Health system costs of cancer in Australia 1993–94

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Health system costs of cancer in Australia 1993–94

An analysis of costs, service use, incidence and mortality by type of cancer

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Preface

This is a joint report of the Australian Institute of Health and Welfare (AIHW) and the National Cancer Control Initiative on the health system costs of cancer in Australia. The AIHW started the Disease Costs and Impact Study (DCIS) in 1992 with funding from the Health Advancement Program of the then Commonwealth Department of Health, Housing, Local Government and Community Services and from the National Health and Medical Research Council. Originally conceived as part of a broader approach to evaluation, and referred to as the Macro Economic Evaluation Model, it estimated the economic impact of specific diseases and disease groups in Australia in 1989–90, both in relation to direct costs to the health system and a range of indirect costs. The study also developed a set of summary measures of disease impact in terms of potential years of life lost and health service use.

In collaboration with the Centre for Health Program Evaluation at Monash University, the methodology has been revised and extended to permit allocation of over 90% of recurrent health expenditure to disease categories. The revised methodology was used to carry out a comprehensive accounting of disease costs across all chapters of the ICD-9 Classification of Diseases for the year 1993–94 (Mathers et al. 1998a). In updating cost estimates to 1993–94 data, the DCIS has focused on the direct costs of health services, so that the disease costings form a disaggregation of national health expenditure. Other disease costing reports to be published by the AIHW during 1998 include:

- *Health System Costs of Diseases and Injury in Australia 1993–94*
- *Health System Costs of Cardiovascular Disease and Diabetes in Australia 1993–94*
- *Disease Costing Methodology used in the Disease Costs and Impact Study 1993–94.*

The Commonwealth Government, through the Department of Health and Family Services, has contracted the Australian Cancer Society to develop the initial phase of a National Cancer Control Initiative (NCCI). The NCCI will provide a national focus in Australia's response to cancer, one of the five National Health Priority Areas. As part of the initial phase, the NCCI has developed a Priority Issues Discussion Paper. This draws on a range of information about the impact and costs of cancer in Australia, including the health system cost estimates reported here.

Summary

Cancer costs the Australian community almost $2 billion per year in direct health system costs, of which more than 80% are treatment costs. The estimated $1,904 million health expenditure on cancer in 1993–94 represents 6% of total recurrent health expenditure. Cancer was responsible 33,176 deaths in 1993–94, or 27% of all deaths in Australia.

The cancer which contributes most to direct health system costs is non-melanoma skin cancer (NMSC), with estimated costs of $232 million. Although only a small number of deaths are due to NMSC (379 in 1993), it dominates new cases, with over 243,000 in 1993 (78% of all new cancers). These cost estimates include health interventions for benign skin tumours and in-situ skin cancers, frequently aimed at excluding or preventing invasive cancer, as well as for invasive cancers.

Colorectal cancer is the second highest contributor to direct costs (an estimated $205 million), ranks second in terms of cancer deaths (4,440 in 1993, 13% deaths), and ranks third in terms of new cases (9,538 cases in 1994). Breast cancer ranks third in terms of direct costs ($184 million), third in terms of deaths (2,641, 8% deaths), and fourth in terms of new cases (8,448 cases). Breast cancer costs are about 80% of those for NMSC. Lung cancer accounts for the largest number of cancer deaths (6,393, 19% deaths), has approximately the same number of new cases as deaths (6,911), and ranks fifth in terms of costs ($107 million).

Unlike most other disease groups, hospital inpatient expenditure accounts for the majority (over 70%) of the estimated health system costs of cancer. Medical service costs outside hospitals account for a further 14%, followed by research (4%), public health programs (4%) and pharmaceutical costs (3%).

Overall, health system treatment costs for cancers are estimated to be 14% higher for females than males. Health system costs for cancer rise with age, peaking in the 45–64 year age group for females and the 65–74 year age group for males, and then decline at older ages. Forty-five per cent of total health system costs of cancer relate to people aged 65 years and over, with a further 33% relating to people aged 45–64 years. Less than 3% of all cancer costs relate to children aged 0–14 years.

Estimated lifetime treatment costs for invasive cancers vary enormously, from around $58,000 per leukemia to less than $3,000 for melanomas and other skin cancers. The average lifetime treatment cost per new case of invasive cancer (excluding NMSC) is estimated to be around $17,000.

The aim of this report has been to provide the best possible estimates of the health system resources directed at the prevention and treatment of cancer to assist in understanding the allocation of resources among the population, across different health sectors, and different cancers. Such information will assist in considering a variety of equity, access and utilisation issues in relation to the use of scarce health care resources.

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Many AIHW staff provided valuable advice on sources of data and analysis of datasets, particularly John Goss, Mark Cooper-Stanbury, Deborah Schofield, Tony Hynes, Simon Eckermann, Elizabeth Moss and Michael Cook. We also thank Ross Saunders, head of the Medicare Statistics section of the Commonwealth Department of Health and Family Services for provision of summary data on medical services for 1993–94.

We would also like to gratefully acknowledge the assistance of the Family Medicine Research Unit of the University of Sydney for provision of a copy of all data contained in the Australian Morbidity and Treatment Survey and for helpful advice.

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1 Introduction

The aim of this report is to provide information on the health system costs associated with cancer prevention and treatment in Australia in 1993–94, and to review opportunities for improving the usefulness and reliability of cancer costing.

Usefulness of disease cost information

This paper has been prepared to assist those involved with planning and formulating health policy, including policies for health service interventions and health research. Governments, health authorities, university research departments and a range of other bodies often seek reliable information on the burden of disease - its nature, extent, impact, and distribution in the population. The uses to which burden of disease measures can be put vary widely, and range from assessing public health significance and monitoring trends through time, to examining the performance of the health care system and its various components, planning health service provision, measuring the potential for health status gains and/or cost offsets, and as an input into economic evaluations and in priority setting.

Apart from the direct burden of disease in terms of loss of health and wellbeing, the existence of disease has important implications for resource utilisation. Health expenditure information provides one framework in which various aspects of the health care system can be described and assessed. Questions like: 'Can we afford the current health care expenditure levels?', 'How much do we spend on cancer relative to other diseases?', Where is the money coming from, where is it being spent, and on whom is it impacting?', can only be discussed sensibly by reference to reliable health expenditure information. Without such information, the tools for describing and analysing the conduct, structure and performance of the health care system would be severely constrained, just as it would be difficult to monitor and assess developments in the broader economy without data on GDP, new vehicle purchases, housing construction, the CPI, or average weekly earnings, for example. This report focuses on health system expenditure data (in part because reliable health system cost information is hard to find on a disease-specific basis). It is important not to lose sight of the central role of community welfare in economic thinking, despite the greater challenges posed by its measurement.

By measuring the impact of cancer (and other diseases) in cost terms, this report presents yet another picture of the way in which disease affects the community. Over and above its morbidity and mortality impacts, disease has important second-order effects on income and production patterns throughout the economy, as well as on resource utilisation within the health care system itself. Disease costing studies can be useful in describing the relationship between disease incidence and prevalence and the consequent structure and utilisation of health services.

Being able to examine how health resources are funded and allocated among different users, different health services and different diseases can be useful in considering a variety of equity, access and utilisation issues. A key issue here for

those in the health promotion field, for example, is the use of limited resources in the diagnosis, treatment and management of preventable illness. Planners may wish to have this information to identify what potential changes in service utilisation may follow the achievement of our national goals and targets, or to develop broad order estimates of the potential health care cost offsets to the cost of the prevention activities.

Direct and indirect costs of disease

Economists make a distinction in disease cost studies between the direct costs of providing health care services and the indirect costs, which focus on lost production due to sickness and premature death but can include as well costs impacting outside the health care sector (such as police and court costs associated with drug abuse, for example). Direct costs thus include all those expenditures on diagnosing, treating and caring for the sick. Indirect costs and intangibles (such as pain and suffering) are not included in the cost estimates presented here, as their meaning is often imprecise and the methodologies for their measurement at the population level are either contentious and/or at an early stage of development.

While the direct costs of disease that are presented here have a clear meaning and usefulness, they do not provide a comprehensive 'costing' in the absence of these indirect costs and intangibles (which, when measurement is attempted, can often yield estimates so large in size that they swamp direct costs). By including information in this report on incidence of new cancer cases and numbers of deaths, aspects of this issue are addressed, but in health status terms rather than in dollars.

Use and interpretation of direct costs of cancer

While direct cost estimates can certainly be useful to planners and researchers for the variety of purposes mentioned above, they too need to be carefully interpreted. Disease costing analysis, like any analytical tool, can be misused. It is important that the uses and limitations of such data be clearly understood. From an economic perspective, the most important points to note are:

- existing expenditure on a disease, no matter how large, is not sufficient in itself to justify further expenditure. Economic guidance on the issue of resource allocation should only be offered using evaluation techniques that combine both costs and outcomes and involve a comparison of alternatives, i.e. the marginal costs and marginal outcomes associated with the specific interventions employed to reduce the disease burden;
- care should be taken in interpreting direct costs associated with disease treatment as an estimate of the savings that would directly result from prevention of disease. The 'cost' may be partly in the form of a fixed asset (a hospital, a medical specialist or a nurse). However, these assets may often be usable elsewhere in the health sector and may thus be seen as 'opportunity costs' associated with the disease under consideration (see Mathers et al. 1998b); and
- although the expenditure estimates reported here provide a broad picture of the health system resources usage classified by age, sex and cancer site, they should be interpreted with caution for specific cancers because the methodology is a

> comprehensive national accounts approach, which, while yielding consistency, good coverage and totals that add up to known expenditures, is not as sensitive or accurate for any specific cancer as a detailed analysis of actual costs incurred by patients with that disease.

Used sensibly and carefully, disease cost estimates (and burden of disease information in general) can also have a role that goes beyond simple description, monitoring and performance assessment. Such information can also be a useful input in the priority-setting process. A discussion paper released by the University of York Centre for Health Economics noted, for example, that:

> Ideally, as part of the exercise of ranking health priorities, it would also be useful to compile information on morbidity, costs and other indicators of the burden of illness. As well as providing the information that would be needed to build improved indicators, the robustness of ranking priorities of life years lost could be tested. Unfortunately, there have not been many studies of the costs of illness for different diseases as undertaken in the United States and other countries (Godfrey et al. 1989, p20).

The Australian Institute of Health and Welfare (AIHW) started its disease costing analysis in 1992 as part of a broader approach to evaluation. The economic evaluation and priority-setting aspects of this work are now being pursued at the Health Economics Unit (HEU) of the Centre for Health Program Evaluation in Melbourne, while the AIHW is focusing on the disease costs and impact aspects. The underlying rationale of the HEU's approach is that priorities for illness prevention and health promotion should be guided by information that includes the public health significance of health problems (using a range of indicators such as mortality, morbidity and costs of illness), but also goes on to consider the theoretical preventability (efficacy) and practical preventability (effectiveness) of the health problems, and the relative cost-effectiveness (efficiency) of individual measures aimed at achieving the potential reductions in the disease burden.

Disease costing is not yet able to provide a comprehensive assessment of the impact of disease on the welfare of society. This would require a measure for the impact of anxiety, pain and suffering, for which satisfactory dollar measures have yet to be developed. Direct health system costs can, nevertheless, be useful indicators of the economic burden which individual diseases place on a society and can help identify and analyse how health resources are allocated among different types of costs, services and diseases.

2 Methodology

The disease cost estimates contained in this report are from the Disease Costs and Impact Study (DCIS) conducted by the AIHW. Appendix B provides a summary of the disease costing methodology and more detailed information on the methodology is given in Mathers et al. (1998b).

Data sources

Total recurrent health expenditures for 1993–94, as estimated by the AIHW (1996), are apportioned by sector using hospital morbidity and casemix data for 1993–94, Medicare and Pharmaceutical Benefits Scheme (PBS) data for 1993–94, the Survey of Morbidity and Treatment in General Practice 1990–91, and the Australian Bureau of Statistics' (ABS) National Health Survey 1989–90.

Health sectors

The health sector areas of expenditure included here are hospital inpatients and outpatients; nursing homes; medical services; allied health professional services; pharmaceuticals; research; certain public health programs relating to cancer prevention (national breast and cervical cancer screening programs, and lung and skin cancer prevention programs) and 'other', which includes other institutional (not elsewhere classified), administration, and other non-institutional. These areas are defined as follows:

Hospital inpatients: inpatient (admitted patient) costs for public hospitals (including public psychiatric hospitals), repatriation (veterans') hospitals and private hospitals. Also included are private medical costs for private patients in public and private hospitals.

Hospital non-inpatients: hospital outpatient services and casualty/accident and emergency services.

Medical services: total costs of all private medical services except those to hospital inpatients (medical services for private patients in hospital are included under hospital inpatients). This sector includes consultations with general practitioners and specialists as well as pathology tests and screening, and diagnostic imaging services. It includes services to veterans.

Pharmaceuticals: includes costs of prescription drugs (whether listed in the PBS or not) and non-prescription (over-the-counter) medicines apart from those dispensed in hospitals (included in estimates of hospital costs).

Nursing homes: includes nursing homes for the aged but not institutions caring for the young disabled (considered a welfare rather than health expenditure).

Allied health services: includes costs of visits to allied health practitioners excluding pharmacists but including dentists, apart from allied health services provided by hospitals.

Other: includes expenditure for certain cancer prevention programs (national screening programs for breast and cervical cancer, and lung and skin cancer prevention programs), for health and medical research, and for administration and other institutional and non-institutional health expenditure (see Appendix B for more details of these sectors).

These sectors represent 92% of total recurrent health expenditure, or just over $31 billion in 1993–94. Recurrent expenditure on health care which has not yet been attributed includes ambulance services, community health services, health promotion and illness prevention (apart from breast, cervical, lung and skin cancer public health programs), ambulance services, and medical aids and appliances. Capital expenditure ($1.8 billion) is also excluded from the costings presented here.

Treatment and prevention

The DCIS attempts to classify health system costs for each disease group into two categories: treatment and prevention. Treatment includes all health system activities relating to the diagnosis, treatment, rehabilitation and palliation for diseases, injuries and symptoms. Prevention includes all activities relating to the primary prevention of diseases, including screening for asymptomatic disease within the hospital and medical sectors.

It is important to note that prevention will include some activities within the medical, hospital and allied health sectors as well as the public health sector. Data on health service activity do not always allow classification into treatment or prevention (see Appendix A) and estimates of health system expenditure for prevention should be interpreted with caution. In addition, the majority of public health and community health expenditure has not yet been included in the DCIS. It is important to note that estimated costs for cancer prevention programs in the public health sector for breast, cervical, skin and lung cancer only have been included in the cost estimates in this report.

Classification of cancers

Cancers have been classified by primary site according to the International Classification of Diseases Ninth Revision (ICD-9) as shown in Appendix A. For most of the costs reported here, cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, since much of the cost associated with screening and treatment of benign and in-situ neoplasms is associated with excluding or preventing malignancy. Figure 2 and Appendix C provide estimates of treatment costs for malignant neoplasms only by site as well as total treatment and prevention costs for neoplasms of all types by site.

Disease impact

This report also contains data on the number of deaths (for major disease groups and for specific cancer sites) in 1993 and the estimated numbers of incident cases of malignant cancer by site in 1993.

Deaths data are derived from the AIHW Mortality Database. Estimated numbers of incident cases of malignant neoplasm are derived from registered new cases reported to the National Cancer Statistics Clearing House of the AIHW. Incidence data for Queensland were not available for 1993 and were estimated from projections of incidence rates for years up to and including 1992. Data on new cases of non-melanoma skin cancer (treated and histologically confirmed) were estimated for 1993 from incidence data for 1990 and 1995 (Anti-Cancer Council of Victoria, unpublished).

Limitations

It must be emphasised that the cost estimates reported here are based on attribution of total health expenditures to diseases based on available information on the mix of diseases treated and the costs of treatment. For medical and allied health services, and to some extent for drugs, utilisation data relate to 1989–90 or 1990–91 and so costs reported for these sectors will not reflect changes in clinical practice or disease patterns between then and 1993–94. The only exceptions to this are for pathology screening tests for cervix and prostate cancer where 1993–94 Medicare data were used. Also, costs of specialist medical services are estimated using 1990–91 data on referral patterns by GPs and costed at the average cost within specialist type. For example, this means that all pathology tests (apart from Pap smear and Prostate-specific antigen (PSA) tests) are assumed to have the same average cost.

As a result, estimated medical costs for specific cancers may differ from the results of more detailed costing studies based on a detailed analysis of the service costs associated with a specific cancer.

The inclusion of certain cancer prevention programs in the public health sector (see Appendix B) has the potential to make estimates of expenditure on cancer non-comparable with those for expenditure in other major disease areas. Prevention activities within other health sectors are included, to the extent that they are identifiable within utilisation data, in the cost estimates for all diseases.

Expenditure on health and medical research has been estimated at chapter level of ICD-9 using a study of research funding in 1991 (Nicholl et al. 1994). Estimates of research expenditure for individual cancers were based on an analysis of the distribution of National Health and Medical Research Council (NHMRC) grants for 1996 and of grants by the New South Wales Cancer Council and the Anti-Cancer Council of Victoria and should be treated with caution.

3 Cancer costs in 1993–94

Overview: cancer and other diseases

The health system costs of disease and injury in Australia in 1993–94, summarised at the broad disease group level (according to ICD-9 chapters), are presented in Table 1. They are ranked in descending order of total costs.

The total direct costs of cancer are $1,904 million (6% of health system costs). Cancer ranks eighth in terms of direct costs, yet is the second highest contributor to deaths (33,176 deaths, which represent 27% of all deaths). Direct costs for both digestive and circulatory diseases are approximately double those of cancer.

Table 1: Cancers and other diseases and injury: health system costs ($ million) by health sector, 1993–94 and numbers of deaths 1993

ICD-9 chapter	Total costs	Hospitals	Medical[a]	Pharma-ceuticals	Dental and allied health services	Nursing home	Other[b]	No. of deaths
Circulatory	3,719	1,657	503	715	40	587	218	53,240
Digestive	3,715	1,070	284	275	1,849	35	202	3,759
Musculoskeletal	3,002	1,207	518	276	416	430	154	681
Injury	2,601	1,663	393	127	160	112	146	7,021
Mental	2,586	1,007	432	198	83	718	147	2,344
Respiratory	2,521	833	624	784	37	107	135	9,245
Nervous system	2,334	766	431	248	227	503	159	2,794
Cancer	1,904	1,327	261	53	12	32	219	33,176
Genitourinary	1,662	997	383	143	17	32	90	1,924
Symptoms	1,334	478	426	302	57	5	66	571
Complications of pregnancy	1,051	941	32	11	6	0	60	15
Endocrine	966	235	222	309	54	47	98	3,892
Skin	956	336	247	259	56	6	53	175
Infectious	849	246	316	193	15	13	65	933
Perinatal	239	221	1	0	0	3	14	696
Blood	192	101	42	24	1	5	18	394
Congenital	159	116	18	2	0	13	8	739
Other[c]	1,607	859	505	122	44		77	—
Total	**31,397**	**14,062**	**5,640**	**4,042**	**3,075**	**2,647**	**1,932**	**121,599**

(a) Medical services for private patients in hospitals are included under Hospitals.

(b) Includes breast, cervical, lung and skin cancer public health programs, research and other institutional, non–institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

(c) Other contact with health services: fertility control, reproduction and development (including normal pregnancy and birth), cosmetic surgery, general health examination, and treatment for unspecified disease.

Circulatory diseases have the highest total direct costs of $3,719 million and account for the largest number of deaths (53,240, which represent 44% of all deaths). Circulatory diseases and cancer combined account for over 70% of deaths yet only 18% of total direct costs.

Digestive diseases have almost the same total direct costs ($3,715 million) as circulatory diseases but rank sixth in terms of deaths (3,759 deaths in 1993). A considerable component of the costs for digestive diseases is the $1,849 million for allied health services, of which $1,830 million represent dental services.

Musculoskeletal and mental disorders, which rank highly in terms of costs ($3,002 million and $2,586 million respectively) and relatively low in terms of deaths (681 and 2,344 deaths respectively), contain chronic diseases with low fatality rates. The disease groups with the lowest direct health system costs are congenital ($159 million) and blood diseases ($192 million), which account for relatively few deaths (739 and 394 respectively).

For all diseases, 45% of direct costs are within the hospital sector (which includes inpatient and non-inpatient services in public, private and repatriation hospitals), 18% medical, 13% pharmaceutical, 10% allied health, 8% nursing homes and 6% other.

Hospital expenditure accounts for 70% of the health system costs of cancer. This proportion is greater for cancer than for any other diseases except complications of pregnancy, and perinatal problems. Medical service costs outside hospitals account for a further 14% (see Figure 1), followed by 4% for the included public health programs, 4% for research and 3% for pharmaceutical costs.

Cancer contributes significantly to hospital costs, but makes a relatively small contribution to medical, pharmaceutical and allied health costs, compared to other diseases. Cancer contributes 9% of hospital costs and is the third highest contributor after injury and circulatory diseases.

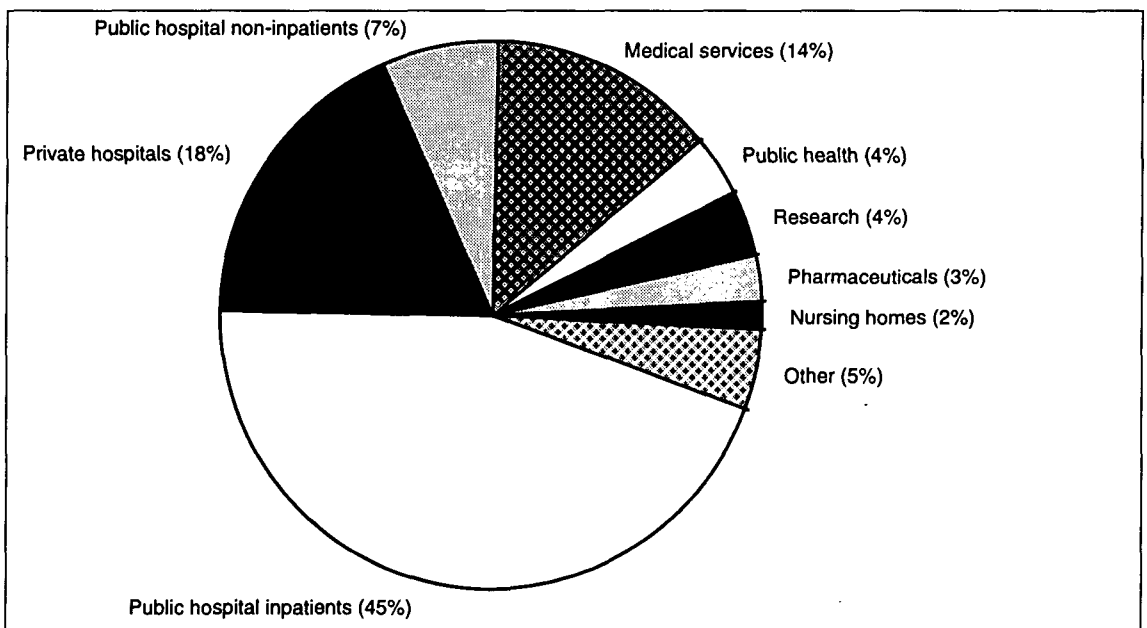

Figure 1: Total health system costs of cancer in Australia 1993–94, by health sector

The 10 most expensive cancers

Table 2 shows the 10 most expensive cancers ranked in descending order by total health system costs (including prevention costs and the costs of treating benign and in-situ neoplasms for each site). Appendix Table C.2 gives health system cost estimates for all cancer sites.

The highest contributor to direct cancer costs is non-melanoma skin cancer (NMSC) ($232 million) which accounts for a small number of deaths (379 in 1993). However, NMSC dominates new cases, with almost 244,000 in 1993 (78% of all new cancers). This estimate of the incidence of NMSC does not include NMSC which is treated but not diagnosed histologically. Costs shown in Table 2 for each cancer site include costs associated with prevention and treatment of benign neoplasms, in-situ neoplasms, and neoplasms of uncertain behaviour as well as malignant neoplasms. Much of the costs for non-malignant neoplasms are associated with excluding or preventing malignancy.

Colorectal cancer is significant in terms of costs, deaths and new cases. It is the second highest contributor to direct costs ($205 million), ranks second in terms of cancer deaths (4,440 in 1993, 13% deaths), and ranks third in terms of new cases (9,538 cases, which is 3% of all new cases and 14% of new cases excluding NMSC).

Breast cancer ranks third in terms of direct costs ($184 million), third in terms of deaths (2,641, 8% deaths), and fourth in terms of new cases (8,448 cases). Breast cancer costs are about 80% of those for NMSC.

Table 2: The 10 most expensive cancers: health system costs by sector, 1993–94 ($ million) and numbers of new cases and deaths in 1993

Cancer site[a]	Total costs	Hospitals	Medical[b]	Pharma-ceuticals	Nursing home	Other[c]	New cases	No. of deaths
1. Non-melanoma skin	232.3	126.0	76.7	4.0	6.0	19.6	243,691	379
2. Colorectal	204.9	170.8	11.3	3.4	4.1	15.4	9,538	4,440
3. Breast[d]	183.9	80.0	10.6	16.2	1.5	75.7	8,448	2,641
4. Leukemia	111.3	93.5	2.8	2.1	1.2	11.7	1,662	1,210
5. Lung	107.3	80.9	6.8	2.7	1.9	14.9	6,911	6,393
6. Lymphoma[e]	105.7	89.3	5.9	1.7	1.5	7.3	3,698	2,288
7. Prostate	101.1	65.8	13.9	8.4	2.1	11.0	10,013	2,544
8. Cervix	86.1	22.4	46.2	0.9	0.1	16.4	1,002	317
9. Uterus	85.6	68.3	11.7	1.2	0.4	4.1	1,227	262
10. Melanoma	65.6	14.7	34.9	1.0	0.4	14.6	6,954	854
All cancers	**1,904.3**	**1,327.2**	**261.0**	**53.1**	**31.6**	**231.5**	**313,651**	**33,176**

(a) Cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, except for new cases, which include incident cases of malignant neoplasm only (see Appendix A).

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes breast, cervical, lung and skin cancer public health programs, allied health services, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

(d) Female breast cancers only.

(e) Includes multiple myeloma.

Lung cancer accounts for the largest number of cancer deaths (6,393, 19% deaths), has approximately the same number of new cases as deaths (6,911), and ranks fifth in terms of costs ($107 million). Lung cancer costs are less than half those for NMSC.

Figure 2 shows total health system costs for the 10 most expensive cancers, in descending order. Total health system costs for each site are divided into treatment costs for malignant neoplasms only (black area) and other costs (including treatment costs for benign and in-situ neoplasms and prevention costs for neoplasms of all types). Appendix Table C.3 gives more detailed information on treatment costs for all cancer sites.

Treatment costs for malignant neoplasms represent around 80% of total costs for NMSC and 50% for breast cancer, but only 11% for cervical cancer, whose costs are dominated by the costs of the national screening program. Other cancers where treatment costs are a low proportion of total costs include melanoma (25%), cancer of the uterus (16%), ovarian cancer (43%) and brain and nervous system cancers (56%). In contrast, treatment costs for lung and prostate cancer represent over 90% of total health system costs for these sites.

For most cancer sites the vast majority of direct costs are for hospital costs. The exceptions are cervical cancer, NMSC and breast cancer, where a significant proportion of the costs are in the medical sector (which includes general practice and specialist consultations, and pathology tests which are not conducted in hospitals) and in the 'other' sector (because public health programs for these three sites have been included in the disease cost estimates).

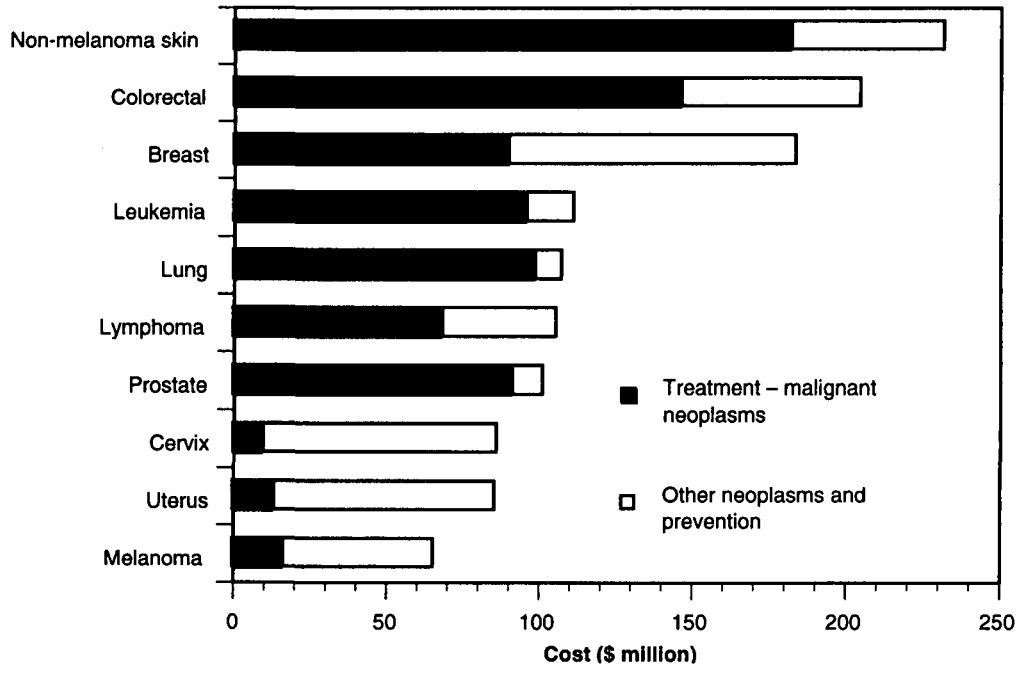

Figure 2: The 10 most expensive cancers in 1993–94: treatment costs for malignant neoplasms and total health system costs (all neoplasms) by site

4 Most expensive cancers for males and females at various ages

The 10 most expensive cancers for males and females

Table 3 shows the total health system costs for males and females and the male to female cost ratio for the 10 most expensive cancers listed in Table 2. Overall, health system treatment costs for cancers are 14% higher for females than males, unlike costs for the most expensive cancer, NMSC, which are 24% higher for males than females. Costs for colorectal cancer and lymphoma are 17% higher for males than females, and costs for lung cancer are over twice as large for males as for females, reflecting the higher smoking prevalence among males in the past.

Table 3: The 10 most expensive cancers: health system costs ($ million) by sex, and male/female ratio of health system costs, 1993–94

	Total health system costs ($ million)		Cost ratio[a]
Cancer site	Males	Females	Male/Female
1. Non-melanoma skin	128.4	103.9	1.24
2. Colorectal	110.3	94.6	1.17
3. Breast[b]	—	183.9	—
4. Leukemia	62.9	48.3	1.30
5. Lung	73.1	34.2	2.14
6. Lymphoma[c]	56.5	49.2	1.15
7. Prostate	101.1	—	—
8. Cervix	—	86.1	—
9. Uterus	—	85.6	—
10. Melanoma	28.5	37.0	0.77
All cancers	**889.7**	**1014.6**	**0.88**

(a) Ratio of total health system costs, not adjusted for numbers of cancer cases in males and females.

(b) Female breast cancers only.

(c) Includes multiple myeloma.

Table 4 shows the health system costs by sector for the 10 most expensive cancers for males and females, ranked separately for each sex. Non-melanoma skin cancer is the most expensive cancer for males, followed by colorectal cancer, prostate cancer, then lung cancer. Breast cancer is the most expensive cancer for women, followed by non-melanoma skin cancer, then colorectal and cervical cancer.

For cervical cancer, 26% of costs are hospital costs, 54% medical costs and 20% of costs are in the 'other' sector (which includes costs for the national screening program, allied health , research etc.).

For NMSC, 54% of costs are hospital costs and 33% are medical costs for both males and females, reflecting the large number of same-day hospital admissions for excision of skin lesions.

For breast cancer, 44% of costs are hospital costs, 10% are pharmaceutical costs, 6% medical costs, and 42% fall in the 'other' sector. The 'other' costs reflect the large contribution of the national breast screening program to this sector (approximately $50 million).

Table 4: The 10 most expensive cancers for males and females: health system costs by sector, 1993–94 ($ million) and numbers of new cases and deaths, 1993

Cancer site[a]	Total costs	Hospitals	Medical[b]	Pharma-ceuticals	Nursing home and other[c]	New cases 1993	No. of deaths 1993
Males							
1. Non-melanoma skin	128.4	70.6	42.6	2.3	12.9	145,946	273
2. Colorectal	110.3	93.5	5.9	1.1	9.8	5,178	2,360
3. Prostate	101.1	65.8	13.9	8.4	13.1	10,013	2,544
4. Lung	73.1	57.4	3.8	2.0	10.0	4,873	4,560
5. Leukemia	62.9	53.1	1.6	1.2	7.1	931	653
6. Lymphoma	56.5	49.2	2.2	0.8	4.3	2,087	1,261
7. Bladder	39.0	32.7	2.0	0.8	3.5	1,794	538
8. Melanoma	28.5	7.0	14.6	0.4	6.5	3,794	575
9. Brain and CNS	26.5	21.4	1.9	0.5	2.6	646	601
10. Head and neck	24.4	20.2	1.3	0.3	2.5	1,738	466
All cancers	**889.7**	**671.3**	**104.4**	**22.9**	**91.1**	**184,966**	**18,727**
Female							
1. Breast	183.9	80.0	10.6	16.2	77.1	8,448	2,641
2. Non-melanoma skin	103.9	55.4	34.1	1.7	12.7	97,745	108
3. Colorectal	94.6	77.2	5.4	2.4	9.7	4,360	2,080
4. Cervix	86.1	22.4	46.2	0.9	16.6	1,002	317
5. Uterus	86.1	22.4	46.2	0.9	16.6	1,227	262
6. Lymphoma	49.2	40.1	3.7	0.9	4.5	1,611	1,027
7. Leukemia	48.3	40.4	1.3	0.9	5.7	731	557
8. Melanoma	37.0	7.7	20.3	0.6	8.4	3,160	279
9. Lung	34.2	23.6	3.0	0.7	6.9	2,038	1,833
10. Ovary	31.3	24.7	2.7	1.0	2.9	1,059	716
All cancers	**1,014.6**	**656.0**	**156.6**	**30.2**	**172.0**	**128,685**	**14,449**

(a) Cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, except for new cases, which include incident cases of malignant neoplasm only (see Appendix A).

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes nursing homes, allied health services, breast, cervical, lung and skin cancer public health programs, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

Skin cancer (melanoma and NMSC) accounts for 55% of total cancer-related medical costs for males and 35% for females. Cervical cancer accounts for a further 30% of cancer-related medical costs for females; prostate cancer for a further 13% of cancer-related medical costs for males.

Breast cancer accounts for 54% of all cancer-related pharmaceutical costs for females and prostate cancer for 37% for males.

Health system costs of cancer by age and sex

Health system costs for cancer rise with age at younger ages then decline at older ages, reflecting the decreasing population size at older ages (Figure 3). In terms of 10-year age groups, cancer costs peak in the 45–54 year age group for females and the 65–74 year age group for males. Figure 4 shows the health system costs for cancer per head of population by age and sex. Per capita health system costs for cancer rise with age through to the oldest ages.

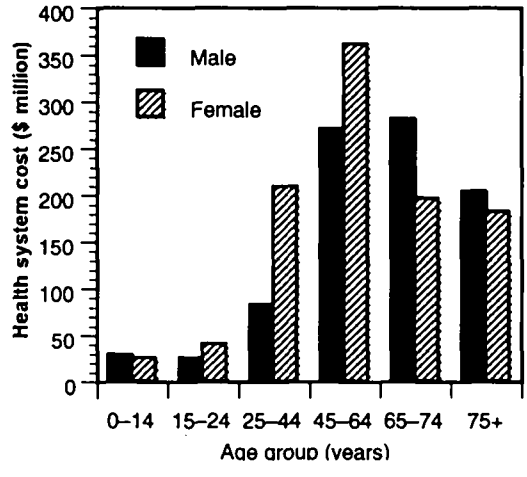

Figure 3: Total health system cancer costs ($ million), by age group and sex, 1993–94

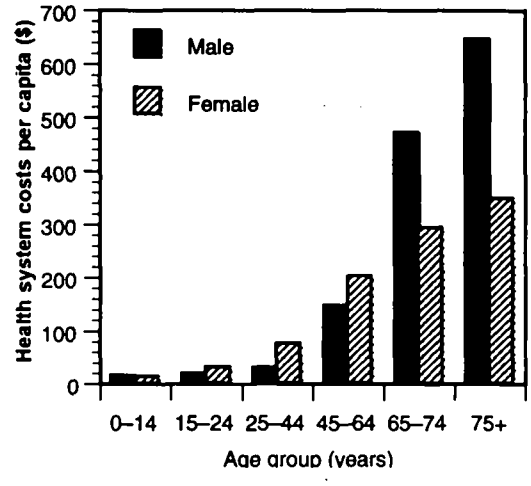

Figure 4: Health system cancer costs ($) per capita by age group and sex, 1993–94

For young and middle-aged people, cancer costs per capita for females exceed those for males. Among older people, cancer costs per capita for males substantially exceed those for females. In part, this is because the incidence rates for the commonest cancers in both sexes are greater for males than females at older ages. Such cancers include colorectal cancer, lung cancer and skin cancers. Additionally, the commonest sex-specific cancers have a different age distribution. Breast cancer costs are greatest for women aged 45–64 years, whereas prostate cancer costs become very large over 65 years.

Table 5: Per cent distribution of health system costs for cancer by age group, males, females and persons, Australia, 1993–94

Age group	Males	Females	Persons
0–14	3.2	2.5	2.8
15–24	2.8	4.0	3.4
25–44	9.2	20.6	15.3
45–64	30.3	35.6	33.1
65–74	31.5	19.3	25.0
75+	22.9	18.1	20.3
Total	**100.0**	**100.0**	**100.0**

Table 6: Total health system costs ($ million) of cancer by health sector, age and sex, 1993–94 and numbers of new cases and deaths, 1993

Sex/ age	Total costs	Hospitals	Medical[a]	Pharma-ceuticals	Nursing home	Other[b]	New cases 1993	No. of deaths 1993
Males								
0–14	28.7	22.3	3.6	0.1	—	2.8	296	75
15–24	25.0	14.4	7.0	0.4	—	3.2	376	64
25–44	82.0	57.2	14.7	1.0	0.4	8.7	14,022	676
45–64	269.7	208.6	31.7	6.2	1.7	21.5	68,877	4,767
65–74	280.7	216.9	28.7	8.7	1.8	24.6	57,026	6,241
75+	203.6	151.9	18.7	6.5	9.0	17.5	44,366	6,904
Total	**889.7**	**671.3**	**104.4**	**22.9**	**12.9**	**78.2**	**184,966**	**18,727**
Females								
0–14	25.2	20.0	2.8	0.1	—	2.3	237	72
15–24	40.6	18.8	15.0	0.2	—	6.6	1,293	74
25–44	209.0	115.8	59.2	4.2	—	29.8	16,032	776
45–64	360.8	236.3	45.4	7.7	—	71.3	47,067	3,589
65–74	195.6	146.3	18.5	7.7	—	23.1	32,868	3,992
75+	183.3	118.7	15.6	10.2	18.7	20.1	31,186	5,946
Total	**1014.6**	**656.0**	**156.6**	**30.2**	**18.7**	**153.2**	**128,685**	**14,449**
Persons								
0–14	53.9	42.3	6.4	0.2	—	5.0	533	147
15–24	65.6	33.3	22.0	0.6	—	9.8	1,669	138
25–44	291.0	173.0	73.9	5.2	0.4	38.5	30,053	1,452
45–64	630.5	444.9	77.1	13.9	1.7	92.8	115,944	8,356
65–74	476.3	363.1	47.2	16.5	1.8	47.7	89,895	10,233
75+	387.0	270.5	34.4	16.7	27.7	37.6	75,552	12,850
Total	**1904.3**	**1327.2**	**261.0**	**53.1**	**31.6**	**231.5**	**313,651**	**33,176**

(a) Medical services for private patients in hospitals are included under Hospitals.

(b) Includes breast, cervical, lung and skin cancer public health programs, allied health services, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

Table 5 shows cancer costs by age group as a proportion of total health system costs of cancer for each sex. Table 6 shows the total health system costs for cancers by age, sex and health sector and also the numbers of new cases and deaths in 1993. The following sections examine the costs for the five most costly cancers for males and females in the following age groups: 0–24 years, 25–24 years, 45–64 years, 65 years and over.

The 5 most costly cancers: persons 0–24 years

Table 7 shows health system costs by sector for the 5 most costly cancers among young people aged 0–24 years. Leukemia contributes the largest direct costs for both males and females aged 0–24 years (about $17 million for males and $12 million for females), followed by cervical cancer for females ($12 million) and then melanoma and non-melanoma skin cancers for both sexes.

Table 7: Males and females aged 0–24 years: health system costs ($ million) for all cancers and the 5 most expensive cancers, 1993–94

Cancer site[a]	Total costs	Hospitals	Medical[b]	Pharma-ceuticals	Nursing home and other[c]	New cases 1993	No. of deaths 1993
Males							
1. Leukemia	16.6	14.8	0.1	0.0	1.8	121	43
2. Melanoma	9.2	0.4	6.8	0.1	1.8	124	9
3. Non-melanoma skin	5.3	3.0	1.8	0.1	0.4	—	—
4. Lymphoma	4.9	4.1	0.4	0.0	0.3	99	19
5. Brain and CNS	3.3	2.4	0.5	0.1	0.3	81	25
All cancers	**53.7**	**36.7**	**10.6**	**0.4**	**6.0**	**672**	**139**
Females							
1. Leukemia	12.1	10.8	0.0	0.0	1.3	105	53
2. Cervix	11.8	1.8	7.1	0.1	2.8	12	—
3. Melanoma	8.4	0.7	6.0	0.1	1.6	143	1
4. Non-melanoma skin	7.8	5.3	1.9	0.0	0.6	922	—
5. Lymphoma	4.2	3.5	0.5	0.0	0.3	71	10
All cancers	**65.8**	**38.9**	**17.8**	**0.3**	**8.8**	**1,530**	**146**

(a) Cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, except for new cases, which include incident cases of malignant neoplasm only (see Appendix A).

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes nursing homes, allied health services, breast, cervical, lung and skin cancer public health programs, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

The 5 most costly cancers: persons 25–44 years

Table 8 shows health system costs by sector for the 5 most costly cancers among adults aged 25–44 years. Cervical cancer contributes the most to costs in women 25–44 years ($46 million), followed by uterus cancer ($33 million), and breast cancer ($29 million). NMSC contributes the most to total direct costs of cancer in men 25–44 ($12 million), followed by leukemia ($11 million). Total health system costs of cancer are over 2.5 times higher for women than men in this age group.

Table 8: Health system costs ($ million) for all cancers and the 5 most expensive cancers, males and females aged 25–44 years, 1993–94

Cancer site[a]	Total costs	Hospitals	Medical[b]	Pharma-ceuticals	Nursing home and other[c]	New cases 1993	No. of deaths 1993
Males							
1. Non-melanoma skin	12.4	5.2	6.2	0.1	0.9	11,354	28
2. Leukemia	10.8	9.6	0.1	0.0	1.1	78	55
3. Lymphoma	9.7	8.9	0.1	0.0	0.7	299	93
4. Melanoma	7.0	1.1	3.6	0.1	2.1	763	86
5. Colorectal	5.2	4.4	0.3	0.0	0.4	216	63
All cancers	**82.0**	**57.2**	**14.7**	**1.0**	**9.1**	**14,022**	**676**
Females							
1. Cervix	46.1	11.0	26.4	0.3	8.3	396	71
2. Uterus	33.1	24.5	6.7	0.3	1.6	69	5
3. Breast	28.5	16.4	2.7	0.7	8.6	1,331	235
4. Non-melanoma skin	16.0	7.8	6.6	0.2	1.4	12,145	5
5. Melanoma	13.9	1.6	8.6	0.2	3.6	853	31
All cancers	**209.0**	**115.8**	**59.2**	**4.2**	**29.8**	**16,032**	**776**

(a) Cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, except for new cases, which include incident cases of malignant neoplasm only (see Appendix A).

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes nursing homes, allied health services, breast, cervical, lung and skin cancer public health programs, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

The 5 most costly cancers: persons 45–64 years

Table 9 shows health system costs by sector for the 5 most costly cancers among adults aged 45–64 years. Breast cancer contributes the most to costs in women 45–64 years ($93 million), followed by cancer of the uterus ($42 million), and colorectal cancer ($31 million). Colorectal cancer contributes the most to costs in men 45–64 years ($41 million), followed by NMSC ($38 million) and lung cancer ($22 million).

Table 9: Health system costs ($ million) for all cancers and the 5 most expensive cancers, males and females aged 45–64 years, 1993–94

Cancer site[a]	Total costs	Hospitals	Medical[b]	Pharma-ceuticals	Nursing home and other[c]	New cases 1993	No. of deaths 1993
Males							
1. Colorectal	40.8	34.9	2.2	0.4	3.3	1,741	680
2. Non-melanoma skin	38.0	19.6	14.3	1.0	3.2	57,988	58
3. Lung	21.8	17.6	1.4	0.3	2.5	1,440	1,305
4. Prostate	18.4	11.7	4.5	0.2	2.0	1,586	205
5. Leukemia	17.3	13.8	0.5	1.1	1.9	216	121
All cancers	**269.7**	**208.6**	**31.7**	**6.2**	**23.2**	**68,877**	**4,767**
Females							
1. Breast	92.7	35.6	4.5	3.8	48.8	3,729	975
2. Uterus	41.6	36.0	3.1	0.5	2.0	510	62
3. Colorectal	30.6	25.8	2.0	0.7	2.2	1,276	465
4. Non-melanoma skin	28.3	13.8	11.8	0.6	2.1	36,724	13
5. Cervix	22.1	6.4	11.0	0.2	4.5	340	99
All cancers	**360.8**	**236.3**	**45.4**	**7.7**	**71.3**	**47,067**	**3,589**

(a) Cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, except for new cases, which include incident cases of malignant neoplasm only (see Appendix A).

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes nursing homes, allied health services, breast, cervical, lung and skin cancer public health programs, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

The 5 most costly cancers: persons 65 years and over

Table 10 shows health system costs by sector for the 5 most costly cancers among people aged 65 years and over. Breast cancer contributes the most to costs in older women ($60 million), followed by colorectal cancer ($58 million) and NMSC ($51 million). Prostate cancer contributes the most to direct costs of cancer in men aged 65 years and over ($82 million), followed by NMSC ($73 million) and colorectal cancer ($64 million).

Table 10: Health system costs ($ million) for all cancers and the 5 most expensive cancers, males and females aged 65 years and over, 1993–94

Cancer site[a]	Total costs	Hospitals	Medical[b]	Pharma-ceuticals	Nursing home and other[c]	New cases 1993	No. of deaths 1993
Males							
1. Prostate	81.9	54.0	8.9	8.1	11.0	8,417	2,339
2. Non-melanoma skin	72.7	42.8	20.4	1.1	8.4	76,604	186
3. Colorectal	64.1	54.1	3.3	0.7	6.1	3,213	1,617
4. Lung	48.2	38.5	2.4	1.7	5.6	3,340	3,185
5. Bladder	29.7	25.0	1.1	0.7	2.9	1,268	463
All cancers	**484.3**	**368.7**	**47.4**	**15.2**	**52.9**	**101,225**	**13,145**
Females							
1. Breast	59.7	25.8	3.1	11.7	19.2	3,377	1,430
2. Colorectal	57.8	47.4	2.7	0.7	7.1	2,928	1,552
3. Non-melanoma skin	51.7	28.5	13.7	0.9	8.6	47,955	89
4. Lung	20.3	14.3	1.4	0.6	4.0	1,360	1,283
5. Leukemia	15.1	10.9	1.0	0.9	2.2	413	358
All cancers	**379.0**	**264.9**	**34.2**	**17.9**	**62.0**	**64,057**	**9,938**

(a) Cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour, except for new cases, which include incident cases of malignant neoplasm only (see Appendix A).

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes nursing homes, allied health services, breast, cervical, lung and skin cancer public health programs, research and other institutional, non-institutional and administration expenditure. Does not include other public health services, community health services, ambulances, or medical aids and appliances.

5 Estimated average lifetime costs of cancer

This section presents information on the approximate total average costs of treatment per new cancer case across the entire lifetime. Treatment costs for malignant neoplasms in 1993–94 are divided by the number of new cases of malignant neoplasms in 1993 to give an approximate estimate of average lifetime treatment costs per incident case. These lifetime cost estimates are approximate because they are based on the assumption that incidence and mortality rates have been steady over time. For cancers where incidence rates have been increasing or decreasing over time, or where improvements in treatment are altering survival rates, the approximate costs shown in Table 11 will underestimate or overestimate the actual lifetime costs of treating a cancer case. These estimates in 1993–94 dollars also assume that the real cost of treating each cancer at various ages and stages through the course of the illness remain constant at their 1993–94 values.

For each cancer site, Table 11 shows health system treatment costs for malignant neoplasms only in 1993–94 and estimated new cases in 1993. Cancer sites are ranked in descending order of average lifetime treatment costs per malignant case. Leukemia is the most expensive cancer with an estimated lifetime treatment cost of nearly $58,000 per new case.

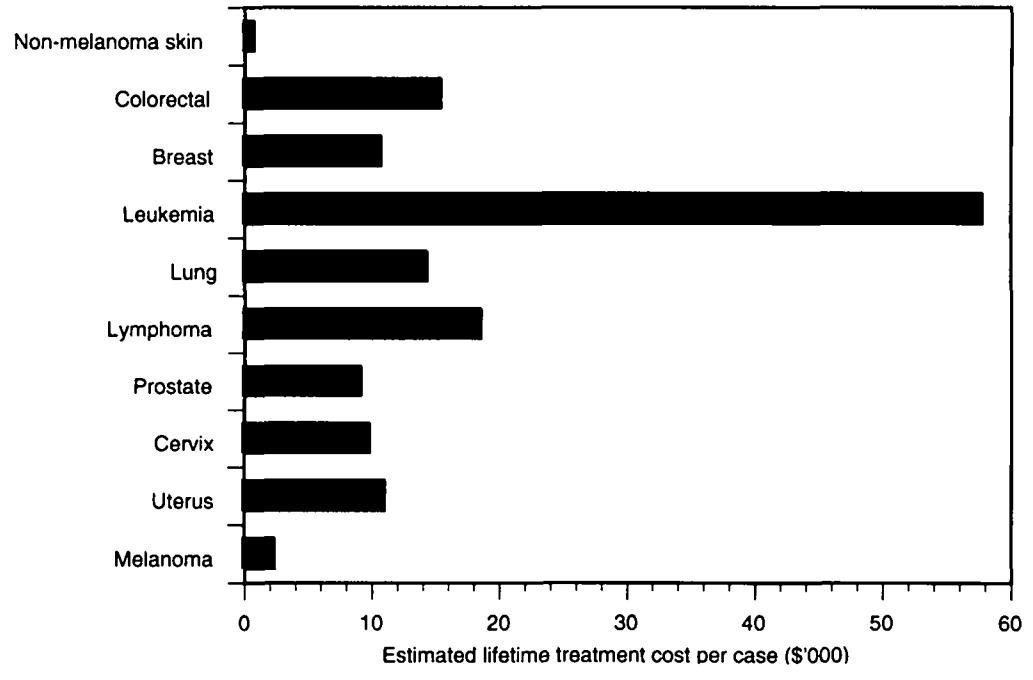

Figure 5: Estimated average lifetime treatment cost per new case for the 10 cancers with highest total health system costs, 1993–94

Estimated lifetime treatment costs vary enormously, from around $58,000 per leukemia to $2,400 for melanoma and $750 per NMSC. The commonest cancers apart from NMSC are in the middle of the list, e.g. around $15,000 for colorectal and lung cancers. Cervical cancer ranks seventeenth in the list at just under $10,000 per new case, followed by prostate cancer at $9,000 per new case. Figure 5 shows the average lifetime treatment cost per new case for the 10 cancers identified in Table 2 as having the highest total health system costs.

Table 11: Lifetime cancer costs per case: estimated treatment costs ($) per new case, number of new cases 1993, and total treatment costs ($ million) 1993–94, ranked by treatment cost per new case

Cancer site	Treatment costs per case[a] ($)	New cases	Treatment costs[b] ($ million)
1. Leukemia	57,777	1,662	96.0
2. Other sites[c]	237,690	7,258	270.3
3. Brain and CNS	25,333	1,182	29.9
4. Oesophagus	21,624	885	19.1
5. Bladder	19,447	2,388	46.4
6. Lymphoma	18,519	3,698	68.5
7. Liver	18,266	469	8.6
8. Stomach	16,305	1,788	29.2
9. Kidney	15,891	1,646	26.2
10. Pancreas	15,820	1,432	22.7
11. Colorectal	15,374	9,538	146.6
12. Lung	14,298	6,911	98.8
13. Head and neck	12,825	2,400	30.8
14. Ovary	12,786	1,059	13.5
15. Uterus	11,020	1,227	13.5
16. Breast	10,680	8,448	90.2
17. Cervix	9,802	1,002	9.8
18. Prostate	9,110	10,013	91.2
19. Melanoma	2,402	6,954	16.7
20. Non-melanoma skin	750	243,691	182.7
All cancers excluding non-melanoma skin	**17,671**	**69,960**	**1,128.1**

(a) Total costs in 1993–94 divided by new cases in 1994 gives an approximate estimate of lifetime costs per incident case where treatment costs, incidence and mortality rates have been steady over time.

(b) Treatment costs for malignant neoplasms only. Prevention costs and research costs excluded, as are treatment costs for non-malignant neoplasms.

(c) Includes cancer of larynx, thyroid, gallbladder, testis and other sites not explicitly listed above.

6 Conclusions

Health system costs of cancer in Australia

The total health system cost of cancer in Australia in 1993–94 is estimated as $1,904 million or 6% of health system costs. For disease groups defined in terms of ICD-9 chapters, cancer ranks eighth in terms of direct costs, yet is the second highest contributor to deaths (33,176 deaths, which represent 27% of all deaths). Direct costs for both digestive and circulatory diseases are approximately double those of cancer.

Unlike most other disease groups, hospital inpatient expenditure accounts for the majority (over 70%) of the health system costs of cancer. Medical service costs outside hospitals account for a further 14%, 11% other costs, 3% pharmaceutical costs, 2% nursing home costs and 0.6% allied health costs.

The cancer which contributes most to direct health system costs is NMSC (an estimated $232 million) which accounts for a small number of deaths (379 in 1993). However, NMSC dominates new cases, with over 243,000 in 1993 (78% of all new cancers). These cost estimates include health interventions for benign skin tumours and in-situ skin cancers, frequently aimed at excluding or preventing invasive cancer, as well as for invasive cancers.

Colorectal cancer is the second highest contributor to direct costs (an estimated $205 million), ranks second in terms of cancer deaths (4,440 in 1993, 13% deaths), and ranks third in terms of new cases (9,538 cases, which is 3% of all new cases and 14% of cases excluding NMSC). Breast cancer ranks third in terms of direct costs ($184 million), third in terms of deaths (2,641, 8% deaths), and fourth in terms of new cases (8,448 cases). Breast cancer costs are about 80% of those for NMSC.

Lung cancer accounts for the largest number of cancer deaths (6,393, 19% deaths), has approximately the same number of new cases as deaths (6,911), and ranks fifth in terms of costs ($107 million).

For most cancer sites, the vast majority of direct costs are for hospital costs. The exceptions are cervical cancer, NMSC and breast cancer, where a significant proportion of the costs are in the medical sector (which includes general practice and specialist consultations, and pathology tests which are not conducted in hospitals) and in the 'other' sector (because public health programs for these three sites have been included in the disease cost estimates).

Overall, health system treatment costs for cancers are estimated to be 14% higher for females than males. Health system costs for cancer rise with age, peaking in the 45–64 year age group for females and the 65-74 year age group for males, and then decline at older ages.

Estimated lifetime treatment costs for invasive cancers vary enormously, from around $58,000 per leukemia to less than $3,000 for melanomas and other skin cancers. The average lifetime treatment cost per new case of invasive cancer (excluding NMSC) is estimated to be around $16,000.

Improving the reliability of cancer costing

The major limitations to the methodology used to estimate the health systems costs of cancer for 1993–94 relate to the lack of up-to-date information on treatment patterns for medical and allied health services, and to some extent for drugs. Utilisation data for these sectors relate to 1989–90 or 1990–91 and will not reflect changes in clinical practice or disease patterns between then and 1993–94.

The 1995 National Health Survey unit record data will be available for future costing work but this provides only self-reported data on medical, allied health and pharmaceutical drug usage for broad categories of illness condition. Improving the reliability of cancer cost estimates requires the collection of detailed morbidity and treatment patterns along the lines of the 1990–91 Survey of Morbidity and Treatment in General Practice. An ongoing survey of general practice activity commenced in April 1998, undertaken by the General Practice Statistics and Classification Unit at the University of Sydney, in collaboration with the Australian Institute of Health and Welfare. The new survey is built on the experience of the 1990–91 Australian Morbidity and Treatment Survey conducted by the Family Medicine Research Unit at the University and will fill a major gap in national health statistics, enabling future disease costing analyses to use up-to-date information on the patterns of morbidity managed by general practitioners and the role of general practitioners in primary health care provision.

The current methodology estimates disease costs associated with medical specialist services from referrals and tests recorded in the survey of general practitioners. It would clearly be preferable and more accurate to directly survey specialist practice patterns, perhaps as part of an ongoing survey of morbidity and treatment patterns in private medical practice. Additionally, utilisation patterns for drugs, pathology and imaging services are estimated from the survey data for general practitioners. Data for medical specialists would enable the differential prescription and test-ordering patterns of medical specialists to be taken into account.

The current methodology assumes that all specialist medical services for a particular type of specialist have the same average cost. This is probably not a major problem for disease-specific specialties but does seriously limit the accuracy of disease cost estimates for services provided by specialties such as physicians, surgeons, paediatricians, diagnostic imaging and pathology. In the current methodology, for example, this means that all pathology tests (apart from Pap smear and PSA tests) are assumed to have the same average cost.

It may be possible to make substantially greater use of data for individual Medicare Benefits Schedule items, as was done in this report for pathology screening tests for cervical and prostate cancer where 1993–94 Medicare data were used. It would then be necessary to take careful steps to ensure the consistency of the medical practitioner survey data with the Medicare utilisation data.

Cost estimates for hospital inpatient services are based on full national casemix information for 1993–94 and national diagnosis-related group (DRG) cost weights and are considered to be the most reliable of all the health sectors. The major limitation is the accuracy of the estimated inpatient fractions for each State and Territory (the proportion of total hospital costs that are considered to relate to inpatient services).

Hospital non-inpatient costs were estimated in this report using self-reported data from the 1989–90 National Health Survey and assuming that all non-inpatient services had the same average cost. There are currently a number of projects underway to develop 'DRG's for non-inpatient services and to estimate average costs for these service categories. Some data on non-inpatient utilisation patterns are also available in a number of States and Territories. Such data, together with cost weights, could be used to substantially improve the costing of non-inpatient service.

Community and public health programs in general are not yet included in the estimates of disease costs due to the difficulties in obtaining comprehensive casemix data for these health sectors. A recent attempt by the Centre for Health Program Evaluation and the AIHW to estimate expenditure on public health programs by broad disease/risk factor areas was able only to quantify Commonwealth expenditure. Estimates of the costs for the breast and cervical cancer national screening programs and for lung and skin cancer prevention programs have been included for this report, but the lack of information on other public health programs severely limits the usefulness and interpretation of the prevention cost estimates provided here. Analysis of national expenditure on public health programs at Commonwealth, State and local level is a very high priority for improving the reliability and usefulness of direct cost estimates for cancer.

AIHW is currently collaborating in the development of a minimum dataset for community health services and it may be possible already to obtain some indicative casemix and costing data for community health services, even at a broad level.

Future analyses of health system costs for cancer should also attempt to include medical aids and appliances and ambulance services. Previous attempts by AIHW to obtain casemix data for ambulance services did not yield usable information to apportion patient transport costs to disease. It is not known whether there is any information on the disease distribution of medical aids and appliances expenditure.

Conclusion

Cancer costs the Australian community around $2 billion per year in direct health system costs, of which more than 80% are treatment costs. It is likely that additional funding of proven cost-effective prevention strategies will result in an overall reduction in total direct costs of cancer in the longer term. This will be addressed in other reports of the National Cancer Control Strategy.

The aim of this report has been to provide the best possible estimates of the health system resources directed at the prevention and treatment of cancer to assist in understanding the allocation of resources among the population, across different health sectors, and for different cancer. Such information will assist in considering a variety of equity, access and utilisation issues in relation to the use of scarce health care resources. For example, the health system cost information presented here could be used to develop broad order estimates of the potential health care cost offsets to the cost of the prevention activities.

It must be emphasised that this report has not attempted to estimate the total economic impact of cancer in Australia. As well as the health system costs documented here, there are substantial costs relating to absenteeism, lost productivity, the burden on carers and family, and lost quality and quantity of life.

As the pressure on health care funding continues to rise, there will be increasing interest in understanding the costs associated with specific diseases and in attempting to evaluate the overall cost-effectiveness of health system interventions. Future disease costing work should take into account the opportunities identified above to improve the data and methodology used for disease costing in Australia.

Glossary

ABS: The Australian Bureau of Statistics.

Acute hospitals: Establishments which provide at least minimal medical, surgical or obstetrical services for inpatient treatment and/or care, and which provide round-the-clock comprehensive qualified nursing service as well as other necessary professional services. Most patients require a relatively short stay.

AIHW: Australian Institute of Health and Welfare.

Allied health services: services provided by allied health practitioners excluding pharmacists and allied health services provided by hospitals.

Bed day: The occupancy of a hospital bed by an inpatient for up to 24 hours.

Bed days: The number of full or partial days of stay for patients who were admitted for an episode of care and who underwent separation during the reporting period. A patient who is admitted and separated on the same day is allocated one patient day.

Benign neoplasm: A neoplasm (or tumour) which does not invade surrounding tissue and is not malignant. See also **malignant neoplasm.**

Cancer (malignant neoplasm): A general term for more than 100 diseases in which malignant cells develop. These diseases ocur 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 death: A death where the underlying cause is indicated as cancer. Persons with cancer dying of other causes are not counted in the death statistics in this publication.

Carcinoma in situ: An early stage of cancer, in which the tumour is still only in the structures of the organ where it first developed, and the disease has not invaded other parts of the organ or spread (metastasised). Most in situ carcinomas are highly curable.

Department of Veterans' Affairs hospitals: Acute care hospitals operated by the Commonwealth Department of Veterans' Affairs to provide hospital treatment for eligible veterans and their dependants at Commonwealth expense. Department of Veterans' Affairs hospitals are recorded as public sector hospitals for data reporting purposes.

Direct costs: The health system costs of providing prevention and treatment services for health problems.

ICD-9: International Classification of Disease. A coding system used to identify the primary site of the malignancy. This classification is in its ninth revision.

Incidence: See **new cancer case.**

Indirect costs: Costs associated with disease and injury other than direct health system costs. These include lost production due to sickness and premature death, as well as costs impacting outside the health care sector (such as caring costs borne by the family, and police and court costs associated with drug abuse, for example).

Inpatient: Any person formally admitted by a hospital. Healthy newborn infants are excluded unless they have a stay of more than 10 days, or are the second or subsequent birth in multiple births.

In-situ: See **carcinoma in-situ.**

Institutional: In this report, denotes the major health care institutions which provide residential care, such as hospitals and nursing homes.

International Classification of Disease (ICD): WHO's internationally accepted classification of death and disease. The ninth revision (ICD-9) is currently in use (WHO 1977).

Invasive cancer: Cancer that has spread beyond the area it developed in, to involve adjacent tissues. For example, invasive breast cancers develop in milk glands (lobules) or milk passages (ducts) and spread to the adjacent fatty breast tissue. Some invasive cancers spread to distant areas of the body (metastasise), but others do not.

Malignant neoplasm: A mass of cancer cells that may invade surrounding tissues or spread (metastasize) to distant areas of the body. See **cancer.**

Mammogram, mammography: An x-ray of the breast; the principal method of detecting breast cancer in women over 40. Screening mammography is used for early detection of breast cancer in women without any breast symptoms. Diagnostic mammography is used to help characterise breast masses or determine the cause of other breast symptoms.

Medical services: Private medical services excluding those to hospital inpatients. This includes consultations with general practitioners and specialists as well as pathology tests and screening and diagnostic imaging services. It includes services to veterans.

Mortality: See **cancer death.**

Neoplasm: An abnormal growth (tumor) that starts from a single altered cell; a neoplasm may be benign or malignant. Cancer is a malignant neoplasm.

Neoplasm of uncertain behaviour: A neoplasm which there is insufficient evidence to classify it as either benign or malignant.

New cancer case: A person who has a new cancer diagnosed for the first time. One person may have more than one cancer and therefore may be counted twice in incidence statistics if it is decided that the two cancers are not of the same origin.

NMSC: See **non-melanoma skin cancer.**

Non-inpatient occasion of service: Occurs when a patient attends a functional unit of the hospital for the purpose of receiving some form of service, but is not admitted. A visit for administrative purposes is not an occasion of service.

Non-inpatient: Patients not requiring admission to hospital, but who receive treatment in accident and emergency (casualty) departments, undergo short-term specialist treatment (such as minor surgery, radiotherapy or chemotherapy), receive care from a recognised non-admitted patient service/clinic of a hospital or are

treated in their own homes through home nursing programs. Previously referred as outpatients.

Non-melanoma skin cancer: Cancer of the skin apart from melanoma (cancer of pigmented melanocytic cells such as those found in moles and freckles).

Nursing homes: Establishments which provide long-term care involving regular basic nursing care to chronically ill, frail, disabled or convalescent persons or senile inpatients. In practice, they cater mainly for older people. They must be approved by the Commonwealth Department of Health and Family Services and/or licensed by the State or Territory, or controlled by government departments.

Outpatient: See **non-inpatient**.

Over-the-counter drugs (OTC): Pharmaceutical drugs available without prescription. Examples are cough mixtures, simple analgesics and antacids. Some OTCs can be sold only by pharmacists, but many can be sold through non-pharmacy outlets.

Pap smear: Papanicolaou smear — a procedure for the detection or diagnosis of malignant and pre-malignant conditions of the female genital tract.

PBS: Pharmaceutical Benefits Scheme.

Pharmaceutical drugs: Includes prescription drugs and over-the-counter medicines.

Prescription drugs: Pharmaceutical drugs available only on the prescription of a registered medical practitioner. These drugs are also known as Schedule Four (or S-4) drugs after the schedule to the State and Territory Acts of Parliament that regulates the sale and distribution of poisons and drugs. Prescription drugs are available only from pharmacists who are regulated by State and Territory laws whether they work in community or in hospital pharmacies.

Prevention: Refers to all health system activities relating to the primary prevention of diseases and injury, including screening for asymptomatic disease within the hospital and medical sectors.

Primary site: The site where cancer begins. Primary cancer is usually named after the organ in which it starts (for example, cancer that starts in the breast is always breast cancer even if it metastasizes to other organs, such as bones or lungs).

Private hospitals: Privately owned and operated institutions approved by the Commonwealth Department of Health and Family Services. Private hospitals cater only for private patients who are treated by a doctor of their own choice and are charged fees for accommodation and medical services. Private hospitals can be classified as acute or psychiatric on the basis of the proportion of acute inpatient services provided.

PSA test: Prostate-specific antigen test — a procedure for the detection or diagnosis of cancer of the prostate gland.

Psychiatric hospitals: Establishments devoted primarily to the treatment and care of inpatients with psychiatric, mental or behavioural disorders.

Public health: The programs, services and institutions, outside the treatment sectors of the health system, which emphasise the prevention of disease and the health needs of the population as a whole.

Public hospitals: As determined by the State or Territory health authority, and includes both recognised and non-recognised hospitals. Recognised hospitals are those nominated by States and Territories and accepted by the Commonwealth and

appearing in schedules to each State/Territory Medicare Agreement (Schedule B in the current Medicare Agreements). They provide free shared-ward accommodation for all who require it and free treatment there by a hospital-appointed doctor. In addition, they provide, to those who are prepared to pay for it (for example, through private insurance), private ward accommodation and the doctor of choice. Thus, public hospitals service much private medical practice as well as public.

PYLL: Potential years of life lost.

Recurrent expenditure: Expenditure which recurs continually or very frequently (for example, salaries). It may be contrasted with capital expenditure, such as the cost of hospital buildings and diagnostic equipment, for which the expenditure is made infrequently.

Repatriation hospitals: Acute care hospitals run by the Commonwealth Department of Veterans' Affairs originally set up to provide hospital treatment for eligible veterans and their dependants at Commonwealth expense.

Research: Health and medical research as defined in the Australian Health Expenditure Bulletins (Australian Institute of Health and Welfare 1996).

Screening: The search for disease, such as cancer, in people without symptoms. Screening may refer to coordinated programs in large populations such as the National Program for the Early Detection of Breast Cancer.

Secondary tumour: A tumour that forms as a result of spread (metastasis) of cancer from its site of origin.

Separation (or discharge): Occurs when an inpatient leaves hospital to return home, transfers to another institution, or dies. The number of separations in a year is almost the same as the number of hospital inpatient episodes.

Treatment: Refers to all health system activities relating to the diagnosis, treatment, rehabilitation and palliation for diseases, injuries and symptoms.

Tumour: A lump or mass which has formed due to excessive accumulation of abnormal cells. 'Tumour' is not a precise medical term. Tumours can be benign (not cancerous) or malignant (cancerous).

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Appendix A: Classification of health expenditure by cancer site

Diseases and injury are classified using the Ninth Revision of the World Health Organisation's International Classification of Disease (ICD–9). The broad categories of disease used in Table 1 to compare the health system costs of cancer with other diseases and injury are defined by the chapters of ICD–9. There are also general categories for fertility control, reproduction and development, cosmetic surgery, general health examination and screening, and treatment and aftercare (disease unspecified) which are grouped together in a final category 'Other'.

The term cancer is generally used to refer to invasive (malignant) neoplasms and excludes in-situ carcinomas, benign neoplasms and neoplasms of uncertain behaviour. The most common cancer in Australia is non-melanocytic skin cancer. Incidence data for this cancer are not collected on a routine basis by cancer registries and are often excluded from statistics relating to 'cancers'.

Since much of the cost associated with screening and treatment of benign and in-situ neoplasms is associated with excluding or preventing malignancy, cancer sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour (see Table A.1). Data on new cases includes incident cases of malignant neoplasm only, as reported to the National Cancer Statistics Clearing House, AIHW. New cases of non-melanocytic skin cancer are estimated from unpublished data on the incidence of treated, histologically confirmed non–melanocytic skin cancer provided by the Victorian Anti-Cancer Council. Appendix C provides estimates by site of treatment costs for malignant neoplasms only, as well as total treatment and prevention costs for neoplasms of all types.

The categories used for costing neoplasms by site and type are defined in Table A.1. Where other classifications of disease are encountered (such as the International Classification of Primary Care (ICPC)), these are mapped across to the ICD–9 codes (see Mathers et al. 1998b for details of these mappings). Costs are split between two categories for each type of neoplasm: treatment and prevention. For some cancers, screening and diagnostic tests may not be specific to a particular site, or indeed to cancer as opposed to other diseases. This problem arises because screening and diagnostic tests were not linked to diagnoses in the 1990–91 Survey of Morbidity and Treatment in General Practice in Australia. Where there were multiple diagnoses, costs for pathology and imaging tests were attributed equally across all diagnoses. Additionally, the ICPC codes do not generally distinguish between preventive and diagnostic screening. As a result, some cancer prevention activities in primary care will be costed in the general prevention category and the general treatment category (in the 'Other' category of Table 1) and will not be included in the cancer costs reported for specific sites or for all cancers.

There is only a single ICPC code for 'skin cancer' and it is not possible to distinguish melanoma from NMSC in the GP survey data. Within each age–sex group, medical, pharmaceutical and allied health costs were apportioned to melanoma and NMSC in proportion to estimated incident cases. An estimated 20% of melanomas are removed by general practitioners rather than specialists, compared with 60% of NMSCs (Robert Burton, personal communication). These estimates were used to separately weight the attributions between melanoma and NMSC categories for general practitioner and for specialist costs.

Table A.1: Classification of cancer sites in terms of ICD-9 codes for neoplasms

Cancer site	Malignant neoplasms	Benign, in-situ and of uncertain behaviour	Prevention activities
Head and neck[a]	140–149	210, 212.0, 230.0, 235.0, 235.1	V76.42
Oesophagus	150	211.0, 230.1, 235.5(p), 239.0(p)	
Stomach	151	211.1, 230.2, 235.2, 239.0(p)	
Colorectal[b]	153–154	211.3, 211.4, 230.3–230.6, 239.0(p)	V76.41
Liver	155	211.5, 230.8, 235.3	
Pancreas	157	211.6–211.7, 235.5(p), 239.0(p)	
Lung[c]	162	212.2, 212.3, 231.1, 231.2, 235.7, 239.1	V16.1, V76.0
Melanoma	172	216 (q), 232 (q), 238.2 (q)	V76.43
Non-melanoma skin[d]	173	216 (q), 232 (q), 238.2 (q)	
Breast [e]	174	217(p), 233.0, 238.3, 239.3	V16.3, V76.1
Cervix	180	219.0, 219.9, 233.1, 233.2, 236.0 (50%)	V76.2
Uterus	179, 182	218, 219.1–219.8, 236.0 (50%)	
Ovary	183	220, 233.3, 236.2	
Prostate	185	222.2, 233.4, 236.5	
Bladder	188	223.2, 223.3, 233.7, 236.7, 236.99, 239.4	V76.3
Kidney	189.0, 189.1	223.0–223.1, 236.91	V16.5
Brain and CNS[f]	191–192	225, 237.5, 239.6	
Lymphoma[g]	200–203	228, 229, 238.5–238.6	V16.7
Leukemia	204–208	238.7	V16.6
Other neoplasms	Balance 140–208	Balance 210–239	Balance V16, V76
Unspecified sites[h]	V58.0, V58.1, V66.1, V66.2, V67.1, V67.2, V71.1, V10, V15.3		V16.9, V76.9

Note: (a) Includes neoplasms of the lip, oral cavity and pharynx.

(b) Includes neoplasms of the colon and rectum (bowel).

(c) Includes neoplasms of the trachea, bronchus and lung.

(d) Includes all neoplasms of the skin apart from melanocytic neoplasms.

(e) Includes female breast cancer only. Male breast cancer is included in the category 'Other neoplasms'.

(f)) Includes all neoplasms of the brain and nervous system.

(g) Includes Hodgkin's disease, non-Hodgkin's lymphoma and multiple myeloma.

(h) Costs in this category are distributed pro-rata across the site-specific categories for this report.

(p) Codes that fall across several categories are distributed in proportion to costs for malignant neoplasms for those sites.

(q) Costs apportioned to melanocytic and non-melanocytic neoplasms in proportion to the costs for malignant neoplasms.

Appendix B: Disease costing methodology

The Disease Costs and Impact Study (DCIS), a joint project of the AIHW and the National Centre for Health Program Evaluation, has developed a methodology for specific diseases and disease groups in Australia (Mathers et al. 1998b). The basic approach for direct costs of health services has been to take known aggregate expenditures on health care and apportion those to disease categories using Australian data (hospital morbidity data, casemix data, the national survey of morbidity and treatment in general practice, and the 1989–90 National Health Survey). The DCIS methodology is documented in detail in Mathers et al. (1998b).

Total recurrent health expenditure in 1993–94 as reported by the AIHW (1996) is disaggregated by the following dimensions:

- Disease (defined by ICD-9 code groups — see Appendix A)
- Sector (hospital inpatient, non-inpatient, medical, pharmaceutical etc.)
- Program (treatment, prevention)
- Sex (male, female)
- Age (0–4, 5–14, 15–24, ... 65–74, 75+).

The proportion of direct health expenditure included in the disease costings in this report represents just over 90% of direct health care expenditure (see Table B.1 for a list of the health sectors included). Recurrent expenditure on health care which has not yet been attributed includes ambulance services, community health services, health promotion and illness prevention (apart from breast, cervix, lung and skin cancer public health programs), ambulance services, and medical aids and appliances.

The attribution of the direct costs of health services to disease is discussed in more detail below and summarised in Table B.1.

Hospital inpatient services

This sector includes inpatient (admitted patient) costs for recognised public hospitals (including public psychiatric hospitals), repatriation (veterans') hospitals and private hospitals. The proportions of total public acute hospital expenditure which relate to inpatients are given by the inpatient fractions estimated for each State and Territory by the National Health Ministers, Benchmarking Working Group (1996).

Disease costs for inpatient services are estimated by apportioning the total inpatient expenditure for each State or Territory to individual episodes of hospitalisation with an adjustment for resource intensity of treatment for the specific episode (using DRGs). Medical costs for private, compensable and other non-public patients in public, repatriation and private hospitals are estimated using DRG-derived medical

cost weights and age–sex specific information from the Health Insurance Commission on in-hospital private medical charges for various categories of service.

Public psychiatric hospital data for NSW and Victoria are used to allocate public psychiatric hospitals inpatient costs. These costs all fall in the mental health chapter of ICD-9.

Outpatient and casualty services

The 1989–90 ABS National Health Survey is used to allocate total expenditure on non-inpatient services for 1993–94. Total visits to outpatient clinics (including casualty or accident and emergency departments) for each age–sex–disease group are estimated from the National Health Survey data on numbers of outpatient visits in the two weeks prior to interview. Expenditure is allocated assuming that all visits have the same cost.

Nursing homes

The distribution of main disabling health condition of nursing home residents in the ABS 1993 Australian Survey of Disability, Ageing and Carers is used to allocate total nursing home expenditure for 1993–94 to age–sex–disease categories at ICD-9 chapter level. Costs are distributed in proportion to the distribution of main disabling condition at the time of the survey. This assumes that the average per day cost of nursing home care is the same for all patients irrespective of diagnosis. Estimated expenditure at chapter level is apportioned to specific disease groups at the sub-chapter level according to the distribution of diagnosis for patients in that age–sex group who transfer from acute hospitals (around 60% of nursing home admissions).

Medical services

This sector includes expenditure on all private medical services apart from those to hospital inpatients. It includes consultations with general practitioners and specialists as well as pathology tests and screening and diagnostic imaging services. The 1990–91 Survey of Morbidity and Treatment in General Practice in Australia (GP survey) is used to allocate age–sex specific out-of-hospital expenditure on medical services to disease diagnoses. This allocation is done separately for general practitioners (based on encounters surveyed in the GP survey) and for 17 categories of specialists (based on the pattern of referrals to each category of specialist in the GP survey).

Age–sex specific out-of-hospital expenditure on medical services is derived from Medicare and Department of Veteran's Affairs (DVA) data. This expenditure covers all charges for which a Medicare or DVA claim has been made. It is adjusted to include expenditure for which claims have not been made using an inflation factor derived from the AIHW health expenditure data on total expenditure on medical services.

This methodology assumes that the pattern of GP services by diagnosis in 1993–94 is the same as that collected in 1990–91, that the pattern of diseases managed by each type of specialist in 1993–94 reflects the pattern of referrals to that specialist type from GPs in 1990–91 and that each referral to a specialist of a given type generates

services with equal cost. Estimates of numbers of services and costs for pathology screening tests for cervix and prostate cancer were adjusted to reflect total Medicare claims and charges for 1993–94 for Pap smears and PSA tests respectively. Utilisation and costs for Pap smears were adjusted upwards by a factor of 1.38 to take account of Pap smears read in public laboratories (Dankiw 1994).

All other screening and diagnostic tests apart from screening mammography (see *Public health programs* below) were costed based on the 1990–91 pattern of referrals by GPs using the overall average charge per pathology test in 1993–94.

Allied health services

The 1990–91 Survey of Morbidity and Treatment in General Practice in Australia and the 1989–90 ABS National Health Survey are used to allocate total Australian expenditure on allied health practitioners to age–sex–disease groups. Total visits to allied health practitioners in 1993–94 for each age–sex–disease group are estimated from the National Health Survey data on visits to 14 types of allied health practitioners in the two weeks prior to interview. Annual visits to other types of allied health practitioner are estimated from referrals by GPs in the GP survey. Expenditure is allocated assuming that all visits have the same cost. The methodology covers all allied health professionals except pharmacists (see below). Costs for dental services are allocated to the 'Digestive system' chapter of ICD–9 and account for the very large allied health expenditure for that chapter (see Table 1).

Pharmaceuticals

Total pharmaceutical expenditure is decomposed into two components: expenditures on prescription drugs and non–prescription (over-the-counter) pharmaceuticals. The 1990–91 Survey of Morbidity and Treatment in General Practice in Australia together with 1993–94 estimates of total costs and numbers of prescriptions for 40 categories of drug are used to allocate total Australian expenditure on prescription pharmaceuticals to age–sex–disease groups. Expenditure on over-the-counter pharmaceuticals is attributed to disease–age–sex groups using information from the 1989–90 ABS National Health Survey. The methodology addresses all pharmaceutical costs apart from the cost of pharmaceuticals dispensed in hospitals, which are included in estimates of hospital costs.

For each of 40 therapeutic drug groups (Pharmaceutical Benefits Pricing Authority 1994), the relative distribution of prescriptions by disease, age and sex for all community prescriptions in 1993–94 is assumed to be the same as that for prescriptions by general practitioners in 1990–91. For diseases where a significant proportion of prescriptions are made by medical specialists, this assumption may have limited validity. Detailed estimates of 1993–94 utilisation and expenditure for the 40 drug categories are used as a starting point for attribution to disease–age–sex groups. This takes into account differences in average drug costs across therapeutic categories, average numbers of repeats and relative changes in utilisation and costs across drug categories between 1989–90 and 1993–94.

There were an estimated 431,000 prescriptions in 1993–94 for anti-neoplastic and immunosuppressant drugs, at an average cost per prescription of $120, an order of magnitude greater than the average cost per prescription of $19 for all other drugs. As noted above, the methodology takes account of the high cost of these drugs.

Public health programs

Community and public health programs in general are not yet included in the estimates of disease costs due to the difficulties in obtaining comprehensive casemix data for these health sectors. However, estimates of the costs for the breast and cervical cancer national screening programs and for lung and skin cancer prevention programs have been included for this report.

Costs of mammographic screening for breast cancer under the National Program for the Early Detection of Breast Cancer are funded outside the Medicare scheme on an equal dollar-for-dollar basis by the Commonwealth and the States and Territories. The total cost of this program is estimated as double the expenditure by the Commonwealth Department of Health and Family Services in 1993–94 (Richardson et al. 1996) and the age distribution of screening obtained from evaluation data (Commonwealth Department of Human Services and Health 1994).

Costs for taking and reading Pap smears under the Organised Approach to Cervical Cancer Screening in Australia are covered by Medicare and are estimated using Medicare data as described above under *Medical services*. The additional costs of recruitment, coordination, registry and quality control reporting are funded on an equal dollar for dollar basis by the Commonwealth and the States and Territories. These additional costs are estimated as double the expenditure by the Commonwealth Department of Health and Family Services in 1993–94 (Richardson et al. 1996) and included under the *Public health* sector.

Public health program costs associated with the prevention of lung cancer have been estimated as a proportion of the total costs of anti-smoking programs in Australia in 1993–94. Michelle Scollo (personal communication, 1998) has estimated that total State and Territory and non-government expenditure on anti-smoking health education programs comprised $14.9 million in 1993–94. To this estimate has been added an estimated $2 million for tobacco legislation enforcement at State and Territory level, and $1.1 million in Commonwealth expenditure. The latter figure comprises an estimated $0.17 million in tobacco-specific programs under the National Drug Strategy and 50% of the National Drug Strategy funding of $1.9 million for school and other general drug education programs (the total expenditure on the National Drug Strategy amounted to $31.1 million in 1993–94).

Total 1993–94 expenditure on anti-smoking activity was thus estimated at $18.0 million. Lung cancer accounts for around 25% of the total disease burden attributable to tobacco smoking (English et al. 1995), so 25% of $18.0 million, or $4.5 million, was identified as public health expenditure related to lung cancer. The other $13.5 million is not included in the disease cost estimates for other diseases at this stage (the costs attributable to prevention of other smoking-related cancers are quite small). The 'lung cancer' expenditure of $4.5 million is allocated to age–sex groups in proportion to the number of smokers in each age–sex group in 1993.

Public health program costs for the prevention of skin cancer in 1993–94 are based on estimates by Carter et al. (1997). These are attributed to melanoma and non-melanocytic skin cancer on a 50:50 basis.

Research

Estimated total Australian expenditure on health and medical research for major disease and population groups in 1991 (Nicholl et al. 1994) was used to attribute 1993–94 total research spending to chapters of ICD-9. This resulted in an estimated

$74.4 million for cancer research in 1993–94. An analysis was carried out of the distribution of NHMRC grants for 1996 (NHMRC 1996) and of grants by the NSW Cancer Council and the Victorian Anti-Cancer Council. These data were used to make preliminary estimates of the distribution of research funding across cancer sites. A more detailed analysis of NHMRC and ABS data on research expenditure is being undertaken by AIHW for future disease cost estimates.

Other institutional, non-institutional and administration

Other institutional health expenditure (the Red Cross Blood Transfusion Service), other non-institutional health expenditure (Family Planning Services) and administration expenditure (Commonwealth, State and Territory health authority administration expenses and management expenses of Medicare and registered private health insurance funds) are allocated to disease–sex–age groups in proportion to total health expenditure for other health sectors.

Table B.1: Summary of methods: health system costs of cancer in Australia, 1993–94

Health sector	Basis of cost attribution to disease–age–sex groups	Data sources
Hospitals		
Acute hospital inpatients repatriation hospital inpatients	Separations weighted by DRG cost weight and length of stay	AIHW National Hospital Morbidity Database 1993–94
Public psychiatric hospital inpatients	Bed days	AIHW National Hospital Morbidity Database 1993–94
Hospital non-inpatients	For all cancers combined: number of visits in last 2 weeks. Attribution to specific cancer sites on basis of distribution of inpatient separations by site.	National Health Survey 1989–90 AIHW National Hospital Morbidity Database 1993–94
Medical services		
In-hospital medical services for private, compensable and other patients	Separations weighted by DRG-based estimated medical service cost weights.	Medicare data on fees charged for eligible in-hospital medical services in 1993–94 AIHW National Hospital Morbidity Database 1993–94
Out-of-hospital medical services	GP encounters weighted by Medicare schedule fee. Specialist referrals by GPs, weighted by Medicare data on fees charged.	Medicare data on fees charged for eligible out-of-hospital medical services in 1993–94 Australian Survey of Morbidity and Treatment in General Practice 1990–91
Pharmaceuticals		
Prescription drugs	Prescriptions weighted by relative utilisation and average prescription cost for therapeutic drug group	Pharmaceutical Benefits Scheme utilisation and cost data for 1993–94 Australian Survey of Morbidity and Treatment in General Practice 1990–91
Over-the-counter medicines	Use of non–prescription medications in the last two weeks	National Health Survey 1989–90
Allied health services	Reported visits in the last 2 weeks together with referrals by GPs	National Health Survey 1989–90 Australian Survey of Morbidity and Treatment in General Practice 1990–91
Nursing homes	For all cancers combined: number of residents by main disabling condition. Attribution to specific cancer sites on basis of distribution of transfers from acute hospitals.	Survey of Disability, Ageing and Carers 1993 AIHW National Hospital Morbidity Database 1993–94.
Other[a]		
Public health	Estimated costs for breast and cervical cancer national screening programs and for lung and skin cancer prevention programs. Costs of other public health programs not included as yet.	Harris and Scott (1995), Richardson et al. (1996), Carter et al. (1997) Medicare data on fees charged for Pap smears and PSA tests in 1993–94
Research	Estimated expenditure for major disease groups from Nicholl et al. Distributed to detailed age–sex–disease groups in proportion to NHMRC and other relevant grant distributions.	Nicholl et al. (1994) NHMRC (1996)
Other institutional, administration and other non-institutional	Allocated to disease–age–sex groups in proportion to total expenditure in other categories	n.a.

Appendix C: Health system expenditure by cancer site 1993–94

Table C.1 shows estimated resident population by age and sex at 30 June 1994, used to calculate costs per capita in this report. Table C.2 shows total estimated health system costs by detailed health sector for all cancer sites in 1993–94. Costs for each cancer site include prevention and treatment costs associated with malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour.

Table C.3 shows estimated treatment costs only by detailed health sector for malignant neoplasms only in 1993–94. These costs exclude public health sector costs, health and medical research costs, and identified costs for prevention activities within the hospital, medical and allied health sectors. Note that the limitations of ICPC coding make it difficult to accurately identify and distinguish preventive screening from diagnostic testing (see Appendix A).

Table C.4 shows estimated utilisation of health services for the prevention and treatment of cancer in 1993–94. As for Table C.2, utilisation for each cancer site relates to malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour.

Table C.5 shows estimated levels of utilisation of health services by sector and cancer site for treatment of malignant neoplasms in 1993–94. The corresponding costs are shown in Table C.3.

Table C.1: Estimated resident population of Australia, by age group and sex, 30 June 1994

Age group	Males	Females	Persons
0-4	661,464	627,683	1,289,147
5–14	1,310,151	1,243,172	2,553,323
15–24	1,396,412	1,336,297	2,732,709
25–24	2,762,031	2,761,005	5,523,036
45–64	1,842,066	1,790,447	3,632,513
65–74	596,874	672,144	1,269,018
75+	315,739	522,916	838,655
Total	**8,884,737**	**8,953,664**	**17,838,401**

Source: ABS 1996.

Table C.2: Total health system costs for neoplasms by health sector and cancer site, 1993–94 ($ million)

	Hospital inpatients					Medical Services[c]			Pharmaceuticals						
Neoplasm site[a]	Public[b] hospitals	Private hospitals	Non-inpatients	Total hospital	Nursing homes	GPs	Specialist	Total medical	Prescription	Over-the-counter	Allied health	Research	Public health[d]	Other[e]	Total costs[f]
Head and neck	22.8	5.2	2.2	30.3	0.4	0.6	1.5	2.1	0.5	0.1	0.6	1.3	1.5	—	36.8
Oesophagus	11.6	2.4	1.2	15.1	0.5	0.4	1.2	1.6	0.3	0.1	0.4	0.6	0.8	—	19.6
Stomach	22.7	6.7	2.8	32.2	0.7	0.9	1.5	2.3	0.7	0.1	0.3	0.7	1.6	—	38.8
Colorectal	93.6	57.0	20.2	170.8	4.1	3.1	8.2	11.3	3.0	0.4	0.7	6.1	8.6	—	204.9
Liver	6.1	0.9	0.5	7.5	0.2	0.2	0.5	0.7	0.1	0.0	0.2	1.3	0.4	—	10.5
Pancreas	14.4	3.5	1.1	19.0	0.7	0.9	0.4	1.3	0.7	0.1	0.1	0.6	1.0	—	23.6
Lung	64.0	10.6	6.3	80.9	1.9	3.1	3.7	6.8	2.5	0.2	2.0	4.2	4.3	4.5	107.3
Melanoma	6.9	6.0	1.8	14.7	0.4	16.9	18.1	34.9	0.2	0.8	2.0	9.0	2.4	1.3	65.6
Non-melanoma skin	58.5	49.6	17.9	126.0	6.0	37.3	39.4	76.7	1.3	2.7	2.2	6.5	9.7	1.3	232.3
Breast[g]	42.7	28.6	8.8	80.0	1.5	3.6	7.0	10.6	15.8	0.3	1.4	19.2	4.9	50.2	183.9
Cervix	15.1	4.3	3.1	22.4	0.1	1.1	45.1	46.2	0.3	0.5	0.2	1.6	3.2	11.5	86.1
Uterus	31.8	28.7	7.8	68.3	0.4	2.4	9.3	11.7	0.9	0.2	0.1	0.3	3.7	—	85.6
Ovary	15.7	6.8	2.2	24.7	0.2	0.6	2.1	2.7	1.0	0.1	0.0	1.4	1.3	—	31.3
Prostate	35.2	24.8	5.7	65.8	2.1	3.2	10.7	13.9	7.8	0.6	0.6	6.3	4.1	—	101.1
Bladder	23.8	14.0	5.3	43.1	1.4	0.7	2.0	2.7	0.8	0.1	0.3	1.1	2.2	—	51.7
Kidney	13.5	6.3	1.3	21.1	0.4	0.7	1.5	2.1	1.9	0.1	0.2	0.7	1.2	—	27.8
Brain and CNS	34.0	6.7	2.0	42.6	1.0	1.6	2.8	4.4	0.9	0.1	0.0	1.6	2.2	—	53.0
Lymphoma[g]	68.6	13.9	6.8	89.3	1.5	2.6	3.3	5.9	1.4	0.2	0.4	2.4	1.8	—	103.1
Leukemia	82.6	6.1	4.8	93.5	1.2	1.1	1.8	2.8	1.9	0.1	—	7.2	4.5	—	111.3
Other sites	190.6	60.2	29.2	280.0	6.7	5.9	14.1	20.0	3.4	0.5	0.7	2.2	16.7	—	330.2
All neoplasms	**854.2**	**342.1**	**130.8**	**1327.2**	**31.6**	**86.7**	**174.2**	**261.0**	**45.7**	**7.3**	**12.4**	**74.4**	**76.0**	**68.7**	**1904.3**

(a) Neoplasm sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour (see Appendix A).
(b) Public acute, public psychiatric and repatriation hospitals.
(c) Medical services for private patients in hospitals are included under Hospital inpatients.
(d) Includes breast, cervical, lung and skin cancer public health programs only.
(e) Other institutional, non-institutional and administration expenditure.
(f) Excludes expenditure for other public health services, community health services, ambulances, medical aids and appliances, and capital expenditure.
(g) Female breast cancers only. Lymphoma includes multiple myeloma.

Table C.3: Treatment costs for malignant neoplasms by health sector and cancer site, 1993–94 ($ million)

Cancer site[a]	Hospital inpatients				Medical Services[c]				Pharmaceuticals				
	Public[b] hospitals	Private hospitals	Non-inpatients	Total hospital	Nursing homes	GPs	Specialist	Total medical	Prescription	Over-the-counter	Allied health	Other[d]	Total costs
Head and neck	20.5	3.5	1.6	25.5	0.3	0.5	2.0	2.5	0.4	0.1	0.6	1.3	30.8
Oesophagus	11.7	2.3	1.1	15.1	0.5	0.4	1.5	1.9	0.3	0.1	0.4	0.8	19.1
Stomach	19.8	4.1	1.5	25.4	0.6	0.6	0.6	1.3	0.5	0.1	0.1	1.2	29.2
Colorectal	81.2	37.0	6.8	124.9	3.5	2.4	5.7	8.1	2.9	0.3	0.7	6.3	146.6
Liver	5.6	0.8	0.5	6.9	0.2	0.2	0.6	0.8	0.1	0.0	0.2	0.4	8.6
Pancreas	14.4	3.5	1.1	19.0	0.7	0.9	0.3	1.1	0.7	0.0	0.1	1.0	22.7
Lung	64.9	10.4	6.1	81.3	1.9	3.0	3.7	6.7	2.4	0.2	2.0	4.2	98.8
Melanoma	6.0	4.9	1.3	12.2	0.3	0.7	2.6	3.3	0.0	0.1	0.1	0.7	16.7
Non-melanoma skin	50.2	39.2	13.6	103.0	5.6	27.6	32.8	60.4	0.8	2.4	2.2	8.3	182.7
Breast[e]	36.2	22.3	6.1	64.6	1.4	2.3	3.2	5.5	14.0	0.2	0.5	4.0	90.2
Cervix	6.9	1.1	0.8	8.8	0.1	0.1	0.3	0.4	0.0	0.0	0.0	0.4	9.8
Uterus	7.1	3.2	1.0	11.3	0.3	0.2	0.5	0.7	0.6	0.0	—	0.6	13.5
Ovary	8.1	2.7	0.9	11.7	0.2	0.2	0.4	0.6	0.5	0.0	—	0.6	13.5
Prostate	37.2	25.3	5.7	68.1	2.1	3.1	5.2	8.4	7.7	0.3	0.6	4.0	91.2
Bladder	23.7	12.6	4.7	41.1	1.3	0.5	0.9	1.3	0.7	0.1	—	2.0	46.4
Kidney	13.4	6.1	1.2	20.7	0.4	0.6	1.3	1.8	1.9	0.1	0.1	1.1	26.2
Brain and CNS	21.2	3.9	1.3	26.3	0.7	0.6	0.5	1.1	0.5	0.0	—	1.3	29.9
Lymphoma[f]	48.3	8.9	4.0	61.1	0.9	0.7	1.3	2.0	1.2	0.1	0.2	2.9	68.5
Leukemia	77.3	5.1	3.7	86.2	0.5	1.1	2.2	3.3	1.9	0.1	—	4.0	96.0
Other sites	179.5	44.0	16.4	239.9	6.8	3.2	6.1	9.3	1.9	0.3	0.5	11.5	270.3
All cancers	**733.2**	**240.8**	**79.2**	**1053.2**	**28.6**	**48.9**	**71.7**	**120.6**	**39.2**	**4.4**	**8.3**	**56.6**	**1310.8**

(a) Malignant neoplasms only.
(b) Public acute, public psychiatric and repatriation hospitals.
(c) Medical services for private patients in hospitals are included under Hospital inpatients.
(d) Other institutional, non-institutional and administration expenditure.
(e) Female breast cancers only.
(f) Includes multiple myeloma.

Table C.4: Estimated health service utilisation for neoplasms by health sector and cancer site, 1993–94

	Hospital admissions ('000)			Hospital bed days ('000)			Medical services[c] ('000)						
Neoplasm site[a]	Public[b] hospitals	Private hospitals	Total hospital	Public[b] hospitals	Private hospitals	Total hospital	Non-inpatient occasions of service ('000)	GPs	Specialist	Total medical	No. of prescriptions ('000)	Allied health consultations ('000)	Nursing home residents[d]
Head and neck	6.3	1.7	8.1	36.5	7.6	44.1	33.5	19.6	38.4	58.0	22.7	35.4	11
Oesophagus	3.5	0.8	4.3	23.7	5.0	28.7	17.5	14.7	29.1	43.7	3.4	25.2	15
Stomach	6.8	3.1	9.9	40.7	11.4	52.0	42.8	30.3	48.8	79.1	9.4	17.9	20
Colorectal	34.4	31.0	65.4	169.4	87.7	257.0	305.3	101.0	177.8	278.8	2.4	38.6	113
Liver	1.7	0.3	2.0	10.9	2.6	13.6	7.8	6.2	12.3	18.4	7.5	10.7	6
Pancreas	3.2	0.8	4.0	28.5	7.8	36.3	16.6	28.6	12.3	40.9	—	6.9	20
Lung	18.8	3.0	21.7	124.4	25.9	150.3	95.1	100.1	84.1	184.2	179.9	116.7	53
Melanoma	4.0	2.4	6.5	12.3	6.9	19.2	27.2	536.2	538.9	1,075.1	—	113.8	10
Non–melanoma skin	39.6	24.5	64.1	77.5	40.8	118.3	270.8	959.3	1,171.9	2,131.2	16.0	127.9	164
Breast[e]	20.1	9.5	29.6	74.4	41.8	116.2	133.0	137.8	146.2	284.0	35.7	78.0	40
Cervix	9.2	1.9	11.1	23.2	5.2	28.5	46.6	46.9	2,509.5	2,556.4	73.3	10.3	4
Uterus	15.0	9.2	24.2	55.9	42.4	98.3	117.6	93.3	174.2	267.5	6.8	3.9	10
Ovary	5.7	1.8	7.5	31.3	11.2	42.5	32.8	23.0	38.4	61.3	37.1	1.0	6
Prostate	10.2	7.5	17.7	70.0	42.1	112.1	86.9	111.9	430.0	541.8	11.0	35.9	57
Bladder	11.5	6.3	17.8	38.8	15.8	54.6	80.5	28.3	45.3	73.5	—	19.5	38
Kidney	3.4	1.1	4.4	25.3	9.3	34.6	19.8	21.4	31.9	53.4	157.7	9.4	12
Brain and CNS	6.9	1.1	8.0	59.4	12.5	71.9	29.8	55.4	61.9	117.3	—	1.9	29
Lymphoma[f]	22.5	4.8	27.3	98.9	20.3	119.3	102.4	95.0	90.4	185.3	20.0	24.1	42
Leukemia	19.0	2.0	21.0	73.3	8.3	81.6	73.1	38.3	75.8	114.1	120.6	—	32
Other sites	64.4	22.5	86.9	358.9	107.3	466.2	441.6	207.2	246.7	453.9	579.1	39.1	183
All neoplasms	**306.4**	**135.2**	**441.7**	**1,433.3**	**512.0**	**1,397.4**	**1,980.7**	**2,654.3**	**5,963.6**	**8,049.9**	**1,282.6**	**716.2**	**864**

(a) Neoplasm sites are defined to include malignant neoplasms, benign neoplasms, in-situ neoplasms and neoplasms of uncertain behaviour (see Appendix A).
(b) Public acute, public psychiatric and repatriation hospitals.
(c) Out-of-hospital medical services only.
(d) Estimated number of nursing home residents at 30 June 1993.
(e) Female breast cancers only.
(f) Includes multiple myeloma.

Table C.5: Estimated health service utilisation for malignant neoplasms by health sector and cancer site, 1993–94

	Hospital admissions ('000)			Hospital bed days ('000)				Medical services[c] ('000)					
Cancer site[a]	Public[b] hospitals	Private hospitals	Total hospital	Public[b] hospitals	Private hospitals	Total hospital	Non-inpatient occasions of service ('000)	GPs	Specialist	Total medical	No. of prescriptions ('000)	Allied health consultations ('000)	Nursing home residents[d]
Head and neck	4.6	0.9	5.6	33.0	6.0	39.0	24.1	15.6	34.4	49.9	21.0	33.3	9
Oesophagus	3.4	0.7	4.1	23.4	4.9	28.4	16.3	11.5	25.2	36.7	15.4	24.3	15
Stomach	4.5	1.0	5.5	35.1	7.6	42.7	22.6	18.1	31.1	49.2	28.1	6.9	16
Colorectal	16.7	7.2	23.9	148.5	58.8	207.3	102.2	72.5	124.8	197.3	66.9	38.6	96
Liver	1.5	0.2	1.7	10.0	2.5	12.4	6.8	4.7	10.4	15.1	6.3	10.0	6
Pancreas	3.2	0.7	4.0	28.0	7.6	35.6	16.0	25.2	9.2	34.4	37.1	6.9	19
Lung	18.4	2.8	21.2	124.2	25.2	149.4	92.1	88.1	75.5	163.6	118.2	116.7	52
Melanoma	3.0	1.8	4.9	11.2	6.0	17.2	20.1	21.2	78.4	99.5	1.4	3.4	8
Non–melanoma skin	31.4	18.4	49.8	68.2	32.7	100.9	205.4	813.5	979.1	1,792.5	63.8	127.2	153
Breast[e]	14.2	6.1	20.3	67.1	36.4	103.5	91.9	69.7	68.8	138.5	170.9	28.5	39
Cervix	2.8	0.3	3.1	14.3	2.2	16.4	12.7	3.6	6.2	9.8	2.3	1.8	4
Uterus	2.6	0.8	3.4	13.9	5.3	19.1	14.7	7.0	9.4	16.4	13.0	—	9
Ovary	2.3	0.6	3.0	17.3	5.3	22.6	13.2	6.0	8.1	14.1	11.2	—	4
Prostate	11.3	7.4	18.8	72.5	42.0	114.4	86.2	90.0	135.0	225.0	223.6	35.9	57
Bladder	11.3	5.4	16.7	38.0	14.3	52.2	71.3	13.3	25.4	38.7	—	—	37
Kidney	3.2	1.0	4.1	24.6	8.9	33.5	17.5	17.2	28.1	45.4	34.9	4.7	12
Brain and CNS	4.5	0.6	5.1	39.4	7.9	47.2	19.5	19.6	8.2	27.8	29.0	—	20
Lymphoma[f]	13.5	2.6	16.1	67.0	12.8	79.8	60.0	21.9	37.7	59.7	19.1	13.1	25
Leukemia	15.2	1.4	16.6	62.5	6.7	69.2	56.7	31.7	75.8	107.5	27.7	—	14
Other sites	136.1	70.7	206.9	532.4	214.6	747.0	902.6	1,254.3	1,382.2	2,636.5	367.4	257.9	187
All cancers	**303.8**	**131.0**	**434.8**	**1,430.5**	**507.5**	**1,121.8**	**1,852.0**	**2,604.6**	**3,152.7**	**5,757.4**	**1,257.4**	**709.0**	**782**

(a) Malignant neoplasms only.
(b) Public acute, public psychiatric and repatriation hospitals.
(c) Out-of-hospital medical services only.
(d) Estimated number of nursing home residents at 30 June 1993.
(e) Female breast cancers only.
(f) Includes multiple myeloma.