food-stuffs, and possibility alcohol, also could have led to a raised incidence.[3,9]

Cancers of the pleura experienced an increase in age-standardized incidence of 138% between 1977-80 and 1997-99 (Table 3). There is evidence of a plateau since 1989-92, however, which may indicate that the “epidemic” of asbestos-related mesotheliomas of the pleura has peaked in South Australia.[3,9]

Cancers of connective and other soft tissue increased in incidence in males by 21% between 1977-80 and 1993-96, due to an increase in the 15-49 year age range, This was largely due to increased numbers of Kaposi’s sarcomas. The recent increase in incidence of AIDS-related Kaposi’s sarcomas around the world has highlighted the importance of future studies of the roles of infectious agents and immunological mechanisms in the aetiology of soft-tissue and other cancers.[3] Recent evidence points, for example, to the role of Herpes Type 8 virus in the aetiology of Kaposi’s sarcoma. During 1997-99, the incidence of cancers of connective and other soft tissue was about 14% higher than the preceding peak rate in 1989-92 (Table 3).

The age-standardized incidence of testicular cancer was similar in 1997-99 to 1993-96, but 41% higher than the 1977-80 baseline (Table 3). Similar increases have been reported for other western

populations.[3,4] While the causes of these increases are not known, there is speculation that sedentary behaviour, viral exposures, or foetal or later exposures to oestrogen-like compounds may have contributed.[3]

An increase of about 43% in the age-standardized incidence of cancers of the kidney and related structures was apparent between 1977-80 and 1997-99 (Table 3). Increases have been reported for many countries and attributed in part to increased detection from advances in ultrasonography and other diagnostic procedures.[3,9] Risk factors include tobacco smoking and a history of using phenacetin-containing analgesics.[3] Risk also has been linked to dietary factors and obesity.

Meanwhile, the age-standardized incidence of lymphoma continued to increase, such that the 1997-99 rate exceeded the 1977-80 baseline by 33% (Table 3). Similar findings have been reported for other populations.[3,4] HIV infection is known to have contributed to this international trend, but the effect would have been insufficient to explain overall increases.[3] Further investigations are warranted to explore possible roles of other viral infections, hair dyes, immunosuppressive states, and exposures to herbicides, non-ionizing radiation, and other environmental agents.

Between 1977-80 and 1993-96, the incidence of leukaemias rose by 12% in males, partly due to an increase for chronic lymphatic leukaemias. The increase is thought to reflect a greater diagnostic sensitivity and possibly an increase in blood testing among older people.[2] The age-standardized rate for 1997-99 was higher than for 1993-96, but similar to the 1989-92 rate (Table 3).

Cancers showing a decrease in incidence in 1977-99 included those with a primary site of lung, stomach and pancreas. The age-standardized incidence of lung cancer was 25% lower in 1997-99 than for 1977-80 (Table 3), which mostly is attributed to reductions in smoking prevalence.[3,9] For stomach cancer, the corresponding reduction was 35%. Similar downward trends have been observed in other western societies and attributed to changes in diet and refrigeration.[4] Fresh fruit and vegetables are considered to have a protective effect, whereas high-risk diets are thought to include those high in smoked, salted, spiced and starchy foods, and alcohol.[3,9] Dietary nitrates and nitrites may predispose to these cancers through conversion to carcinogenic N-nitroso compounds.[3,9] Refrigeration is thought to: reduce bacterial contamination and breakdown products in food; and facilitate a supply of fresh fruit and vegetables throughout the year.[3] *Helicobacter pylori* has been implicated in the aetiology of stomach cancer, and infection with this organism may have reduced as a result of refrigeration and potentially the widespread use of antibiotics.[3]

Meanwhile, there was a 16% reduction in the age-standardized incidence of pancreatic cancer between 1977-80 and 1997-99 (Table 3). Tobacco smoking is an established risk factor, and the large reduction in smoking prevalence in males in past decades likely would have contributed to this decrease.[3,9]

B. Females (Table 2)

A total of 3,351 cancers was diagnosed in females in 1999, 63% of them, cancers of the breast (28%), large bowel (colon/rectum) (16%), skin (melanoma) (9%), and lung (7%), and lymphomas (5%). This was similar to the total for 1998, despite comparatively high figures in 1999 for cancers of the large bowel (colon/rectum), lung and ovary.[1]

Between 1977-80 and 1997-99, the age-standardized incidence for all cancer sites combined increased by 30%, mostly due to increases for cancers of the breast, lung, and skin (melanoma) (Table 3). Meanwhile, increases also were indicated for cancers of the lip, large bowel (colon/rectum), kidney, and oesophagus, and for lymphomas, leukaemias, and multiple myelomas and immunoproliferative neoplasms.

The age-standardized incidence of breast cancer in 1997-99 was: 7% higher than for 1993-96; and 52% higher than the 1977-88 incidence which preceded the introduction of population screening by mammography (Table 3). An earlier increase has been reported for other populations and attributed to increased maternal age at first birth, lower parity, and perhaps earlier menarche, later menopause and other hormonal influences.[3,4] Diet and obesity also were suspected to have played a part.[3,9] The South Australian data also point to a small increase in incidence that preceded population-based mammographic screening, which then was followed by a large increase in

numbers of screen-detected cases. Meanwhile, the diameters of breast tumours have reduced markedly, such that the proportion under 20mm increased from 28% in 1980-86 to approximately 53% in 1997-98, indicating a greatly improved prognosis.[1]

The age-standardized incidence of lung cancer increased by 69% between 1977-80 and 1989-92, but then by only 3% between 1989-92 and 1997-99 (Table 3). The increase is attributed to historic increases in smoking prevalence.[3,4] The indication of a plateau since 1989-92 suggests that the epidemic of lung cancer in women may have peaked.

Compared with the 1977-80 baseline, the age-standardized incidence of skin cancer (melanoma) was 69% higher for 1993-96 (Table 3). This is thought to reflect a real increase in incidence, together with increased detection.[3,4] The incidence for 1997-99 was slightly lower than for 1993-96, which accords with signs of an emerging plateau in males, and may reflect early effects of the long-standing promotion of sun protection.[3]

Large-bowel (colon/rectum) cancer experienced a 12% increase in age-standardized incidence between 1977-80 and 1989-92, which was attributed mostly to dietary factors plus an increased detection of early tumours.[3] Since then, the rate has stabilized, which accords with evidence of a plateau in males (Table 3).

The age-standardized incidence of lymphomas increased by 44% between 1977-80 and 1997-99, which was consistent with the increase for males (Table 3). Similar increases have been reported for other populations, prompting a range of aetiological investigations.[3,4] Also, as for males, an increase applied to leukaemias, approximating 32% between 1977-80 and 1997-99, which is thought to reflect increased diagnostic sensitivity.[2] Females showed an increased incidence of multiple myeloma and immunoproliferative neoplasms, which may have been due to diagnostic advances, including a greater use of high-resolution imaging, such that solitary myelomas could be visualized and biopsied more readily.[4] The increase was 41% between 1977-80 and 1997-99 (Table 3). While the incidence also was relatively high for males in 1997-99, no discernible time trend was apparent for that sex during 1977-96.

A progressive increase in incidence of lip cancer was evident between 1977-80 and 1997-99, approximating 310% (Table 3). This is thought to constitute both a real increase and increased detection.[3,4] While sun exposure likely would have been an important contributor, alcohol and tobacco consumption could have played a part.[3,9]

An increase in age-standardized incidence of oesophageal cancer of about 38% also was evident between 1977-80 and 1997-99 (Table 3). This could have been due to changes in alcohol consumption, together with increased tobacco smoking in past decades.[3,9] As for lung cancer, there is the indication of a plateau since the late 1980s.

Kidney cancer also increased in incidence between 1977-80 and 1997-99, as for males, with a 42% increase presenting (Table 3). While increased detection from advances in diagnostic procedures may have contributed, it is likely that historic trends in tobacco smoking would have had an effect.[3,9]

Cancers showing a declining incidence in 1977-99 included those with a primary site of cervix and stomach. The age-standardized incidence of cervical cancer in 1997-99 was the lowest recorded by the Registry since its commencement in 1977. It was 39% lower than the 1977-80 baseline (Table 3). This is attributed mostly to the detection through screening of precursor lesions, leading to their early treatment.[3,4] Meanwhile, there was a reduction of 35% for stomach cancer, which is thought to reflect dietary changes, improvements in refrigeration, and reductions in bacterial contamination and breakdown.[3,4,9]

MORTALITY

A. Males (Table 4)

A total of 1,735 cancer deaths was recorded for males in 1999, approximately 3% more deaths than for 1998.[1] Of the 1999 deaths, 60% were due to cancers of the lung (23%), prostate (15%), large bowel (colon/rectum) (14%) and stomach (4%), and leukaemias (4%).

Between 1977-80 and 1997-99, the age-standardized mortality rate (all sites) reduced by 11%, mostly due to reductions for lung and stomach cancers. The reduction was 27% for lung cancer (Table 6), which mostly is attributed to reduced tobacco smoking.[3,4] Meanwhile, the reduction was 41% for stomach cancer, potentially due to changes in diet and refrigeration, and possibly reductions in gastric infection with *Helicobacter pylori*.[3,4,9]

Other cancers showing a reduction in mortality included those sited in the pancreas and nasopharynx (Table 6). The 21% reduction between 1977-80 and 1997-99 for pancreatic cancer mortality was largely due to a reduced incidence, which likely was affected by reductions in tobacco smoking.[3] By comparison, the reduction of 67% for nasopharyngeal cancer mortality did not reflect a decrease in incidence, but rather an increase in case survival.

Prostate cancer mortality was 14% lower in 1997-99 than 1993-96, when a reduction in age-standardized incidence of a similar magnitude took place (Table 3). Further monitoring will be necessary to see if these reductions persist.

Age-standardized mortality rates for testicular cancer showed a decline, with the 1997-99 rate being 71% lower than for the 1977-80 baseline (Table 6). This contrasts with an increase in incidence over this period and is attributed to treatment advances, including advances in adjuvant chemotherapy for non-seminomatous lesions.[3]

By comparison, cancers of the pleura showed a two-fold increase in age-standardized mortality rate between 1977-80 and 1997-99 (Table 6). The rate appeared to have plateaued during 1989-99, however, which accorded with a plateau in incidence. Hopefully, future data will confirm that the "epidemic" of mesotheliomas has peaked.

B. Females (Table 5)

A total of 1,311 cancer deaths was recorded in females in 1999, 5% fewer deaths than for 1998.[1] Of the 1999 deaths, 54% were due to cancers of the large bowel (colon/rectum) (16%), breast (15%), lung (14%) and stomach (4%), and lymphomas (6%). Most of the overall reduction can be attributed to breast cancer.

Between 1977-80 and 1989-92, the age-standardized mortality rate (all sites) increased by 8%, but then there was a trend reversal, such that the 1997-99 rate was 9% lower than for 1989-92 (Table 6). Cancers with a declining mortality included those sited in the breast, cervix, stomach and colon.

The mortality rate for breast cancer was 8% lower in 1997-99 than for the 1977-80 baseline, and the lowest rate reported for a three-year period since the Registry was introduced (Table 6). A more detailed comparison of age-standardized mortality rates for 1997-99 with rates for the preceding 10-year period (ie, 1987-96) pointed to: a 1% increase for age groups under 50 years; a 19% reduction for 50-69 year olds; and a 9% reduction for women aged 70 years or more. There is the potential for both screening and adjuvant therapy to have contributed to these reductions. Notably, 50-69 year olds have been the principal target of mammographic screening in Australia.[10]

A particularly low age-standardized mortality rate presented for cervical cancer in 1997-99, such that it was 63% lower than for the 1977-80 baseline (Table 6). The reduction is attributed to a decrease in incidence due to screening for pre-invasive lesions, leading to their early treatment, plus gains in case survival from an increased proportion of cancers being found at a "curable" microinvasive stage.[1,3,4]

Meanwhile, there was a 43% reduction in age-standardized mortality rate for stomach cancer, which equated in approximate terms with the reduction in males (Table 6). Again, this is potentially due to changes in diet and refrigeration, and possibly reductions in gastric infection with *Helicobacter pylori*.[3,4,9]

Colonic cancer showed a reduced age-standardized mortality of approximately 27% between 1977-80 and 1997-99 (Table 6). This is thought to be due to gains in case survival from increased early detection and advances in clinical management.[1,3,11]

Since 1989-92, when the age-standardized lung-cancer mortality rate was 69% higher than for the 1977-80 baseline, the rate has reached a plateau. This accords with incidence trends and suggests that the lung-cancer epidemic may have peaked.

By comparison, there was an increase in age-standardized mortality rate of about 20% between 1977-80 and 1997-99 for multiple myeloma and immunoproliferative neoplasms (Table 6). An increased incidence also was recorded over this period. The reasons for these trends are not known, although it is suspected that diagnostic advances may have contributed.[4] A similar trend in mortality rate and incidence in males did not achieve statistical significance ($p>0.250$) between 1977-80 and 1993-96, although comparatively high figures were recorded for 1997-99.

REFERENCES

1. South Australian Cancer Registry. Epidemiology of cancer in South Australia. Incidence, mortality and survival, 1977-98. Incidence and mortality, 1998. Adelaide: Openbook Publishers, 1999.
2. South Australian Cancer Registry. Epidemiology of cancer in South Australia. Incidence, mortality and survival, 1977-96. Incidence and mortality, 1996. Adelaide: Openbook Publishers, 1997.
3. Schottenfeld D, Fraumeni JF (eds). Cancer epidemiology and prevention. 2nd edition. New York: Oxford University Press, 1996.
4. Doll R, Fraumeni JF, Muir CS (eds). Trends in cancer incidence and mortality. New York: Cold Spring Harbor Press, 1994.
5. Mandel JS, Bond JH, Church TR et al. Reducing mortality from colorectal cancer by screening for faecal occult blood. N Eng J Med 1993; 328: 1365-1371.
6. Kronborg O, Fenger C, Olson J et al. Randomised study of screening for colorectal cancer with faecal-occult-blood test. Lancet 1996; 348: 1467-1471.
7. Hardcastle JD, Chamberlain JO, Robinson MHE et al. Randomised controlled trial of faecal-occult-blood screening for colorectal cancer. Lancet 1996; 348: 1472-1477.
8. Australian Health Technology Advisory Committee, National Health and Medical Research Council. Colorectal cancer screening. Canberra: Australian Government Publishing Service, 1997.
9. Tomatis L (ed). Cancer: causes, occurrence and control. Lyon: International Agency for Research on Cancer, 1990.
10. Australian Health Ministers' Advisory Council. Breast Cancer Screening Evaluation Committee. Breast cancer screening in Australia: future directions. Australian Institute of Health, Prevention Program Evaluation Series No. 1. Canberra: Australian Government Publishing Service, 1990.
11. Hoffman D, Moore J, Roder D. Trends in survival for colonic cancer; the impact of sub-specialization. Aust NZ J Surg 1997; 67: 842-845.

TABLE 1: MALE CASES
*Cancer cases diagnosed in South Australia in 1999**

Sites	*No*	*%*	*CR*	*ASR*	*Sites*	*No*	*%*	*CR*	*ASR*
Total	3,883	100.0	525.9	336.0	Thyroid	20	0.5	2.7	2.1
Prostate	947	24.4	128.3	77.0	Tongue	18	0.5	2.4	1.8
Lung	453	11.7	61.4	37.4	Eye	14	0.4	1.9	1.6
Colon	320	8.2	43.3	26.9	Floor of mouth	13	0.3	1.8	1.1
Skin (melanoma)	310	8.0	42.0	30.1	Small intestine	12	0.3	1.6	1.0
Rectum	239	6.2	32.4	21.2	Oropharynx	11	0.3	1.5	0.9
Lymphomas	172	4.4	23.3	15.9	Hypopharynx	11	0.3	1.5	1.1
Bladder	136	3.5	18.4	10.7	Bone etc.	11	0.3	1.5	1.4
Leukaemias	136	3.5	18.4	12.7	Mouth (nos)	10	0.3	1.4	0.9
Kidney etc.	133	3.4	18.0	12.4	Penis etc.	10	0.3	1.4	0.7
Lip	131	3.4	17.7	12.0	Breast	9	0.2	1.2	0.7
Stomach	112	2.9	15.2	9.4	Sinonasal	8	0.2	1.1	0.7
Pancreas	81	2.1	11.0	6.9	Salivary gland	5	0.1	0.7	0.4
Mult. myeloma etc.	65	1.7	8.8	5.1	Mouth/pharynx (nos)	4	0.1	0.5	0.3
Oesophagus	62	1.6	8.4	5.1	Digestive (nos)	4	0.1	0.5	0.3
Brain	56	1.4	7.6	5.6	Cranial nerves etc.	4	0.1	0.5	0.5
Connective tiss. etc.	45	1.2	6.1	4.4	Nasopharynx	2	0.1	0.3	0.2
Larynx	42	1.1	5.7	3.6	Thymus, heart,				
Pleura	40	1.0	5.4	3.4	mediastinum	2	0.1	0.3	0.4
Testis	37	1.0	5.0	4.2	Anus	2	0.1	0.3	0.2
Gallbladder etc.	31	0.8	4.2	2.7	Endocrine (not thyroid)	2	0.1	0.3	0.2
Liver	25	0.6	3.4	1.9	Unspecified	138	3.6	18.7	10.7

* *CR = crude incidence rate per 100,000 males.*
ASR = age-standardized incidence rate (World Population) per 100,000 males.

TABLE 2: FEMALE CASES
*Cancer cases diagnosed in South Australia in 1999**

Sites	*No*	*%*	*CR*	*ASR*	*Sites*	*No*	*%*	*CR*	*ASR*
Total	3,351	100.0	444.0	269.0	Liver	13	0.4	1.7	0.9
Breast	928	27.7	123.0	82.6	Eye	13	0.4	1.7	1.3
Colon	350	10.4	46.4	23.1	Oropharynx	9	0.3	1.2	1.0
Skin (melanoma)	288	8.6	38.2	26.8	Bone etc.	9	0.3	1.2	0.9
Lung	225	6.7	29.8	15.8	Mouth (nos)	8	0.2	1.1	0.6
Rectum	175	5.2	23.2	12.6	Tongue	7	0.2	0.9	0.6
Lymphomas	156	4.7	20.7	12.2	Digestive (nos)	7	0.2	0.9	0.6
Uterine body	141	4.2	18.7	12.0	Pleura	7	0.2	0.9	0.6
Ovary	115	3.4	15.2	9.8	Small intestine	6	0.2	0.8	0.6
Leukaemias	89	2.7	11.8	7.5	Salivary gland	5	0.1	0.7	0.3
Kidney etc.	74	2.2	9.8	6.6	Larynx	5	0.1	0.7	0.4
Stomach	62	1.9	8.2	3.7	Anus	5	0.1	0.7	0.4
Cervix	62	1.9	8.2	6.2	Floor of mouth	4	0.1	0.5	0.4
Thyroid	60	1.8	7.9	6.0	Endocrine (not thyroid)	4	0.1	0.5	0.6
Pancreas	57	1.7	7.6	3.3	Vagina	3	0.1	0.4	0.2
Mult. myeloma etc.	50	1.5	6.6	3.4	Nasopharynx	2	0.1	0.3	0.2
Lip	45	1.3	6.0	3.0	Mouth/pharynx (nos)	2	0.1	0.3	0.2
Brain	42	1.3	5.6	3.1	Sinonasal	2	0.1	0.3	0.2
Gallbladder etc.	39	1.2	5.2	2.3	Thymus, heart,				
Bladder	36	1.1	4.8	2.3	mediastinum	2	0.1	0.3	0.1
Oesophagus	35	1.0	4.6	2.2	Cranial nerves etc.	2	0.1	0.3	0.3
Connective tiss. etc.	32	1.0	4.2	3.0	Gum	1	0.0	0.1	0.0
Vulva	23	0.7	3.0	1.3	Hypopharynx	1	0.0	0.1	0.1
					Unspecified	150	4.5	19.9	9.4

* *CR = crude incidence rate per 100,000 females.*
ASR = age-standardized incidence rate (World Population) per 100,000 females.

*TABLE 3: Mean annual age-standardized cancer incidence per 100,000 population; South Australia, 1977 to 1999**

		Year of diagnosis					
Site	*Sex*	*1977-80*	*1981-84*	*1985-88*	*1989-92*	*1993-96*	*1997-99***
Lip	M****	8.9	12.7	13.7	13.3	13.1	12.3
	F****	1.0	2.6	2.7	3.2	4.0	4.1
Tongue	M	1.6	1.9	1.8	1.8	1.8	1.5
	F	0.8	0.8	0.7	0.7	0.6	1.0
Salivary gland	M	1.3	1.4	0.9	0.8	1.2	0.8
	F	0.6	0.6	0.5	0.6	0.6	0.4
Gum	M	0.1	0.2	0.3	0.2	0.2	0.1
	F	0.1	0.1	0.1	0.2	0.1	0.1
Floor of mouth	M	1.1	1.0	0.8	1.3	0.8	1.1
	F	0.3	0.2	0.3	0.3	0.2	0.3
Mouth (nos)	M	0.6	0.9	1.3	1.0	1.0	0.9
	F****	0.3	0.5	0.6	0.7	0.8	0.5
Oropharynx	M	1.4	1.4	1.5	1.8	1.2	1.3
	F	0.4	0.3	0.3	0.4	0.3	0.6
Nasopharynx	M	0.5	0.6	0.5	0.4	0.6	0.3
	F	0.2	0.2	0.1	0.0	0.2	0.1
Hypopharynx	M	0.7	1.0	1.1	1.4	0.8	0.6
	F	0.2	0.1	0.4	0.1	0.1	0.1
Mouth/pharynx (nos)	M	0.1	0.2	0.1	0.3	0.4	0.2
	F****	0.0	0.0	0.0	0.1	0.1	0.1
Oesophagus	M	4.2	4.1	4.0	4.2	4.7	5.3
	F****	1.3	1.6	1.8	1.9	1.9	1.8
Stomach	M****	14.2	13.5	12.2	10.6	9.4	9.2
	F****	6.3	4.7	4.3	4.2	4.3	4.1
Small intestine	M	0.9	0.4	0.9	1.1	0.8	0.8
	F	0.5	0.5	0.6	0.4	0.3	0.6
Colon	M****	22.5	24.0	23.9	28.2	27.7	27.9
	F****	21.3	19.8	21.5	23.0	22.3	22.1
Rectum	M****	14.6	17.9	18.4	18.1	20.4	20.4
	F****	9.5	10.5	10.7	11.6	12.3	11.7
Liver etc.	M****	1.6	2.1	1.7	2.1	2.2	2.7
	F	0.6	0.7	0.6	0.9	0.8	0.9
Gallbladder etc.	M	2.4	1.9	2.3	1.9	2.2	2.2
	F	2.0	2.4	2.5	3.2	2.4	2.4
Pancreas	M	7.7	7.5	6.9	6.7	6.6	6.5
	F	4.8	3.9	4.7	4.9	4.6	4.7
Sinonasal	M	0.8	0.4	0.7	0.5	0.5	0.6
	F	0.4	0.2	0.4	0.3	0.2	0.3
Larynx	M	4.2	5.5	5.3	4.5	3.9	3.2
	F	0.4	0.8	0.4	0.5	0.4	0.3
Lung	M****	54.5	49.7	46.1	48.8	41.4	40.9
	F****	9.3	11.4	13.2	15.7	15.4	16.1
Pleura	M****	1.3	1.3	2.7	3.0	2.2	3.1
	F	0.2	0.1	0.4	0.5	0.3	0.6

		Year of diagnosis					
Site	*Sex*	*1977-80*	*1981-84*	*1985-88*	*1989-92*	*1993-96*	*1997-99***
Thymus etc.	M	0.2	0.3	0.1	0.3	0.2	0.4
	F	0.0	0.0	0.2	0.2	0.1	0.1
Bone etc.	M****	1.2	1.2	1.0	0.5	0.8	1.3
	F****	0.9	0.7	0.8	0.5	0.5	1.0
Connective tissue etc.	M****	2.9	2.4	3.3	4.4	3.5	5.0
	F	2.3	2.4	2.1	2.0	2.2	3.0
Skin (melanoma)	M****	13.6	15.3	22.4	27.9	30.4	31.4
	F****	16.7	17.8	23.1	24.9	28.2	27.7
Breast	M	0.6	0.5	0.6	0.7	0.6	0.6
	F****	55.7	54.3	58.5	71.2	80.0	85.3
Cervix	F****	9.4	9.5	10.8	8.1	6.3	5.7
Placenta	F	0.0	0.3	0.0	0.1	0.1	0.1
Uterine body	F	12.7	11.5	11.3	11.0	11.6	12.1
Ovary	F	9.0	8.3	8.7	9.8	8.1	8.4
Vagina etc.	F	0.6	0.6	0.4	0.4	0.4	0.3
Vulva	F	1.6	1.4	1.3	1.2	1.3	1.2
Prostate	M****	42.6	45.0	45.8	55.4	97.8	84.7
Testis	M****	3.7	3.2	3.5	4.0	5.4	5.2
Penis	M	0.7	0.7	0.5	0.6	0.4	0.7
Bladder ***	M	16.0	12.7	12.8	10.8	11.1	10.7
	F	3.7	3.5	3.3	2.8	2.7	2.9
Kidney etc.	M****	7.9	8.1	8.9	8.3	10.2	11.3
	F****	3.8	4.6	4.1	4.9	5.5	5.4
Eye	M	0.8	0.6	1.0	1.0	1.0	1.7
	F	0.9	0.5	0.7	0.7	0.3	1.1
Brain	M	6.4	7.4	7.2	5.9	7.0	6.7
	F****	4.1	4.7	5.1	5.4	5.4	4.0
Cranial nerves etc.	M	0.2	0.3	0.2	0.4	0.5	0.5
	F	0.2	0.4	0.3	0.1	0.3	0.4
Thyroid	M	1.4	1.4	1.2	1.7	1.6	2.4
	F	3.7	3.8	3.8	3.0	4.8	5.9
Endocrine (other)	M	0.5	0.7	0.4	0.6	0.7	0.4
	F****	0.8	0.4	0.4	0.3	0.2	0.6
Lymphomas	M****	12.6	14.0	13.9	13.9	15.5	16.8
	F****	9.7	8.8	9.5	10.9	11.8	14.0
Multiple myeloma etc.	M	4.1	3.7	4.1	5.3	4.1	5.3
	F****	2.2	2.5	2.6	3.2	3.6	3.1
Leukaemias	M****	10.6	11.1	11.9	14.1	11.9	13.8
	F****	6.5	6.1	8.0	8.6	8.0	8.6
All sites	M****	279.4	289.9	296.8	319.1	358.5	353.4
	F****	210.4	213.3	230.6	251.7	263.5	274.1

* *Standardized directly by age to the World Population.*

** *Preliminary estimates.*

*** *Invasive-disease criteria changed for bladder cancer between 1977-81 and 1982-99 (see Methods).*

**** *"P value" for age-adjusted linear trend "statistically significant" ($p<0.050$) between 1977-80 and 1993-96, as indicated by Poisson regression.[2] NB: Bladder-cancer analysis restricted to 1982-96.*

TABLE 4: MALE DEATHS
*Deaths from cancer in South Australia in 1999**

Sites	*No*	*%*	*CR*	*ASR*	*Sites*	*No*	*%*	*CR*	*ASR*
Total	1,735	100.0	235.0	136.7	Oropharynx	9	0.5	1.2	0.9
Lung	404	23.3	54.7	31.1	Tongue	7	0.4	0.9	0.5
Prostate	260	15.0	35.2	17.1	Hypopharynx	7	0.4	0.9	0.5
Colon	135	7.8	18.3	10.6	Floor of mouth	6	0.3	0.8	0.6
Rectum	100	5.8	13.5	8.3	Digestive (nos)	6	0.3	0.8	0.5
Stomach	76	4.4	10.3	6.1	Mouth (nos)	4	0.2	0.5	0.3
Leukaemias	68	3.9	9.2	6.0	Bone etc.	4	0.2	0.5	0.5
Pancreas	63	3.6	8.5	5.1	Thyroid	4	0.2	0.5	0.3
Lymphomas	61	3.5	8.3	5.5	Nasopharynx	2	0.1	0.3	0.2
Bladder	56	3.2	7.6	4.1	Testis	2	0.1	0.3	0.2
Brain	56	3.2	7.6	5.7	Lip	1	0.1	0.1	0.1
Skin (melanoma)	44	2.5	6.0	3.8	Salivary gland	1	0.1	0.1	0.1
Oesophagus	42	2.4	5.7	3.3	Mouth/pharynx (nos)	1	0.1	0.1	0.1
Kidney etc.	38	2.2	5.1	3.2	Sinonasal	1	0.1	0.1	0.1
Multiple myeloma etc.	37	2.1	5.0	3.1	Breast	1	0.1	0.1	0.1
Pleura	31	1.8	4.2	2.8	Penis	1	0.1	0.1	0.0
Liver	28	1.6	3.8	2.1	Eye	1	0.1	0.1	0.1
Larynx	19	1.1	2.6	1.5	Cranial nerves etc.	1	0.1	0.1	0.1
Gallbladder etc.	15	0.9	2.0	1.0	Endocrine				
Connective tissue etc.	15	0.9	2.0	1.4	(not thyroid)	1	0.1	0.1	0.1
Small intestine	11	0.6	1.5	0.7	Unspecified	116	6.7	15.7	8.7

* *CR = crude death rate per 100,000 males.*
ASR = age-standardized death rate (World Population) per 100,000 males.

TABLE 5: FEMALE DEATHS
*Deaths from cancer in South Australia in 1999**

Sites	*No*	*%*	*CR*	*ASR*	*Sites*	*No*	*%*	*CR*	*ASR*
Total	1,311	100.0	173.7	85.1	Connective tissue etc.	11	0.8	1.5	0.8
Breast	195	14.9	25.8	15.1	Tongue	7	0.5	0.9	0.6
Lung	184	14.0	24.4	12.3	Pleura	6	0.5	0.8	0.5
Colon	130	9.9	17.2	7.5	Vagina	5	0.4	0.7	0.3
Rectum	74	5.6	9.8	4.3	Vulva	5	0.4	0.7	0.3
Lymphomas	73	5.6	9.7	5.0	Mouth (nos)	4	0.3	0.5	0.2
Stomach	57	4.3	7.6	3.1	Bone etc.	4	0.3	0.5	0.3
Ovary	57	4.3	7.6	4.0	Lip	3	0.2	0.4	0.1
Leukaemias	57	4.3	7.6	3.8	Small intestine	3	0.2	0.4	0.2
Pancreas	54	4.1	7.2	3.5	Mouth/pharynx (nos)	2	0.2	0.3	0.1
Gallbladder etc.	37	2.8	4.9	1.9	Thyroid	2	0.2	0.3	0.1
Brain	36	2.7	4.8	2.4	Gum	1	0.1	0.1	0.0
Uterine body	31	2.4	4.1	1.9	Oropharynx	1	0.1	0.1	0.0
Skin (melanoma)	29	2.2	3.8	2.2	Hypopharynx	1	0.1	0.1	0.1
Kidney etc.	26	2.0	3.4	1.4	Sinonasal	1	0.1	0.1	0.1
Mutliple myeloma etc.	23	1.8	3.0	1.3	Thymus, heart,				
Bladder	22	1.7	2.9	1.2	mediastinum	1	0.1	0.1	0.0
Oesophagus	19	1.4	2.5	1.0	Eye	1	0.1	0.1	0.1
Liver	15	1.1	2.0	1.0	Cranial nerves etc.	1	0.1	0.1	0.1
Cervix	15	1.1	2.0	1.3	Endocrine (not thyroid)	1	0.1	0.1	0.1
Digestive (nos)	13	1.0	1.7	0.9	Unspecified	104	7.9	13.8	6.0

* *CR = crude death rate per 100,000 females.*
ASR = age-standardized death rate (World Population) per 100,000 females.

*TABLE 6: Mean annual age-standardized cancer mortality rate per 100,000 population; South Australia, 1977 to 1999**

		Year of death					
Site	*Sex*	*1977-80*	*1981-84*	*1985-88*	*1989-92*	*1993-96*	*1997-99***
Lip	M	0.2	0.1	0.1	0.1	0.1	0.2
	F***	0.0	0.0	0.1	0.1	0.1	0.0
Tongue	M	0.8	0.8	0.8	0.9	0.8	0.9
	F	0.3	0.3	0.2	0.3	0.2	0.5
Salivary gland	M	0.5	0.7	0.4	0.1	0.5	0.4
	F	0.1	0.1	0.1	0.1	0.1	0.2
Gum	M***	0.0	0.1	0.1	0.2	0.1	0.1
	F	0.0	0.0	0.0	0.1	0.0	0.1
Floor of mouth	M	0.5	0.6	0.3	0.5	0.4	0.4
	F	0.1	0.1	0.0	0.1	0.2	0.1
Mouth (nos)	M	0.4	0.3	0.4	0.2	0.4	0.2
	F	0.2	0.0	0.1	0.2	0.3	0.2
Oropharynx	M	0.8	0.6	0.9	0.9	0.9	0.9
	F	0.2	0.2	0.1	0.2	0.1	0.2
Nasopharynx	M***	0.6	0.4	0.3	0.3	0.2	0.2
	F	0.0	0.2	0.1	0.1	0.1	0.0
Hypopharynx	M	0.4	0.7	0.6	1.0	0.4	0.5
	F	0.1	0.1	0.2	0.1	0.1	0.0
Mouth/pharynx (nos)	M	0.2	0.1	0.0	0.1	0.3	0.1
	F	0.0	0.0	0.0	0.0	0.0	0.0
Oesophagus	M	4.2	3.2	3.1	3.5	3.4	3.8
	M	1.2	1.1	1.2	1.5	1.1	1.4
Stomach	M***	11.0	10.2	9.4	8.0	6.9	6.5
	F***	5.3	3.7	3.0	2.9	3.4	3.0
Small intestine	M	0.6	0.3	0.4	0.4	0.5	0.6
	F	0.4	0.2	0.4	0.3	0.1	0.2
Colon	M	11.5	12.1	11.1	11.9	12.3	10.2
	F***	11.1	10.2	9.2	9.5	8.8	8.1
Rectum	M	6.3	8.5	8.5	7.6	8.4	8.1
	F	4.3	4.3	4.3	5.0	4.2	4.7
Liver etc.	M	1.4	1.9	1.4	1.8	1.8	2.2
	F	0.5	0.6	0.5	0.6	0.7	0.8
Gallbladder etc.	M	1.9	1.7	1.9	1.6	1.6	1.5
	F	1.8	2.0	1.8	2.2	2.2	1.8
Pancreas	M***	7.2	7.1	6.6	6.3	6.0	5.7
	F	4.3	3.6	4.2	4.6	4.2	4.2
Sinonasal	M	0.5	0.3	0.2	0.3	0.3	0.3
	F	0.2	0.1	0.1	0.2	0.1	0.1
Larynx	M	1.5	1.6	1.2	1.6	1.1	1.4
	F	0.2	0.1	0.2	0.1	0.1	0.2
Lung	M***	46.0	43.0	39.7	40.9	35.2	33.7
	F***	7.5	9.1	10.2	12.7	11.6	11.9
Pleura	M***	1.3	0.9	2.0	2.7	2.1	2.6
	F	0.2	0.1	0.3	0.4	0.3	0.4

		Year of death					
Site	*Sex*	*1977-80*	*1981-84*	*1985-88*	*1989-92*	*1993-96*	*1997-99***
Thymus etc.	M	0.1	0.3	0.1	0.1	0.1	0.1
	F	0.0	0.0	0.1	0.1	0.1	0.0
Bone etc.	M***	0.5	0.6	0.3	0.4	0.3	0.4
	F	0.3	0.4	0.3	0.1	0.3	0.1
Connective tissue etc.	M	1.1	1.0	0.8	1.5	1.3	1.7
	F	0.6	0.9	0.7	1.0	0.7	0.8
Skin (melanoma)	M	3.5	3.3	3.4	4.1	3.5	3.7
	F	2.1	2.0	2.3	2.0	2.0	2.2
Breast	M	0.1	0.0	0.2	0.1	0.1	0.2
	F	18.8	18.6	20.3	19.8	20.4	17.3
Cervix	F***	3.5	2.8	2.4	2.6	1.6	1.3
Placenta	F	0.0	0.0	0.0	0.0	0.1	0.0
Uterine body	F***	2.3	2.0	2.3	2.0	1.6	1.8
Ovary	F	5.5	5.1	5.7	5.4	5.4	4.3
Vagina etc.	F	0.3	0.3	0.2	0.1	0.2	0.2
Vulva	F***	0.5	0.5	0.4	0.3	0.2	0.2
Prostate	M***	18.3	14.5	15.3	17.2	18.8	16.1
Testis	M***	0.7	0.4	0.2	0.4	0.3	0.2
Penis	M***	0.2	0.2	0.2	0.1	0.0	0.0
Bladder	M	5.3	4.4	4.8	4.0	4.2	4.2
	F	1.3	1.2	1.0	1.6	1.3	1.3
Kidney etc.	M	3.4	3.7	4.4	3.7	3.7	3.6
	F	1.7	2.1	1.8	2.3	1.8	1.7
Eye	M	0.4	0.3	0.2	0.1	0.1	0.2
	F	0.2	0.2	0.2	0.2	0.1	0.2
Brain	M	4.9	5.8	5.4	5.0	5.4	5.2
	F	3.7	3.2	3.6	3.7	3.7	3.8
Cranial nerves etc.	M	0.0	0.2	0.1	0.0	0.1	0.1
	F	0.0	0.1	0.2	0.2	0.0	0.1
Thyroid	M***	0.4	0.2	0.3	0.2	0.1	0.2
	F	0.2	0.4	0.4	0.3	0.2	0.2
Endocrine (other)	M	0.4	0.5	0.2	0.1	0.4	0.1
	F	0.4	0.2	0.2	0.2	0.3	0.2
Lymphomas	M	6.4	6.4	5.3	5.6	6.4	5.9
	F	4.7	4.0	4.3	4.4	4.7	4.8
Multiple myeloma etc.	M	2.4	2.6	2.3	3.1	2.6	3.0
	F***	1.5	1.4	1.7	1.8	1.8	1.8
Leukaemias	M	6.7	6.4	5.9	6.5	6.4	6.3
	F	3.9	3.9	4.0	4.1	4.0	4.0
All sites	M	159.6	155.6	149.1	152.3	148.7	141.4
	F***	93.6	93.3	96.1	101.4	96.3	92.0

* *Standardized directly by age to the World Population.*

** *Preliminary estimates.*

*** *"P value" for age-adjusted linear trend "statistically significant" ($p<0.050$) between 1977-80 and 1993-96, as indicated by Poisson regression.*[2]

ABSTRACT

INDEX