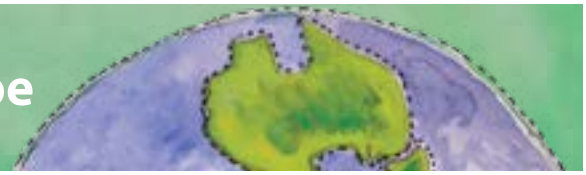
4.4 The changing cancer landscape



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There have been many successes, and there are many remaining challenges, in cancer control. While the incidence of cancer is rising, the good news is that overall average mortality at the population level is falling and real improvements in survival are continuing.

These changes in the cancer landscape are not universal, and differ greatly by cancer type and population group. The overall average is not necessarily indicative or representative of individual experience, where a diagnosis of cancer is anything but 'good news'.

The observed rise in overall cancer incidence can be broadly attributed to advancements in early detection (through organised screening programs and better detection technology), the ageing population and changes in risk factor exposure. The observed fall in the overall cancer mortality rate can be mainly attributed to a combination of earlier detection (at a more treatable stage) and more effective treatments. The number of cancer-related deaths is attributable to changes in risk factor exposure and the ageing of the population.

The net result of increasing cancer incidence and decreasing overall mortality is more people living with cancer, that is, higher and gradually increasing prevalence due to increased survival in the population. Better survival rates for some cancers bring an increasing emphasis on living with, and after, a cancer diagnosis.

This article examines broadly some features of this changing landscape through:

- describing cancer and the current disease burden
- summarising the historical gains in cancer control
- estimating the future cancer disease burden and discussing emerging issues
- outlining areas where future gains could be made.

What do we know about cancer?

Box 4.1

Defining cancer

Cancer, also called malignancy, is a term for diseases in which abnormal cells divide without control and can invade nearby tissues.

Cancer cells can also spread to other parts of the body through the blood and lymph systems. There are several main types of cancer. Carcinoma is a cancer that begins in the skin or in tissues that line or cover internal organs. Sarcoma is a cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue. Leukaemia is a cancer that starts in blood-forming tissue, such as the bone marrow, and causes large numbers of abnormal blood cells to be produced and enter the blood. Lymphoma and multiple myeloma are cancers that begin in the cells of the immune system. Central nervous system cancers are cancers that begin in the tissues of the brain and spinal cord.

Source: National Cancer Institute 2014.

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Cancer is a major cause of illness in Australia, with more than 116,500 people diagnosed with cancer in 2010 (excluding non-melanoma skin cancer), and around 43,200 dying from cancer in 2011 (see Box 4.1, Table 4.3). Cancer contributed 16% of the total disease burden in Australasia (Australia and New Zealand), based on findings from the Global Burden of Disease Study 2010. (For more information on the burden of disease, see Chapter 4 'Burden of disease'.)

In 2008–2009, the total health system expenditure in Australia on neoplasms (including cancer and non-cancerous tumours) was $4,526 million, an increase from $2,894 million in 2000–01, after adjusting for inflation (AIHW 2013). The majority of health system expenditure on cancer in 2008–09 was on hospital-admitted cancer services (79%), followed by prescription pharmaceuticals (12%) and out-of-hospital services (9%). Expenditure on national population screening programs was just over $332 million in 2008–09.

The cancer burden differs by sex, age and population group. These differences are summarised in Table 4.3.

Table 4.3: Cancer incidence, mortality and survival at a glance

	Incidence	Mortality	Survival
	There were 116,580 new cases of cancer in 2010 (excluding non-melanoma skin cancer), a rate of 487 per 100,000 people.	There were 43,211 deaths from cancer in 2011, a rate of 172 per 100,000 people.	In the period 2006–2010, 5-year relative survival for all cancers combined was 66%. That is, people diagnosed with cancer had a 66% chance of surviving at least 5 years compared with their counterparts in the general population.
	The incidence of all cancers combined was 1.4 times as high among males (585 per 100,000) compared with females (406 per 100,000).	Mortality from all cancers combined was 1.6 times as high among males (219 per 100,000) compared with females (137 per 100,000).	Females (67%) tended to experience slightly higher survival than males (65%) overall.
	Cancer can develop at any age but around 70% of all cancers are diagnosed in people aged 60 and over.	Deaths from cancer are most common among older people, with more than 80% of all deaths from cancer occurring in people aged 60 and over.	Survival decreased with age: from 86% among people aged 0–39 to 43% among those aged 80 and over.

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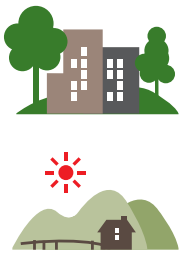
Table 4.3 (continued): Cancer incidence, mortality and survival at a glance

	Incidence	Mortality	Survival
	Indigenous Australians were 1.1 times more likely to be diagnosed with cancer in 2004–2008 compared with their non-Indigenous counterparts.	Indigenous Australians were 1.5 times more likely to die from cancer in 2007–2011 compared with their non-Indigenous counterparts.	Indigenous Australians had lower 5-year relative survival (40%) in 1999–2007 compared with their non-Indigenous counterparts (52%).
	People living in areas of lower socioeconomic status had a higher incidence of all cancers combined (490 per 100,000) compared with people living in areas of higher relative socioeconomic status (482 per 100,000), in 2004–2008.	People living in areas of lower socioeconomic status had higher mortality from all cancers combined (172 per 100,000) compared with people living in areas of higher relative socioeconomic status (151 per 100,000), in 2006–2010.	People living in areas of lower socioeconomic status had lower 5-year relative survival (63%) compared with people living in areas of higher socioeconomic status (71%), in 2006–2010.
	Incidence rates of all cancers combined were higher for Australians living in *Inner regional* areas (504 per 100,000) than people living in *Outer regional* (495 per 100,000), *Major cities* (480 per 100,000) and *Remote* and *Very remote* areas (474 per 100,000), in 2004–2008.	Mortality rates for all cancers combined were higher for Australians living in *Remote* and *Very remote* areas (196 per 100,000) and *Outer regional* areas (193 per 100,000) than for those living in *Major cities* (171 per 100,000) and *Inner regional* areas (185 per 100,000), in 2006–2010.	Five-year survival from all cancers combined was highest among people living in *Major cities* (67%) compared with *Inner regional* (66%), *Outer regional* (65%) and *Remote* and *Very remote* areas (63%), in 2006–2010.

For more information, see Chapter 4 'Cancer in Australia'.

What has changed over time?

In Australia, there are some notable historical trends in cancer incidence, mortality and survival (Figure 4.4). The trend data presented here reflect the breadth (from first to most recent year) of available national data: 1982–2010 for incidence, 1968–2011 for mortality and 1982–1986 to 2006–2010 for survival.

The overall cancer incidence rate has on average increased by 0.9% per year between 1982 and 2010 (Figure 4.4). This increase reflects annual rises in the incidence of some of the most commonly diagnosed cancers such as prostate cancer, breast cancer and melanoma of the skin, as well as some rarer cancers such as liver and testicular cancers. In contrast, the incidence of some cancers, including lung, bladder and cervical, fell significantly in that same period. There has been a moderation in the overall trend in more recent years, with incidence rising by an average of 0.5% per year from 2001 to 2010.

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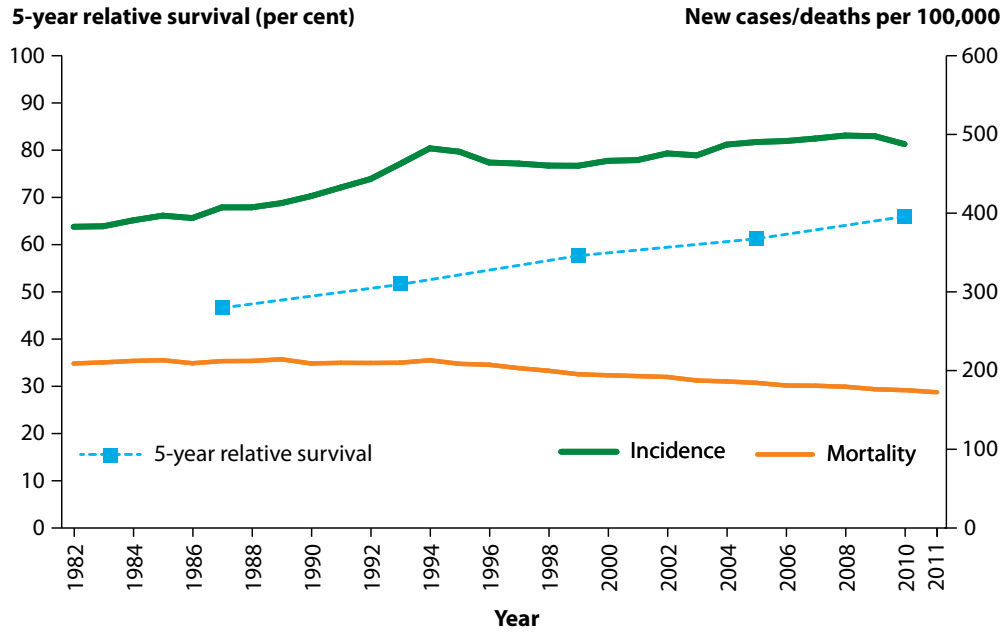
Figure 4.4



Notes

1. Deaths registered in 2009 and earlier are based on the final version of cause of death data; deaths registered in 2010 and 2011 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS. Data for 2010 have not been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010.
2. Data points for 5-year relative survival refer to the final year in each 5- or 6-year at-risk period: 1982–1987, 1988–1993, 1994–1999, 2000–2005, 2006–2010.

Sources: AIHW Australian Cancer Database 2010; AIHW National Mortality Database; AIHW 2012b.

Incidence (1982–2010), mortality (1982–2011) and 5-year relative survival (1982–1987 to 2006–2010) of all cancers combined, Australia

The good news is that despite the overall substantial increase in incidence, overall mortality on average from all cancers, including the cancers that are the leading causes of death, fell by 0.3% per year between 1968 and 2011 (Figure 4.4). This fall reflects substantial improvements in survival, thought to include substantial real gains in survival—that is, delaying death, and not only earlier diagnosis extending the measured time between diagnosis and death. There has been a gain in the overall trend in more recent years, with mortality falling by an average of 1.0% per year from 1991 to 2011.

Between 1982–1987 and 2006–2010, 5-year relative survival for all cancers combined rose from 46.9% to 66.1%, a rise of 41% across that period. This trend was observed for most, but not all, cancer types: survival from bladder, larynx and lip cancers fell, although the change was only significant for bladder cancer.

Changes in cancer incidence, mortality and survival have been shaped by a wide range of factors, including changes in exposure to the risk factors for cancer, improved primary prevention, advancements in cancer treatment, and for some cancers, earlier detection through organised screening programs (bowel, breast and cervical) and opportunistic testing (prostate) (Armstrong 2013).

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Changes in exposure to risk factors

Changes in exposure to cancer risk factors at the population level can increase or decrease cancer incidence, which in turn may produce a parallel change in cancer mortality, noting the lag in time between exposure and the onset of cancer (Armstrong 2013). For most cancers, the causes are not fully understood; however, some causal factors are well recognised, and include:

- behavioural factors such as tobacco smoking, alcohol, diet, obesity and physical inactivity
- family history, genetic susceptibility and reproductive and hormonal factors
- occupational and environmental exposures (for example, radiation, asbestos, ultraviolet light and chronic infection)
- medical and iatrogenic factors (AIHW & AACR 2012; IARC 2008; WCRF & AICR 2007).

Selected cancers strongly influenced by changes in exposure to known and quantifiable risk factors in previous decades include lung and stomach cancers, melanoma of the skin and cervical cancer.

Tobacco smoking is the largest single risk factor for lung cancer in Australia, and is responsible for about 90% of lung cancers in males and 65% in females (AIHW: Ridolfo & Stevenson 2001). Lung cancer incidence and mortality among males has declined steadily since the 1980s, which is attributed to the steadily declining rate in daily tobacco smoking: from 58% in 1964 to 16% in 2010. In contrast, for females, lung cancer incidence and mortality among females continue to rise. This is attributable to a later turnaround in smoking rates: from a high of 33% in 1976 to 14% in 2010 (AIHW 2012a; OECD 2013).

Ultraviolet radiation is the leading risk factor for melanoma of the skin. In Australia, the incidence of melanoma of the skin rose between 1982 and 2010—at around 5.0% per year during the 1980s, moderating to 2.8% per year after that. The initial rapid increase is partly attributable to individual behaviour and the use of solariums, resulting in increased exposure to solar ultraviolet radiation (Armstrong & Kricker 2001; Cust et al. 2011). The moderated trend after the 1980s is consistent with increased awareness of skin cancer and improved sun protective behaviours as a result of extensive skin cancer prevention programs dating back to the 1970s (AIHW 2012a).

The major causes of stomach cancer are the bacterium *Helicobacter pylori*, poor nutrition and smoking. There have been continuous falls in stomach cancer incidence between 1982 and 2010, and stomach cancer mortality between 1968 and 2011—2% and 3% per year, respectively. The falls are largely attributable to a decline in the prevalence of *H. pylori*, and to dietary improvements and the decline in smoking rates (Armstrong 2013). Further improvements in incidence and mortality are expected as a result of the continued decreasing trend in daily smoking.

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Chronic infection with the human papillomavirus (HPV) is the cause of around 70–80% of all cervical cancers (Brotherton 2008). The AIHW and the Victorian Cytology Service recently conducted a study to evaluate the effectiveness of the HPV vaccine against cervical abnormalities among school-aged women (Gertig et al. 2013). This study demonstrated that the population-based HPV vaccination program in Australia is preventing cervical pre-cancer lesions in young women, with a fall in cervical abnormalities after the program was implemented in 2007 (Gertig et al. 2013). The effect of the vaccine is expected to increase over time as women vaccinated at age 12–13 become eligible to be screened in the cervical screening program and enter the age ranges where cancer incidence is more common. This is an area where gains may also follow for other cancers with a similar viral aetiology (see Glossary) to cervical cancer.

Early detection through organised screening

Australia has national population screening programs for 3 cancers—breast, cervical and bowel cancer. BreastScreen Australia was introduced in 1991, the National Cervical Screening Program (NCSP) also started in 1991, and the National Bowel Cancer Screening Program (NBCSP) was introduced in 2006.

These screening programs aim to reduce illness and death from these cancers through early detection of cancer and pre-cancerous abnormalities and effective follow-up treatment. Since it was introduced, BreastScreen Australia has had a major impact in moderating an increasing incidence trend and in contributing to falling mortality in breast cancer. Similarly, the NCSP has had a major impact in enhancing decreasing trends for cervical cancer incidence and mortality (Figure 4.5).

The introduction of the BreastScreen Australia program resulted in an initial rapid increase in the number of breast cancers diagnosed in 1992–1994, followed by a more moderate increasing trend to 2010, accompanied by a steady decline in breast cancer mortality from 1994 (Figure 4.5A). The introduction of the NCSP resulted in a rapid decline (from an already decreasing trend) in cervical cancer incidence from 1991 to 2002, followed by a more stable trend to 2010 and a steady decline in cervical cancer mortality from 1991 to 2004, followed by a stable trend to 2010 (Figure 4.5B). A similar effect from the NBCSP is expected for bowel cancer in the longer term.

For more information on cancer screening programs, see Chapter 8 'Cancer screening in Australia'.

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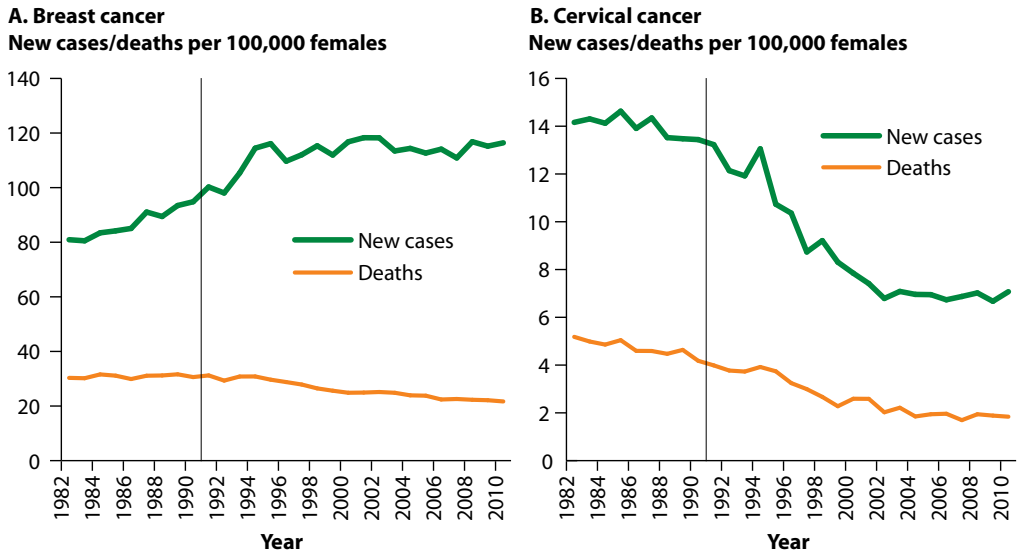
Figure 4.5



Notes

1. Deaths registered in 2008 and earlier are based on the final version of cause of death data; deaths registered in 2009 and 2010 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS. Data for 2010 have not been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010.
2. The solid vertical line at 1991 indicates the introduction of the national screening programs.

Sources: AIHW Australian Cancer Database 2010; AIHW National Mortality Database.

Incidence and mortality of breast cancer (A) and cervical cancer (B), Australia, 1982–2010

Improvements in treatment

Broadly, a variety of improvements in cancer treatments are thought to have led to improvements in cancer outcomes, particularly decreasing mortality (improved survival). These include: advances in imaging and technology used to develop and administer treatments; more focused or targeted therapies; multi-disciplinary approaches to treatment; more options in, and access to, treatment settings; and clinical trials for patients.

Examples of improvements include:

- the use of platinum-based chemotherapy, credited with the fall in mortality from testicular cancer (Einhorn 1981)
- multi-disciplinary use of chemotherapy and radiotherapy, effecting a reduction in mortality from rectal cancer (Philip et al. 1995; Roh et al. 2009; Sauer et al. 2012; Woods et al. 2001)

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- the availability of and participation in clinical trials, a significant factor in reducing mortality from childhood cancers (Stiller et al. 2012)
- the advent of targeted, precision or personalised treatments, such as Hereceptin for HER-2 type breast cancers, leading to improved survival from that breast cancer sub-type (Romond et al. 2005).

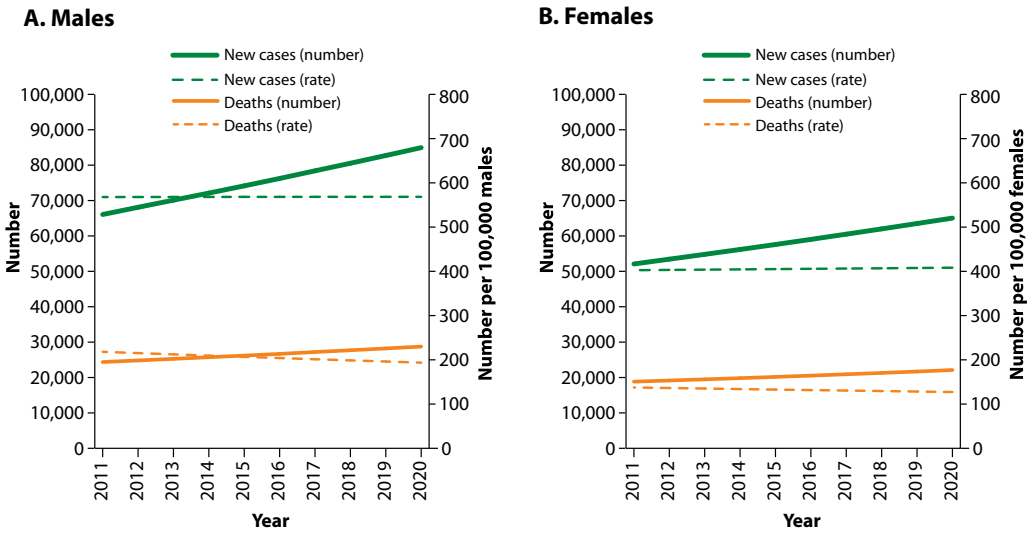
What might the future bring?

Projected incidence and mortality

Extrapolation of historical trend data for all cancer incidence (1982 to 2007) and mortality (1968 to 2010) shows that between 2011 and 2020:

- numbers of new cases and deaths are expected to rise for both males and females
- the incidence rate among females is expected to rise, although the change will not be significant
- the incidence rate among males is not expected to change
- the mortality rate is expected to fall for both males and females (Figure 4.6).

Figure 4.6



Note: Projected years 2011 to 2020 based on actual data from 1982 to 2007 (incidence) and 1968 to 2010 (mortality).
Sources: AIHW Australian Cancer Database 2010; AIHW National Mortality Database.

Projected cancer incidence and mortality among males (A) and females (B), all cancers combined, Australia, 2011 to 2020

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Based on these projections, in 2020:

- 150,000 people are expected to be diagnosed with cancer, an increase of 29% from 2010
- 50,800 people are expected to die from cancer, an increase of 18% from 2010.

Emerging issues

The combined effect of several factors—increasing incidence, decreasing mortality in some cancers, high and improving survival for some cancers, earlier diagnosis and detection, and developments in treatment and management of cancer—is a steady increase in the proportion of the population who have been diagnosed with cancer. This population is also termed the prevalent or survivorship population.

In 2007, there were around 775,000 Australians alive who had been diagnosed with cancer in the 26 years since incidence data were first collected at a national level (from 1982), accounting for 3.7% of the total Australian population in that year (AIHW 2012b). It is likely, based on the continuation of current projected trends in incidence and mortality, that this population will continue to slowly rise over time, with an accompanying rise in the economic and social burden of cancer.

This will all mean, now and into the future, major changes in the experience of cancer for some individuals, their families and carers (Hawkins et al. 2010; Quality Health 2013). It also means a challenge for the health system in responding to these changes, particularly with an ageing population.

These changes and challenges are being seen now in emerging issues such as the survivorship experience, caring for people with cancer, ageing with cancer, recurrent and multiple primary cancers, and cancer in the presence of other conditions (comorbidity).

Survivorship experience

Survivorship is increasingly recognised as beginning at diagnosis and continuing long after treatment ends. It is more than simply not dying from cancer, and focuses on living with, and after, a cancer diagnosis (Jackson et al. 2013). Cancer survivors often face emotional, physical and financial challenges as a result of the detection, diagnosis and treatment of cancer. In the longer term, people diagnosed with cancer:

- may experience enduring physical symptoms following their treatment, such as late effects of radiation or post-surgical loss of function
- can be at risk of recurrence, that is, the return of the same primary cancer after treatment and after a period during which cancer cannot be detected
- may be at increased risk of developing other primary cancers due to the effects of treatment (for example, developing leukaemia after administration of alkylating agents), underlying genetics, and/or other risk factors for cancer (Youlden & Baade 2011).

These longer-term risks, and the associated stressors and reduced quality of life for cancer survivors and their family, friends and caregivers, highlight the importance of follow-up health care and of survivorship as part of the cancer control continuum (Hawkins et al. 2010; Jackson et al. 2013).

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Cancer, caring and ageing

The increasing size of the population who have had cancer also means a corresponding increase in the number of people caring for someone through cancer diagnosis, treatment and remission, often into old age. As some cancer treatment and care modalities move away from the acute (hospital) setting and into outpatient, primary, nurse-led or community care settings, greater support for and recognition of informal carers of people with cancer will be needed (Access Economics 2010; Cancer Council Australia & Clinical Oncological Society of Australia 2010). Many cancer support organisations and groups recognise the importance and growing size of this population, and provide support to carers, siblings and friends of people with cancer (Cancer Council Victoria 2011). This shift away from the acute care setting is also apparent in palliative care, with a South Australian study reporting that 70% of respondents would prefer to die at home than elsewhere, if faced with a terminal illness such as cancer (Foreman et al. 2006). (For more information on Palliative care, see Chapter 6 'Palliative care in Australia'.)

The increasing size of the aged population in Australia is a contributing factor to the projected increase in the number of new cancer cases and cancer-related deaths to 2020. Ageing, in the context of survivorship and the increasing prevalence population, also increases the likelihood of:

- recurrent (returning) cancers, as people live longer and into old age after a cancer diagnosis
- the occurrence of multiple primary cancers, with ageing compounding the effect of existing cancer risk factors (that lead to the first primary cancer)
- cancer as a comorbid chronic disease.

The last of these, cancer and comorbidity, is discussed briefly below.

Cancer and comorbidity

As people survive longer with cancer it will become increasingly important for cancer to be considered in the context of patients' other ongoing health conditions. While it is not possible with current available data to examine the incidence and prevalence of cancer as a comorbid condition, it is possible to use mortality data to analyse the proportion of Australians who have both cancer and other conditions recorded as causes of death.

Current monitoring tends to focus on cancer as an *underlying* cause of death. However, this type of analysis excludes those deaths where cancer was an *associated* cause of death, that is, any cause other than the underlying cause. (For more information on multiple causes of death, see Chapter 3 'Multiple causes of death in Australia'.)

In 2011, cancer was recorded as the underlying cause in 43,221 deaths, accounting for 29% of all deaths in that year. Cancer was recorded as an *associated* cause in an additional 6,299 deaths, where the most common underlying causes were chronic ischaemic heart disease, acute myocardial infarction or other chronic obstructive pulmonary disease. In total, 49,520 deaths in that year (34%) included cancer as a cause of death (either underlying or associated).

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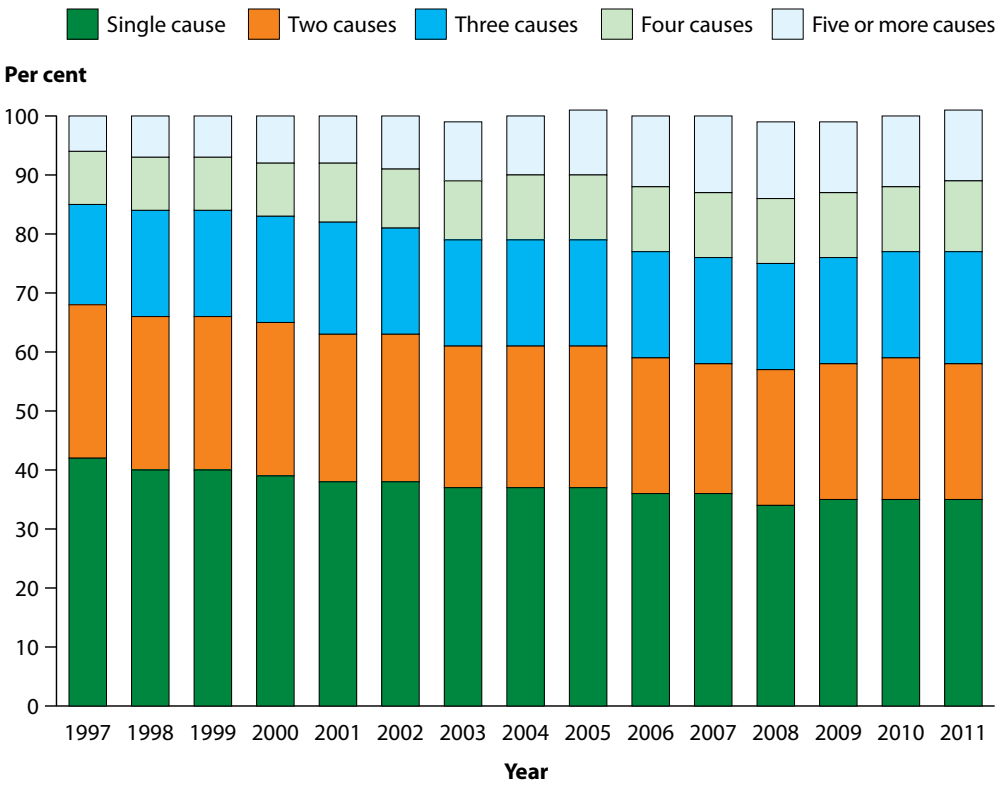
When cancer was recorded as a cause of death (either underlying or associated), it was the *underlying* cause in 87% of those deaths. Of these, 35% had only 1 cause recorded (the *underlying* cause), followed by 23% with 2 causes, 19% with 3 causes and 12% each with 4 and 5 or more causes. The proportion of deaths reported as being caused by 3 or more causes rose from 32% in 1997 to 42% in 2011 (Figure 4.7).

Figure 4.7



Note: Deaths registered in 2009 and earlier are based on the final version of cause of death data; deaths registered in 2010 and 2011 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS. Data for 2010 have not been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010.

Source: AIHW National Mortality Database.

Number of causes of death when cancer is the underlying cause of death, 1997 to 2011

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Where can future gains be made?

The data presented in the section 'What has changed over time?' indicate that, overall, there have been rises in cancer incidence, and falls in cancer mortality. This indicates that efforts in cancer control in recent decades have been successful in preventing and delaying deaths from cancer. Based on the latest projections presented in the section 'What might the future bring?', cancer incidence rates are expected to remain steady while cancer mortality rates are expected to continue to fall. For further gains to be made in cancer control, all aspects of the cancer control continuum will need attention, from primary prevention through to survivorship care. Areas where it appears that significant gains could be made are in risk reduction (primary prevention), early detection and multi-disciplinary care.

Risk reduction (primary prevention)

Reducing the risk of cancer can be achieved by reducing the prevalence of the genomic, modifiable, environmental and infectious risk factors for cancer in the population. Significant gains have already been achieved through control of modifiable risk factors such as tobacco smoking and sun exposure, and infectious risk factors such as HPV and *H.pylori*. Future approaches could build on these successes to focus on reducing modifiable risk factors such as abdominal overweight and obesity, alcohol and sedentary behaviour, and infectious risk factors such as hepatitis. Opportunities also exist in emerging technologies such as genome sequencing, which allows individuals to discover, and take appropriate preventive action to reduce or remove, their inherent cancer risk. (For more information on primary prevention, see Chapter 5 'Behavioural risk factors' and Chapter 8 'Prevention for a healthier future'.)

Early detection

Detecting cancer earlier, when it is most treatable and outcomes are likely to be better, has a significant impact on treatment outcomes and survival. Significant gains have already been achieved through the 3 existing population-based screening programs. These gains could be built on by implementing risk-based targeted screening programs and activities, expanding the existing screening programs (such as the planned expansion of the NBCSP) and investigating the potential for screening programs for other cancers where appropriate. (For more information on the existing national cancer screening programs in Australia, see Chapter 8 'Cancer screening in Australia'.)

Coordinated care models

Helping people with a cancer risk factor, pre-cancerous condition or cancer to get well and stay well will have a significant impact across the cancer continuum. Australia is fortunate in having evidence-based guidelines for all major cancers that are regularly reviewed and updated. Using standardised and coordinated approaches to survivorship care may help reduce the effect of risk factors, slow or prevent the progression of pre-cancerous conditions to cancer, improve treatment outcomes (including adverse and late effects) and reduce adverse psychosocial effects related to cancer diagnosis and treatment (Jackson et al. 2013).

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What is missing from the picture?

In Australia, we are fortunate in having access to complete, timely and quality national cancer incidence and mortality data. However, there are broad areas for improvement, as outlined below.

Gaps in cancer data and information include areas where the data are:

- not available, for example, the incidence of non-melanoma skin cancers and cancer staging data
- incomplete, or not sufficient for national reporting purposes, for example, Indigenous status data.

Gaps in cancer analysis and reporting include areas where data are:

- not yet available for analysis, for example, Indigenous trends over time
- only now becoming available for analysis, for example, longitudinal cancer incidence data for recurrent and multiple primary cancer analyses
- available but require linkage, for example, differences in cancer outcomes for people who participate in screening programs compared with those who do not.

Improvements in cancer data completeness, quality and availability will help provide a stronger evidence base on emerging cancer issues, the current and planned cancer control interventions, and future trends.

Where do I go for more information?

More information on cancer in Australia is available at the AIHW website at www.aihw.gov.au/cancer.

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