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In this section, eight cancer types are outlined briefly as a way of contextualising the analysis and highlighting cancer types that are important in Australia – either because of their public health programs or because of large incidence or mortality percentage changes – to illustrate how policy, programs or other changes may have affected these measures. These have been selected based on a combined list of the top five cancer sites for males and females in incidence and mortality according to IARC GLOBOCAN 2008 working estimates, and cancer types of national importance in Australia.5

Firstly, trends in incidence and mortality for the cancer type are described – including data from the IARC GLOBOCAN project to illustrate global incidence and mortality working estimates for 2008 in individuals aged 74 years and under. Additionally, the most current survival data available for Australia from the AIHW are also provided.3 The AIHW survival data are presented to provide context rather than to facilitate a comparison between survival trends and our findings. However, the AIHW data were only available for all ages combined. The relative survival and five-year conditional relative survival data reported by the AIHW show the probability of surviving a given number of years, provided that an individual has already survived a specific amount of time after diagnosis.3

A brief overview of current prevention strategies, screening programs and treatment methods in use globally and in Australia are also provided. The results of our analysis for the specific cancer type are then presented and discussed.
7.1 Breast cancer (C50)

7.1.1 Background
Breast cancer is the most common cancer diagnosed in females globally. Males can also develop breast cancer but it is a rare condition, with less than 1% of breast cancer cases reported in males. IARC GLOBOCAN 2008 working estimates show that the incidence for breast cancer was 36.3/100,000 in females up to 74 years of age, with considerable variability by region. Incidence is much higher in Western Europe and Australia/New Zealand than in less developed regions such as Eastern Africa. Improved diagnosis and increased use of screening partially accounted for rising number of incident cases of breast cancer until a recent reversal of trends in Western countries, attributed to the reduced use of HRT. The mortality rate for breast cancer is 10.9/100,000 in females under 75 years of age and is decreasing globally.

The incidence of breast cancer in Australia rose until the late 1990s but has recently levelled off, and has been decreasing since about 2000. Relative survival is high with an 89% probability of surviving for at least 5 years at diagnosis. The 5-year conditional relative survival was 90% at 1 year and 95% at 5 years after diagnosis. Survival rates, however, are negatively affected by remoteness and socioeconomic group, with more disadvantaged groups having lower survival.

7.1.1.1 Causes and risk factors
Having first-degree relatives with breast cancer doubles the relative risk, while having second-degree relatives with breast cancer increases risk to a lesser extent. Other non-modifiable risk factors for breast cancer include being female, age, breast density, and hormonal factors such as early menarche and late menopause. The risk of breast cancer is higher in females who have a high concentration of the endogenous hormone oestradiol. Multiple risk factors are associated with reproductive history (including low parity, lack of breast feeding and late age for first birth). Obesity is correlated with increased risk. Proven causative agents include alcohol consumption, certain oral contraceptive and HRT formulations, and ionising radiation.

Environmental and lifestyle factors account for more cases of breast cancer than familial history and inherited genetic characteristics. Childbearing is reported to have a protective effect; however, this effect has been isolated to particular age groups, with younger females who have ever given birth being at higher breast cancer risk.
An evaluation of existing evidence, led by the World Cancer Research Fund, has found:

- **Convincing evidence for:**
  - Lactation decreasing risk of breast cancer in pre- and postmenopausal women
  - Consuming alcoholic drinks increasing risk of breast cancer in pre- and postmenopausal women
  - Body fatness and factors leading to greater adult-attained height increasing risk of breast cancer in postmenopausal women

- **Probably evidence for:**
  - Body fatness decreasing risk of breast cancer in premenopausal women
  - Physical activity decreasing risk of breast cancer in postmenopausal women (evidence is only limited for premenopausal women)
  - Greater birth weight and factors leading to greater adult-attained height increasing risk of breast cancer in premenopausal women
  - Abdominal fatness and adult weight gain increasing risk of breast cancer in premenopausal women

No dietary factors apart from alcohol consumption have been consistently associated with risk of breast cancer. Despite earlier indications, consumption of fruit or vegetables is not established at the level of ‘limited–suggestive’ evidence as decreasing risk of breast cancer overall in premenopausal or postmenopausal females.

During menopause, limited or no use of HRT has been shown to reduce risk in comparison to continuous use. In an Australian study, a reduction in prescribing of HRT between 2001 and 2003 coincided with a fall in breast cancer incidence in females aged 50 and over. HRT users, depending on the type of treatment, have an elevated risk, which reduces when use is ceased.

Additional modifiable risk factors for all females include X- and y-radiation and alcohol consumption, with an estimated 12% of all breast cancer cases in females 18 and over attributable to alcohol consumption. Combined oestrogen and progesterone oral contraceptive use is also linked to slight increased risk of breast cancer.

The findings of a global collaboration found that risk was increased (1.07–1.24) in premenopausal females either currently using contraception or having ceased it within 10 years; however, there was no increase in risk 10 years after cessation. Similarly, a South African study found negligible risk in breast cancer patients 5 years after cessation.

There are a number of breast tumour subtypes that are associated with differing risk factors. Hormone receptor–positive tumours, in comparison to hormone receptor–negative tumours, have been more strongly associated with reproductive factors such as menarche at an early age, lack of childbearing, higher body mass index (BMI) in younger females and increased age at first full-term birth. Hormone receptor–negative tumour risk was inversely associated with vegetable consumption. Core basal phenotype breast cancer appears to have a different aetiology to other breast cancer types and consequently other risk factors. Importantly, this would suggest that certain breast cancer subtypes may, in future, require specialised risk models and specialised screening and prevention programs.

### 7.1.2 International prevention/screening/treatment programs

Some potential chemopreventive drugs have been identified for the prevention of breast cancer. Both tamoxifen and raloxifene reduce the risk of breast cancer, especially in high-risk females. However, further research is required to confirm the exact treatment effects and adverse outcomes. For example, tamoxifen has been convincingly identified as a cause of endometrial cancer, and its use in breast cancer treatment must incorporate additional risk to females.

Population-based screening programs for breast cancer have been established in many countries for females aged 50 years and over, and overall, showed a reduction in breast cancer mortality in past randomised controlled trials. National screening programs, however, have been clouded by conflicting expert opinion on their effectiveness. Some experts argue that screening plays an important role in identifying cancerous growths when they are small and more easily treated, leading to
earlier intervention and more successful treatment.\textsuperscript{20} Others claim that the benefit provided by screening is outweighed by overdiagnosis, a combination of diagnoses brought forward in detection time and asymptomatic cancers detected through screening.\textsuperscript{95} Generally, overdiagnosis is compensated for by the lack of screening in older age groups, but adequate follow-up is required for this to be reflected accurately in study results.\textsuperscript{95} Claims of overdiagnosis resulting from screening have stemmed from differing study methods used to assess its impact.\textsuperscript{90, 95} It has been suggested that the frequency of mammographies could be personalised for individuals based on risk factors, to reduce overdiagnosis and unnecessary screening.\textsuperscript{96}

Reductions in mortality resulting from organised screening programs are similar to, but not greater than, those from past randomised controlled trials, suggesting that more time may be needed to identify any further trends of screening impact.\textsuperscript{91} Population studies are often used in national program assessment, which are an important starting point, but need to be supported by cohort or case-control studies based on individual data which is closer to the evaluation method used in the original randomised controlled trials.\textsuperscript{91} It may take many years before population data show a true change due to screening; and realising full implementation of a national program also requires time and relies on a larger number of professionals to deliver the service.\textsuperscript{90} This suggests that ecological studies\textsuperscript{11}, although commonly used, are not always appropriate to assess results of screening programs.\textsuperscript{91}

Taking this into account, reportedly two lives are saved for every case overdiagnosed in Europe.\textsuperscript{98} After adjusting for differing study methods, an approximate 26\% reduction in mortality was found after 6–11 years of follow-up in a number of European studies.\textsuperscript{99} Advances in treatment explain a proportion of the fall in mortality rates, and further advances in technology will continue to change programs and affect incidence and mortality rates.\textsuperscript{90, 92-94, 100, 101}

The Australian national screening program (BreastScreen) was initiated in 1991, and under this scheme, females are invited to participate in fully funded mammograms every two years (see section 8.3.5.8).\textsuperscript{1} Recalling that the scientific rationale for this is unclear. In 2009–2010, 55\% of females aged 50–69 participated in the screening program.\textsuperscript{6} An analysis of BreastScreen participation in South Australia showed a 30–41\% reduction in mortality for females aged 50 or over.\textsuperscript{103} A Western Australian study also suggests a reduction in mortality by about half due to screening.\textsuperscript{23} In 2007, the BreastScreen Australia Evaluation Advisory Committee undertook an appraisal of the program, and their recommendations supported the program’s continuation – but suggested changes to the target groups and frequency.\textsuperscript{26} Not all these recommendations have been implemented yet.\textsuperscript{98}

Treatment options depend on the extent and subtype of the cancer, and can range from lumpectomy (removal of the tumour) to mastectomy (complete removal of the breast). This may be followed by radiation therapy, chemotherapy, hormone therapy or other targeted therapy.\textsuperscript{20} Short-term survival and recurrence can be positively influenced by the use of aspirin, according to an American study.\textsuperscript{104} Tamoxifen is also used to treat patients with oestrogen receptor–positive breast cancer to reduce the risk of recurrence during treatment and for up to 10 years after treatment.\textsuperscript{105} The use of tamoxifen generally ceases after 5 years, but a recent study has suggested value in continuing treatment for 10 years after initial treatment, as it reduces recurrence and mortality.\textsuperscript{105} Tamoxifen, however, has side effects that need to be considered before recommending prolonged use.\textsuperscript{21} When examining long-term survival, the most important predictors are tumour size, lymph node status and grade.

In Australia, 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 patients.\textsuperscript{2, 106} In contrast to the AIHW findings, a review of the literature found that factors such as age and SES have a lower association with long-term survival when other prognostic factors are also taken into account.\textsuperscript{107}

Recurrent incidence of breast cancer can increase in survivors with regular alcohol consumption – especially in postmenopausal and overweight/obese females.\textsuperscript{108} A healthy lifestyle is associated with increased long-term survival. Other risk factors can increase recurrence and impact the clinical behaviour of a tumour and, therefore, affect survival.\textsuperscript{107}

\textsuperscript{11}Ecological studies are where the units of observation are populations rather than individuals
7.1.2 Incidence and mortality rates in Australia 1987-2007

Our analysis shows that between 1987 and 2007, breast cancer incidence has increased from the expected numbers by 34%, while mortality has reduced by 31% (Table 7–1). Both changes were statistically significant (Table 7–2) and are largely attributed to the national screening program, improved management of breast cancer and reduced population risk through changing behaviour. For example, after the use of HRT was linked to breast cancer incidence in 2001, its use dropped dramatically among females aged 50 and over, corresponding with a concomitant 6.7% fall in incidence. Incidence and mortality rates from 1987 to 2007 are illustrated in Figure 7–1 and Figure 7–2.

Figure 7–1
Breast cancer deaths and incident cases in Australia 1987-2007

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths¹</td>
</tr>
<tr>
<td>Observed in 2007 (O)⁴</td>
<td>1,691</td>
</tr>
<tr>
<td>Expected in 2007 (E)⁵</td>
<td>2,464</td>
</tr>
<tr>
<td>Difference (O-E)</td>
<td>-773</td>
</tr>
<tr>
<td>Change in (O-E)/E (%)</td>
<td>-31</td>
</tr>
</tbody>
</table>

¹An average of the observed rates for 2006 to 2008 was applied to the 2007 population to calculate the observed number of deaths and incident cases for 2007.
²An average of the observed rates for 1986 to 1988 was applied to the 2007 population to calculate the expected number of deaths and incident cases for 2007.
³All figures have been rounded to the nearest whole number.

<table>
<thead>
<tr>
<th></th>
<th>Mortality</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AAPC</td>
<td>Confidence Interval (95%)</td>
</tr>
<tr>
<td>Male</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td>-1.8</td>
<td>-2.2, -1.5</td>
</tr>
<tr>
<td>Persons</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Increase in breast cancer incidence globally has been attributed to changes over time in screening practices, childbearing and breastfeeding; HRT intake; and other lifestyle factors, such as obesity and limited physical activity. Evidence has shown that earlier detection, modern therapy and healthier lifestyles can improve the long-term survival of breast cancer patients.

Long-term survivors of breast cancer generally have a good quality of life. Patient factors positively influencing quality of life, as evidenced in a systematic review, were not undergoing chemotherapy treatment, receiving emotional support from family and friends, and having a relatively high income. Breast cancer in females under 50 years of age is sometimes more aggressive and presents with a different set of issues, including infertility, early menopause and recurrence of breast cancer. This group was also more likely to suffer from depression and the anxiety about the prospect of breast cancer recurrence.

In 2004/05, 24% of Australian government expenditure for cancer was allocated to breast cancer. The largest proportion of this was spent on screening services, followed by hospital admitted–patient services. The total value of this expenditure on breast cancer was approximately AUS$331 million. Breast cancer incidence (2004–2008) decreased with geographical remoteness and increased with improving SES. Breast cancer is also a high health system burden with an increase of 72% in the number of females hospitalised due to breast cancer between 2000/01 and 2009/10.

In Australia, the increase in incidence is attributed to the success of the BreastScreen program, which is part of the Australian Government’s cancer prevention strategy developed nationally but managed at a state/territory level. Continuous evaluation of the BreastScreen program’s effectiveness is essential to maintaining an optimal use of budgetary health care spending and ensuring the most at-risks groups are being targeted. As outlined in the BreastScreen evaluation, the current system capacity will not be able to meet demand in the years to come. Revisions have been recommended to various aspects of the program to improve its efficiency. A key recommendation of the evaluation was improved national policy leadership to facilitate the availability of an equitable service across the nation. The national accreditation process for the provision of screening services is also being reviewed to improve the standardisation of the program across locations. No reliable national data currently exist on mammography screening coverage.
7.1 Breast cancer

References


