Cancer is the largest cause of disease burden in Australia.\textsuperscript{1, 2} In 2010, cancer was responsible for around 30\% of all Australian deaths.\textsuperscript{1} One in 10 hospitalisations in 2010/11 were cancer-related.\textsuperscript{3} Cancer survival in Australia has, however, improved by around 40\% over the past 3 decades.\textsuperscript{4}

The risk of cancer increases significantly with age: in 2007, the average age of a new cancer diagnosis was 67 years for males and 64 years for females. So as Australia’s population ages and treatment outcomes improve, more needs to be done to prevent, detect and treat cancer, as well as to support the increasing numbers of people living with cancer long term.

This research explores cancer outcomes over the past 20 years, using reductions in mortality over that time as a key indicator of success and as a guide to where sustained and greater effort is required to ensure future advances. This is a summary of a more detailed, cancer type–specific report that will be released in stages throughout 2013. As this summary shows, improved cancer outcomes will require all levels of government and other stakeholders, such as community groups, not-for-profit organisations and industry, to work together to provide effective cancer control programs across a spectrum spanning primary prevention, early detection and patient care.\textsuperscript{5}
Twenty-year snapshot

Cancer control policy in Australia has evolved over the past 20 years. Since the 1980s, cancer control has been incorporated into the national strategic direction, beginning with the inclusion of cancer as a national health priority area in 1996, as well as specific public health campaigns to provide cancer screening for three cancer types and to reduce modifiable risk factors. In 2005, the intergovernmental National Service Improvement Framework (NSIF) for cancer was released, outlining high-level policy priorities across the cancer control spectrum. All Australian governments, federal, state and local, endorsed the NSIF; however, there was no implementation plan. A number of the NSIF initiatives have nonetheless been implemented over subsequent years.

Currently, the range of public health and preventive services in Australia are coordinated and administered by intra- and intergovernmental agencies. Services that relate to cancer control are:

- Immunisation services and other communicable disease control
- Programs to reduce the use and harmful effects of tobacco and alcohol
- Prevention programs to reduce weight gain and to promote physical activity and healthy eating choices
- Programs to promote sun protection
- Environmental monitoring and control, including management of harmful chemicals
- Screening programs for breast, cervical and bowel cancer.

Most population-based interventions are targeted at people under the age of 75 years, where actions could prevent cancer and mortality benefit is likely to be greater. An analysis of changes in cancer mortality over two decades could provide some insight into the impact of prevention, screening, diagnosis and treatment advances.

Cancer Council NSW research

Our report compares and analyses cancer mortality in Australia in 2007 with baseline data from 1987, a time when several cancer control programs were in their infancy. It tracks improvements in mortality by cancer type, as well as the relative lack of progress for some forms of cancer.

In doing this, we can estimate what Australia’s cancer mortality profile for people under the age of 75 years might have looked like in 2007 had a number of improvements in cancer control not been introduced (using 1987 as a baseline). The analysis also shows where improvements in mortality reduction have not occurred. The annual numbers of deaths for each major cancer type were obtained from the Australian Bureau of Statistics. We then compared expected and observed numbers of cancer deaths in 2007, based on the mortality rates reported in 1987.
Key findings

Overall, 7,827 (28%) fewer deaths occurred in 2007 than would have been expected based on 1987 rates (20,104 observed vs. 27,931 expected), and over the full period from 1987 to 2007, there were 61,190 fewer deaths than expected, had the cancer death rate in 1987 remained constant. The difference varies greatly between cancer types, and the table and figure below show the three cancer types with the largest reductions in mortality between 2007 observed and expected figures – lung, bowel and breast cancers. While improvements can be seen in a number of areas, there are also a group of cancers, which are reasonably common (over 500 deaths in under-75-year-olds) but which show little or no improvements in mortality, including pancreatic, oesophageal, and brain and related cancers – these numbers are also shown in the table and figure below.

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Observed deaths in 2007 (O)*</th>
<th>Expected deaths in 2007 (E)*</th>
<th>Difference (O-E)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
</tr>
<tr>
<td>TOTAL – all cancers</td>
<td>11,535</td>
<td>8,569</td>
<td>20,104</td>
</tr>
<tr>
<td>Top 3 Reductions In Mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>2,668</td>
<td>1,555</td>
<td>4,223</td>
</tr>
<tr>
<td>Bowel</td>
<td>1,197</td>
<td>791</td>
<td>1,988</td>
</tr>
<tr>
<td>Breast (Female)</td>
<td>-</td>
<td>1,691</td>
<td>1,691</td>
</tr>
<tr>
<td>Little Change In Mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain And Related</td>
<td>535</td>
<td>334</td>
<td>869</td>
</tr>
<tr>
<td>Pancreas</td>
<td>678</td>
<td>442</td>
<td>1,120</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>506</td>
<td>112</td>
<td>618</td>
</tr>
</tbody>
</table>

* All figures have been rounded

Table 1: Mortality rates: number of observed deaths in Australia in 2007 compared to the expected number of deaths based on 1987 rates for people aged under 75 years

Figure 1: Difference in observed and expected number deaths in Australia 1987–2007 (under 75 years of age) by cancer type
**Top three cancers with reduction in mortality**

**Lung cancer** is the largest cause of cancer death in Australia now, as it was in the late 1980s. However, deaths from lung cancer have fallen in greater numbers than for any other cancer type over the past 20 years, largely as a result of declines in male smoking since the 1970s – there is usually a time lag between smoking behaviour and lung cancer diagnosis. There were 2,154 fewer lung cancer deaths in 2007 than we would have expected from the 1987 baseline. A large proportion of lung cancer cases in Australia are attributed to tobacco use (65% in females, 90% in males). The popularity of smoking in Australian women peaked at a later time than in men. We are yet to see the relative declines in lung cancer in females that have been observed in males. It is important to note that Australian males smoke at higher rates than females in all but one age group (12- to 17-year-olds), and that lung cancer deaths in men are still significantly higher than in women.

It is also important to note that while reduced numbers of lung cancer deaths in the past 20 years are a success story for tobacco control, lung cancer survival after diagnosis has not improved significantly, so research into improved lung cancer outcomes should be a high priority.

**Bowel cancer** mortality fell by 1,797 deaths between 1987 and 2007. Reduced mortality is probably due to improved treatment technology and adherence to national management and treatment guidelines. Early detection may also have had an impact, though there was no organised screening during our research period, apart from the dissemination of faecal occult blood test kits to a limited age group from late 2006.

The greatest future reductions in bowel cancer mortality across the whole population are expected to be gained from population-wide screening. Individual behaviour modifications, such as increased physical activity, can also reduce bowel cancer risk. Despite the welcome mortality reductions since 1987, bowel cancer remains the second-largest cause of cancer death in Australia, yet it is one of the easiest cancers to treat if detected early.

The National Bowel Cancer Screening Program currently targets Australians turning 50, 55 and 65 years with a one-off screening test. Those turning 60 in 2013 will be recruited from 1 July this year, with 70-year-olds being included from 1 July 2015. These are welcome program expansions; however, the evidence shows that all Australians aged 50 and over should be screened every two years. Independent public health and medical authorities need to continue to call on the Federal Government for an expedited expansion of the screening program, which is not scheduled for completion until 2034.
Breast cancer mortality fell by 773 deaths between 1987 and 2007 and this reduction is likely to be due to a combination of earlier detection and improved treatment. Australia’s free mammographic screening program, BreastScreen Australia, was phased in from the late 1980s and fully in place by the mid-1990s\textsuperscript{25}, and is estimated to reduce breast cancer mortality among participants by about half.\textsuperscript{26} The management of early breast cancer improved with the introduction of clinical practice guidelines in 1995. These guidelines led to increased use of adjuvant radiotherapy, chemotherapy and hormone therapy in oestrogen receptor–positive women (mainly tamoxifen until the late 1990s and then aromatase inhibitors and luteinising hormone–releasing hormone analogues thereafter).\textsuperscript{27,28} Additionally, population risk has been reduced through changing behaviours. For example, after the use of hormone replacement therapy was linked to breast cancer incidence in 2001, its use dropped dramatically among women aged 50 and over, corresponding with a concomitant 6.7% fall in incidence.\textsuperscript{29} Many risk factors associated with breast cancer are unavoidable (such as having a low number of children), but there are lifestyle factors, such as increased physical activity, reduction in obesity and reduced alcohol consumption, that could reduce breast cancer risk.\textsuperscript{30}

Cancer types with little improvement in mortality

Brain and related cancers (comprising also small numbers of other central nervous system cancers), fell by 148 deaths from 1987 to 2007. Brain cancer has a low survival rate but is not generally common in Australia. However, it is one of the leading causes of death in young Australians.\textsuperscript{31} Survival is closely related to age at diagnosis and histology.\textsuperscript{32} Advances in treatment methods have been limited.\textsuperscript{32} Little is known about environmental causes of brain cancer, despite extensive research.\textsuperscript{33} International work on cellular phone use has not found any associations with increased brain cancer risk.\textsuperscript{33,34} Further research is needed in identifying molecular markers of brain cancer and improving treatment to reduce mortality.\textsuperscript{33}

Pancreatic cancer showed a small reduction of 69 deaths from 1987 to 2007, a reduction which was not statistically significant. Pancreatic cancer has a poor prognosis and is difficult to treat.\textsuperscript{35,36} Tobacco smoking is attributed to 20–25% of the pancreatic cases worldwide, and is considered the most significant of all its modifiable risk factors.\textsuperscript{21,35,37} Beside tobacco, current research indicates that other factors, such as ‘body fatness’ assessed using BMI, abdominal girth and adult weight gain, are associated with increased risk of pancreatic cancer.\textsuperscript{38} The risk of developing pancreatic cancer increases with age, and as a result, is uncommon in people under 50 years of age unless there is a family history of a rare genetic disorder.\textsuperscript{21,35,37} Localised cases of pancreatic cancer also have poor survival rates, suggesting that early detection through screening would be of limited benefit.\textsuperscript{35} Improvements in diagnostic techniques to detect precursor cells, as well as new treatments, could help reduce mortality.
Oesophageal cancer mortality fell by 64 deaths between 1987 and 2007, not a statistically significant reduction. Worldwide estimates show oesophageal cancer is more common in males than in females, which is the case in Australia as well. The prognosis is often poor and treatment is usually palliative rather than curative. The main risk factors for oesophageal cancer are tobacco consumption, alcohol consumption, gastro-oesophageal reflux and obesity, depending on the subtype. As a result, public health interventions to reduce obesity, alcohol intake and smoking could further aid the prevention of oesophageal cancer. In addition, greater emphasis should be placed on advancements in diagnostic methods and improvements to curative treatment which could lead to future reduction in mortality.

Where to from here

Cancer control measures in Australia have been effective in reducing the number of cancer deaths over the past two decades. Prevention (particularly tobacco control), improvements in treatment and the introduction of screening programs have all played an important role in reducing mortality, and will continue to be critical. These interventions need to be maintained at their current rate to sustain the progress that has already been achieved, and enhanced to keep up with population growth and to increase coverage to populations that have been underserved.

Recent investments and actions to address tobacco control, including a tobacco tax increase, mass media campaigns and advertising restrictions, such as plain packaging for cigarettes, should translate to further reductions in smoking-related cancers. An expanded bowel cancer screening program would conservatively be expected to prevent between 300 and 500 deaths per year.

However, the Australian healthcare system has limitations in treating the needs of patients with chronic illnesses, as it has historically focused more on acute care. The challenges of caring for an increased number of cancer patients at a time when population ageing will place other pressures on the health system will be significant. We can expect to see increases in the numbers of cancers related to obesity, with the high and increasing numbers of people being classified overweight and obese – as well as increases in cases of other prevalent diseases such as cardiovascular disease and diabetes.

As a nation, Australia is progressing well, with life expectancies for males (80 years) and females (84 years) exceeding those of the UK, USA and Canada, and just below those of Japan (87 for females and 80 for males). With ageing populations, and guidelines focusing on treatment and management restricted to patients under the age of 75, reassessment of current protocols are needed. The reduction in cancer mortality shows that we are being successful and heading in the right direction. However, cancer types with little improvement in mortality reduction require more investment in research. There is also significant potential to further reduce the number of deaths from cancers for which mortality has declined over the past 20 years.
References


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