Cancers attributed to smoking and alcohol consumption

Alcohol and smoking are risk factors for many cancers. In 2000, cancers attributed to excessive alcohol consumption accounted for 3.2% of all new cases of cancer, while those cases attributed to smoking accounted for 12.7% of all new cases of cancer. Cancers attributed to smoking also accounted for a large proportion of deaths from cancer in 2000 (21.6% of all cancer deaths). These data and those in Tables 50 and 51 are derived from a series of age- and sex-specific aetiological fractions developed by Ridolfo and Stevenson (2001) and from cancer incidence estimates for specific cancer sites for 2000. These fractions are based on an analysis of international and Australian studies and estimate the probability that a specific agent (alcohol or tobacco) causes a specific disease (cancer). The cancers thought to be directly attributable to smoking (excluding passive smoking) and alcohol are listed in Table 2.

Table 2: Cancer site and percentage of new cancers attributed to excessive alcohol consumption and to smoking, Australia, 2000

Cancer site	Males (%)	Females (%)
Cancers attributable to excessive alcohol consumption		
Oral cancers[(a)]	38	27
Oesophagus	45	35
Liver	37	29
Larynx	50	43
Female breast cancer	—	11
Cancers attributable to smoking		
Oral cancers[(a)]	52	40
Oesophagus	50	41
Stomach	12	8
Anus	39	32
Pancreas	23	17
Larynx	69	59
Lung	89	71
Vulva	—	34
Penis	20	—
Kidney	17	12
Renal pelvis	50	41
Bladder	38	29

(a) Oral cancers include C01–C06, C09–C10 and C12–C14.

Note: In editions prior to *Cancer in Australia 1999*, cancers of the uterus and cervix were included among cancers attributable to smoking. However, more recent research has shown that this is not the case.

Source: Aetiological fractions from Ridolfo & Stevenson 2001 applied to 2000 cancer incidence data.

While tobacco and alcohol have each been associated with cancer in their own right, they often occur together and may interact to produce higher or lower risks. To the extent possible, the estimates of the aetiological fractions have been derived to represent the independent contribution of each risk factor. However, it is not possible to allow for all the complexities of the interactions between risk factors using this methodology. Hence the

fractions for tobacco and alcohol cannot be summed to give a combined effect of the two risk factors.

It is estimated that 2,697 new cases of cancer were directly attributable to alcohol consumption in 2000 at a rate of 14.3 cases per 100,000 population, as were 1,227 deaths at a rate of 6.5 per 100,000 population. While other cancers may be indirectly caused by alcohol consumption in combination with other risk factors, alcohol is believed to be the primary causative agent for differing proportions of specific cancers. The mechanism by which alcohol causes cancer has not been fully determined, but the major metabolite of ethanol has been shown to be carcinogenic in animal experiments (English et al. 1995). The lifetime risk of cancers attributable to alcohol consumption is 1 in 94 for males and 1 in 76 for females. Between 1990 and 2000, the incidence rate for cancers attributable to alcohol consumption in females increased by an average of 1.5% per annum, while the male rate decreased by an average of 0.2% per annum.

Cancers attributable to smoking account for 16.8% of all new cases of cancer in males and 7.9% of all new cases of cancer in females. This large difference is attributable to the higher rates of smoking among men than women in the past 30 years. Twenty-five years ago smoking rates in men were almost double those in women. This is no longer the case. In 2001, 26% of men and 21% of women aged over 14 years were current smokers (AIHW 2003a). Organs associated with the respiratory system are the ones most affected by cigarette smoke, as a result of the known carcinogens in cigarette smoke such as polycyclic aromatic hydrocarbons (Table 2). Epidemiological evidence indicates that other cancers, including cancers of the upper digestive tract, bladder, renal pelvis (kidneys) and pancreas are also associated with cigarette smoking (English et al. 1995).

Cigarette smoking is estimated to have directly caused 10,807 new cases of cancer (57.2 new cases per 100,000 population) and 7,650 deaths (40.5 per 100,000 population) in 2000. Between 1990 and 2000, the male incidence rate for cancers attributable to smoking fell by an average of 1.4% per year, while the rate for females rose by 0.7% per year. Over the same period, mortality rates fell by 1.9% per annum for males and rose by 2.9% per annum for females (Figure 11).

The following illustrates the improvements in the male mortality rate for cancers from the decline in smoking among men. If the 1990 age-specific rates attributable to smoking were applied to the 2000 male population there would be an additional 2,093 male deaths due to smoking in 2000. In contrast, the female mortality rate for cancers attributable to smoking has increased since 1990 because of the lag effect on cancer incidence of rising rates of smoking among women in the 1960s and 1970s. There would be 498 fewer female deaths in 2000 if the 1990 rates were applied to the 2000 female population.

Cancer rates in the states and territories, 1996–2000

Cancer incidence and mortality are reported here for the combined period 1996–2000 for all states and territories. Cancer registration is based on state and territory of residency of the patient at the time of diagnosis.

Melanoma rates

Cancer incidence is generally similar among states and territories. However, variation in the incidence of melanoma among states creates some differences in the overall incidence rates.

An analysis of all cancers combined (excluding skin cancers other than melanoma) showed that Queensland had the highest incidence in both males (574.3 per 100,000 population) and females (411.4 per 100,000 population), while the Northern Territory reported the lowest incidence with 480.0 cases per 100,000 for males and 367.1 per 100,000 for females (Figure 8, Table 37) because of lower incidence among Aboriginal and Torres Strait Islander people.

Melanoma risk is generally highest in the northern areas and lower in the more southerly areas, showing a correlation to exposure to ultraviolet radiation (Jelfs et al. 1994). Age-standardised mortality ranges from 3.8 deaths per 100,000 population for Tasmania to 6.5 deaths per 100,000 population for Queensland (Table 37).

Incidence rates excluding melanoma

When the impact of melanoma was removed from the comparison, the order of states and territories with the highest and lowest cancer incidence rate for males changed with South Australia reporting the highest incidence rate for all cancers combined (excluding melanoma and other skin cancers) among males (511.3 per 100,000 population), closely followed by the Australian Capital Territory (510.0 per 100,000 population). The Northern Territory reported the lowest, with 442.5 cases per 100,000 population. The remaining states and territories reported the following rates for males: Victoria 503.2 per 100,000 population, Queensland 500.3, Tasmania 491.7, New South Wales 481.8 and Western Australia 462.0. For females, Queensland reported the highest rate (359.9 per 100,000 population), closely followed by Victoria (359.5 per 100,000 population). Western Australia reported the lowest (329.3 per 100,000 population). The remaining states and territories reported the following rates for females: South Australia 354.9, Tasmania 353.7, Australian Capital Territory 349.1, New South Wales 342.1 and the Northern Territory 340.1 per 100,000 population. New South Wales has lower incidence because of its relatively high proportion of the population born in overseas countries, including many recent arrivals. Migrants/recent arrivals from Asia have lower incidence of cancer (Grulich et al. 1995; McCredie et al. 1999).

Mortality rates by state of registration of death

The 1996–2000 cancer mortality rates reported for males across the states and territories range from 270.1 per 100,000 population in Tasmania to 244.4 per 100,000 population in the Northern Territory. For females, the mortality rates vary from 199.7 per 100,000 population in the Northern Territory to 147.2 in New South Wales (Table 32).

These rates are in respect of deaths for which cancer was the underlying cause of death coded by the Australian Bureau of Statistics (ABS) from death certificates. Some state cancer registries undertake more detailed analyses of all persons with malignant cancer who have died and therefore publish in their state reports numbers and rates of cancer deaths by cancer which differ from the ABS figures in this report.

Mortality by state of registration and state of usual residence

State and territory mortality rates in this publication refer to the state and territory in which deaths were registered. However, it is not uncommon for persons diagnosed with cancer to travel interstate for treatment and end of life care so special care needs to be taken when interpreting these rates, especially for the Australian Capital Territory and the Northern Territory.

Of cancer deaths registered in the Australian Capital Territory during the period 1996–2000, 17.3% usually resided in another state or territory, the majority (16.0%) coming from New South Wales (Table 3).

During the same period, 7.1% of cancer deaths of usual residents of the Northern Territory were registered outside the Territory, the majority in South Australia (3.4%).

Table 3: Cancer deaths by state of usual residence and state of registration, 1996–2000

	State of usual residence									
State of Registration	**NSW**	**Vic**	**Qld**	**WA**	**SA**	**Tas**	**ACT**	**NT**	**Other**	**Total**
NSW	58769	215	269	13	23	9	34	12	1	*59345*
VIC	328	45023	61	11	29	21	8	6	0	*45487*
QLD	522	64	30256	8	14	10	6	9	0	*30889*
WA	16	18	13	15141	8	3	1	4	8	*15212*
SA	52	36	11	5	15444	1	2	29	0	*15580*
TAS	1	8	2	3	3	5056	1	0	0	*5074*
ACT	361	9	11	2	6	1	1869	0	0	*2259*
NT	6	4	5	4	10	1	0	789	0	*819*
Total	*60055*	*45377*	*30628*	*15187*	*15537*	*5102*	*1921*	*849*	*9*	*174665*
	Per cent of deaths registered in each state by state of usual residence									
NSW	99.0	0.4	0.5	0.0	0.0	0.0	0.1	0.0	0.0	*100.0*
VIC	0.7	99.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	*100.0*
QLD	1.7	0.2	98.0	0.0	0.0	0.0	0.0	0.0	0.0	*100.0*
WA	0.1	0.1	0.1	99.5	0.1	0.0	0.0	0.0	0.1	*100.0*
SA	0.3	0.2	0.1	0.0	99.1	0.0	0.0	0.2	0.0	*100.0*
TAS	0.0	0.2	0.0	0.1	0.1	99.6	0.0	0.0	0.0	*100.0*
ACT	16.0	0.4	0.5	0.1	0.3	0.0	82.7	0.0	0.0	*100.0*
NT	0.7	0.5	0.6	0.5	1.2	0.1	0.0	96.3	0.0	*100.0*
Total	*34.4*	*26.0*	*17.5*	*8.7*	*8.9*	*2.9*	*1.1*	*0.5*	*0.0*	*100.0*
	Per cent of deaths in state of usual residence by state of registration									
NSW	97.9	0.5	0.9	0.1	0.1	0.2	1.8	1.4	11.1	*34.0*
VIC	0.5	99.2	0.2	0.1	0.2	0.4	0.4	0.7	0.0	*26.0*
QLD	0.9	0.1	98.8	0.1	0.1	0.2	0.3	1.1	0.0	*17.7*
WA	0.0	0.0	0.0	99.7	0.1	0.1	0.1	0.5	88.9	*8.7*
SA	0.1	0.1	0.0	0.0	99.4	0.0	0.1	3.4	0.0	*8.9*
TAS	0.0	0.0	0.0	0.0	0.0	99.1	0.1	0.0	0.0	*2.9*
ACT	0.6	0.0	0.0	0.0	0.0	0.0	97.3	0.0	0.0	*1.3*
NT	0.0	0.0	0.0	0.0	0.1	0.0	0.0	92.9	0.0	*0.5*
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Note: All deaths during the five-year period with year of death 1996 to 2000.

Source: AIHW mortality database.

Cancers attributed to smoking

Lung cancer incidence rates are highest in the Northern Territory (for males 76.9 cases per 100,000 population, for females 42.3) (Table 36). The lowest lung cancer incidence rates are reported for males in the Australian Capital Territory (45.6 per 100,000 population) and for females in South Australia (24.4).

State and territory variations in cancers attributed to smoking generally reflect those observed for lung cancer (Table 51). The Northern Territory reported the highest incidence rates for males and females (113.7 and 42.5 per 100,000 population respectively). The Australian Capital Territory reported the lowest smoking-related cancer incidence rates for males (72.3 per 100,000 population) and South Australia had the lowest rate for females (27.6). Death rates from cancers attributed to smoking were highest in the Northern Territory for both males and females (87.7 and 32.4 per 100,000 population respectively).

These patterns of incidence probably reflect smoking behaviour approximately 10–25 years ago, due to the time lag between exposure to carcinogens in the tobacco smoke and the diagnosis of cancer. Differentials in smoking rates between the states and territories reported in the 2001 National Health Survey (ABS 2002b) are likely to affect smoking-related cancer incidence rates in the future. Queensland (52.9%) reported the highest proportion of current and ex-smokers, and the Australian Capital Territory the lowest at 49.3%, with the national average 51.5%.

Breast cancer and prostate cancer

The Australian Capital Territory reported the highest incidence rates for female breast cancer (118.0 per 100,000), followed by South Australia (115.4 per 100,000), Victoria (114.5 per 100,000), and Queensland (113.6 per 100,000). The Northern Territory reported the lowest incidence rate (93.1 cases per 100,000 population) (Table 38).

The Australian Capital Territory reported high rates of prostate cancer (172.4 per 100,000 population), while considerably lower rates were reported in the Northern Territory (102.6 per 100,000 population) (Table 42), a rate influenced by the low Indigenous population incidence rates (d'Espaignet et al. 1996). These interstate variations in prostate cancer incidence might also be explained by differences in the time and rate of uptake of prostate-specific antigen (PSA) testing in the states and territories (Smith et al. 1998; Threlfall et al. 1998).

Cervical cancer

There were large differences in cervical cancer incidence among the states and territories. This probably reflects in part the relative impact of the screening programs in each jurisdiction. Most of the large states show consistent rates of approximately 8–10 new cases per 100,000 population; however, South Australia shows a substantially lower rate of 6.8 per 100,000 population (Table 39). The Northern Territory has a very high incidence rate of 15.9 per 100,000 population. A major contributor to this incidence rate is the high rate of cervical cancer among the Indigenous population, which d'Espaignet et al. (1996) indicated was up to three times the rate of the non-Indigenous population. This situation is also reflected in a high mortality rate (8.4 deaths per 100,000 population). This high mortality rate may be an indicator of late-stage detection of these cancers.

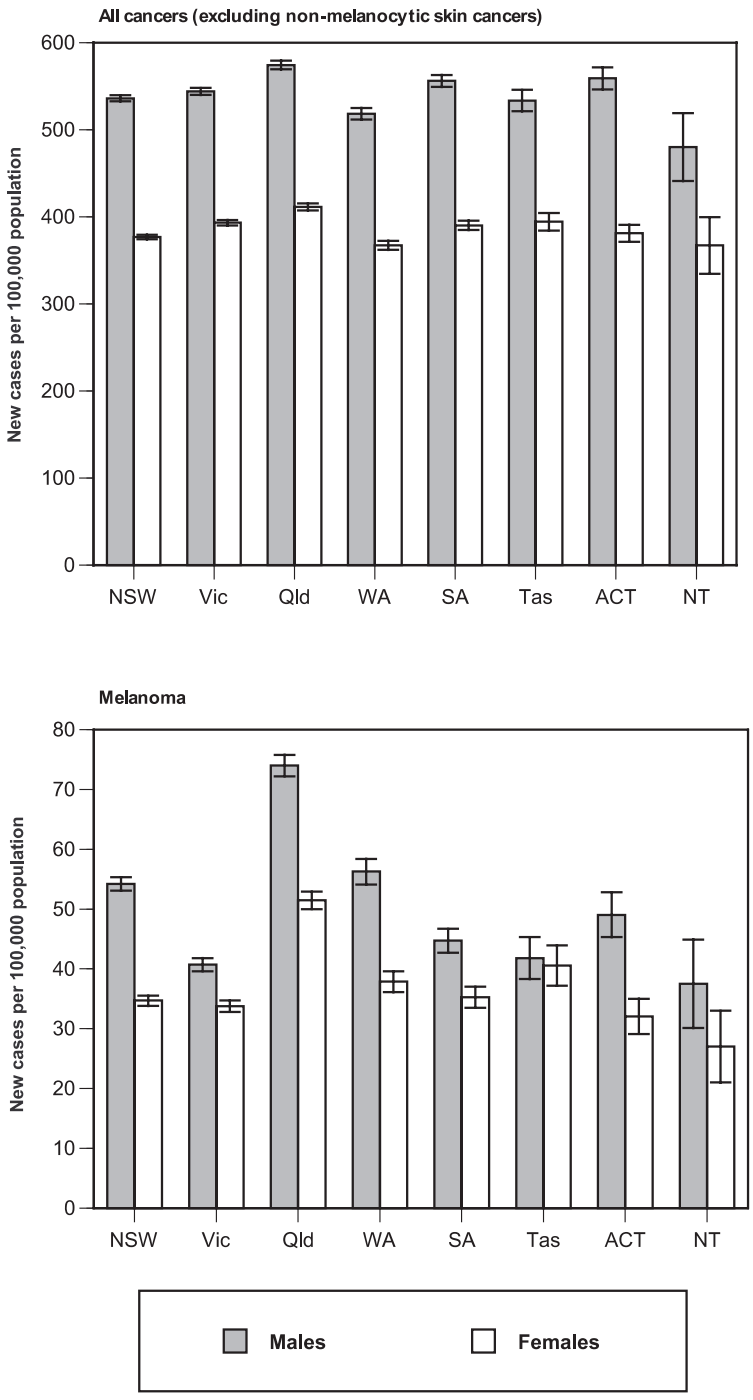
Explanations for variations

Differences in state and territory cancer incidence rates may be explained by variations in underlying cancer risk, the availability and utilisation of diagnostic procedures, reporting and coding inconsistencies, and normal incidence rate fluctuations. A case in point is bladder cancer (Table 44), where state and territory comparisons vary by more than 100%. This is largely due to differences in local coding practices, particularly in regard to the inclusion or exclusion of tumours of uncertain behaviour. One of the main functions of the AACR is to identify such differences in coding practice and agree on strategies to standardise coding and produce comparable state and territory data that are also comparable to published international statistics.

Incidence rates for several types of cancer published in this report are considerably lower for the Northern Territory than for other states. These differences are predominantly due to low incidence of these cancers in Indigenous Australians, who comprise 29% of the Northern Territory population (Condon et al. 2001). Incomplete case ascertainment also contributed to these lower rates to a small extent. A review of data quality in the Northern Territory Cancer Register undertaken during 2001 concluded that, compared to other Australian states, cancer notification to the Northern Territory Cancer Registry in the period 1991–2000 was approximately 10% incomplete (unpublished, J Condon). Under-ascertainment appeared to be due to incomplete notification from one notification source and was not restricted to any particular type of cancer.

Care should be taken when interpreting incidence rates, especially for less common cancers and for states and territories with small populations. To reduce the problems of statistical variation due to a small number of cases, the numbers and rates presented for the states and territories in Tables 32 to 51 in this publication are annual averages of the five-year period 1996–2000. For annual sex- and cancer-specific data, or data cross-classified by other variables (for example, age, geographic area), the state and territory cancer registries should be contacted directly.

All cancers and melanoma incidence rates by sex, states and territories



Source: Cancer in Australia 2000, AIHW & AACR, 2003.

Figure 8: Age-standardised incidence rates (95% confidence intervals) for all cancers (excluding skin cancers other than melanoma) and for melanoma, states and territories, 1996–2000