Results and Maps

Overview

When disparities in cancer incidence and survival are evident, there are a number of potential explanations, including but not restricted to differences in environmental risk factors, access to screening and diagnostic services, access to effective treatment and care, migration of cancer patients, the mix of cancer types present in that region (when comparing rates for all invasive cancers), or even random chance.

The table below presents the summary of observed geographic variation for incidence and survival by type of cancer and gender.

	Incidence		Survival	
Cancer site	**Males**	**Females**	**Males**	**Females**
All invasive cancers	Strong	Strong	Strong	Strong
Oesophagus	Strong	None	None	None
Stomach	Weak	None	Moderate	None
Colorectal	None	None	Strong	Strong
Pancreas	None	None	None	None
Lung	Strong	Strong	Strong	Strong
Melanoma	Strong	Strong	None	None
Breast – females only		Strong		Strong
Cervical		Moderate		None
Uterus		Strong		None
Ovary		None		Weak
Prostate	Strong		Strong	
Kidney	Strong	Weak	None	None
Bladder	Strong	None	None	None
Brain	None	None	None	None
Thyroid	None	Strong	None	None
Non-Hodgkin lymphoma	Strong	Strong	Moderate	Strong
Leukaemia	Moderate	Moderate	Moderate	None
Myeloma	Weak	None	None	None

A recent report from New South Wales (NSW)[11] examining geographic differences in cancer incidence and mortality found similar evidence for geographical variation in many of the same cancers. There were some differences however. While Queensland had strong or moderate evidence of geographical variation in incidence for non-Hodgkin lymphoma, kidney cancer (males only) and leukaemia, there was no corresponding evidence of variation for NSW. There are many potential explanations for these discrepancies, including differences between the methodologies used to estimate the variation.

These results are also similar to that observed in the previous CCQ report.[1] The main exceptions are a current lack of evidence for geographic variation in colorectal cancer incidence, as well as no significant geographic variation in survival for ovarian cancer, kidney cancer and myeloma. In addition there is now strong evidence for geographical variation in female breast cancer survival. As in the comparisons with the NSW report, differences in the results could be due to the methodological differences, or the much broader geographical areas used in the 2005 CCQ report.

The following discussion provides an overview of the results by type of cancer:

All invasive cancers (Pages 14-17)

There was strong spatial variation throughout the State in the incidence of all invasive cancers for both males and females. More remote areas tended to have lower incidence (8% lower in remote areas than the Queensland average for both males and females).

Survival differed throughout the State also, with survival decreasing as disadvantage and/or remoteness increased for both genders. These results are similar to those observed in the United Kingdom[25] and the United States of America.[26]

Among males, the risk of dying within five years after being diagnosed with cancer while living in outer regional and remote areas was an estimated 12% and 31% higher respectively than the Queensland average. Corresponding figures for females were 11% higher and 20% higher. Combined, this meant that 795, or 9% of cancer deaths within five years of diagnosis among males living in these areas could have been prevented if smoothed survival estimates matched the Queensland average, and 428 deaths (9%) among females.

Possible reasons for these disparities include reduced access to health care and diagnostic or screening services as well as differences in cancer risk factors such as tobacco smoking, diet, alcohol consumption and physical activity. Differences in the mix of cancer types between areas may also result in survival disparities, for example, if one area has many melanoma cases (high survival), while another area has a large number of lung cancer cases (low survival) then the overall survival will differ between these regions.

Oesophageal cancer (Pages 18-21)

There was strong evidence of geographical variation in the incidence of oesophageal cancer for males only. Males in outer regional (15% higher) and remote (17% higher) areas generally had higher incidence of oesophageal cancer than the Queensland average. Recognised risk factors for oesophageal cancer include tobacco smoking, moderate to heavy alcohol intake, low or infrequent consumption of raw fruits and vegetables, acid reflux and obesity.[27]

There was no evidence of geographical variation in incidence among females, or for survival among either males or females.

Stomach cancer (Pages 22-25)

Males had moderate evidence of geographical variation in stomach cancer survival, but only weak evidence of spatial variation in stomach cancer incidence. Females had no evidence for geographical variation in either incidence or survival across Queensland. Risk factors for stomach cancer include high consumption of pickled, smoked or salty foods, current or previous infection with *Helicobacter pylori*, or a family history of stomach cancer.[28]

Among males, remote regions tended to have lower survival (13% higher risk of death) than the Queensland average, as did outer regional areas (9% higher risk of death). Combined, this meant that 25, or 8% of deaths due to stomach cancer within five years of diagnosis among males living in these areas could have been prevented if smoothed survival estimates matched the Queensland average.

Colorectal cancer (Pages 26-29)

No spatial variation in the incidence of colorectal (bowel) cancer was apparent for either males or females. Recognised risk factors for colorectal cancer include increasing age, family history and unhealthy behaviours such as lack of exercise, obesity, excessive alcohol consumption, or tobacco smoking.[29] Diseases such as diabetes mellitus, inflammatory bowel diseases or inherited diseases such as familial adenomatous polyposis or hereditary non-polyposis coli also increase the risk of developing colorectal cancer.[29]

However, there was strong evidence of geographical variation in colorectal cancer survival across Queensland. Survival tended to be lower than the Queensland average in more rural, remote or disadvantaged areas.

The risk of dying within five years after being diagnosed with cancer while living in outer regional and remote areas among males was an estimated 13% and 17% higher respectively than the Queensland average. Corresponding figures for females were 10% higher and 12% higher. Combined, this meant that 134, or 11% of deaths due to colorectal cancer within five years of diagnosis among males living in outer regional or remote areas could have been prevented if smoothed survival estimates matched the Queensland average, and 71 deaths (9%) among females.

Socioeconomically advantaged regions had higher survival than the State average (6% and 5% lower risk of death among males and females in the most socioeconomically advantaged areas, respectively), while disadvantaged areas had lower survival (5% higher risk of death among males).

It is currently unknown whether this survival differential is due to colorectal cancer patients in socioeconomically disadvantaged or more remote areas being diagnosed at a more advanced stage, or having differential access to treatment. Socioeconomic inequalities in survival for colorectal cancer have also been observed in other Australian States.[1,3,30-32]

Pancreatic cancer (Pages 30-33)

There were no geographical differences in pancreatic cancer incidence or survival for either males or females. Apart from tobacco smoking and a family history of pancreatic cancer, which are well-established risk factors, the causes of this cancer are unclear.[33] Chronic pancreatitis and diabetes mellitus have been consistently associated with pancreatic cancer.[33]

Lung cancer (Pages 34-37)

There was strong evidence of geographical variation in both the incidence of lung cancer and survival from lung cancer for males and females throughout Queensland.

Among males living in the socioeconomically most advantaged (14% lower) or advantaged areas (10% lower), incidence was below the Queensland average, while males living in the disadvantaged (5% higher), most disadvantaged (15% higher), outer regional (6% higher) or remote areas (18% higher) had incidence risks above the Queensland average. Although there was strong evidence of variation in incidence among females across Queensland, these patterns by remoteness and area-level socioeconomic status were not evident.

Since tobacco smoke exposure is the strongest risk factor,[34] differences in lung cancer incidence by socioeconomic status are most likely due to geographical differences in the prevalence of smoking.[35] Studies in Queensland and throughout Australia have consistently reported substantially higher rates of smoking among people living in lower SES areas.[36-38] Differences between the incidence patterns for males and females may reflect their different smoking prevalence 20 to 30 years ago.[39]

Similar patterns were observed for both males and females for survival disparities, with those residing in affluent or urban areas having higher survival, while those in disadvantaged, outer regional or remote areas had lower survival.

Males diagnosed with lung cancer while living in outer regional and remote areas had an estimated 11% and 17% higher risk of death within five years respectively than the Queensland average. Corresponding figures for females were 12% and 18% higher. Combined, this meant that 200, or 9% of deaths due to lung cancer within five years of diagnosis among males living in these areas could have been prevented if smoothed survival estimates matched the Queensland average, and 80 deaths (9%) among females.

Potential reasons for these differences in survival outcomes may include access to treatment services, the type of treatment available, and cultural considerations among Indigenous persons including beliefs about cancer and language barriers.[40]

Melanoma (Pages 38-41)

There was strong evidence for geographical variation in melanoma incidence for both males and females. Remote (22% lower for males and 11% lower for females) and disadvantaged areas (6% lower and 7% lower for males in disadvantaged and most disadvantaged areas, respectively) generally had incidence rates below the Queensland average, while males in the most advantaged areas had 4% higher incidence. This incidence pattern is largely consistent with other States in Australia showing higher incidence of melanoma in coastal regions.[11,41] The main risk factors for developing melanoma are exposure to ultraviolet radiation, the presence of many moles, and a family history of melanoma.[42]

There was no evidence for spatial variation throughout Queensland in survival after a melanoma diagnosis for males or females.

Breast cancer – females only (Pages 42-43)

There was strong evidence for geographical variation in female breast cancer incidence and survival across Queensland.

The incidence of breast cancer among women living in affluent areas was higher than the Queensland average (10% higher for most advantaged and 2% higher for advantaged areas), while the incidence among women living in disadvantaged (4% lower), most disadvantaged (6% lower), outer regional (10% lower) or remote (15% lower) areas was below the Queensland average. Variations in incidence by socioeconomic status have been linked mainly to lifestyle factors, with women in affluent areas being more likely to delay childbearing, have fewer children and/or use hormone replacement therapy, which are all risk factors for developing breast cancer.[43-45]

There was also a marked gradient for survival, which decreased with increasing remoteness of residence and greater disadvantage. Females diagnosed with breast cancer while residing in affluent areas had higher survival (11% lower risk of death for the most advantaged areas), while the risk of dying within five years after diagnosis among females in outer regional and remote areas was an estimated 12% and 14% higher respectively than the Queensland average. Combined, this meant that 73, or 10% of deaths due to breast cancer within five years of diagnosis among females living in these areas could have been prevented if smoothed survival estimates matched the Queensland average.

Research studies examining socioeconomic disparities suggest this is likely to reflect differences in stage at diagnosis, but may also be influenced by treatment access or quality.[46-48]

Cervical cancer (Pages 44-45)

There was moderate evidence of geographical variation in cervical cancer incidence across Queensland, with incidence rates for remote regions being 15% above the Queensland average.

Papanicolaou screening (pap smear) tests are likely to impact on the incidence, as they detect and enable treatment of precancerous lesions resulting from sexually transmitted human papillomaviruses. Therefore, if there is high screening utilisation of pap smears, this can result in lower incidence of cervical cancer. In Queensland, as in Australia, the participation rates for cervical cancer screening are lower in remote communities and areas of low socioeconomic status.[49,50] Women in Indigenous communities – many of which are in the Far Northern areas of the State – are also more likely to have lower participation in cervical cancer screening.[51]

There was no evidence of geographical differences for survival from cervical cancer.

Uterine cancer (Pages 46-47)

There was strong evidence of spatial variation in the incidence of uterine cancer throughout Queensland, however there did not seem to be a consistent pattern according to rurality or socioeconomic status. Nonetheless, women living in the most disadvantaged areas had a 7% higher incidence of uterine cancer. Reproductive factors such as early age at menarche, late menopause and no children increase the risk of developing uterine cancer, as does obesity, hypertension and diabetes.[52] Physical activity and low-fat diets seem to decrease the risk.[52]

There was no evidence of geographical variation in survival from uterine cancer.

Ovarian cancer (Pages 48-49)

There was no evidence of spatial variation in ovarian cancer incidence, and only weak evidence of geographical differences for survival throughout the State. The causes of this cancer are unclear, but protective factors include childbearing, oral contraceptive use and hysterectomy.[53]

Prostate cancer (Pages 50-51)

Prostate cancer incidence and survival showed strong evidence of geographical variation.

Incidence was higher in the most advantaged areas (5% higher risk of diagnosis), and lower in the most disadvantaged areas (3% lower).

Remote regions tended to have lower incidence rates (an estimated 14% lower) and survival (18% higher risk of death) than the Queensland average. Outer regional areas also had lower survival (8% higher risk of death) than the State average. Combined, this meant that 94, or 7% of deaths due to prostate cancer within five years of diagnosis among males living in these

areas would not have occurred if smoothed survival estimates matched the Queensland average.

Prostate-specific antigen (PSA) testing, which is used to detect asymptomatic prostate cancer, can inflate the reported incidence of prostate cancer. PSA testing is less common in more rural areas than in capital cities throughout Australia,[7] and this could be contributing to these observed patterns. Increased prostate cancer incidence in the United States has also been associated with higher socioeconomic status, and this was also considered to be largely due to socioeconomic differences in PSA testing.[54]

Kidney cancer (Pages 52-55)

There was strong evidence of spatial variation in the incidence of kidney cancer among males, but only weak evidence of variation among females. For males, incidence rates in outer regional (12% lower) and remote (15% lower) tended to be lower than the Queensland average. Known risk factors for kidney cancer include tobacco smoking, obesity and hypertension.[55]

There was no evidence for geographical variation in survival among males or females.

Bladder cancer (Pages 56-59)

There was strong evidence of geographical variation in bladder cancer incidence among males, but no evidence of variation among females. For males, the incidence rates for bladder cancer in outer regional (7% lower) and remote (18% lower) areas tended to be below the Queensland average. Risk factors for developing bladder cancer include exposure to tobacco smoke and other toxic chemicals.[56]

There was no evidence of spatial variation in survival for bladder cancer among either males or females.

Brain cancer (Pages 60-63)

There was no evidence of geographical differences in brain cancer incidence or survival for either males or females. The causes of brain cancers are unknown, although exposure to high dose ionizing radiation is a risk factor, as are certain inherited or genetic conditions.[57]

Thyroid cancer (Pages 64-67)

There was strong evidence of geographical variation in thyroid cancer incidence among females, but no evidence of variation among males. Among females, thyroid cancer incidence in more remote areas was below the Queensland average (10% lower for outer regional areas), while it tended to be higher in SLAs classified as most advantaged (11% higher). The main risk factors for developing thyroid cancer are iodine deficiency and exposure to ionising radiation.[58] It is possible that increased utilisation of medical procedures may be influencing these differentials, as elsewhere many small, sub-clinical thyroid cancers are now being detected, often while undergoing neck imaging for other reasons.[59]

There was no evidence of spatial variation in thyroid cancer survival across Queensland.

Non-Hodgkin lymphoma (Pages 68-71)

There was strong evidence of geographical variation in the incidence of non-Hodgkin lymphoma across Queensland among both males and females. Incidence was lower in outer regional (10% lower and 12% lower among males and females respectively) and remote (16% lower males, 13% lower females) areas. Females also experienced incidence differentials by socioeconomic status, with incidence 8% higher for advantaged areas, and lower for disadvantaged areas, but these were not evident for males. Risk factors for developing non-Hodgkin lymphoma include disorders of immune dysfunction or acquired states of severe immunosuppression, family history of lymphoma or infection with viruses such as Epstein-Barr virus.[60]

There was moderate (for males) to strong (for females) evidence of geographical variation in survival from non-Hodgkin lymphoma, with the affluent or urban areas having higher survival, while the socioeconomically disadvantaged (7% and 10% higher risk of dying for males and females, respectively), outer regional and remote areas had lower survival compared to the Queensland average.

Among males, the risk of dying within five years after being diagnosed with non-Hodgkin lymphoma while living in outer regional and remote areas was 13% higher and 21% higher respectively than the Queensland average. Corresponding figures for females were 22% higher and 26% higher. Combined, this meant that 29, or 11% of deaths among males due to non-Hodgkin lymphoma within five years of diagnosis living in these areas could have been prevented if smoothed survival estimates matched the Queensland average, and 29 deaths (16%) among females.

Leukaemia (Pages 72-75)

There was moderate evidence of spatial variation in the incidence of leukaemia across Queensland for males and females. Males and females in the most affluent areas had incidence above the Queensland average, while incidence tended to be lower in remote areas. Recognised risk factors for developing leukaemia include exposure to benzene, tobacco smoke or high levels of ionising radiation, certain chemotherapy drugs, genetic disorders such as Down syndrome, or some blood diseases.[61]

There was also moderate evidence of geographical differences in survival for males, but no evidence for females.

Among males, the risk of dying within five years after being diagnosed with leukaemia while living in outer regional and remote areas was 10% higher and 3% higher respectively than the Queensland average (remote was non-significant). Combined, this meant that 28, or 9% of deaths among males due to leukaemia living in these areas within five years of diagnosis could have been prevented if smoothed survival estimates matched the Queensland average.

Myeloma (Pages 76-79)

There was only weak evidence of geographical variation in myeloma incidence among males, and no evidence for variation among females. There was no evidence of spatial variation in myeloma survival across Queensland. The causes of this cancer are largely unknown, although risk factors include a family history of myeloma and increasing age.[62]