APPENDIX A: CANCER REGISTRATION IN TASMANIA

ABOUT THE TASMANIAN CANCER REGISTRY

The Tasmanian Cancer Registry was established in 1977 as a population-based registry covering the whole of Tasmania. The Registry was established to provide the State Government with accurate cancer incidence and mortality statistics and to monitor cancer trends. In July 1988 the operation of the Cancer Registry was moved from the Department of Health Services to the Menzies Research Institute. Cancer was proclaimed a notifiable disease in December 1992 and cancer registration since then has had a legislative basis.

An Advisory Committee assists the Registry. Registry staff includes a non-medical Registrar, project officer and two clerks. Volunteers also assist with the paper data handling. The Registry has access to a biostatistician and a computer consultant. The medical director of the Registry is the Director of the Menzies Research Institute. The Tasmanian Cancer Registry is a full member of the Australasian Association of Cancer Registries and the International Association of Cancer Registries.

SOURCES OF DATA

All pathology laboratories in the State provide the Registry with copies of histopathological and cytology reports of cancer and cell marker reports. Cancer notification forms are supplied by the two radiation oncology clinics. Private and public hospitals notify diagnoses of cancer to the Registry upon discharge of patients or provide a computerised listing of cancer cases periodically. Death certificates of Tasmanian people are reviewed for mention of cancer as a cause of death. Interstate registries supply data to the Tasmanian Cancer Registry on Tasmanian residents who seek treatment interstate or who move interstate at some time after cancer diagnosis.

DATA HANDLING

Paper copies of all data are retained and a file is maintained for each cancer case. Paper records for persons deceased are archived two years after death. Data for the period 1980 to 1999 was entered into software provided by the South Australian Cancer Registry. At least one tumour per ICD–9 site was able to be recorded and updated as new data was supplied.

Due to cervix and breast screening programs and a special research interest in melanoma and lung cancer, these cancer sites are fast tracked and data are entered as soon as the Registry receives them. The Tasmanian Cancer Registry still collects all pathology reports of non-melanoma skin cancers (NMSC) and stores them annually in alphabetic order. Due to resource considerations, NMSC is not routinely entered onto the database and incidence is no longer regularly reported. Deaths from NMSC are reported annually, but are not published in this report.

DATA COLLECTION AND CODING PRACTICES

Data collected by the Registry include demographic data for the cancer patient, cancer site and morphology, date of diagnosis, cause and date of death and the names of the providers of medical care. Additional tumour data are collected for melanoma, breast and haematological cancers. Complete registration details are recorded for the first primary cancer for each 3-digit topography site. In situ cancers and second primary cancers with the same three-digit site code are also recorded but are not included in this report. Multiple primary cancers are counted according to the rules set out by the International Association of Cancer Registries. The primary site of cancer was coded according to IARC International Classification of Diseases, ninth edition (ICD-9) and morphology according to SNOMED II. Coding practices specific to the Tasmanian Cancer Registry are detailed below.

DATA CONTROL AND QUALITY ASSURANCE

A case flagging system is used to identify data that are entered in error. Data matching programs are used to identify incorrect spellings, name changes upon marriage and date of birth inconsistencies. Before any analyses, a duplicate-checking program is run to identify and delete double entries. In addition, the National Cancer Statistics Clearing House collates all State and Territory data and checks for duplicate registrations across two or more states.

Data are obtained from multiple sources. Most case registrations will include data from both a pathology laboratory and a hospital service (either as an inpatient or at the radiotherapy clinics). Data quality is higher with verification from more than one source. Where insufficient information is received to enable complete registration, active follow-up is undertaken. Information is sought from treating

APPENDIX B: CANCER CODES (ICD-9) AND COMBINATIONS

Buccal cavity	
Lip	140
Tongue	141
Salivary glands	142
Gum	143
Floor of mouth	144
Other and unspecified parts of the mouth	145
Pharynx	
Oropharynx	146
Nasopharynx	147
Hypopharynx	148
Other sites within the lip, oral cavity and pharynx	149
Head and neck	141-149
Digestive organs and peritoneum	
Oesophagus	150
Stomach	151
Small intestine	152
Colon	153
Rectum	154
Colorectal	153-154
Liver and intrahepatic bile ducts	155
Gallbladder and extrahepatic bile ducts	156
Pancreas	157
Retroperitoneum and peritoneum	158
Unspecified digestive organs	159
Respiratory system	
Nasal Cavities, middle ear and accessory sinuses	160
Larynx	161
Trachea, bronchus and lung	162
Pleura	163
Respiratory systems, ill-defined and other intrathoracic organs	164-165
Bone, connective tissue, skin and breast	
Bone and articular cartilage	170
Connective and other soft tissue	171
Melanoma	172
Non-melanocytic skin cancer (NMSC)	173
Breast	174-175

Genitourinary organs	
Cervix (invasive)	180
Placenta	181
Corpus uteri	182
Ovary and other uterine adnexae	183
Other and unspecified female genital organs	184
Prostate	185
Testis	186
Penis and other male genital organs	187
Bladder	188
Kidney, ureter and urethra	189
Other and unspecified site	
Eye	190
Brain	191
Other and unspecified parts of the nervous system (NS)	192
Thyroid gland	193
Other endocrine glands	194
Other and ill-defined sites	195
Unspecified site	199
Lymphatic and haematopoietic tissue	
Non-Hodgkin's lymphoma (NHL)	200+202
Lymphosarcoma and reticulosarcoma	200
Hodgkin's disease	201
Other neoplasms of lymphoid and histiocytic tissue	202
Multiple myeloma and immunoproliferative neoplasms	203
Lymphatic leukaemia	204
Myeloid leukaemia	205
Monocytic leukaemia	206
Other unspecified leukaemias	207-208
Leukaemias	204-208
Smoking and alcohol-related cancers	
Alcohol-related cancers (aetiological fractions are applied to the following codes)	141, 143-146, 148-150, 155, 161, 174
Smoking-related cancers (aetiological fractions are applied to the following codes)	140-141, 143-151, 154.3-.4, 157, 161-2, 180, 184.4, 187.1-.4, 188, 189.0-.1.

Source: World Heath Organization 1977[1]

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[1] Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR) 2001. Cancer in Australia 1998. AIHW cat. no. CAN 12. Canberra: AIHW (Cancer Series no. 17).

COMMENTS ON THE USE OF ICD-9 CODE IN THIS REPORT

140	Lip: applies to squamous cell carcinomas arising from the mucosa or muco-epidermal junction.
152	Small intestine: includes sarcomas and carcinomas but lymphomas are coded as 200 or 202.
155	Liver: only those tumours proved by histological examination or special tests are included, others are regarded as metastatic.
158	Peritoneum and Retroperitoneal tissue: on the advice of an authority of soft tissue tumours, primaries are being coded to 171.
162	Bronchus and Lung: includes only tumours considered to be primary.
171	Bone: includes only primary bone tumours.
172	Cutaneous melanoma: invasive lesions only included.
173	Non-melanoma skin: mortality rates are only in this report.
174-175	Breast: invasive lesions only included.
180	Cervix Uteri: includes micro-invasive lesions but not in-situ cancers.
188	Bladder: includes invasive tumours only.
196-199	Secondary sites: all coded under 199 if primary site unknown.
200	Lymphosarcoma & reticulosarcoma: only diffuse non-Hodgkin's lymphomas are included under this code number.
204-208	Leukaemias: certain changes have been made to 2060, 2070 and 2072 to incorporate them in the Acute Myeloid (AML) 2050 FAB Classification (M1-M7).

Please note that none of the 3 digit ICD-9 codes have been changed (140-208). However, it must be pointed out that some of the 4-digit codes of ICD-9 have been expanded or condensed to concur with changes in pathology classifications and where numbers warrant this practice. As the International Agency for Research in Cancer (IARC) scientific publication *Cancer in Five Continents*[2] is based on 3-digit codes, this modification does not affect international comparisons.

[2] Parkin D.M, Whelan S.L, Ferlay J, Raymond L, Young J, Cancer Incidence in Five Continents, Volume VII, IARC Scientific Publications No. 143, Lyon, 1997.

doctors and from public hospital medical records. Tissue examination (histology, cytology, and haematology) is considered to be the most accurate diagnostic method. The percentage of cases with tissue examination is an indicator of the quality of the data.

In some circumstances, the only cancer notification received by the Tasmanian Cancer Registry is a death certificate, often occurring where neither pathology nor hospitalization were appropriate for the care of the individual. For the period from 1980 to 1999 the Registry did not accept cases on the basis of death certificate only. Each death certificate notification is actively followed up until the time and place of diagnosis are ascertained and the diagnosis verified. If the diagnostic details cannot be confirmed, the case is not registered.

APPENDIX C: METHODS PART 1: INCIDENCE AND MORTALITY 1980-1999

STATISTICAL CONCEPTS AND THEIR USE

Incidence

Cancer incidence is defined as the number of new cases of cancer in a population during a specific period. The incidence data in this report refer to cases of cancer diagnosed between January 1980 and December 1999 among persons who were residents of Tasmania at the time of diagnosis.

Mortality

Cancer mortality refers to deaths from cancer during a specific period among people who were diagnosed as having cancer while they were residents of Tasmania. Those who die elsewhere in Australia are notified to the Tasmanian Cancer Registry by other State and Territory cancer registries. Likewise, the Tasmanian Cancer Registry advises other State and Territory cancer registries of persons diagnosed of cancer interstate who die in Tasmania.

Population

The estimated resident population of Tasmania at 30th of June of each year from 1980 to 1999 was used as the population at risk of being diagnosed or dying from cancer in that year. Every five years the Australian Bureau of Statistics (ABS) conducts a census of the population of Australia. Estimates of the resident population are calculated for the ABS in intervening years.

RATES AND FORMULAE

This section describes the methods used to calculate the estimates presented in the tables and graphs in this report.

The calculations in the example below are for incidence, but the methods are applicable to mortality.

Example table[3]

Lung Cancer incidence (ICD 162) - females

Age group	No. of cases 1980-1999 [c_i]	Person-years at risk, 1980-1999* [n_i]	Age-specific rate per 100,000 population [r_i]	Australian 1991 Standard population ** [N_i]	Expected number of cases	$r_i*N_i^2/n_i$
	Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**	**Column 6**
00-04	0	336,228	0.0	1,271,703	0.0	0
05-09	0	347,480	0.0	1,272,208	0.0	0
10-14	0	360,551	0.0	1,241,619	0.0	0
15-19	0	360,934	0.0	1,364,074	0.0	0
20-24	0	345,684	0.0	1,396,764	0.0	0
25-29	1	345,325	0.3	1,399,663	4.1	16
30-34	3	350,536	0.9	1,425,735	12.2	50
35-39	15	336,854	4.5	1,328,387	59.2	233
40-44	35	300,832	11.6	1,294,271	150.6	648
45-49	54	260,224	20.8	1,029,145	213.6	845
50-54	83	227,373	36.5	846,934	309.2	1152
55-59	129	208,306	61.9	725,950	449.6	1567
60-64	171	197,390	86.6	736,868	638.4	2383
65-69	201	184,031	109.2	671,390	733.3	2675
70-74	174	158,529	109.8	510,755	560.6	1806
75-79	141	121,303	116.2	384,495	446.9	1417
80-84	82	78,555	104.4	229,828	239.9	702
85+	40	59,591	67.1	154,247	103.5	268
All ages	**1,129**	**4,579,726**		**17,284,036**	**3920.9**	**13761**

* Tasmanian female population, sum of mid-year estimates for all years 1980-1999.
** Australian Bureau of Statistics[4].

[3] Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR) 2001. Cancer in Australia 1998. AIHW cat. No. CAN 12. Canberra: AIHW (Cancer Series no. 17), p 67.

[4] Sources: a) Population by age and sex, Australian States and Territories, 1978-1983, Australian Bureau of Statistics, Catalogue No.3201.0; b) Population Statistics, Tasmania, 1984-1989, Australian Bureau of Statistics, Catalogue No. 3204.6;c) Demography, Tasmania, 1990-1999, Australian Bureau of Statistics, Catalogue No. 3311.6.

Rates per 100,000

To allow comparisons of incidence and mortality between populations of unequal size, it is common practice to express incidence and mortality as rates per 100,000 person-years at risk of being diagnosed or dying from cancer. Each resident of Tasmania contributes one person-year for every complete year during the specific period they lived in Tasmania (for those diagnosed with or dying from cancer, one person-year for every complete year prior to the diagnosis or death). In practice, person-years at risk are approximated from estimates of the mid-year population (every person in the estimated mid-year population is taken to contribute one person-year).

Crude rates (CR)

The crude rate per 100,000 (per annum) is calculated by dividing the number of new cancer cases in a given population, by the population at risk in a specific time period, and then multiplying it by 100,000. For the example of lung cancer for females:

$$\text{Crude incidence rate} = \frac{\text{Column 1 total}}{\text{Column 2 total}} \times 100{,}000$$

$$= \frac{1{,}129}{4{,}579{,}726} \times 100{,}000$$

$$= 24.7 \text{ per } 100{,}000$$

Age specific rates

Age specific rates are based on five-year age groups and are calculated by dividing the number of cases by the population of the same sex and age group, and multiplying by 100,000. For the example of lung cancer for females; the age-specific rate for women aged 75-79 years was:

$$\text{Age-specific incidence rate (age 75-79)} = \frac{\text{Column 1 for this age group}}{\text{Column 2 for this age group}} \times 100{,}000$$

$$= \frac{141}{121{,}303} \times 100{,}000$$

$$= 116.2 \text{ per } 100{,}000$$

Age-standardised rates (AS rate)

To allow comparisons of incidence (or mortality) rates between populations with different age distributions, it is common practice to calculate the incidence (or mortality) that would occur in a standard reference population subject to the same age specific rates of incidence (or mortality). This is referred to as direct age standardisation, and the rates age-adjusted in this way are referred to as age standardised rates. For this report, rates were standardised against the Australian 1991 Standard Population (to allow comparisons across time and with other Australian States and Territories) and against the 1966 World Population (to allow international comparisons). In the following example the reference population is the 1991 Australian Population. The direct method consists of three steps:

Step 1 Calculate the age-specific rate for each age group (column 3).

Step 2 Calculate the expected number of cases in each 5-year age group by multiplying the age-specific rates (column 3) by the corresponding standard population (column 4) and dividing by 100,000, to obtain the expected number of cases in the reference population (column 5).

Step 3 Sum the expected number of cases in each age group (column 5), and divide this sum by the total of the standard population (column 4) used in the calculation and multiply by 100,000[5].

$$\text{ASR} = \frac{\text{Column 5 total}}{\text{Column 4 total}} * 100{,}000$$

For the example of lung cancer for females:

$$\text{ASR} = \frac{3920.9}{17284036} * 100{,}000 = 22.7$$

Three-year leading averages

To better discern time trends, the incidence and mortality rates depicted in the Figures have been smoothed using three year moving averages of the data. To make full use of the Registry data available since 1978, a leading moving average was used. For example, to calculate the three-year leading moving average for lung cancer incidence for females in 1980, the average of the age-standardised incidence rates for 1978, 1979 and 1980 was calculated. This average was plotted as the age standardised incidence rate for 1980. The average for the years 1979, 1980 and 1981 was plotted as the rate for 1981 and so forth. This technique was used to smooth the random yearly fluctuations that can occur in the Tasmanian cancer data due to the relatively small number of cancer cases that occur in this State.

Confidence intervals

The Tables in this report show 95% confidence intervals for crude and age standardised rates. Ninety five percent confidence intervals are calculated to indicate a range of possible values for the 'true' rate that is reasonably consistent with the data. The confidence intervals are expected to include the 'true' rate on 95% of occasions. This supposes that the actual occurrence of cancer in any year was only one of many possible outcomes for that year, and that the rates calculated are subject to sampling error for that reason.

For this report, the 95% confidence interval for the crude rate were calculated as:

$$\text{CR} \pm 1.96 \text{ x SE(CR)} \quad \text{where} \quad \text{SE(CR)} = \frac{\sqrt{\text{Column 1 total}}}{\text{Column 2 total}} \times 100{,}000$$

For example, for lung cancer in females this gives:

$$24.7 \pm 1.96 \text{ x} \frac{\sqrt{1129}}{4{,}579{,}726} \times 100{,}000$$

which is (23.2 – 26.1).

For this report, the 95% confidence intervals for the age standardised rate were calculated as:

$$\text{ASR} \pm 1.96 \text{ x SE(ASR)} \quad \text{where} \quad \text{SE(ASR)} = \frac{\sqrt{\text{Column 6 total}}}{\text{Column 4 total}} \times 100{,}000$$

[5] Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR) 2001. Cancer in Australia 1998. AIHW cat. No. CAN 12. Canberra: AIHW (Cancer Series no. 17), p 70.

For example, for lung cancer in females this gives:

$$22.7 \pm 1.96 \times \frac{\sqrt{13761}}{17{,}284{,}036} \times 100{,}000$$

which is (21.4 – 24.0).

Cumulative rates and risk of cancer

The cumulative rate (and lifetime risk) is an estimate of the proportion of diagnoses of cancer or deaths from cancer expected in the population over a period of time. In this report the cumulative rate is calculated for ages 0-74. The cumulative rate is obtained by summing the age-specific rates (incidence or mortality) multiplied by the width of each age interval in years. The factor of 100 is used to present the result as a percentage (rates per 100).

$$\text{Cumulative rate} = \frac{5 \times (\text{column 3 total}) \times 100}{100{,}000}$$

"Cumulative risk is a more exact measure of risk, which takes account of the sequential removal from the population at risk, of people who are diagnosed with (for incidence) or die of the disease. It can be expressed as a percentage or, by rearranging the fraction, as a risk of '1 in *n*', and can be calculated from the cumulative rate"[6]:

$$n = \frac{1}{\left(1 - e^{-\text{Cumulative rate}/100}\right)}$$

This lifetime risk of being diagnosed or dying from cancer assumes a person stays at risk for the whole period and that the age specific rates experienced in the current year apply throughout life[7]. It disregards the effects of death from other causes or interventions, which may reduce the chances of cancer diagnosis and fails to take account of specific cancer risk factors, for example, the risk for men who smoke would be higher than that for those who have never smoked[8].

An example of lifetime risk calculated for female lung cancer is provided below:

$$\text{Cumulative Rate} = \frac{5 \times 442 \times 100}{100{,}000} = 2.21\%$$

Lifetime risk is 1 in 46

[6] Coates MS, Tracey EA, Cancer in New South Wales: Incidence and mortality 1998 and incidence for selected cancers 1999. Sydney: NSW Cancer Council, 2001.
[7] Coates MS, Tracey EA, Cancer in New South Wales: Incidence and mortality 1998 and incidence for selected cancers 1999. Sydney: NSW Cancer Council, 2001.
[8] Threlfall TJ, Thompson JR (1999) Cancer incidence and mortality in Western Australia, 1997. Health Department of Western Australia, Perth. Statistical series number 57.

Person-years of life lost (PYLL)

Person-years of life lost is an estimate of the total number of years of life lost due to death from cancer usually prior to 75 years of age because deaths before that age are considered to be premature. In this report PYLL was calculated by adding up the years between age at death and 75 for each person dying from cancer (e.g. a person dying at age 55 contributes 20 years to the measure of person-years of life lost).

Percent of all cancers

This refers to the proportion of all cancers (excluding non-melanoma skin cancers) occurring at a particular site or type, expressed as a percentage. For example, the percentage of lung cancer incidence for females to all cancers diagnosed in females from 1980 to 1999 was:

$$\text{Percent of all cancers} = \frac{1{,}129}{15{,}667} * 100$$

$$= 7.2\% \text{ (rounded to 7\% in the report)}$$

Sex ratio

The sex ratio describes the relative incidence or mortality for males compared with females. This report uses age standardised rates to calculate sex ratios, with the incidence or mortality rate for males divided by the incidence or mortality rate for females. A sex ratio greater than 1 for males (e.g. 3.1:1 in the case of lung cancer incidence) indicates an excess of cancers of this type in males compared to females. If the sex ratio is less than 1 in males (e.g. 0.4:1 in the case of thyroid cancer incidence), an excess of cancers of this type in females compared to males is indicated. For example, the male:female sex ratio for lung cancer during 1980 to 1999 was:

$$\text{Sex ratio} = \frac{71.2}{22.7}$$

$$= 3.1{:}1$$

Percent change of rates over time

In this report, rates observed in the first three years and the last three years of the period were averaged, and the percent change was calculated by dividing their difference by the average rate for the first three years. An example for lung cancer incidence in females is shown:

$$\text{Percent change of rates over time} = \frac{25.70 - 15.72}{15.72} * 100$$

$$= 63.5\%$$

Logarithmic scale

In this report age-specific incidence rates for each cancer are plotted using a logarithmic scale. On this scale two pairs of points will be the same distance apart if their ratios are equal. The distance between 1 and 10 on the logarithmic scale is equal to the distance between 10 and 100. Using a logarithmic scale facilitates assessment of relative rates of increase, and is useful when the rates are being examined vary considerably.

APPENDIX D: METHODS PART 2: GEOGRAPHICAL ANALYSIS

Sources of data

Persons diagnosed with cancer notified to the Tasmanian Cancer Registry between the years 1993 and 1999 were assigned to a locality[10] based on their locality of residence at the time they were first registered for any cancer since the start of the Registry in 1978. Locality was obtained from the National Localities Index produced by the Australian Bureau of Statistics (ABS). This index lists all the urban centres, localities and streets in Tasmania as well as the major Statistical Local Area (SLA) in which they lie. We have found that 11% of diagnoses occurring between 1996 and 1999, were from persons previously diagnosed with a cancer (933/8682). An unknowable proportion of this 11% may have moved from the locality in which they were diagnosed with their first primary cancer to another locality, and therefore will have been misclassified in our analysis.

Persons with a cancer diagnosis were then assigned to:

- one of 29 LGAs;
- one of five Relative Socio-Economic Disadvantage index categories; and
- to one of five ASGC Remote Area categories;

based one the locality in which they live.

Approximately 56 of the localities listed lie across two or more SLAs and are referred to as 'split localities'. As SLA and Local Government Area (LGA) boundaries are similar, localities were assigned to an LGA on the basis of the SLA in which they were situated in the National Localities Index.

Population denominators

The estimated Resident Population (ERP) of each collection district was obtained from the ABS by sex and five-year age groups for the 1996 Census year. The population data in each collection district was then built up to the level of locality and was applied across seven years (1993 – 1999) for analysis by remoteness, and applied across four years (1996 – 1999) for analysis by socio-economic status to calculate cancer incidence rates, on the assumption that the Tasmanian population was mostly stable over these periods. The Estimated Resident Population (ERP) for each LGA by sex and five-year age groups was also obtained from the ABS for the years 1996, 1997, 1998 and 1999 to calculate standardised incidence ratios (SIRs) for cancer.

Incidence and mortality

Incidence and mortality rates were age standardised to the Australian 1991 standard population and expressed as per 100,000 population.

Confidence intervals

The 95% confidence intervals for age standardised incidence rates were calculated using Poisson approximation to the binomial. This approach is described in detail in the methods of the report - *Cancer in Tasmania, Part 1: Incidence and Mortality 1980 – 1999*.

[10] National Localities Index, Australian Bureau of Statistics, Cat. No. 1252.0, Commonwealth of Australia, 2001.

Test of differences (heterogeneity) and test of linear trend

Poisson regression was used to investigate associations between remoteness and cancer incidence and mortality, and between socio-economic status and cancer incidence using PROC GENMOD in SAS. The age-standardised number of cases was fitted as the dependent variable and offset against the population person years. Note that the age-standardised number of cases was calculated as the multiplication of the person years at risk and the AS Rate. Using the example of the incidence of all cancers in females, the table below illustrates how they were calculated for ASGC remote area categories:

ASGC Remote Areas categories	Person Years at Risk	Actual number of cases	AS Rate per 100,000	Age-standardised number of cases
1. Inner Regional	1,073,814	4538	360.0	3866
2. Outer Regional	568,778	2146	343.1	1951
3 & 4. Remote and very remote	38,395	117	270.6	104

The analysis proceeded for a cancer if there were at least five age standardised cases in each ASGC Remote Areas category. To test for heterogeneity (referred to as test of differences in the report) two indicator (0/1) terms were included for ASGC Remote Areas categories with the reference being 'Inner Regional Australia'. Where there appeared to be a linear trend in the AS rates across ASGC Remote Areas categories, this was investigated by replacing the indicator terms by a single term with values ranging from 1 (inner regional Australia) to 3 (Remote or Very remote Australia). Likewise, for the socio-economic status analyses to test for heterogeneity four indicator (0/1) terms were included for IRSD categories with the reference being 'high socio economic status'. Where there appeared to be a linear trend in the AS rates across SEIFA categories, this was investigated by replacing the indicator terms by a single term with values ranging from 1 (high) to 5 (Low).

In both cases, statistical significance was assessed using the chi-square test. Due to the large number of comparisons being made in this report, a p-value of 0.01 or less was considered to indicate statistically significant heterogeneity (or linear trend) of AS Rates among the categories[11].

Calculation of the standardised rate ratio (SRR) and 95% Confidence Intervals

The standardised rate ratio (SRR) is the ratio between two directly age standardised rates (ASR), and represents the relative risk of disease in one population (population 1) compared to another population (population 2). That is,

$$SRR = \frac{ASR_1}{ASR_2}$$

If the rates of the two populations were the same, the SRR would be 1.0[12]. The standardised rate ratio was calculated for each of the three ASGC Remote Areas categories, with the reference being cancer incidence in inner regional areas. A SRR above 1.0 would indicate that the corresponding ARIA plus area has a cancer mortality rate higher than that of the inner regional areas[13]. Similarly, the standardised rate ratio was calculated for each of the five IRSD score categories of socio-economic status, with the reference being the high IRSD category. A SRR above 1.0 would indicate that the corresponding IRSD category has a cancer incidence rate higher than that of the high IRSD category. It is usual to calculate also the statistical significance of the standardised rate ratio (as an indication of

[11] Armitage & Berry, Statistical Methods in Medical Research, Blackwell Scientific Publications (2nd ed) 1987, pgs 405-407.
[12] Boyle P, Parkin DM (1991). Statistical methods for registries, Chapter 11, in Cancer Registration: Principles and Methods, Jensen OM, Parkin DM, MacLennan R, Muir CS & Skeet RG (eds) IARC Scientific Publications No 95. Lyon: International Agency for Research on Cancer,pgs 138 & 139.
[13] Boyle P, Parkin DM (1991). Statistical methods for registries, Chapter 11, in Cancer Registration: Principles and Methods, Jensen OM, Parkin DM, MacLennan R, Muir CS & Skeet RG (eds) IARC Scientific Publications No 95. Lyon: International Agency for Research on Cancer,pgs 138 & 139.

whether the observed ratio is significantly different from unity[14]. To calculate the confidence interval for the SRR we used the approximation suggested by Smith, 1987[15]:

The 95% Confidence intervals for the SRR can be calculated as:

$$\text{Lower bound} = SRR^{1-\frac{1.96}{X}}$$

$$\text{Upper bound} = SRR^{1-\frac{1.96}{X}}$$

Where $X = \frac{ASR_1 - ASR_2}{\sqrt{SE(ASR_1)^2 + SE(ASR_2)^2}}$ and SE (ASR) has been defined in the methods in Part 1: Incidence and mortality.

CANCER INCIDENCE BY LOCAL GOVERNMENT AREA (LGA) 1996 – 1999

Local Government Areas

There are twenty-nine Local Government Areas in Tasmania. LGAs are geographical areas of responsibility of incorporated Local Government Council and are the smallest political divisions in the Tasmania.

LOCAL GOVERNMENT AREAS OF TASMANIA BY DIVISION

NORTH	SOUTH	MERSEY-LYELL
Break O'Day	Brighton	Burnie
Dorset	Central Highlands	Central Coast
Flinders	Clarence	Circular Head
George Town	Derwent Valley	Devonport
Launceston	Glamorgan/Spring Bay	Kentish
Meander Valley	Glenorchy	King Island
North Midlands	Hobart	Latrobe
West Tamar	Huon Valley	Warratah/Wynyard
	Kingborough	West Coast
	Sorell	
	South Midlands	
	Tasman	

[14] Boyle P, Parkin DM (1991). Statistical methods for registries, Chapter 11, in Cancer Registration: Principles and Methods, Jensen OM, Parkin DM, MacLennan R, Muir CS & Skeet RG (eds) IARC Scientific Publications No 95. Lyon: International Agency for Research on Cancer.

[15] Smith (1987) referenced in Boyle P, Parkin DM (1991). Statistical methods for registries, Chapter 11, in Cancer Registration: Principles and Methods, Jensen OM, Parkin DM, MacLennan R, Muir CS & Skeet RG (eds) IARC Scientific Publications No 95. Lyon: International Agency for Research on Cancer.

Standardised Incidence Ratio (SIR)

General approach to calculate SIR

Age standardization of incidence rates was performed using the indirect method. The observed number of new cases (denoted O) represents all new cancers diagnosed in a specified LGA between 1996 and 1999. The expected numbers of new cases (denoted E) in each age group was estimated by applying the age specific incidence rates for Tasmania as a whole to the LGA population. These age-specific expected numbers were summed across age groups to obtain the total expected for each LGA. The SIR was then calculated as the number of observed cases in each LGA divided by the expected number of cases for that LGA multiplied by 100. The formula for the SIR is[16]:

$$\text{SIR} = \frac{O}{E} \times 100$$

If the SIR for an LGA is above 100 the cancer incidence rate in that LGA is greater than in Tasmania as a whole. In contrast, if the SIR is less than 100 the incidence of cancer in that LGA is lower than for Tasmania as a whole. The SIRs were 'shrunk' using the Empirical Bayes method described below to obtain better area-specific estimates that were less affected by sampling error. The smoothed SIRs for each LGA have been categorised into five groups: <85.0 low, 85.0 to 94.9 below average, 95-0 to 104.9 average, 105.0 to 116.9 above average, and = 117 high[17]. The incidence in an LGA was considered to be statistically significantly more or less than expected if the corresponding 99% confidence interval did not include 100.

Empirical Bayes method to obtained smoothed SIRs

Variation in the observed number of cancers in an area can be caused by chance fluctuation as well as true differences in the risk of cancer in its population. In order to stabilize the area-specific estimates of the SIR an Empirical Bayes approach was applied to get 'shrunken' estimators[18]. It was assumed that the SIRs followed a Gamma distribution with mean μ and standard deviation σ. An Empirical Bayes estimator for each cancer site was calculated using the formula:

$$\text{Smoothed SIR} = \frac{O + \mu^2/s^2}{E + \mu/s^2} \times 100$$

where O is the observed number of cases in an LGA and E is the expected number of cases based on Tasmanian population as a whole as described above. The mean (μ) was set to 1 and σ was estimated using the SAS procedure PROC NLIN[19]. If both the observed (O) and expected (E) cases are large (from LGAs with large populations) then the smoothed SIR is close to the SIR, whereas if they are both small (from LGAs with small populations), then it is 'shrunk' towards the average for the State as a whole (i.e. 100).

Confidence intervals for smoothed SIRs

For this report, the 99% confidence interval for the Smoothed SIR were calculated as:

Smoothed SIR $\pm$ 2.58 x SE(Smoothed SIR)

Where $\text{SE(Smoothed SIR)} = \sqrt{\frac{\text{Smoothed SIR}}{100 \times (E + m/s^2)}} \times 100$

[16] Lewis NM, Nguyen H, Smith DP, Coates MS, Armstrong BK. Geographic distribution of cancer in New South Wales in 1991 to 1995 by Local Government Area. Sydney, NSW Cancer Council, 1999.

[17] Lewis NM, Nguyen H, Smith DP, Coates MS, Armstrong BK. Geographic distribution of cancer in New South Wales in 1991 to 1995 by Local Government Area. Sydney, NSW Cancer Council, 1999.

[18] Yu XQ, O'Connell DL, Gibberd RW, Smith DP, Armstrong BK. Cancer survival, incidence and mortality by Area Health Service in NSW 1994 to 2000. Sydney: The Cancer Council NSW, 2003.

[19] The SAS macro was provided by Prof Bob Gibberd, 2001. School of Medical Practice and Population Health, Faculty of Health, University of Newcastle.

CANCER INCIDENCE AND MORTALITY BY REMOTENESS 1993 - 1999

The ARIA+ index

The Accessibility/Remoteness Index of Areas+ (ARIA+) tool was obtained from the Australian Bureau of Statistics at Canberra, and ARIA+ scores were provided for each locality in Tasmania. The ARIA+ index is based on 1996 Census data and measures remoteness using ARIA+ index values (between 0 to 15) in terms of access along road networks from a populated locality in Australia to the closest of five service centres that are classified by population size. The ARIA+ index classifies people into Australian Standard Geographical Classification (ASGC) Remote Areas. ASGC Remote Area categories are based on ARIA+ methodology. There are six ASGC Remote Area categories– major cities, inner regional areas, outer regional areas, remote areas, very remote areas and migratory[20]. In allocating an ASGC Remoteness Area category to an area of land, only the first five categories are applicable.
None of the localities in Tasmania were classified as major cities as none of Tasmania's centres have a population greater than 250,000, which is a requirement for a centre to be classified as a major city. In addition, the ARIA+ index weights islands as more remote than mainland Australia.

Due to the small numbers of cancer cases living in remote and very remote areas in Tasmania these two categories were combined into a single category of remote and very remote areas. Data were only analysed by ASGC Remote Areas categories if there was at least 5 expected cancer cases in each category, including the combined category of remote and very remote. Because of the small numbers of cancer deaths in remote and very remote areas in Tasmania, it was not possible to compare cancer mortality for some cancers by ASGC Remote Areas categories.

The table below illustrates the distribution of the Tasmanian population across the three ASGC Remote Areas categories assigned by locality in 1996. In 1996 over 60% of Tasmania's population resided in inner regional areas.

Table 49: Distribution of Tasmanian population, cancer cases and cancer deaths by ASGC Remote Areas categories for the Census year 1996 assigned by locality.

ASGC Remote Areas categories	ARIA+ index value ranges	Number and percent of population		Number & percent of cancer cases		Number & percent of cancer deaths	
1. Inner regional Australia	0.20 to 2.40.	298,396	62.9%	9,734	65.3%	4,496	65.1%
2. Outer regional Australia	2.41 to 5.92.	164,520	34.7%	4,970	32.6%	2,256	32.7%
3 & 4. Remote & very remote Australia	5.93 to 10.53 (Remote) & > 10.53 (Very remote)	11,527	2.4%	321	2.2%	151	2.2%
Total		474,443	100%	15,025	100%	6,903	100%

[20] The sixth ASGC Remoteness Areas category of migratory areas are composed of off-shore, shipping & migratory CDs. In allocating an ASGC Remoteness Areas category to an area of land, only the first five categories are applicable.

CANCER INCIDENCE BY SOCIO-ECONOMIC STATUS 1996 – 1999

The index of relative socio-economic disadvantage

The Index of relative socio-economic disadvantage (IRSD) is one of five Socio-Economic Indexes for Areas (SEIFA)[21] developed by the Australian Bureau of Statistics. The five SEIFA indexes measure different aspects of social and economic conditions of Australians by geographic areas based on 1996 Australian Census data. The IRSD describes a person's position in society based on criteria such as low income, low educational level attained, high unemployment and jobs in relatively unskilled occupations. This index reflects the socio-economic well-being of an area rather than that of individuals, and is commonly used in health research to identify geographic areas of disadvantage.

Calculation of IRSD scores

The SEIFA96 software package software was purchased from the ABS. Scores for the Index of relative socio-economic disadvantage were derived for locality of residence. Localities in Tasmania were obtained from the National Localities Index[22]. Collection districts that made up each locality in Tasmania were obtained from the ABS' Collection District Lookup Table for 1986 to 1996[23]. There were 52 localities where the CDs that comprised that locality were not listed in the Collection District Lookup Table for 1986 to 1996, and had to be obtained from ABS Census maps. There were 1,539 cases where the person's locality of residence could not be assigned because city rather than suburb was provided in their address details in the cancer registry. This was resolved by assigning these people to a locality (to a city or a suburb) based on their street address.

IRSD scores for each locality of residence in Tasmania were calculated by averaging the IRSD scores for all collection districts in that locality. People were classified into one of five categories of socio-economic disadvantage based on their index of relative socio-economic disadvantage (IRSD) score – high, medium high, medium, medium low, and low. The five IRSD categories by locality of residence were distributed so that approximately twenty percent of Tasmania's population fell into each of the five IRSD categories.

Table 50: Distribution of Tasmanian population, and cancer cases by IRSD categories from 1996 to 1999 assigned by locality.

IRSD categories of socio-economic status	IRSD category cut offs	IRSD scores	Number and percent of population		Number and percent of cancer cases	
1. High	90%*	>1058.3	97,288	21%	1,982	22.8%
2. Medium high	75%	1006.5 to 1058.2	94,801	20%	1,317	15.2%
3. Medium	50%	958.1 to 1006.4	88,907	19%	1,367	15.7%
4. Medium low	25%	908.4 to 958.0	84,956	18%	2,172	25%
5. Low	10%	<908.4	108,429	23%	1,844	21.2%
Total			474,381*	100%	8,682	100%

*****There were 62 people in the Tasmanian population where IRSD score was unknown because the Australian Bureau of Statistics did not supply the IRSD score for 4 collection districts.

[21] Socio-Economic Indexes for Areas 1996, Australian Bureau of Statistics, Cat. No. 2033.0.30.001, Commonwealth of Australia, 1998, & 1996 Census of Population and Housing, Socio-economic indexes for Areas, Australian Bureau of Statistics, cat. No. 2039.0, Commonwealth of Australia, 1998.
[22] National Localities Index, Australian Bureau of Statistics, Cat. No. 1252.0, Commonwealth of Australia, 2001.
[23] Collection District Look up Table 1986 to 1996, Australian Bureau of Statistics (available on request from the ABS).

APPENDIX E: POPULATION DATA

Estimated resident population of Tasmania, 30 June 1980-1999

The estimated resident population of Tasmania as of 30 June for the years 1980 to 1999 were sourced from the Australian Bureau of Statistics[24].

Australian Standard Population and World Standard Population

	Australian Standard Population* (1991)		World Standard Population # (1966)	
Age	**Population**	**% of total**	**Population**	**% of total**
0-4	1,271,703	7.4	12,000	12.0
5-9	1,272,208	7.4	10,000	10.0
10-14	1,241,619	7.2	9,000	9.0
15-19	1,364,074	7.9	9,000	9.0
20-24	1,396,764	8.1	8,000	8.0
25-29	1,399,663	8.1	8,000	8.0
30-34	1,425,735	8.2	6,000	6.0
35-39	1,328,387	7.7	6,000	6.0
40-44	1,294,271	7.5	6,000	6.0
45-49	1,029,145	6.0	6,000	6.0
50-54	846,934	4.9	5,000	5.0
55-59	725,950	4.2	4,000	4.0
60-64	736,868	4.3	4,000	4.0
65-69	671,390	3.9	3,000	3.0
70-74	510,755	3.0	2,000	2.0
75-79	384,495	2.2	1,000	1.0
80-84	229,828	1.3	500	0.5
85+	154,247	0.9	500	0.5
Total	**17,284,036**	**100.0**	**100,000**	**100.0**

* Australian Bureau of Statistics 1993.

Doll et al. 1996.

[24] Sources: a) Population by age and sex, Australian States and Territories, 1978-1983, Australian Bureau of Statistics, Catalogue No.3201.0; b) Population Statistics, Tasmania, 1984-1989, Australian Bureau of Statistics, Catalogue No. 3204.6; c) Demography, Tasmania, 1990-1999, Australian Bureau of Statistics, Catalogue No. 3311.6.

APPENDIX F: GEOGRAPHY AND DEMOGRAPHY OF TASMANIA

LOCATION

The state of Tasmania is a group of islands lying south of the southeast corner of the Australian mainland, between latitudes 40 degrees 38' and 43 degrees 39' south, and between longitudes 144 degrees 36' to 148 degrees 23' east.

AREA

The area of the state, including smaller islands, is 68,114 km^2 or about 0.9% of the total area of Australia. Tasmania is separated from the mainland by Bass Strait, which averages 240 kilometres in width. The Southern Ocean bounds the south and west coastline of the state, while the Tasman Sea bounds the coastline to the east. At its greatest length, Tasmania spans some 296 kilometres from north to south; at its greatest width it is 315 kilometres from the eastern coast to the western coast.

CLIMATE

Tasmania has a temperate climate. Rainfall is regular over the state with minimal seasonal variation in concentration. The south and west coast areas of Tasmania are vulnerable to strong winds and heavy rain due to its position on the border of the Roaring Forties wind belt, and influence of the South American land mass to the west. In general, Tasmania's temperature is mild throughout the year with mean temperatures between summer and winter rarely varying by more than 8 degrees centigrade in coastal towns.

POPULATION NUMBERS

The estimated resident population of Tasmania in 1980 was 422,900 compared to 470,803 in 1999. Only 2.5% of Australia's population reside in Tasmania.

POPULATION DISTRIBUTION

Tasmania is the most decentralised state in Australia, with almost 60% of people living outside the capital city statistical division. The average population density is 7 persons per km^2 for the whole state.

AGE AND SEX

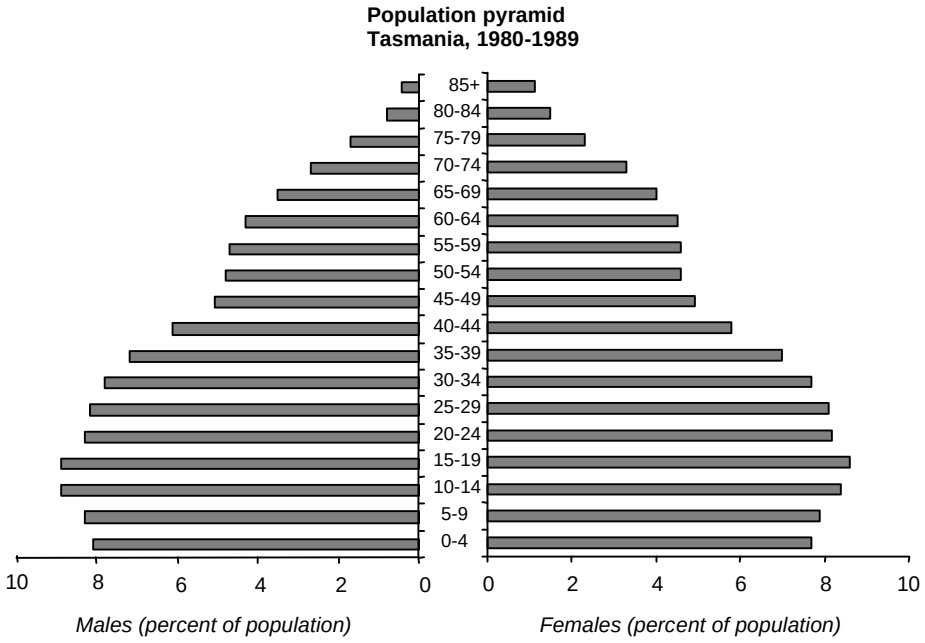
The age-sex distribution of Tasmania for the two decades, 1980-89 and 1990-99, is presented in two population pyramids[25]. Tasmania's population distribution is aging; due to a shift from natural increase to natural decline, brought about by an excess of deaths over births. Since the 1970s there has been low and still-falling fertility, and substantial net migration loss over the key reproductive ages. While Tasmania's birth rate is the second highest in Australia, since 1990 a net loss of over 21,000 people ages 18-38 years (a decline of 14.0 per cent) has offset any gains through natural increase. Tasmania's average annual growth rate declined between 1991-1996 (0.3%) and 1996-2001 (-0.1%)[26]. Over the next 30 years the population pyramid is expected to become rectangular and thicken in the 60 year and over age groups[27]. The future cohorts of elderly may contain higher proportions of people who will be 'sicker', if improvements in life expectancy are not matched by improvements in morbidity. This may result in increased cancer incidence in the elderly.

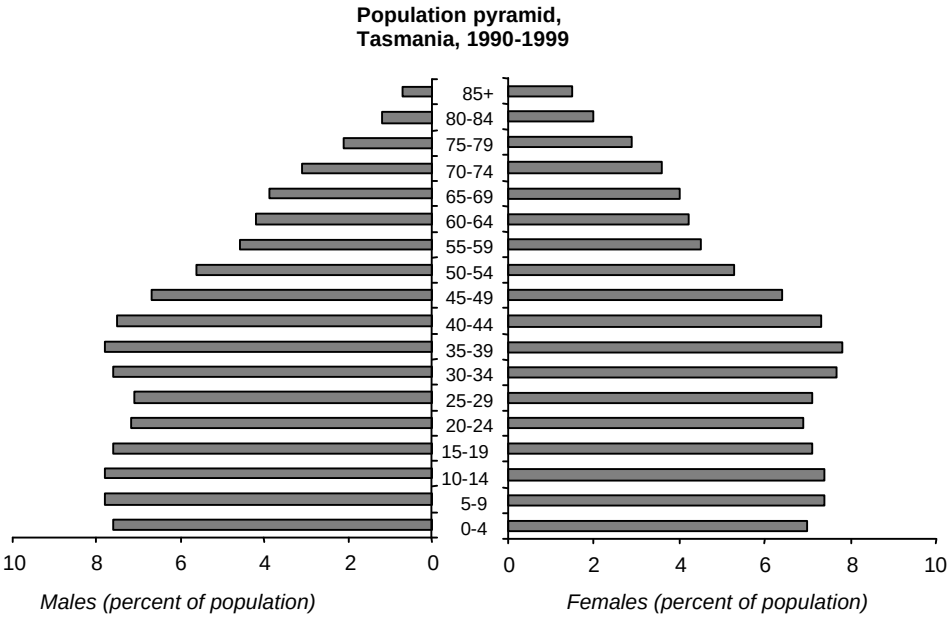
[25] Estimated resident population by age and sex for Statistical Subdivision and Statistical Division in Tasmania, at 30 June 1980-1999, Australian Bureau of Statistics, released in data cube 3235.6.80.001, 2002.

[26] Australian Demographic Statistics, Australian Bureau of Statistics, Cat. No. 3101.0, Dec 2001.

[27] Jackson N, 'When the population clock stops ticking: an indicative study of population ageing in Tasmania', University of Tasmania, 2001.

POPULATION PYRAMIDS, TASMANIA, 1980S AND 1990S





INDUSTRY & EMPLOYMENT

Tasmania has a primary industry base of aquaculture, agriculture, viticulture, mining and forestry. Secondary industries include textile, confectionery, beer and beverages, zinc and aluminum smelters, and vegetable and milk processing. Tourism is also a major industry in Tasmania. At the time of the 1996 Census 51.4% of total persons in Tasmania were employed. The retail sector is the largest employer, followed by manufacturing, and Health and Community Services.

VITAL STATISTICS

Less Tasmanians are getting married. The crude marriage rate was 5.3 per 1000 of the mean population in 1999, compared to 6.6 in 1991, and 8.2 in 1981. The crude divorce rate was 3.0 per 1000 population in 1999 and 1991, up from 2.7 in 1981. Over the 20-year period there was both a decline in births and infant mortality. The crude birth rate in Tasmania was 12.8 per 1000 live births in 1999, a decrease from 14.7 in 1991, and 16.9 in 1981. The infant mortality was 7.6 rate per 1000 live births in 1999, compared to 9.0 in 1991, and 12.3 in 1981.

In 1981 life expectancy at birth was 69.8 years for males and 77.6 years for females. This rose to 73.1 years for males and 79.6 years for females in 1991, and rose further in 1991 to 75.4 years for males and 80.7 years for females. The crude death rate was 8.0 per 1000 in 1999, 7.9 in 1991, and 7.9 in 1981. In 1999 the crude death rate per 100,000 populations was 842.3 for males and 765.8 for females, and the sex ratio of male to female deaths was 106.8

The primary cause of death in the Tasmanian population in 1999 was disease of the circulatory system (including ischaemic heart disease). 38% of male and 42% of female deaths were attributed to this cause. Malignant neoplasms (cancers) contributed to 28% of male and 25% of female deaths. The third major cause of death was cerebrovascular (stroke) with 10% of females and 8% of males dying of this condition. Diseases of the respiratory system then made up 9% of male and 8% of female deaths.

APPENDIX G: QUALITY INDICATORS

Two commonly used indices of data quality are tabulated in this report: the mortality to incidence ratio (M/I%) and morphological verification (MV%). These quality indices were calculated for the ten-year period 1990 to 1999. Quality indices for the period 1980 to 1989 were excluded from this report, as the data entry of the basis of diagnosis for cancers during this period was less reliable than that for the 1990s.

One way of assessing the completeness of cancer ascertainment is the M/I%. This measure is calculated by dividing the number of deaths attributed to a specific cancer in a defined population by the number of new cases of the same cancer registered during the same period in the same population. For cancers with a poor prognosis, the ratio will be close to 100%. If it exceeds 100% this may indicate that the cancer is being under-registered, but a more likely explanation for this result with uncommon cancers is that it is a result of random fluctuations in the annual number of new cases and deaths.

MV% represents the percentage of cases with morphological verification. MV% includes all diagnoses based on exfoliative cytology, haematological examinations (for leukaemia) as well as diagnoses derived from the histological examination of a tissue specimen (cancers which were diagnosed following tissue or needle biopsy). In the 1990s, the percentage of all cancers with morphological verification[28] was 92% of all male and female cases.

Other cancer registries in Australia report on the quality indicator, HV% or histological verification. This typically includes cancer diagnosis based on the histological examination of a tissue specimen, as well as diagnosis based on exfoliative cytology and haematological examinations. This quality indicator reflects the percent of morphological and histological verification of basis of diagnosis described by the MV% quality index in this report. Technically, by including both histological and morphological basis of diagnosis, the term MV% most accurately describes this.

The percent of morphological verification for pancreatic cancer in males (53%) and in females (48%) in the 1990s was low compared to the MV% for other cancers. This is because the Endoscopic Retrograde Choledocho-Pancreatagram (ERCP) procedure became extensively utilised in the 1990s, and the Tasmanian Cancer Registry classifies the basis of diagnosis for this procedure as radiology.

Death certificate only (DCO) cases are a common quality indicator presented by cancer registries, however, as the Registry does not register cases on the basis of a death certificate only, the number of DCO cases[29] has not been calculated for this report[30]. Each death certificate notification is actively followed up until the time and place of diagnosis are ascertained and the diagnosis verified. If the diagnostic details cannot be confirmed, the case is not registered.

The Registry calculated the percentage of all cancers that were classified as primary site unknown (PSU), because it is one of the quality indicators used for international comparisons[31]. PSU includes other and ill-defined sites within the digestive organs and peritoneum, other and ill-defined sites within the respiratory system and intrathoracic organs and primary site unknown. In the 1990s, the percentage of all cases classified as PSU was 4% for males and 5% for females.

[28] Parkin D.M, Whelan S, Ferlay J, Raymond L and Young J. *Cancer Incidence in Five Continents Vol VII*. IARC Scientific Publication No 143. Lyon: International Agency for Research on Cancer, 1997 (p 50).

[29] Those cases for which no other information than a death certificate mentioning cancer can be obtained

[30] The process of registering DCO cases is being currently reviewed by the Tasmanian Cancer Registry and will be available in reports from 2001.

[31] Parkin D.M, Chen V.W, Ferlay J, Galceran J, Storm H.H and Whelan S. *Comparability and Quality Control in Cancer Registration.* IARC Technical Report No 19. Lyon: International Agency for Research on Cancer, 1994 (p 51).

TABLE 51: INDICATORS OF DATA QUALTIY FOR THE 1990s

ICD-9	CANCER TYPE	INCIDENCE	MORTALITY	M/I%*	MV%**
MALES		**1990 - 1999**			
140-208	All cancers	11,495	5,431	47	92
151	Stomach	341	279	82	94
153-154	Colorectal	1,531	763	50	95
157	Pancreas	225	206	91	53
162	Lung	1,547	1,331	86	81
172	Melanoma	807	105	13	100
185	Prostate	2,931	740	25	96
188	Bladder	647	153	24	99
189	Kidney	352	163	46	89
193	Thyroid	56	11	20	98
200+202	Non-Hodgkin's lymphoma	419	211	50	98
204-208	All leukaemia	283	156	55	94
FEMALES					
140-208	All cancers	9,185	4,165	45	92
151	Stomach	184	142	77	93
153-154	Colorectal	1,397	702	50	93
157	Pancreas	218	202	93	48
162	Lung	669	570	85	86
172	Melanoma	832	75	9	100
174	Breast (female)	2,331	658	28	97
180	Cervical	280	111	40	99
183	Ovarian	323	204	63	92
188	Bladder	197	64	32	97
189	Kidney	177	67	38	87
193	Thyroid	161	12	7	99
200+202	Non-Hodgkin's lymphoma	367	187	51	98
204-208	All leukaemia	231	134	58	94

M/I%*: Mortality to incidence ratio
MV%:** Morphological verification

APPENDIX H: GLOSSARY[32]

ABS: Australian Bureau of Statistics.

Age-specific rate: A rate for a specific age group. The numerator and denominator refer to the same age group. It is usually expressed per 100,000 people in the population per year.

Age standardised rate: Standardisation is a set of techniques used to remove as far as possible the effects of age or other confounding variables when comparing two or more rates. The age-standardized rate can be seen as the weighted average of the age-specific rates, the weights being taken from the standard population. Age standardized incidence rates show the cancer incidence or mortality rate the population would have had if, while retaining their own age-specific rates, they had a standard population. In this report age-standardised rates were calculated using the mid-year population of Australia in 1991 and the 'World' 1966 population as standard populations.

AIHW: Australian Institute of Health and Welfare.

ARIA + **index:** The Accessibility/Remoteness Index of Areas + tool (based on the ARIA index) measures remoteness using ARIA+ index values (between 0 to 15) in terms of access along road networks from a populated locality in Australia to the closest of five service centres that are classified by population size based on the 1996 Census data. The ARIA+ index classifies people into Australian Standard Geographical Classification (ASGC) Remote Areas.

ASGC Remoteness Areas: This classification consists of six ASGC Remoteness Area classes (Major cities, Inner Regional, Outer Regional, Remote and Very Remote and Migratory. Each ASGC Remoteness Area class consists of a range of ARIA+ index values.

ARIA + index value: Refers to a continuous variable (with values ranging from 0 to 15) assigned to populated localities.

Australian Standard Geographical Classification (ASGC): Is an ABS classification used to collecting and disseminating geographically referenced statistics. The ASGC is a hierarchical classification system consisting of six interrelated classifications structures – Main structure, local government area structure, statistical district structure, statistical region structure, urban centre/locality structure and selection of state structure.[33]

Cancer (malignant neoplasm): A term used to describe one of several diseases, which result when the process of cell division, by which tissues normally grow and renew themselves, becomes uncontrolled and leads to the development of malignant cells. These cancer cells multiply in an uncoordinated way, independently of normal growth control mechanisms, to form a tumour. This tumour may expand locally by invasion or systemically by metastasis via the lymphatic or vascular systems. If left untreated most malignant tumours will eventually result in death.

Cancer incidence: Cancer cases diagnosed in a defined population during a specified period. It is variously used to denote numbers or rates.

Cancer mortality: Deaths from cancer in a defined population during a specified period. It may be used to denote numbers or rates.

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[32] Definitions adapted from a) Last J.M (ed) A dictionary of Epidemiology 2nd edition. Oxford: Oxford University Press, 1988, b) Parkin D.M, Whelan S.L et al (eds) Cancer Incidence in Five Continents Vol. VII. IARC Scientific Publications No. 143. Lyon: International Agency for Research on Cancer, 1997, c) Coates MS, Tracey EA, Cancer in New South Wales: Incidence and mortality 1998 and incidence for selected cancers 1999. Sydney: NSW Cancer Council, 2001, d) Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR) 2001. Cancer in Australia 1998. AIHW Cat. No. CAN 12. Canberra: AIHW (Cancer Series no. 17), e) Dos Santos Silva, I. Cancer epidemiology: principals and methods, 1999, IARC, published by the International Agency for Research on Cancer, f) Module OV1 Introduction, Biostatistics A, Graduate Diploma in Clinical Epidemiology, Centre for Clinical Epidemiology and Biostatistics Australia, The University of Newcastle, Australia, 2003, and g) 1996 Census of Population and Housing, Socio-economic indexes for Areas, Australian Bureau of Statistics, cat. No. 2039.0 1998.

[33] Statistical Geography Volume 3, Australian Standard Geographical Classification (ASGC), Urban Centres/Localities, Australian Bureau of Statistics, Cat. No. 2909.0, 1996.

Cancer type: The type of cancer affecting the body and/or the place in the body where the cancer occurs.

Cases: These are individual cancers. A person may have more than one cancer, giving rise to multiple cases in the same person. Second cases in one person are only counted if they are of different cell type or originate in a different organ.

Chi-square (c^2) test: Any statistical test based on comparison of a test statistic to a chi-square distribution. Are commonly used to detect if two or more populations differ from one another; these tests usually involve counts of data, and may involve comparisons of samples from the distributions under study, or the comparison of a sample to a expected distribution.

Collection District (CD): A collection district defines an area that one census collector can cover in a ten-day period. In urban areas CDs average about 200 dwellings. In rural areas the number of dwellings per CDs reduces as population densities decrease[34].

Confidence interval: Is a measure of how precise an estimate of the true value (e.g. mean, rate) is in a population. Confidence intervals have an upper and lower range of which the true value is expected to lie within in the source population. A narrow confidence interval implies high precision and a wide confidence interval implies low precision.

CNS: central nervous system.

Crude rate: An estimate of the proportion of a population that is diagnosed with (or dies from) cancer during a specified period. It is usually expressed per 100,000 people in the population per year.

Cumulative rate: Is a measure of disease occurrence. It can be calculated by the sum of the age-specific incidence rates, multiplied by the width of the age groups. The cumulative rate provides an estimate of cumulative risk.

Cumulative risk: The probability that a person will be diagnosed with or die from a particular cancer within a specified age period in the absence of any competing cause of death.

Estimated Resident Population (ERP): Estimates of the resident population in Australia each year are based on adjustment (for under-enumeration) census counts by place of usual residence to which are added the number of Australian residents estimated to have been temporarily overseas at the time of the Census. Overseas visitors to Australia are excluded from this calculation. The estimated residential population also takes into account natural increase, net overseas migration; and for States and Territories, estimated interstate movements involving a change of usual residence[35].

Index of Relative Socio-Economic Disadvantage (IRSD): Is one of five Socio-Economic Indexes for Areas which classifies areas by high, medium high, medium, medium and low socio-economic status based on 1996 Census variables such as low income, low educational attainment, high unemployment, and jobs in relatively unskilled occupations by their geographic area of residence.

Lifetime risk: The risk that a person will be diagnosed with or die from cancer during their life. It is the cumulative risk calculated from the age range 0-75 years.

Linear trend (Test for): The linear component of trend is used to test whether there is an overall increase (or decrease) in the dependent variable (e.g. AS Rate) as the independent variable (e.g. IRSD score, Remote Areas category) increases.

Local Government Area (LGA): Are spatial units that represent the whole geographical area of responsibility of incorporated Local Government Council. All of Tasmania's population are assigned to a LGA of usual residence in Australian Bureau of Statistics estimated residential population (ERP) data.

[34] Statistical Geography Volume 3, Australian Standard Geographical Classification (ASGC), Urban Centres/Localities, Australian Bureau of Statistics, Cat. No. 2909.0, 1996.
[35] Demography, Australian Bureau of Statistics, Cat. No. 3311.6, 1999.

Locality: Is defined as the name of a place where people live or work – or say they live or work[36]. In this report locality refers to the name of a place where people live.**ICD-9:** The International Classification of Disease is a coding system used to identify the primary site of the malignancy. This publication uses the ninth revision of the ICD classification.

Morphology: The type of cancer as diagnosed microscopically by a pathologist.

National Localities Index: Is a comprehensive list of Localities across Australia together with their Australian Standard Geographical Classification (ASGC) Main Structure codes and postcodes based on the 1996 Census.

NHL: Non-Hodgkin's Lymphoma

PSA: Prostate-specific antigen testing is a diagnostic technique used for the detection of prostate cancer.

PYLL (0-74): Person-years of life lost prior to the age of 75.

P-value: A probability, ranging from zero to 1, of obtaining a result as extreme or more extreme than the one observed when the null hypothesis is true.

Rate: A measure of the frequency of an event.

Rural, Remote and Metropolitan Areas (RRMA) index: Classifies statistical local areas of Australia into metropolitan, rural and remote areas. The Department of Primary Industry and Energy developed the RRMA in 1994. The ARIA+ index is now the preferred measure of accessibility to service centres in Australia.

Service centre: This is an ABS-defined urban centre consisting of a population cluster of 1,000 or more people. Their boundaries are based on CDs[37].

Site: The place in the body where the cancer occurs.

Smoothed Standardised Incidence Ratio (Smoothed SIR): Is a standardised incidence ratio that has been smoothed using Empirical Bayes methods. Smoothing is an established technique used to reduce the effect of chance fluctuations in SIRs in areas with small populations.

Socio-Economic Indexes for Areas (SEIFA): Are five indexes derived from the 1996 Census that measure different aspects of social and economic conditions of Australians by geographic areas.

Socio-Economic status (SES): Describes a person's position in society based on criteria such as income, educational level attainted, value of dwelling places, etc.

Standardised Incidence Ratio (SIR): The ratio of the number of events observed in a population to the number that would be expected if the sample population had the same specified rates as the standard population, multiplied by 100.

Standardised Rate Ratio (SRR): A rate ratio in which the numerator and denominator rates have been standardised to the same (standard) population distribution.

Statistical Local Areas (SLAs): Are based on the administrative areas of local government where these exist. Where there is no incorporated body of local government, SLAs are defined to cover the unincorporated area[38].

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[36] National Localities Index, Australian Bureau of Statistics, Cat. No. 1252.0, 2001.
[37] ABS (Australian Bureau of Statistics) 2002. Australian Standard Geographical Classification (ASGC) 2002. ABS cat. No. 1216.0. Canberra: ABS.
[38] ABS (Australian Bureau of Statistics) 2002. Australian Standard Geographical Classification (ASGC) 2002. ABS cat. No. 1216.0. Canberra: ABS.

Statistical significance: Statistical methods allow an estimate to be made of the probability of an observed or greater degree of association between independent and dependent variables under the null hypothesis. From the estimate from this sample population the statistical significance of a result can be stated. The level of statistical significance is usually stated by the p-value and is set at a p-value less than 0.05.

TCR: Tasmanian Cancer Registry.

Test of differences (Test of heterogeneity): Is a Poisson test for association to examine if there is any excess variability in the observed counts of a disease across categories (e.g. IRSD categories, ASGC Remote Area categories).

Topography: The site where the cancer originated.

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