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Mortality and incidence trends for leading cancers in Queensland, 1982 to 2002

Lisa Hall, Danny Youlden and Michael Coory, Health Information Branch, Information Directorate, Queensland Health

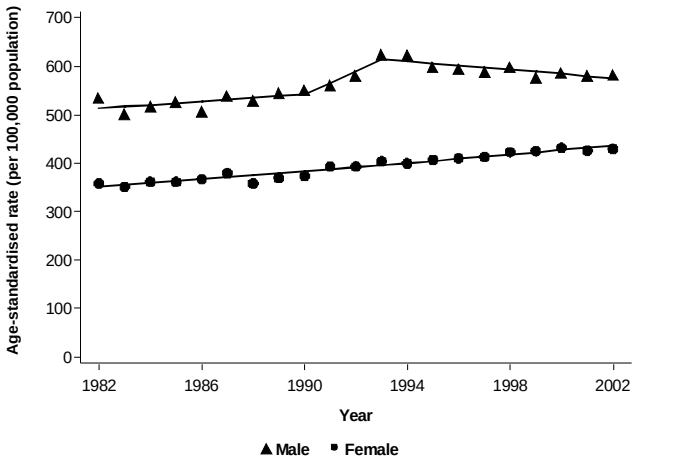
Summary

- The aim of this publication is to provide an update on the cancer mortality and incidence trends in Queensland, using the latest data available (1982 to 2002). Trends are presented for all cancers combined and for the seven National Health Priority cancers: lung, colorectal (large bowel), prostate, breast, cervix, melanoma and non-Hodgkin's lymphoma. Results for two other important cancers, stomach and ovary are also reported. Trends for males and females are presented separately.
- For certain cancers the trend was not the same over the entire period 1982 to 2002. For example, a slow increase occurred for breast cancer mortality between 1982 and 1994, followed by a decrease in more recent years. A statistical technique called "joinpoint analysis"[1] was used to describe changing trends over successive segments of time (see Appendix A).
- Mortality rates for all cancers combined have been decreasing for both sexes since the mid-1990s. For women, the overall decline in cancer mortality rate corresponds with improvements in mortality due to breast cancer and continuing decreases in mortality from colorectal, cervical, stomach, and ovarian cancer. For men, the recent decline in the overall cancer death rate appears to be mainly driven by recent improvements in mortality from prostate cancer and continuing improvement in mortality due to lung, colorectal and stomach cancer.
- Mortality has continued to increase significantly for lung cancer among women. The number of lung cancer deaths among females in Queensland exceeded the number of breast cancer deaths for the first time in 2002.
- Mortality has continued to increase significantly for non-Hodgkin's lymphoma for men.
- Trends in the incidence of cancers are sometimes difficult to interpret and may be related to changes in screening practices and public awareness, rather than a real change in the underlying incidence of the specific cancer.
- The incidence rate (or rate of new cases) of cancers increased consistently among women during the entire period 1982 to 2002. This was driven mainly by significant increases in breast cancer, lung cancer, non-Hodgkin's lymphoma and melanoma, while cancer of the cervix and stomach cancer have shown a drop in the incidence rate. In contrast to females, trends in the incidence of cancer among men have decreased recently, associated with continuing decreases in lung and stomach cancer. However, the incidence of melanoma and non-Hodgkin's lymphoma continue to increase among men.

Incidence trends for all cancers combined

A total of 17,938 new cancers (incidence) were diagnosed in Queensland during 2002. Of these, 9,804 new cancers were reported for males and 8,134 for females.

Figure 1. Incidence trends for all cancers combined by sex, Queensland, 1982-2002



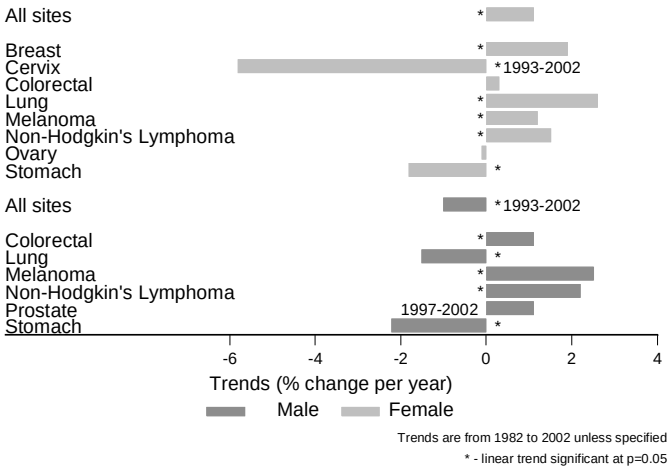
Rates standardised to Australian 2001 population

For females, overall cancer incidence continued to increase by 1.1% per year (Figures 1 and 2, Appendix B). Increases in the incidence of breast cancer (mainly due to increased screening), lung cancer, non-Hodgkin's lymphoma and melanoma are driving this trend. There have been significant decreases in incidence for cervical and stomach cancer.

For males, cancer incidence increased to 1993 but since then has decreased by 0.7% per year (Figures 1 and 2, Appendix B). This recent trend is due to significant decreases in the incidence of stomach and lung cancer and a large fall in the incidence of prostate cancer during the mid-1990s, which probably represents

depletion of prevalent cases from the pool of men having prostate-specific antigen (PSA) testing during that time[2]. The incidence of prostate cancer has been on the increase again since 1997, but this latest trend is not statistically significant. The trend for all cancers has been somewhat offset by increases in the incidence rates of colorectal cancer, non-Hodgkin's lymphoma and melanoma.

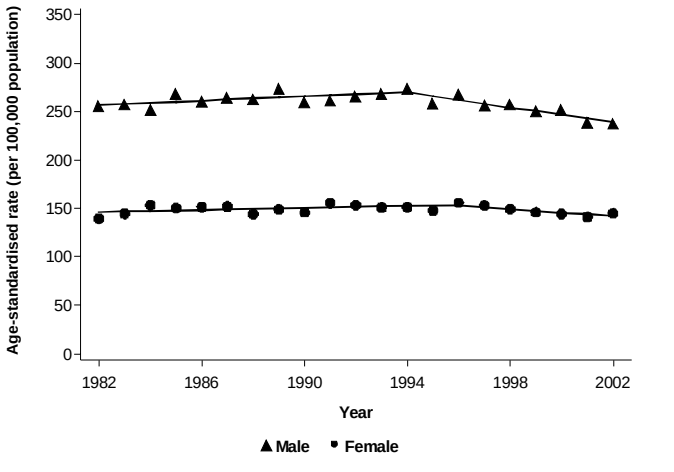
Figure 2. Recent trends in incidence by type of cancer and sex (annual percentage change)



Mortality trends for all cancers combined

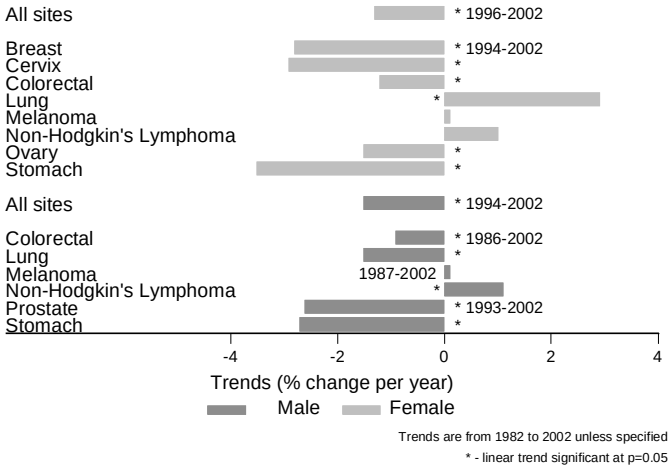
In 2002 there were a total of 6,610 deaths from cancer recorded in Queensland (3,804 males and 2,806 females).

Figure 3. Mortality trends for all cancers combined by sex, Queensland, 1982-2002



For females, the mortality rate increased slightly (0.3% per year) from 1982 to 1996 but has since decreased by 1.3% per year, corresponding to an overall decrease in the mortality rate for women of 7.3% between 1996 and 2002 (Figures 3 and 4, Appendix C). This decrease in the cancer mortality rate for females is due to a falling trend in mortality for breast cancer since 1994 and continuing decreases in the mortality rates for stomach, cervical, ovarian and colorectal cancer. In contrast to the overall decline in mortality rates, there have been large increases in mortality among women for lung cancer, with the rate increasing by 2.9% per year. This continuing increase means that the number of lung cancer deaths among females in Queensland exceeds the number of breast cancer deaths for the first time in 2002. The mortality rate for non-Hodgkin's lymphoma has continued to increase slowly over the study period; however this increase is not statistically significant.

Figure 4. Recent trends in mortality by type of cancer and sex (annual percentage change)



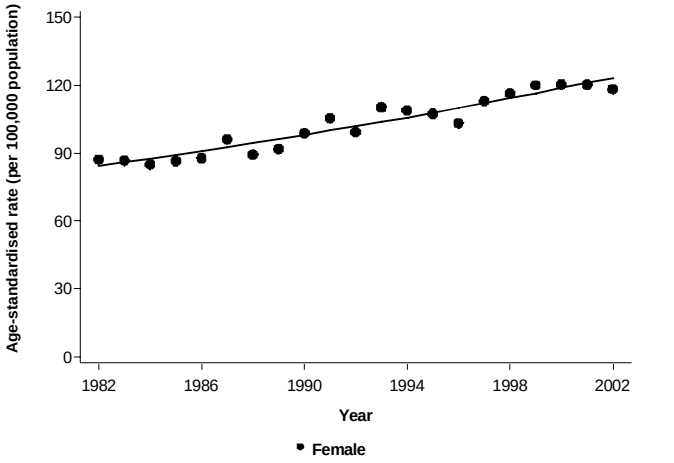
The pattern of mortality rates for males for all cancers combined is very similar to that observed for females with an increase of 0.4% per year between 1982 and 1994, followed by a decrease of 1.5% per year since then (Figures 3 and 4, Appendix C). This represents a significant decrease in the cancer mortality rate for males of 11.5% for the eight years from 1994 to 2002. The down turn in mortality for males is due to recent decreases in mortality from prostate cancer and continuing improvements in mortality caused by lung, stomach and colorectal cancers. However, there have been significant increases in mortality due to non-Hodgkin's lymphoma.

Specific cancers

Breast cancer

Breast cancer is a common cancer among women, both in terms of incidence and mortality. The incidence of breast cancer has continued to increase by 1.9% per year (Figure 5). Much of the recent increase in incidence is due to increased screening.

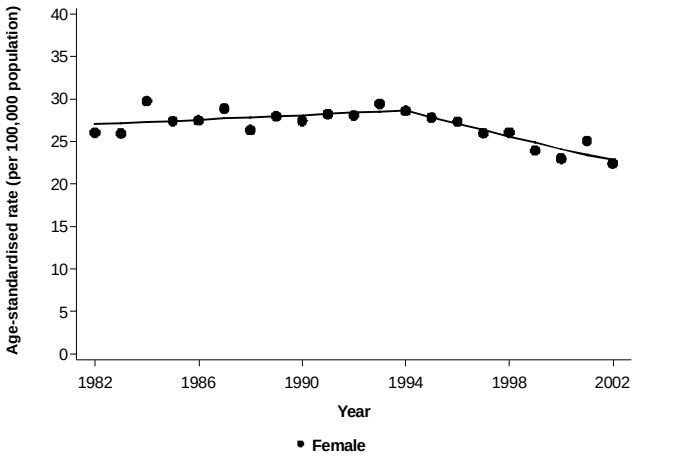
Figure 5. Incidence trend for breast cancer, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Mortality from breast cancer increased slowly by 0.5% per year between 1982 and 1994, but since then the trend in mortality rate has been reversed and it is now decreasing by 2.8% per year (Figure 6). This corresponds to an overall decrease in the mortality rate for the eight years from 1994 to 2002 of 20.6%.

Figure 6. Mortality trend for breast cancer, Queensland, 1982-2002



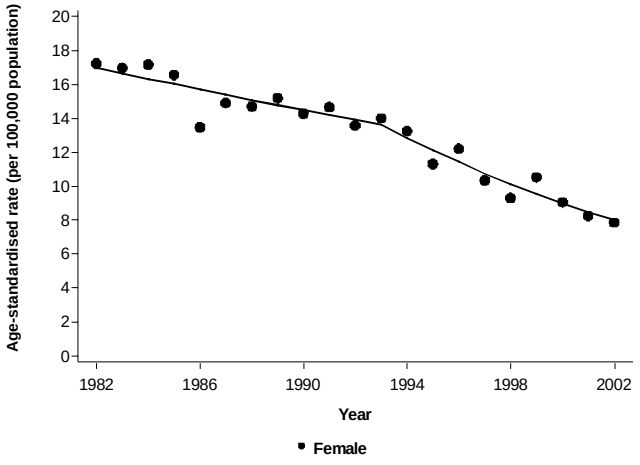
Rates standardised to Australian 2001 population

A decline in mortality for breast cancer has also been observed in the other States of Australia and in several other countries such as Britain and the United States[2,3]. This decrease is commonly attributed to two main factors. Firstly, the widespread use of mammographic screening has made an important contribution in improving the early detection of breast cancers. Between January 2001 and December 2002, a total of 330,423 women were screened by the BreastScreen Queensland program. Of these, 208,677 women were in the 50-69 year old target group corresponding to a participation rate of 58.7% within that age group[4]. Secondly, a portion of the decrease is probably due to the increased use of adjuvant chemotherapy for node-positive disease, mainly in pre-menopausal women, and tamoxifen in post-menopausal women.

Cervical cancer

Between 1982 and 1993 the incidence rate for cervical cancer declined by an average of 2.0% per year. Since 1993 the incidence of cervical cancer has decreased by 5.8% per year. This corresponds to an overall decrease in the incidence rate of 41.5% for the nine years from 1993 to 2002 (Figure 7).

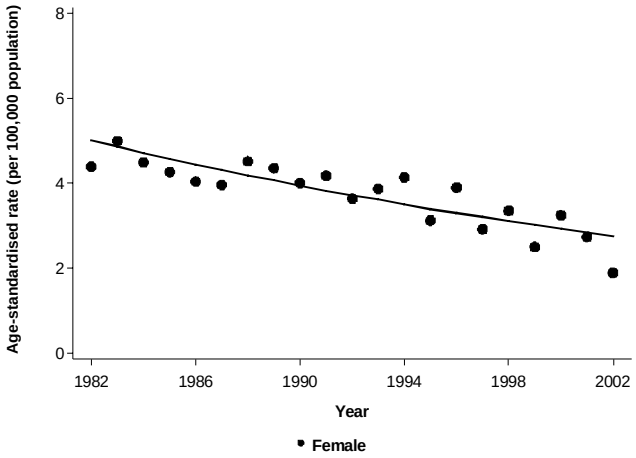
Figure 7. Incidence trend for cervical cancer, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Mortality rates for cervical cancer have also shown a steady decline in Queensland during the study period (Figure 8). Between 1982 and 2002 the mortality rate decreased by a total of 44.9%.

Figure 8. Mortality trend for cervical cancer, Queensland, 1982-2002



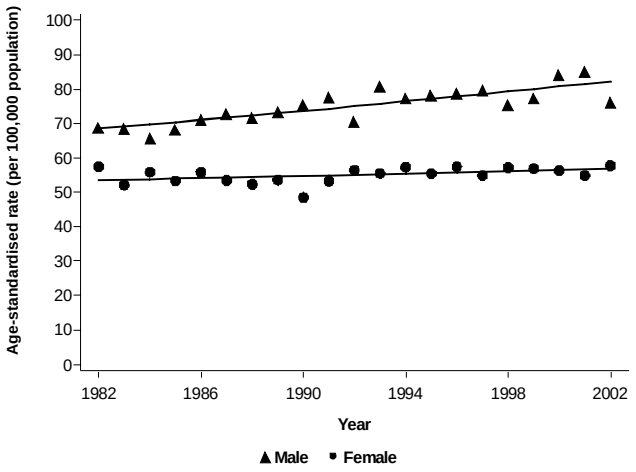
Rates standardised to Australian 2001 population

Experts agree that the continuing decrease in mortality is largely due to the organised cervical screening program[5]. A total of 575,760 women aged 20-69 years old were screened for cervical cancer in Queensland in the years 2001 and 2002, giving an age-standardised participation rate of 56.7% within the target cohort[4].

Colorectal cancer

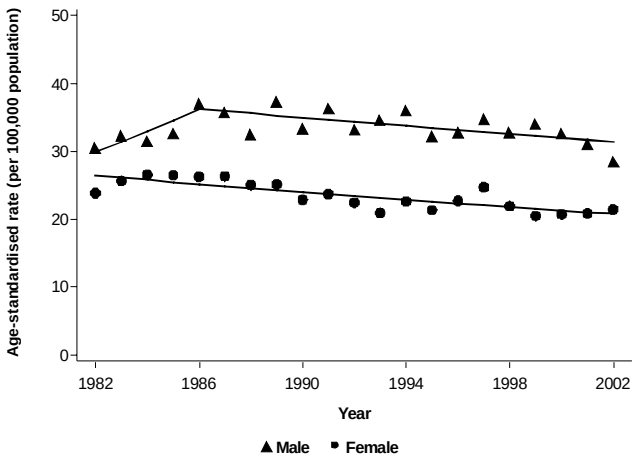
There has been a steady increase in the incidence rate of colorectal cancer for both men (0.9% per year) and women (0.3% per year) since 1982, although the trend for women failed to reach statistical significance (Figure 9). In contrast, mortality rates have decreased significantly for both men and women, with a decrease of 0.9% per year for males from the mid-1980s (following an increasing trend between 1982 and 1986) and 1.2% per year for females (Figure 10). This represents an overall improvement in the mortality rate of 13.3% for men since 1986 and 21.1% for women since 1982.

Figure 9. Incidence trends for colorectal cancer by sex, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Figure 10. Mortality trends for colorectal cancer by sex, Queensland, 1982-2002

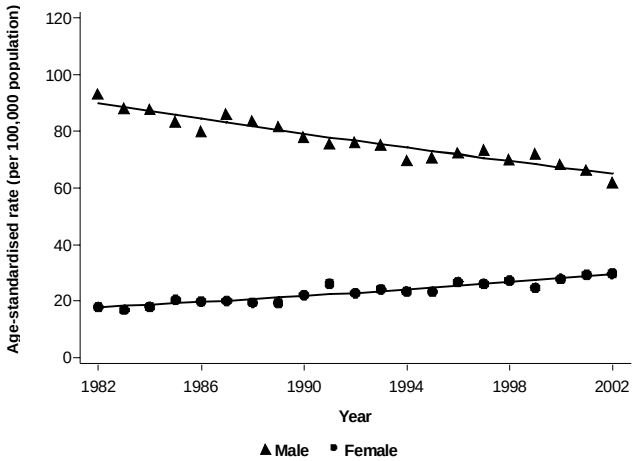


Rates standardised to Australian 2001 population

Lung cancer

Both incidence and mortality rates for lung cancer have shown ongoing improvement for males, decreasing by 1.6% and 1.5% per year respectively (Figures 11 and 12). Since 1982, this corresponds to a 25.7% decrease in the mortality rate for males in Queensland.

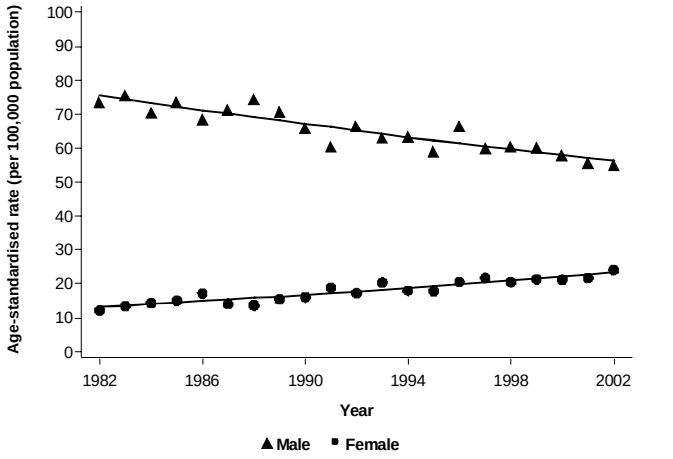
Figure 11. Incidence trends for lung cancer by sex, Queensland, 1982-2002



Rates standardised to Australian 2001 population

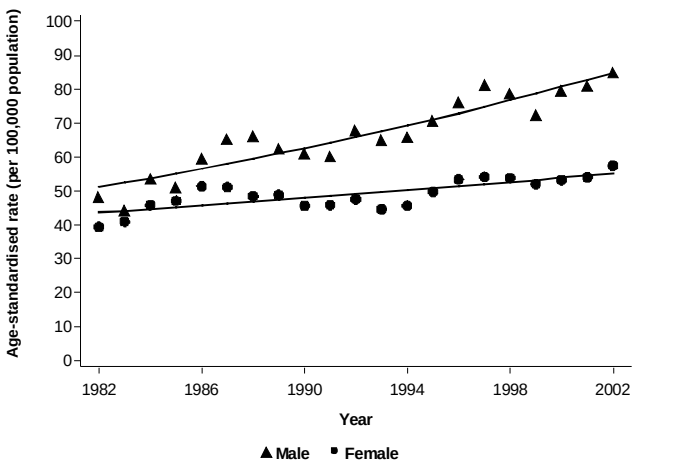
However the trends for females continue to increase, with incidence and mortality rates showing annual increases of 2.6% and 2.9% respectively (Figures 11 and 12). This corresponds to a 76.1% increase in mortality for females between 1982 and 2002. In 2002 for the first time more female deaths and a higher mortality rate were associated with lung cancer than with breast cancer.

Figure 12. Mortality trends for lung cancer by sex, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Figure 13. Incidence trends for melanoma by sex, Queensland, 1982-2002



Rates standardised to Australian 2001 population

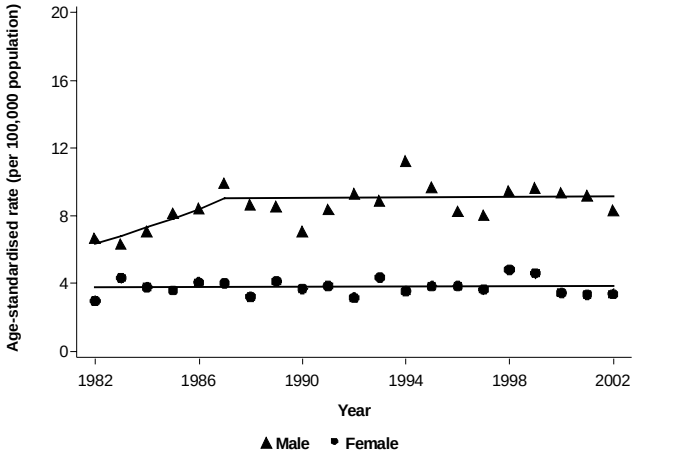
Despite these differing trends, both the incidence and mortality rates for men remain around threefold those currently experienced by women. The differences observed in lung cancer rates between males and females can be attributed to past patterns of smoking prevalence. It is widely accepted that smoking is the cause of most lung cancers, with current incidence rates reflecting smoking behaviour 20 or more years earlier[6].

Melanoma

Australia has the highest incidence rate of melanoma of any country in the world, and Queensland in turn has a much higher rate of melanoma incidence than any other State or Territory[2,7]. Incidence rates of melanoma can fluctuate according to public awareness. For example, notifications increase following publicity about skin cancer on television. Nevertheless, the long-term trend in the incidence rate for both men and women is increasing, with the growth being more pronounced for men (2.6% increase per year compared with 1.2% for women) (Figure 13).

Mortality rates due to melanoma have remained relatively constant for both sexes since the mid 1980s increasing at an average of 0.1% per year (Figure 14). These increases are not statistically significant.

Figure 14. Mortality trends for melanoma by sex, Queensland, 1982-2002

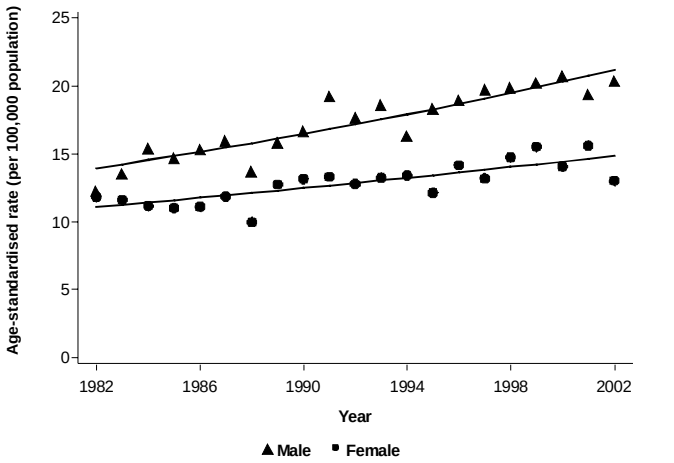


Rates standardised to Australian 2001 population

Non-Hodgkin's lymphoma

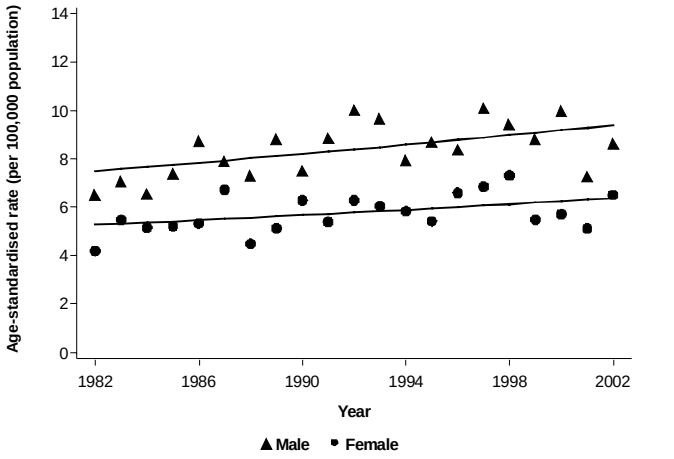
Incidence rates for non-Hodgkin's lymphoma in Queensland have continued to go up, with an annual increase of 2.1% for males and 1.5% for females (Figure 15). Mortality rates for this disease are also continuing to increase, although at a slower rate compared to the rise in incidence: 1.1% per year for males and 1.0% per year for females (and this latter result failed to reach statistical significance) (Figure 16). This corresponds with a significant overall increase of 25.2% in the mortality rate for males since 1982.

Figure 15. Incidence trends for non-Hodgkin's lymphoma by sex, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Figure 16. Mortality trends for non-Hodgkin's lymphoma by sex, Queensland, 1982-2002



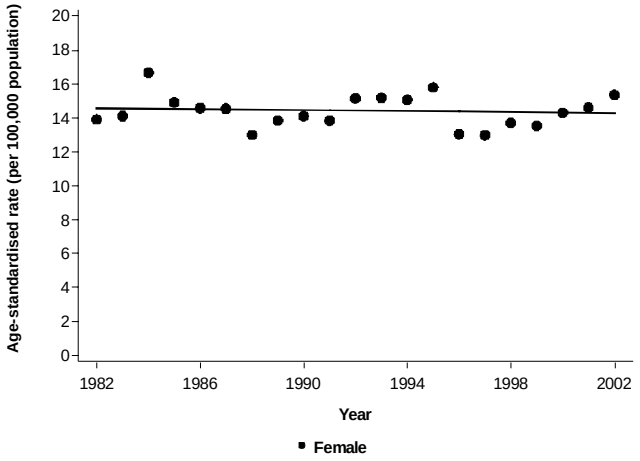
Rates standardised to Australian 2001 population

Despite ongoing international research, the causes of non-Hodgkin's lymphoma remain largely undefined[8]. Immunodeficiency status, both congenital and acquired (eg. HIV), has been shown to raise the risk of developing non-Hodgkin's lymphoma, but this does not account for all of the increase in incidence rates. A number of potential environmental sources are also being investigated.

Ovarian cancer

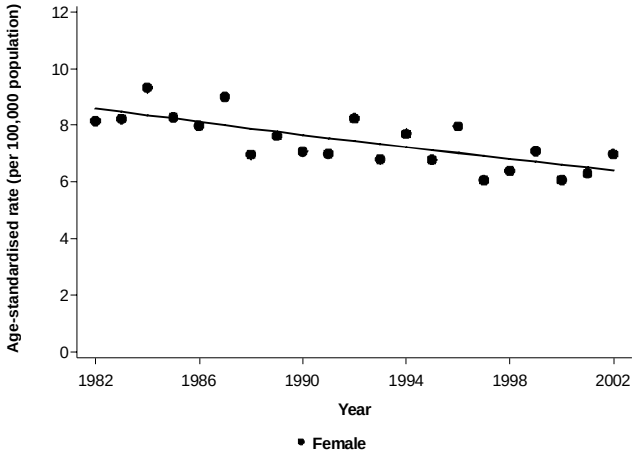
No significant trend was evident in the incidence rate of ovarian cancer in Queensland (Figure 17). However, the mortality rate from ovarian cancer has shown a continuing, significant decrease of 1.5% per year on average, corresponding to a total drop in the mortality rate of 26.1% between 1982 and 2002 (Figure 18). While the ongoing decrease in the ovarian cancer mortality rate is favourable, the survival rate is still relatively poor because the disease is often not diagnosed until it has reached a more advanced stage.

Figure 17. Incidence trend for ovarian cancer, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Figure 18. Mortality trend for ovarian cancer, Queensland, 1982-2002



Rates standardised to Australian 2001 population

Prostate cancer

Prostate cancer is the leading registrable cancer amongst males [2]. The sharp increase in the incidence rate of prostate cancer in Queensland between 1988 and 1994 coincided with increases in the use of PSA and allied testing (Figure 19). The incidence rate then decreased between 1994 and 1997 which probably represents depletion of prevalent cases due to men having earlier PSA testing. Since 1997 there has been a slight increase of 2.1% per year, but this trend has not achieved statistical significance.

Figure 19. Incidence trend for prostate cancer, Queensland, 1982-2002

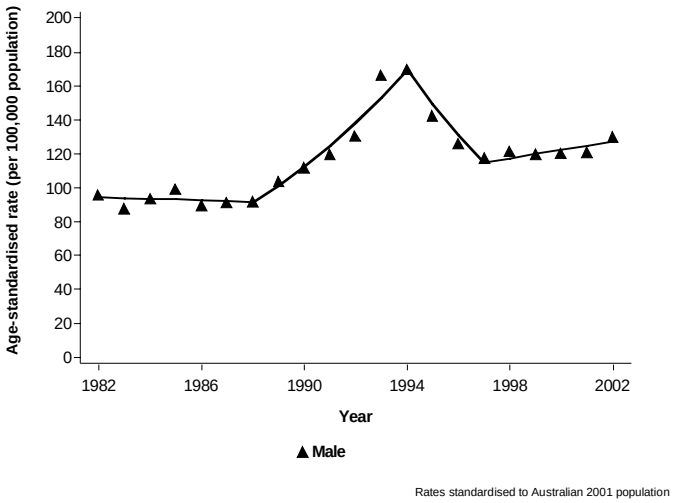


Figure 20. Mortality trend for prostate cancer, Queensland, 1982-2002

The mortality rate from prostate cancer peaked in Queensland in 1993, and has been decreasing by 2.6% per year since then. The total drop in mortality rate for the nine years to 2002 was 21.0%. No-one is sure why mortality from prostate cancer has decreased. In particular, we still do not have definitive evidence that PSA screening can reduce mortality. Also, it is possible that the mortality reduction could be due to better treatment of early-stage disease with surgery or radiotherapy, or better treatment of advanced prostate cancer with medical anti-androgenic therapies.

Stomach cancer

Incidence and mortality trends for stomach cancer continue to show significant decreases for both sexes. Specifically, incidence rates for men in Queensland are decreasing by an average of 2.3% per year and for women by 1.8% per year (Figure 21). Mortality rates have been dropping even more quickly, with an annual decline of 2.7% for males and 3.5% for females (Figure 22). This represents an overall reduction in the mortality rate of 42.0% and 51.0% for males and females in Queensland respectively in the period from 1982 to 2002.

Figure 21. Incidence trends for stomach cancer by sex, Queensland, 1982-2002

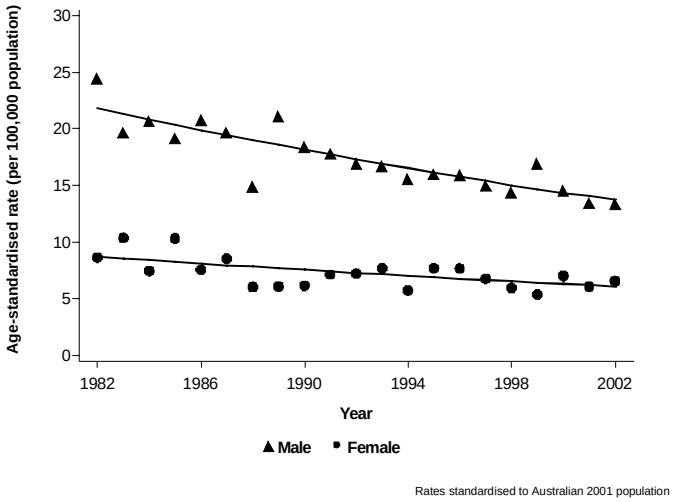
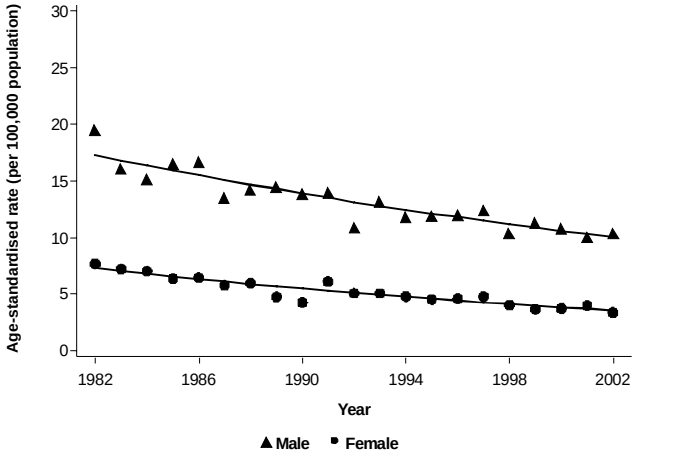


Figure 22. Mortality trends for stomach cancer by sex, Queensland, 1982-2002



There is evidence linking inadequate intake of vegetables and fruit with cancer of the stomach[9]. It is reasonable to conclude that some of the improvement in stomach cancer can be attributed to better diet, particularly increased consumption of fruit and vegetables. A reduction in gastric infections brought about by the widespread use of refrigeration over the last few decades is also believed to have had a role in this trend.

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Appendix A

Joinpoint analysis

Joinpoint analysis is a statistical method that describes changing trends over successive segments of time and also determines the amount of increase or decrease within each time period. Joinpoint analysis chooses the best fitting point, called a joinpoint, at which the rate of increase or decrease changes significantly.

The analysis begins with the assumption of constant change over time (i.e., no joinpoint). Up to three joinpoints were tested in each model. The selected model is the simplest one (i.e. the least number of joinpoints) supported by the input data.

Annual percent change (APC)

The APC is the average rate of change in the cancer trend per year, as determined by the selected joinpoint model. A negative APC describes a decreasing trend, and a positive APC describes an increasing trend. A trend is deemed to be statistically significant if the 95% confidence interval does not include zero.

Age-standardisation

All data used in the modelling process for this publication was age-standardised to the 2001 Australian estimated resident population. Data in previous information circulars has been standardised to the 1991 Australian estimated resident population[10,11]. Some of the incidence and mortality rates reported will be different from the corresponding rates in earlier information circulars as a result of this change in the standard population, rather than as a result of changes in the underlying cancer data.

Source of data

Queensland Cancer Registry 2004. Cancer in Queensland. Incidence and Mortality 1982-2002. Brisbane: Queensland Cancer Fund, Queensland Health.

Appendix B

Cancer incidence trends, Queensland, 1982-2002

Site	ICDO codes	Trend 1 Period	APC[1] (95% CI)	Trend 2 Period	APC[1] (95% CI)	Trend 3 Period	APC[1] (95% CI)
Females							
All sites	C00-C80	1982-2002	+1.09 (+1.0, +1.2)				
Breast	C50	1982-2002	+1.92 (+1.6, +2.2)				
Cervix	C53	1982-1993	-1.98 (-3.1, -0.8)	1993-2002	-5.78 (-7.4, -4.2)		
Colorectal	C18-C20, C218	1982-2002	+0.30 (+0.0, +0.6)				
Lung	C33, C34	1982-2002	+2.58 (+2.1, +3.0)				
Melanoma	C44, M872-M879	1982-2002	+1.18 (+0.7, +1.6)				
Non-Hodgkin's lymphoma	M959, M967-M971	1982-2002	+1.48 (+0.9, +2.1)				
Ovary	C56	1982-2002	-0.10 (-0.6, +0.4)				
Stomach	C16	1982-2002	-1.79 (-2.8, -0.8)				
Males							
All sites	C00-C80	1982-1990	+0.69 (-0.1, +1.5)	1990-1993	+4.26 (-1.9, +10.8)	1993-2002	-0.72 (-1.2, -0.2)
Colorectal	C18-C20, C218	1982-2002	+0.92 (+0.6, 1.2)				
Lung	C33, C34	1982-2002	-1.61 (-1.9, -1.4)				
Melanoma	C44, M872-M879	1982-2002	+2.57 (+2.1, +3.1)				
Non-Hodgkin's Lymphoma	M959, M967-M971	1982-2002	+2.11 (+1.6, +2.6)				
Prostate [2]	C61	1988-1994	+10.83 (+7.2, +14.6)	1994-1997	-12.14 (-23.0, +0.3)	1997-2002	+2.06 (-0.8, +5.0)
Stomach	C16	1982-2002	-2.30 (-2.9, +1.7)				

1. Annual percentage change
2. The trend for prostate cancer incidence among males between 1982 and 1988 was -0.52 (-3.9, +2.9)

Appendix C

Cancer mortality trends, Queensland, 1982-2002

Site	ICDO codes	Trend 1 Period	APC[1] (95% CI)	Trend 2 Period	APC[1] (95% CI)	Trend 3 Period	APC[1] (95% CI)
Females							
All sites	C00-C80	1982-1996	+0.31 (-0.1, +0.7)	1996-2002	-1.25 (-2.3, -0.2)		
Breast	C50	1982-1994	+0.51 (-0.2, +1.3)	1994-2002	-2.84 (-4.0, -1.7)		
Cervix	C53	1982-2002	-2.94 (-3.9, -2.0)				
Colorectal	C18-C20, C218	1982-2002	-1.18, (-1.6, -0.8)				
Lung	C33, C34	1982-2002	+2.87 (+2.3, +3.4)				
Melanoma	C44, M872-M879	1982-2002	+0.08 (-0.9, +1.1)				
Non-Hodgkin's lymphoma	M959, M967-M971	1982-2002	+0.96 (+0.0, +1.9)				
Ovary	C56	1982-2002	-1.46 (-2.1, -0.8)				
Stomach	C16	1982-2002	-3.49 (-4.1, -2.9)				
Males							
All sites	C00-C80	1982-1994	+0.42 (+0.1, +0.8)	1994-2002	-1.51 (-2.1, -0.9)		
Colorectal	C18-C20, C218	1982-1986	+4.90 (-1.2, +11.4)	1986-2002	-0.89 (-1.5, -0.3)		
Lung	C33, C34	1982-2002	-1.47 (-1.8, -1.2)				
Melanoma	C44, M872-M879	1982-1987	+7.27 (-1.6, +1.3)	1987-2002	+0.08 (-1.2, +1.3)		
Non-Hodgkin's Lymphoma	M959, M967-M971	1982-2002	+1.13 (+0.2, 2.03)				
Prostate	C61	1982-1993	+3.66 (+2.4, +4.9)	1993-2002	-2.58 (-3.8, -1.4)		
Stomach	C16	1982-2002	-2.69 (-3.2, -2.2)				

1. Annual percentage change