

Mortality and incidence trends for leading cancers in Queensland, 1982 to 2001

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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 2001). 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 2001. 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).
- The incidence rate (or rate of new cases) of cancers increased consistently among women during the entire period 1982 to 2001. 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.
- Trends in the incidence of cancers are often 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.
- 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 decreases in deaths due to lung, colorectal and stomach cancer.

- Mortality has continued to increase significantly for lung cancer among women, and for non-Hodgkin's lymphoma and melanoma for men.

Incidence trends for all cancers combined

A total of 17,125 new cancers (incidence) were diagnosed in Queensland during 2001. Of these, 9,313 new cancers were reported for males and 7,812 for females.

Figure 1: Incidence trends for all cancers combined by sex, Queensland, 1982-2001

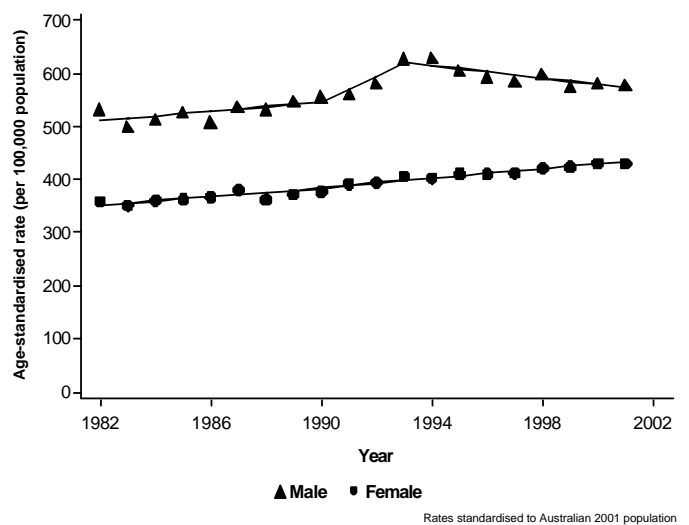
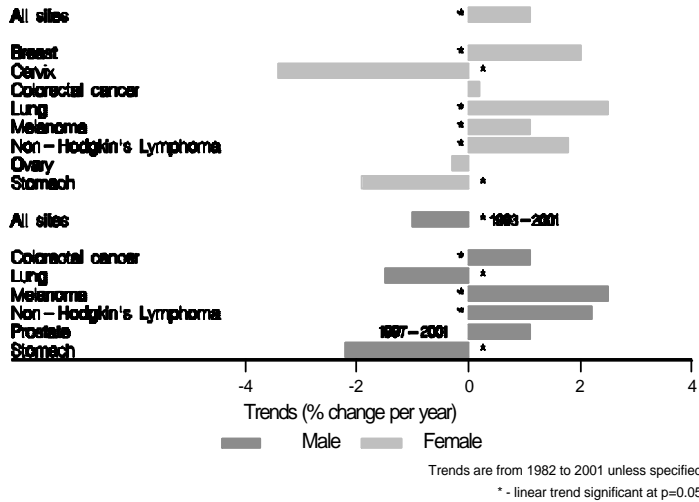


Figure 2: Recent trends in incidence by type of cancer and sex (annual percentage change)



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 1.0% 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 is probably associated with a decrease in ad-hoc testing for prostate-specific antigen (PSA). 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.

Mortality trends for all cancers combined

In 2001 there were a total of 6,343 deaths from cancer recorded in Queensland (3,699 males and 2,644 females).

Figure 3: Mortality trends for all cancers combined by sex, Queensland, 1982-2001

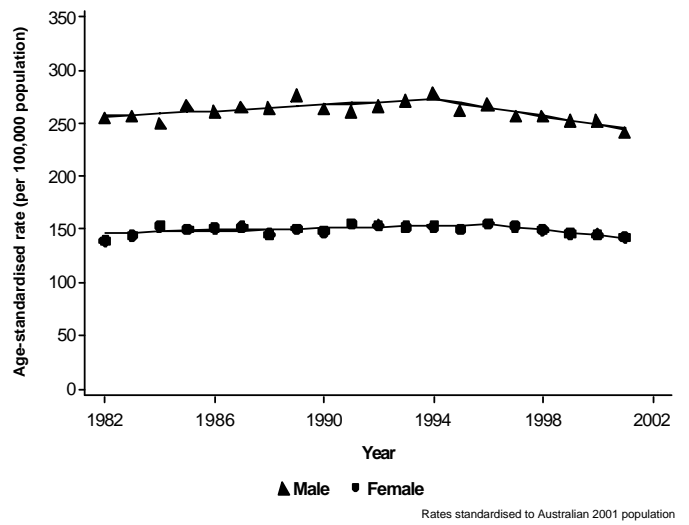
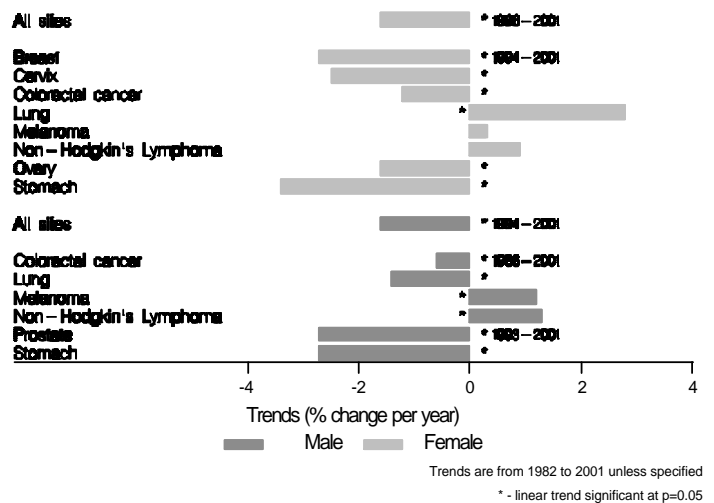


Figure 4: Recent trends in mortality by type of cancer and sex (annual percentage change)



For females, the mortality rate increased slightly (0.4% per year) from 1982 to 1996 but has since decreased by 1.6% per year, corresponding to an overall decrease in the mortality rate for women of 7.9% between 1996 and 2001 (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 2.8% per year. Mortality rates for non-Hodgkin's lymphoma and melanoma have both continued to increase slowly over the study period,

but neither of these increases was statistically significant.

The pattern of mortality rates for males for all cancers combined is very similar to that observed for females with an increase of 0.5% per year between 1982 and 1994, followed by a decrease of 1.6% per year since then (Figures 3 and 4, Appendix C). This represents a significant decrease in the cancer mortality rate for males of 10.4% for the seven years from 1994 to 2001. 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 and melanoma.

Specific cancers

Breast cancer

Breast cancer is the most common cancer among women, both in terms of incidence and mortality. The incidence of breast cancer has continued to increase by 2.0% per year (Figure 5). Much of the recent increase in incidence is due to increased screening.

Figure 5: Incidence trend for breast cancer, Queensland, 1982-2001

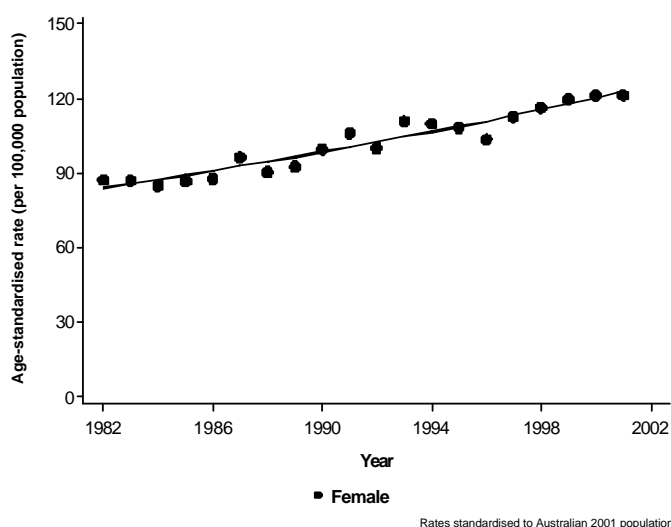
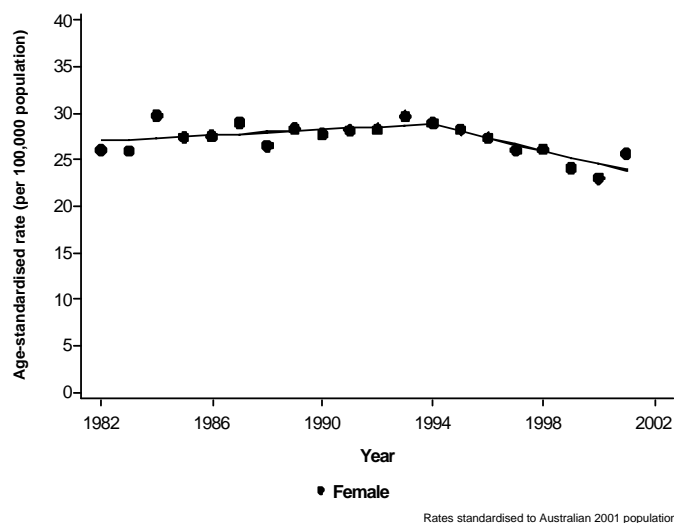


Figure 6: Mortality trend for breast cancer, Queensland, 1982-2001



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 2.7% per year (Figure 6). This corresponds to an overall decrease in the mortality rate for the seven years from 1994 to 2001 of 17.3%.

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 209,017 women in the 50-69 year old target group were screened by the BreastScreen Queensland program, corresponding to a participation rate of 58.8% within that age group⁴. 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

Both incidence and mortality rates for cervical cancer have shown a steady decline in Queensland during the study period (Figures 7 and 8). Between 1982 and 2001 the incidence rate decreased by a total of 48.4% and the mortality rate by 38.5%.

Experts agree that the continuing decrease in mortality is largely due to the coordinated Pap smear program⁵. 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 cohort⁴.

Figure 7: Incidence trend for cervical cancer, Queensland, 1982-2001

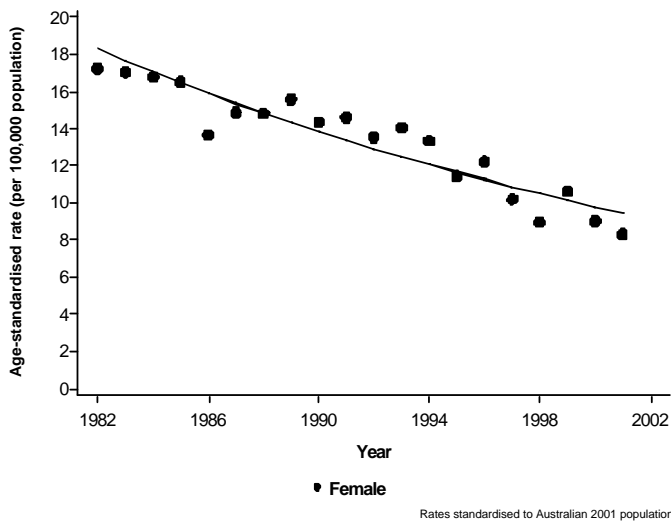
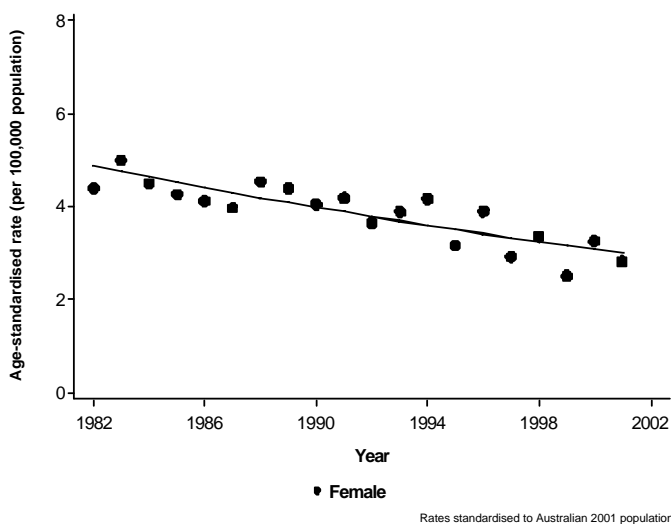


Figure 8: Mortality trend for cervical cancer, Queensland, 1982-2001



Colorectal cancer

There has been a steady increase in the incidence rate of colorectal cancer for both men (1.1% per year) and women (0.2% 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 0.6% 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 9.0% for men since 1986 and 21.0% for women since 1982.

Figure 9: Incidence trends for colorectal cancer by sex, Queensland, 1982-2001

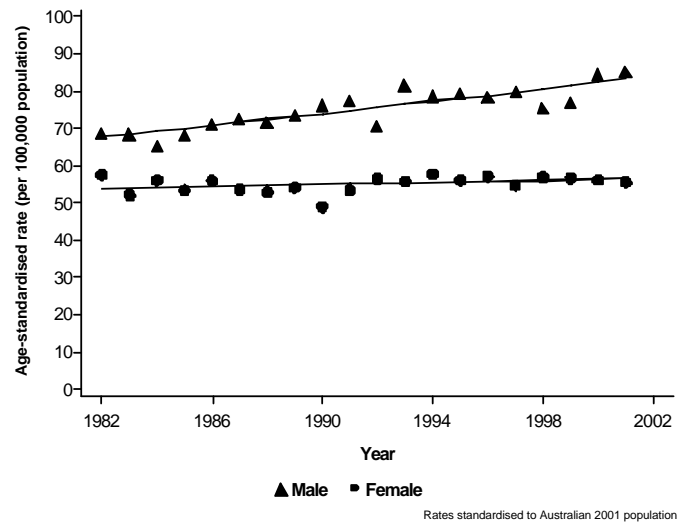
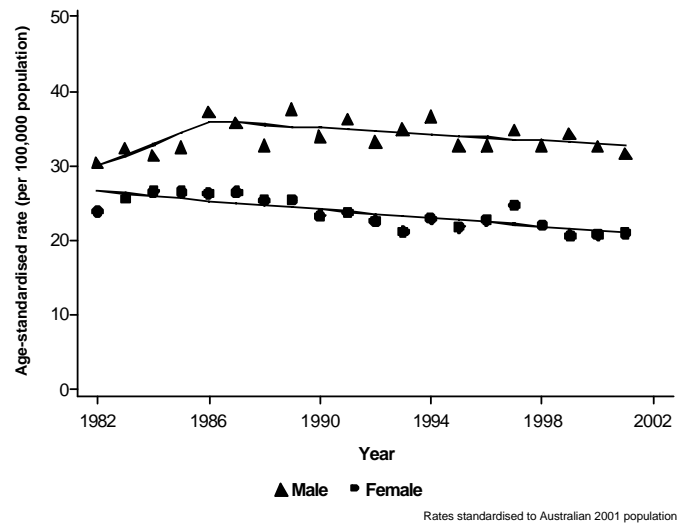


Figure 10: Mortality trends for colorectal cancer by sex, Queensland, 1982-2001



Lung cancer

Both incidence and mortality rates for lung cancer have shown ongoing improvement for males, decreasing by 1.5% and 1.4% per year respectively (Figures 11 and 12). However, the trends for females continue to rise, with the incidence and mortality rates showing annual increases of 2.5% and 2.8% respectively. Since 1982, this corresponds to a 23.2%

decrease in the mortality rate for males in Queensland but a 69.0% increase for females. Despite these differing trends, both the incidence and mortality rates for men remain around threefold those currently experienced by women.

Figure 11: Incidence trends for lung cancer by sex, Queensland, 1982-2001

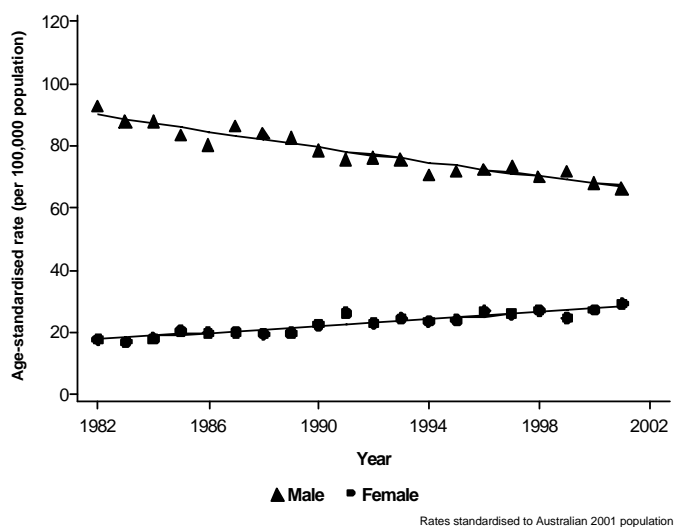
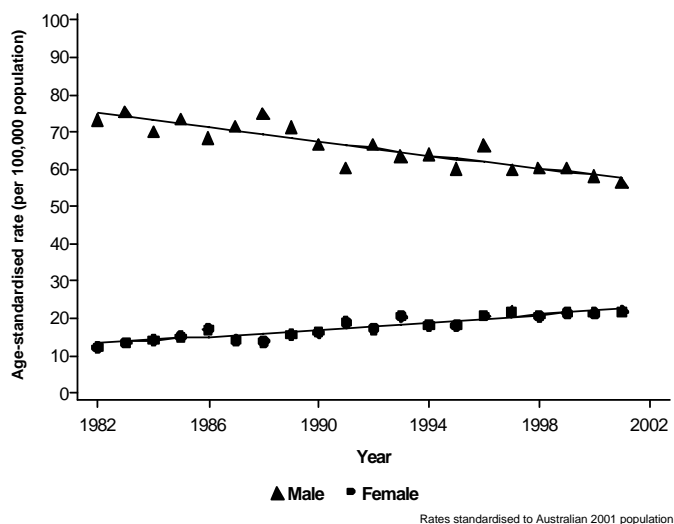


Figure 12: Mortality trends for lung cancer by sex, Queensland, 1982-2001

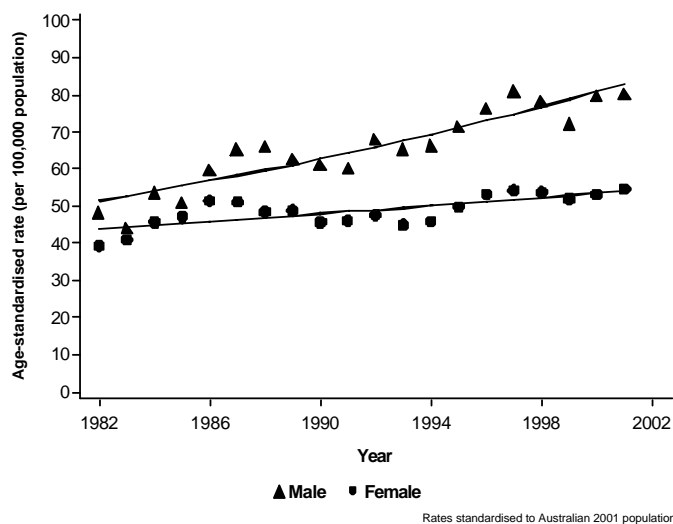


The differences observed in lung cancer rates between males and females can be attributed to past patterns of smoking prevalence. It is widely accepted that smoking is the cause of most lung cancers, with current incidence rates reflecting smoking behaviour 20 or more years earlier⁶.

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 (2.5% increase per year compared with 1.1% for women) (Figure 13).

Figure 13: Incidence trends for melanoma by sex, Queensland, 1982-2001



Mortality rates due to melanoma were also trending upwards for both sexes (Figure 14). However, the rate of change was only statistically significant for men at 1.2% annually, giving an overall increase of 26.4% in the mortality rate for males between 1982 and 2001.

Figure 14: Mortality trends for melanoma by sex, Queensland, 1982-2001

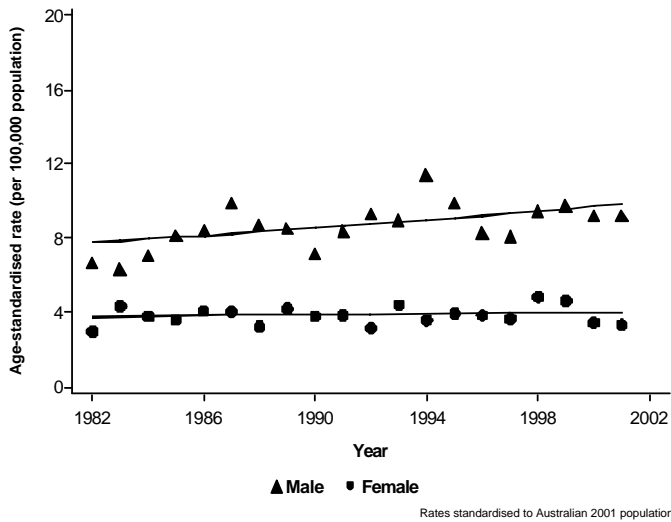
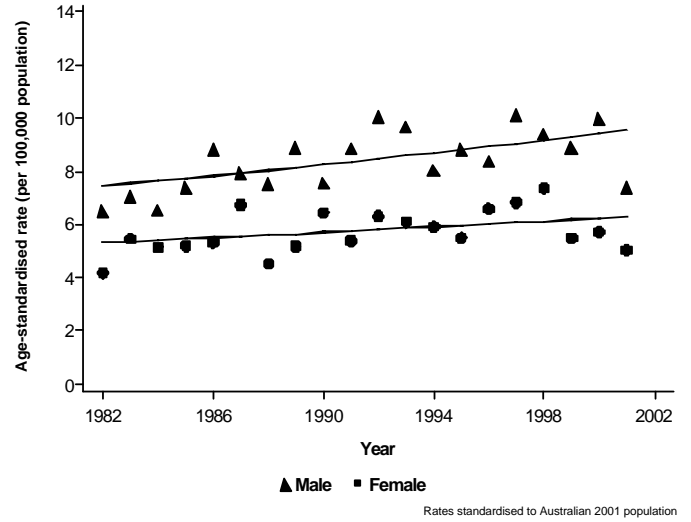


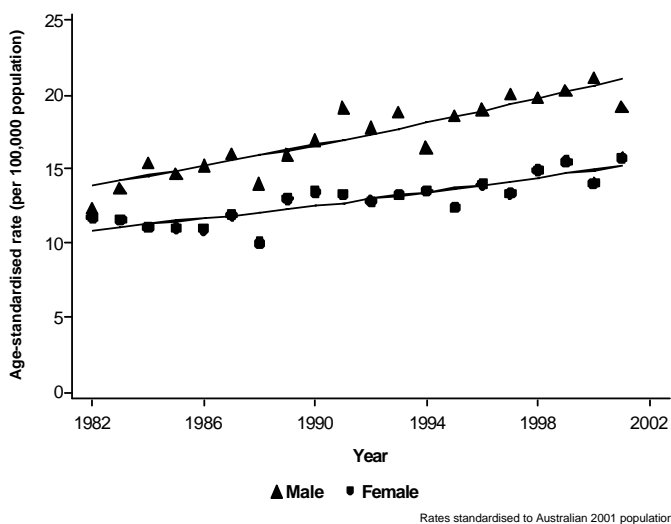
Figure 16: Mortality trends for non-Hodgkin's lymphoma by sex, Queensland, 1982-2001



Non-Hodgkin's lymphoma

Incidence rates for non-Hodgkin's lymphoma in Queensland have continued to go up, with an annual increase of 2.2% for males and 1.8% 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: 1.3% per year for males and 0.9% per year for females (and this latter result failed to reach statistical significance) (Figure 16). This corresponds with a significant overall increase of 28.1% in the mortality rate for males since 1982.

Figure 15: Incidence trends for non-Hodgkin's lymphoma by sex, Queensland, 1982-2001



Despite ongoing international research, the causes of non-Hodgkin's lymphoma remain largely undefined⁸. 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 1.6% per year on average, corresponding to a total drop in the mortality rate of 26.1% between 1982 and 2001 (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, 1982-2001

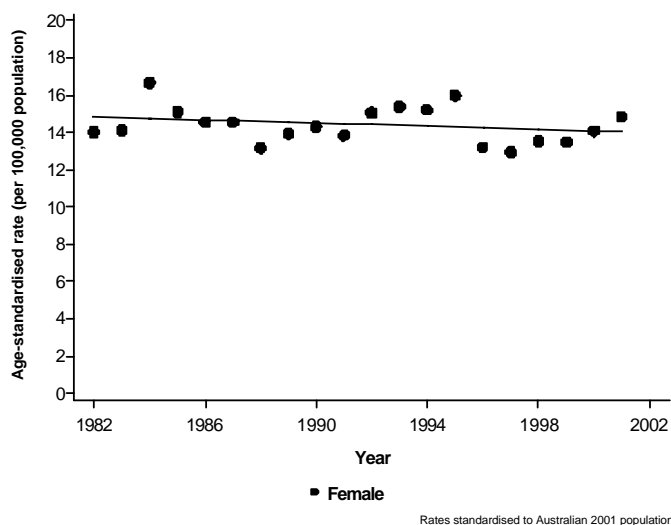
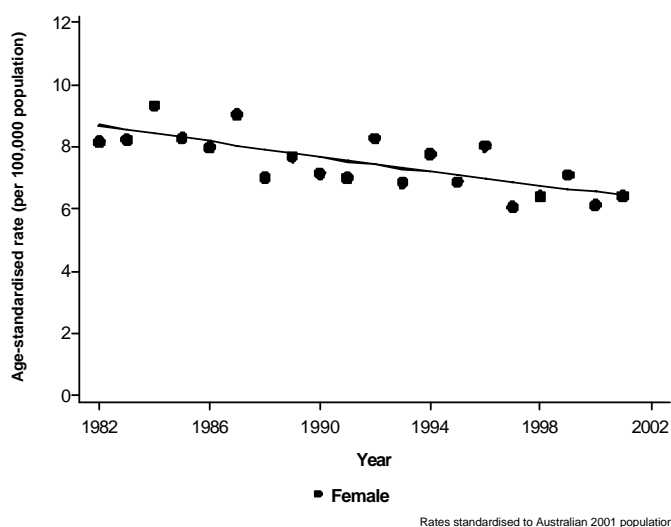


Figure 18: Mortality trend for ovarian cancer, Queensland, 1982-2001



Prostate cancer

Prostate cancer is the leading registrable cancer amongst males². The sharp increase in the incidence rate of prostate cancer in Queensland between 1988 and 1994 coincided with increases in the use of prostate-specific antigens (PSAs) and allied testing (Figure 19). The incidence rate then fell just as quickly between 1994 and 1997 as the use of these tests declined. Since 1997 there has been a slight increase of 1.1% per year, but this trend has not achieved statistical significance.

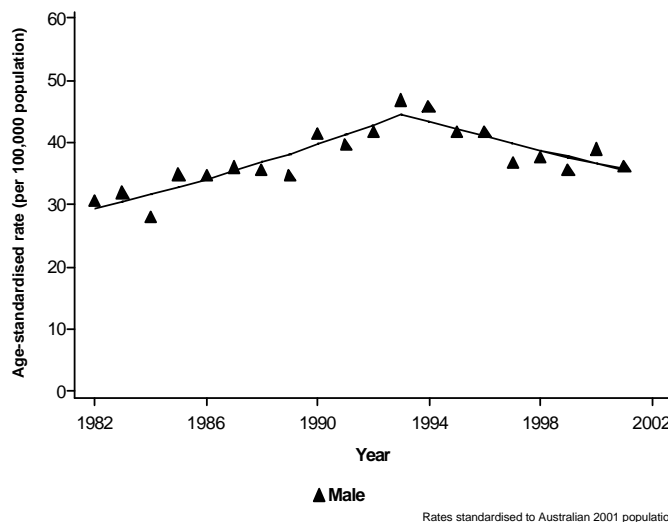
The mortality rate from prostate cancer peaked in Queensland in 1993, and has been decreasing by 2.7%

per year since then. The total drop in mortality rate for the eight years to 2001 was 19.8%. As yet, there is no agreement among experts about the causes of the change in the mortality trend for prostate cancer.

Figure 19: Incidence trend for prostate cancer, Queensland, 1982-2001



Figure 20: Mortality trend for prostate cancer, Queensland, 1982-2001



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 2.2% per year and for women by 1.9% per year (Figure 21). Mortality rates have been dropping even more quickly, with an annual decline of 2.7% for males and 3.4% for females (Figure 22). This represents an overall reduction in the mortality rate of 40.7% and 48.1%

for males and females in Queensland respectively in the period from 1982 to 2001.

Figure 21: Incidence trends for stomach cancer by sex, Queensland, 1982-2001

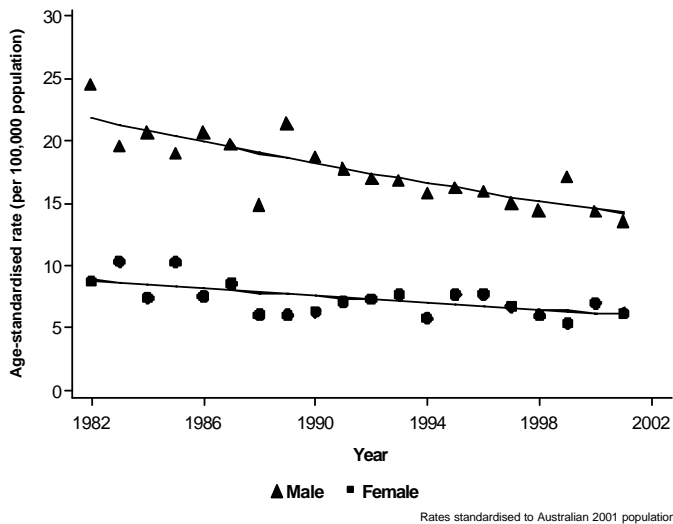
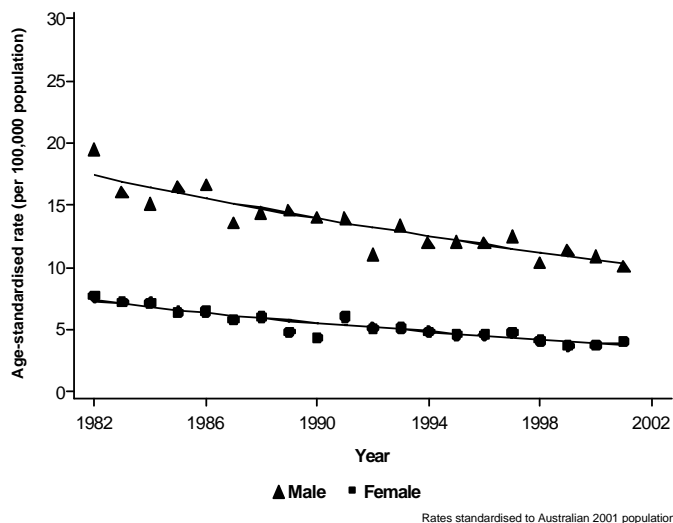


Figure 22: Mortality trends for stomach cancer by sex, Queensland, 1982-2001



There is evidence linking inadequate intake of vegetables and fruit with cancer of the stomach⁹. 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.

References

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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.

Appendix B Cancer incidence trends, Queensland, 1982-2001

Site	ICDO codes	Trend 1		Trend 2		Trend 3	
		Period	APC ¹ (95% CI)	Period	APC ¹ (95% CI)	Period	APC ¹ (95% CI)
Females							
All sites	C00-C80	1982-2001	+1.11(+1.0, +1.2)				
Breast	C50	1982-2001	+2.02 (+1.7, +2.3)				
Cervix	C53	1982-2001	-3.42 (-4.1, -2.7)				
Colorectal	C18-C20,C218	1982-2001	+0.25 (0.0, +0.5)				
Lung	C33,C34	1982-2001	+2.49 (+2.0, +3.0)				
Melanoma	C44, M872-M879	1982-2001	+1.10 (+0.6, +1.6)				
Non-Hodgkin's Lymphoma	M959, M967-M971	1982-2001	+1.77 (+1.2, +2.3)				
Ovary	C56	1982-2001	-0.29 (-0.8, +0.3)				
Stomach	C16	1982-2001	-1.91 (-3.0, -0.8)				
Males							
All sites	C00-C80	1982-1990	+0.80 (0.0, +1.6)	1990-1993	+4.43 (-2.3, +11.6)	1993-2001	-0.99 (-1.6, -0.4)
Colorectal	C18-C20,C218	1982-2001	+1.08 (+0.8, +1.4)				
Lung	C33,C34	1982-2001	-1.53 (-1.8, -1.3)				
Melanoma	C44, M872-M879	1982-2001	+2.54 (+2.0, +3.1)				
Non-Hodgkin's Lymphoma	M959, M967-M971	1982-2001	+2.20 (+1.7, +2.7)				
Prostate ²	C61	1988-1994	+10.86 (+7.1, +14.7)	1994-1997	-12.34 (-23.6, +0.6)	1997-2001	+1.08 (-3.2, +5.5)
Stomach	C16	1982-2001	-2.23 (-2.9, -1.6)				

1. Annual percentage change

2. The trend for prostate cancer incidence among males between 1982 and 1988 was -0.27 (-3.8, +3.3)

Appendix C Cancer mortality trends, Queensland, 1982-2001

Site	ICDO codes	Trend 1		Trend 2		Trend 3	
		Period	APC ¹ (95% CI)	Period	APC ¹ (95% CI)	Period	APC ¹ (95% CI)
Females							
All sites	C00-C80	1982-1996	+0.39 (+0.1, +0.7)	1996-2001	-1.64 (-2.9, -0.4)		
Breast	C50	1982-1994	+0.54 (-0.3, +1.4)	1994-2001	-2.68 (-4.2, -1.1)		
Cervix	C53	1982-2001	-2.53 (-3.3, -1.7)				
Colorectal	C18-C20,C218	1982-2001	-1.23 (-1.7, -0.8)				
Lung	C33,C34	1982-2001	+2.80 (+2.2, +3.4)				
Melanoma	C44, M872-M879	1982-2001	+0.32 (-0.8, +1.4)				
Non-Hodgkin's Lymphoma	M959, M967-M971	1982-2001	+0.89 (-0.2, +2.0)				
Ovary	C56	1982-2001	-1.58 (-2.3, -0.9)				
Stomach	C16	1982-2001	-3.39 (-4.0, -2.7)				
Males							
All sites	C00-C80	1982-1994	+0.52 (+0.2, +0.9)	1994-2001	-1.55 (-2.2, -0.9)		
Colorectal	C18-C20,C218	1982-1986	+4.66 (-0.4, +10.0)	1986-2001	-0.63 (-1.2, -0.1)		
Lung	C33,C34	1982-2001	-1.38 (-1.7, -1.1)				
Melanoma	C44, M872-M879	1982-2001	+1.24 (+0.2, +2.3)				
Non-Hodgkin's Lymphoma	M959, M967-M971	1982-2001	+1.31 (+0.4, +2.3)				
Prostate	C61	1982-1993	+3.86 (+2.5, +5.2)	1993-2001	-2.72 (-4.2, -1.2)		
Stomach	C16	1982-2001	-2.71 (-3.3, -2.2)				

1. Annual percentage change