Cystectomy in Queensland public and private hospitals 2004 -2013

for bladder cancer

qccat queensland cancer control analysis team

the Partnership queensland cancer control safety and quality partnership

Queensland Government

Acknowledgements

This report has been prepared under the auspices of The Queensland Cancer Control Safety and Quality Partnership, a gazetted quality assurance committee under Part 6, Division 1 of the Hospital and Health Boards Act 2011.

The Cystectomy in Queensland public and private hospitals 2004-2013 report should be interpreted in the context of a previous publication by The Partnership: Surgery for Bladder Cancer in Queensland Infocus – access and flows 2002-2011. This publication provides detailed information on cancer incidence, mortality and survival, surgery rates and patient flows for patients undergoing surgery for bladder cancer. The report is available at https://qccat.health.qld.gov.au.

This report was prepared by Danica Cossio, Tracey Guan and Shoni Philpot, of the Queensland Cancer Control Analysis Team.

We wish to thank Dr Geoff Coughlin and the Queensland Urological Subcommittee for reviewing the report and providing valuable comments.

Disclosure

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Background

The Cystectomy in Queensland public and private hospitals for bladder cancer 2004-2013 report has been developed to contribute to our understanding of variation in complex cancer surgery between Hospital and Health Services (HHS) and individual hospitals in Queensland. Cystectomy is a relatively uncommon surgical procedure and the management of patients undergoing the surgery is complex. Patients require care from a multidisciplinary team to ensure they receive the appropriate treatment that will lead to the best outcomes. By providing information on the patterns of surgery and outcomes this report aims to guide best practice.

This report reveals differences between HHS and individual hospitals which may not be obvious in daily clinical practice but become clear with this type of analysis.

The Partnership

This report is an initiative of the Queensland Urological Subcommittee, a subcommittee of The Queensland Cancer Control Safety and Quality Partnership (The Partnership), a gazetted quality assurance committee under Part 6, Division 1 of the Hospital and Health Boards Act 2011 in 2004. A key role of The Partnership is to provide cancer clinicians, Hospital and Health Services (HHS), Hospitals and the Department of Health with cancer information and tools to deliver the best patient care. The Partnership is supported by the Queensland Urological Subcommittee: Dr Geoff Coughlin (chair), Dr Nigel Dunglinson, Dr Simon Wood, Dr Kiran Hazratwala, Dr Roger Watson, Dr Scott McClintock and the Queensland Cancer Control Analysis Team (QCCAT) who have worked together to prepare this report.

The Partnership encourages you to consider how this information will inform how cystectomy for bladder cancer is managed in your jurisdiction in Queensland. Cystectomy in Queensland will continue to be monitored with a focus on ensuring the best possible outcomes for our patients.

Where has the data come from?

Since 2004 QCCAT have compiled and analysed a vast amount of information about cancer incidence, mortality, survival, surgery and other treatments.

Key to QCCAT's program of work is our ability to link population based cancer information on an individual patient basis, using a master linkage key specifically developed by our team. This matched and linked data is housed in Queensland Oncology Repository (QOR), a resource managed by QCCAT. This centralised repository, QOR, compiles and collates data from a range of source systems including Queensland Cancer Registry, hospital admissions data, death data, treatment systems, public and private pathology, hospital clinical data systems and QOOL (Queensland Oncology On-Line). QOR contains approximately 32 million records between 1982 and 2014. Our matching and linking process provides the 350,000+ matched and linked records of cancer patients between 2004 and 2013, which are the starting point for this analysis.

What data has been included?

Bladder cancer cohort

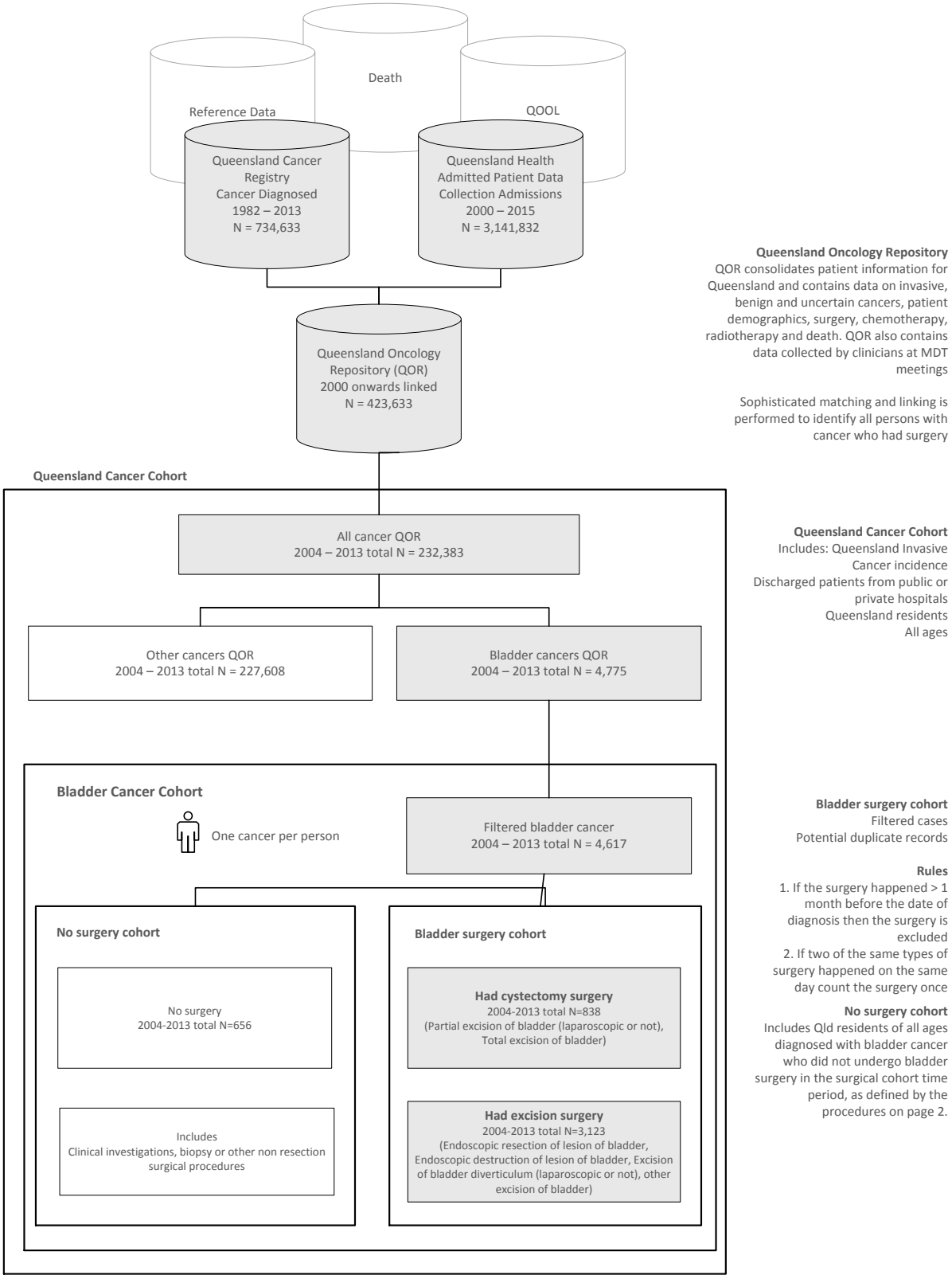
Population	Queensland residents
Gender	All
Year of diagnosis	2004-2013
Diagnosis	The International Classification of Diseases for Oncology (ICD-O) has been applied to define invasive bladder cancer as those with a primary site of C67. Invasive bladder cancer is defined as any tumour that has penetrated or invaded the basement membrane including: Submucosa, lamina propria, stroma, muscluaris mucosa (T1) Muscle coat (T2) Serous coat (T3) Perivesical fat or adventitia (T4) Patients diagnosed with a tumour that is completely confined within the epithelium is classified as insitu / non-invasive have been excluded from this report.

Cystectomy cohort

Procedures	Patients who underwent cystectomy (Total excision of bladder – ICD-10-AM code 37014-00, Laparoscopic partial excision of bladder ICD-10-AM code 37000-00, Partial excision of bladder ICD-10-AM code 37000-01) for invasive bladder cancer. Those who underwent cystectomy for causes other than invasive bladder cancers were excluded.
Sector	Public and private
Assigning surgery	To assign a surgery record to a person with cancer the earliest diagnosis in the cancer group is used. For example, if a person was diagnosed with a primary trigone of bladder cancer in 2012 and a primary bladder neck cancer in 2014, then the surgery record that is linked to the cancer in the trigone diagnosed in 2012 will be reported. Therefore, population incidence is higher at 4,775 cases than number of cases in surgery cohort 4,617.

How have the cohorts been defined?

2004-2013: PUBLIC & PRIVATE HOSPITAL PATIENTS



Queensland Oncology Repository
QOR consolidates patient information for Queensland and contains data on invasive, benign and uncertain cancers, patient demographics, surgery, chemotherapy, radiotherapy and death. QOR also contains data collected by clinicians at MDT meetings

Sophisticated matching and linking is performed to identify all persons with cancer who had surgery

Queensland Cancer Cohort
Includes: Queensland Invasive Cancer incidence
Discharged patients from public or private hospitals
Queensland residents
All ages

Bladder surgery cohort
Filtered cases
Potential duplicate records

Rules
1. If the surgery happened > 1 month before the date of diagnosis then the surgery is excluded
2. If two of the same types of surgery happened on the same day count the surgery once

No surgery cohort
Includes Qld residents of all ages diagnosed with bladder cancer who did not undergo bladder surgery in the surgical cohort time period, as defined by the procedures on page 2.

Key findings

- All 4,775 invasive bladder cancers diagnosed in Queensland between 2004-2013 are included in this report.
- Patients who do not receive surgery tend to be older than patients who receive surgery.
- Only 18% of patients with invasive bladder cancer have a cystectomy.
- 73% of invasive bladder cancer patients are living two years following cystectomy.
- On average 84 cystectomies are performed each year (range of 64 – 96).
- Cystectomy is performed equally in the public and private sector, however there were 6 more private hospitals performing the surgery with 17 private and 11 public hospitals over the ten year period.
- The annual average cystectomy rate for individual hospitals ranges from 0.1 to 11.5 per annum.
- Metro South Hospital and Health Service perform just under half (43%) of all the cystectomy surgery in Queensland.
- 30 day postoperative mortality was very low at 1.1% for patients undergoing cystectomy in Queensland.
- 90 day postoperative mortality rates of 4.2% following cystectomy for bladder cancer are among the best in the world.
- Postoperative mortality is associated with increasing age and comorbidities.

Part 1

Epidemiology of invasive bladder cancer in Queensland

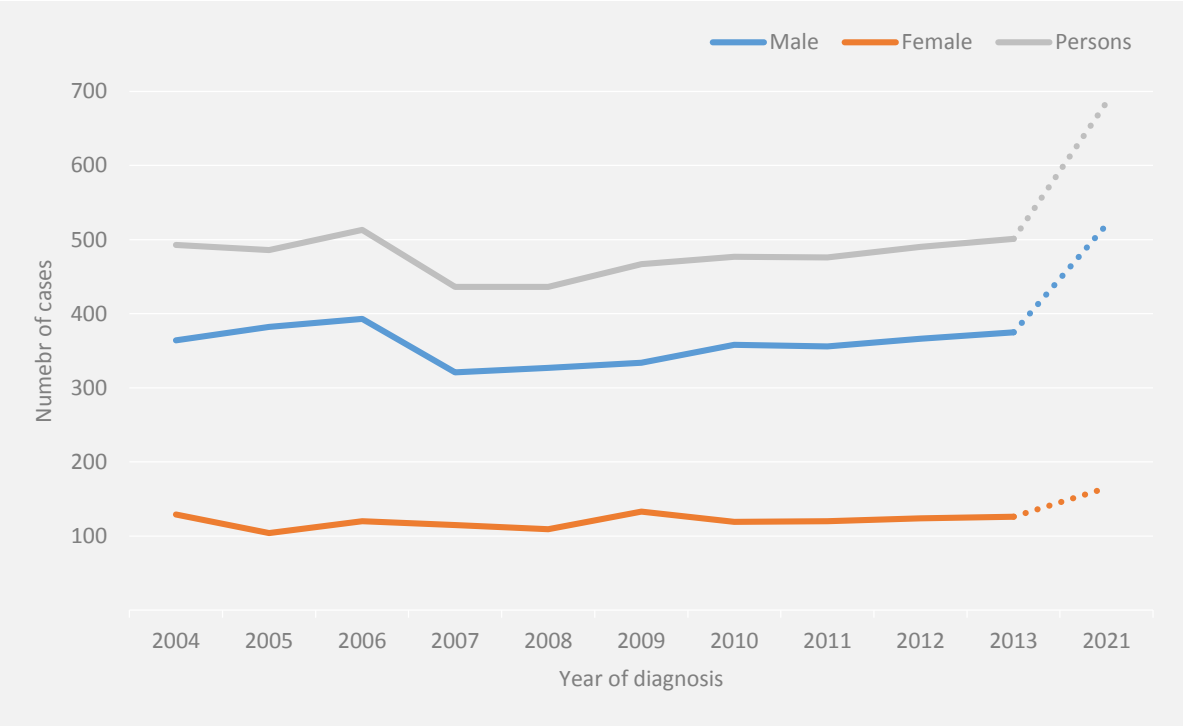
Incidence and mortality projections Queensland 2021

It is estimated in 2021 that 685 new cases of invasive bladder cancer will be diagnosed among Queensland residents and that 290 Queenslanders will die of the disease.

Invasive bladder cancer is expected to continue to be more common in males (520 new cases), than in females (165 cases). Projected incidence for 2021 (685 cases) shows a 37% increase from the 2013 incidence of 501 cases.

209 invasive bladder cancer deaths were recorded in 2013 with an expected increase of 39% by 2021 (290 cases).

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 1.1: Actual and projected incidence

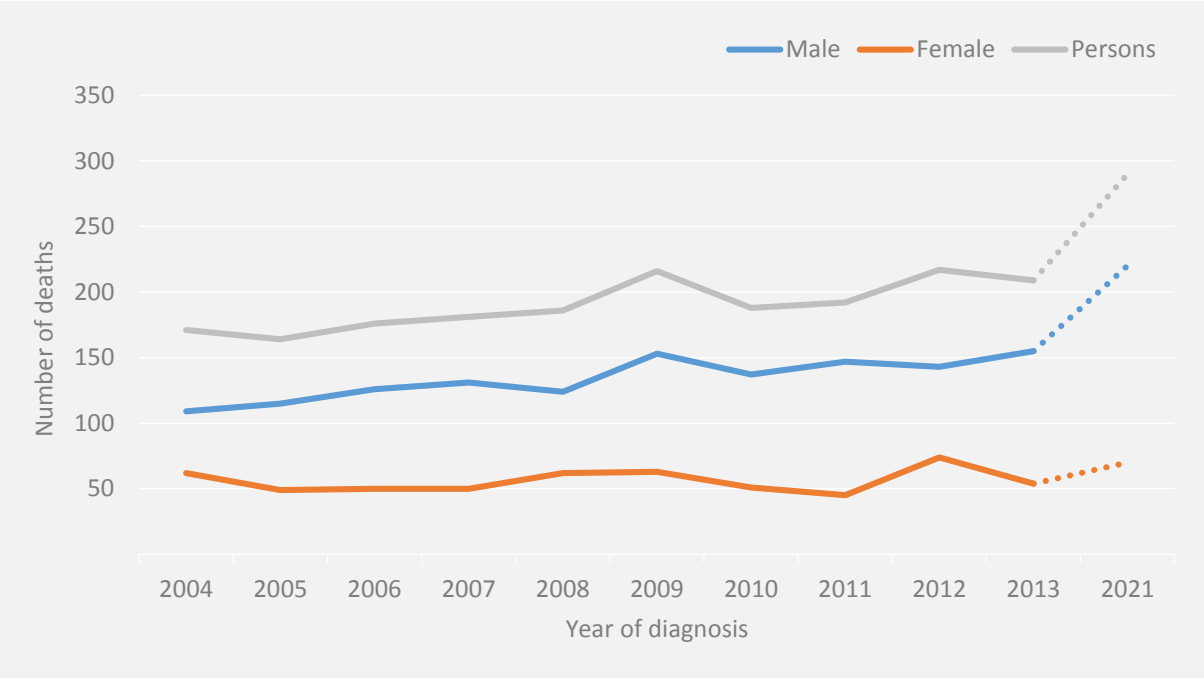


INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Table 1.1: Actual and projected incidence

Incidence	**All years**	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2021 (expected)
Number of cases	**4775**	493	486	513	436	436	467	477	476	490	501	685

Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 1.2: Actual and projected mortality



INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Table 1.2: Actual and projected mortality

Mortality	**All years**	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2021 (expected)
Number of cases	**1900**	171	164	176	181	186	216	188	192	217	209	290

Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

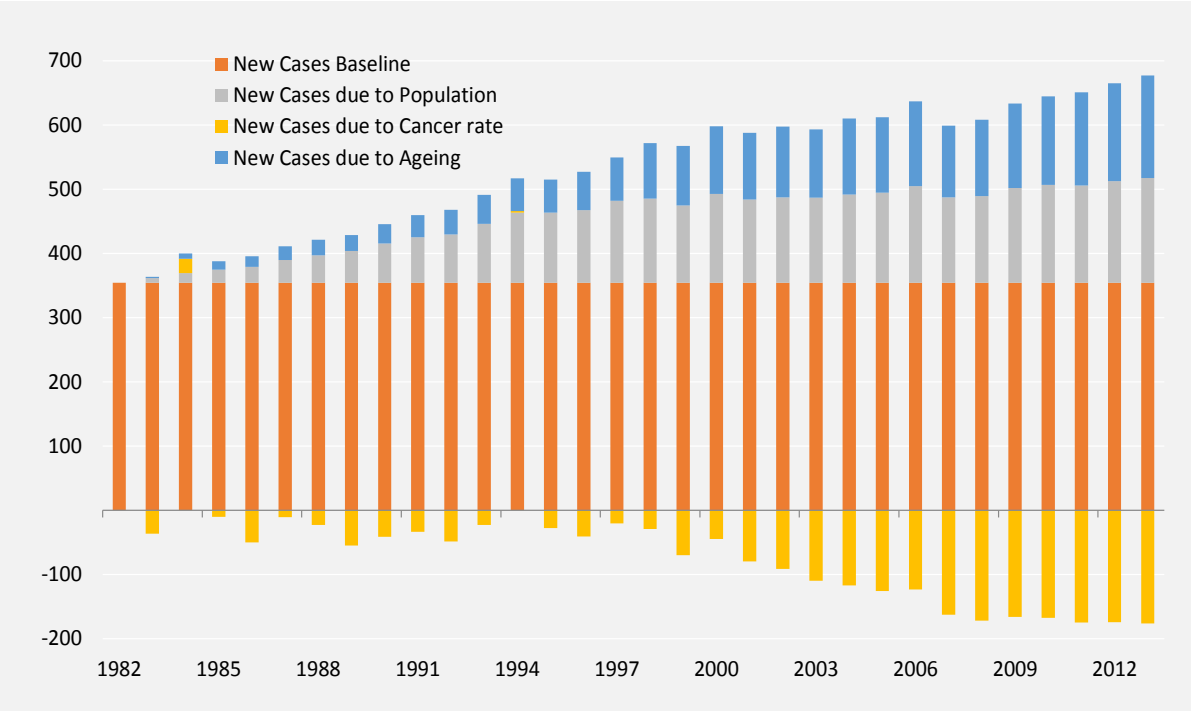
Incidence and mortality

The number of new cases of invasive bladder cancer among Queensland residents has increased by 42% between 1982 and 2013. For males, the number of new cases increased from 276 in 1982 to 375 (36%) in 2013; for females, the number of new cases increased from 78 to 126 (62%). These increases were mainly due to population growth and ageing.

Queensland's population increased from 2.4 million in 1982 to 4.7 million in 2013, an increase of 92%, making Queensland the fastest growing state in Australia and one of the fastest among developed countries.

The invasive bladder cancer rate, unlike many other cancers, has consistently decreased over time.

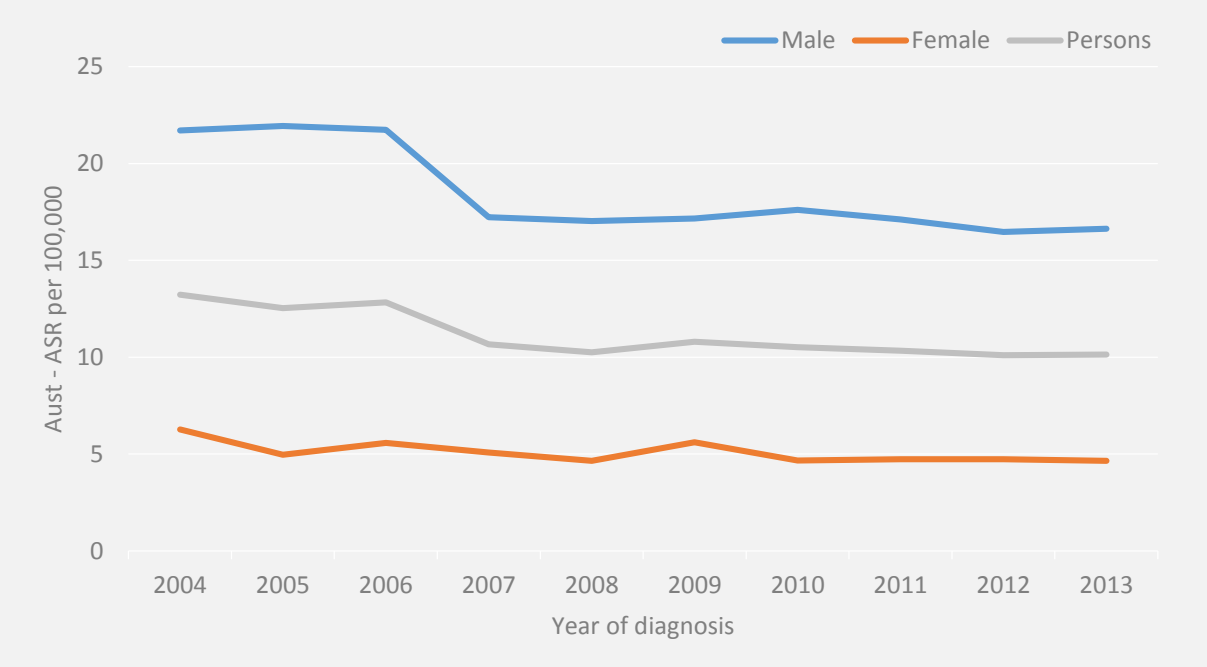
INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 1.3: Growth in bladder cancer



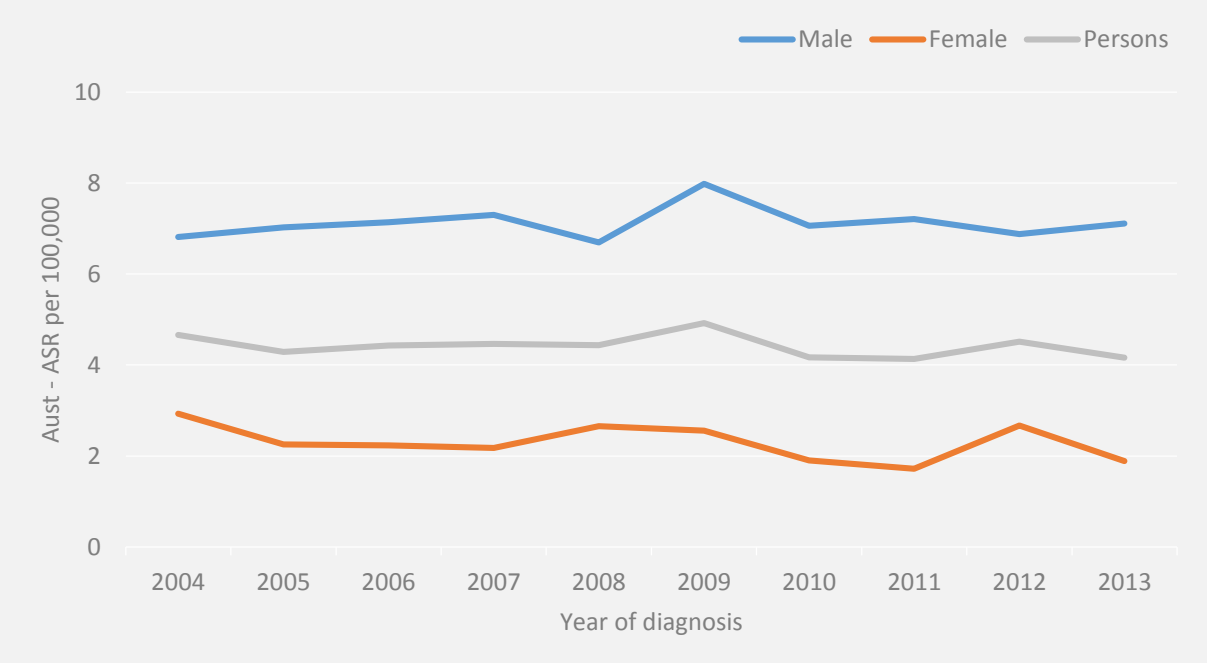
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

The age-standardised incidence rate of invasive bladder cancer decreased from 13.2 per 100,000 in 2004 to 10.1 per 100,000 in 2013. Age-standardised incidence rates of invasive bladder cancer overall are on average three times lower for females compared to males. Mortality rates have remained stable with a rate of 4.7 per 100,000 in 2004 to 4.2 per 100,000 in 2013.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 1.4: Age-standardised incidence rates per 100,000



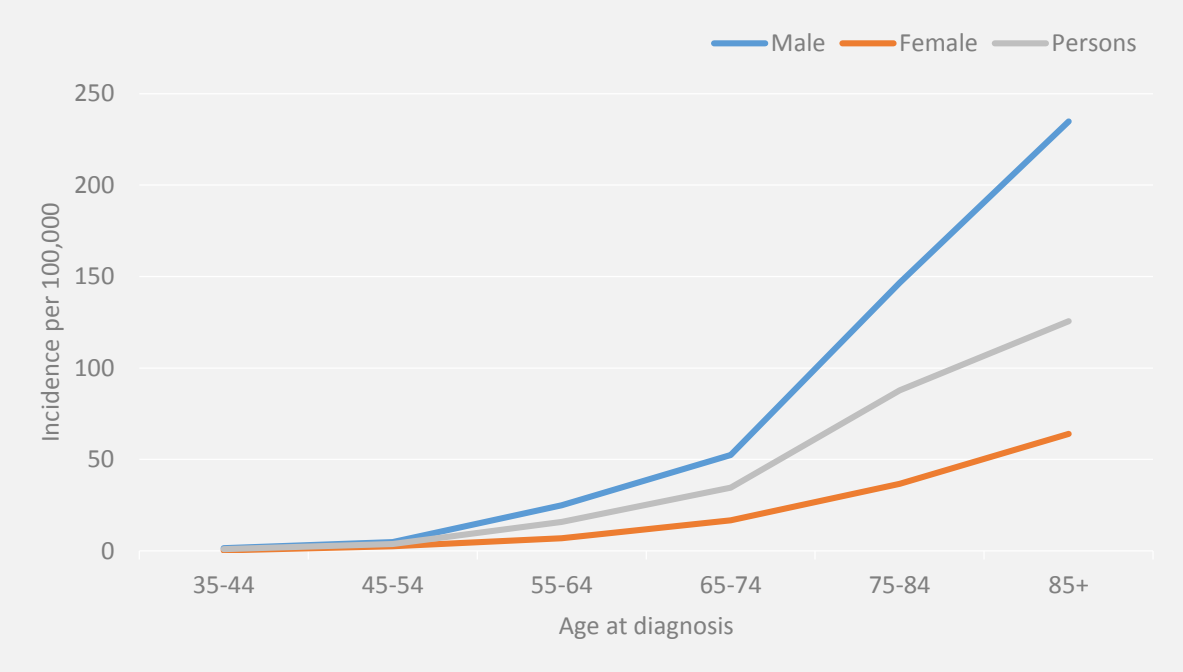
INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 1.5: Age-standardised mortality rates per 100,000



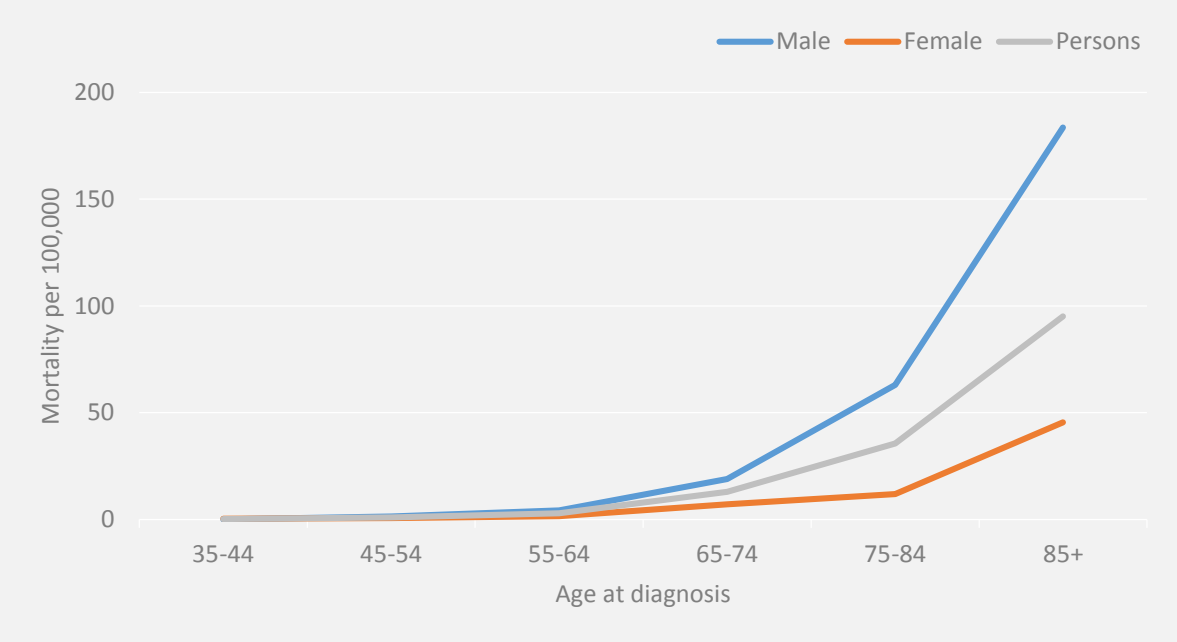
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Invasive bladder cancer incidence and mortality rates both increased with age overall in 2013. For every 100,000 people aged 85 and older, 126 were diagnosed with and 95 died from invasive bladder cancer. Very few cases of invasive bladder cancer were recorded for persons under the age of 45 (<5 cases per 100,000).

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2013
Figure 1.6: Incidence per 100,000, by age at diagnosis



INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2013
Figure 1.7: Mortality per 100,000, by age at diagnosis



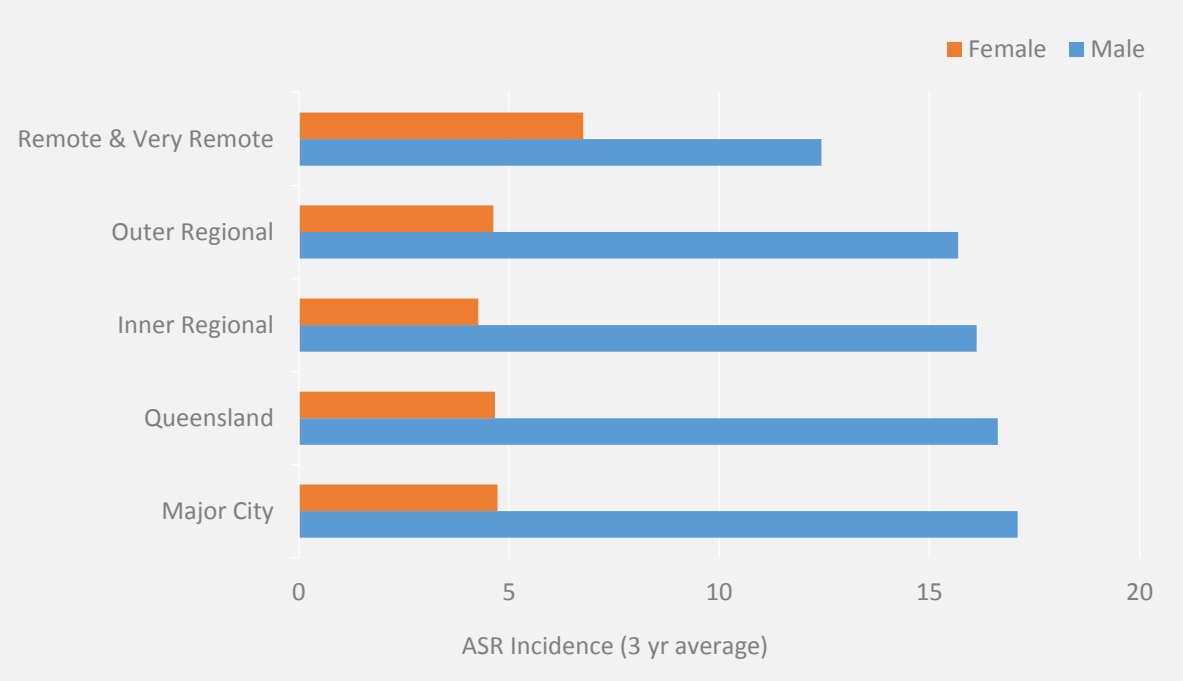
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Variation in incidence and mortality

On average, incidence for invasive bladder cancer varied by remoteness of residence for both males and females from 2011-2013. The highest average rate was seen in males who lived in the major city areas of Queensland (17.1 per 100,000), for females the highest average rate was 6.8 per 100,000 in remote & very remote areas of Queensland. Overall incidence rates in major city, outer regional and inner regional rates were similar whilst rates for remote & very remote areas of Queensland were slightly lower for males and slightly higher for females.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2011-2013

Figure 1.8: Age-standardised 3 year average incidence rates by remoteness of residence



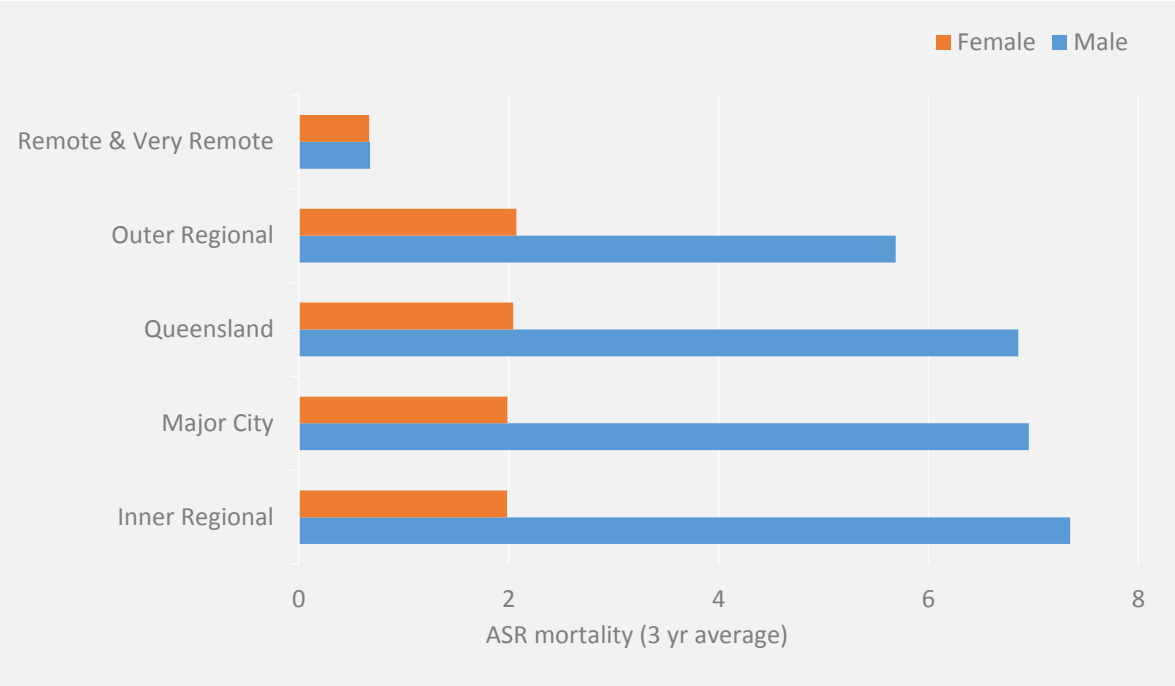
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Note: In the interest of completeness, incidence and mortality rates have been included for those with fewer than 16 cases. Incidence and mortality rates based on numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. For example, the relative standard error (RSE) will be equal or greater than 25% when incidence rates are based on fewer than 16 cases. For more information, refer to the technical notes available at:
http://www.cdc.gov/cancer/npcr/uscs/2007/technical_notes/stat_methods/suppression.htm

Mortality rates for invasive bladder cancers varied by remoteness for both males and females from 2011-2013. The rates for males ranged from 7.3 per 100,000 for males who lived in the inner regional areas of Queensland to 0.7 per 100,000 who lived in remote & very remote areas of Queensland. Rates for females were similar with remote & very remote areas with a much lower rate than the other regions (0.7 per 100,000 for remote & very remote vs approx. 2 per 100,000 for other areas).

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2011-2013

Figure 1.9: Age-standardised 3 year average mortality rates by remoteness of residence



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Note: In the interest of completeness, incidence and mortality rates have been included for those with fewer than 16 cases. Incidence and mortality rates based on numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. For example, the relative standard error (RSE) will be equal or greater than 25% when incidence rates are based on fewer than 16 cases. For more information, refer to the technical notes available at:
http://www.cdc.gov/cancer/npcr/uscs/2007/technical_notes/stat_methods/suppression.htm

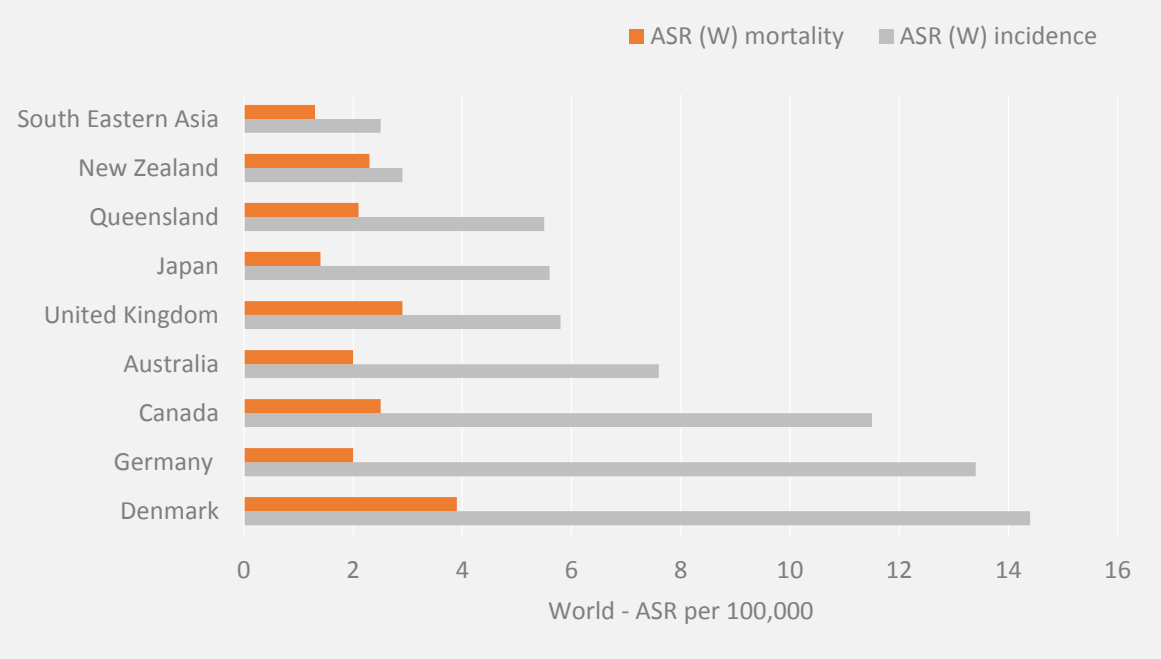
Bladder cancer national and international comparisons

Invasive bladder cancer incidence is low in both South Eastern Asia and New Zealand, with rates of approximately 3 cases per 100,000 people. Australian incidence rates are more than two times higher with 7.6 cases per 100,000 people.

Similarly, age-standardised mortality rates for invasive bladder cancer in South Eastern Asia were low with 1.3 cases per 100,000. Australian rates are also low with approximately 2 cases per 100,000 people.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2012

Figure 1.10: Age-standardised incidence and mortality rates for selected international regions

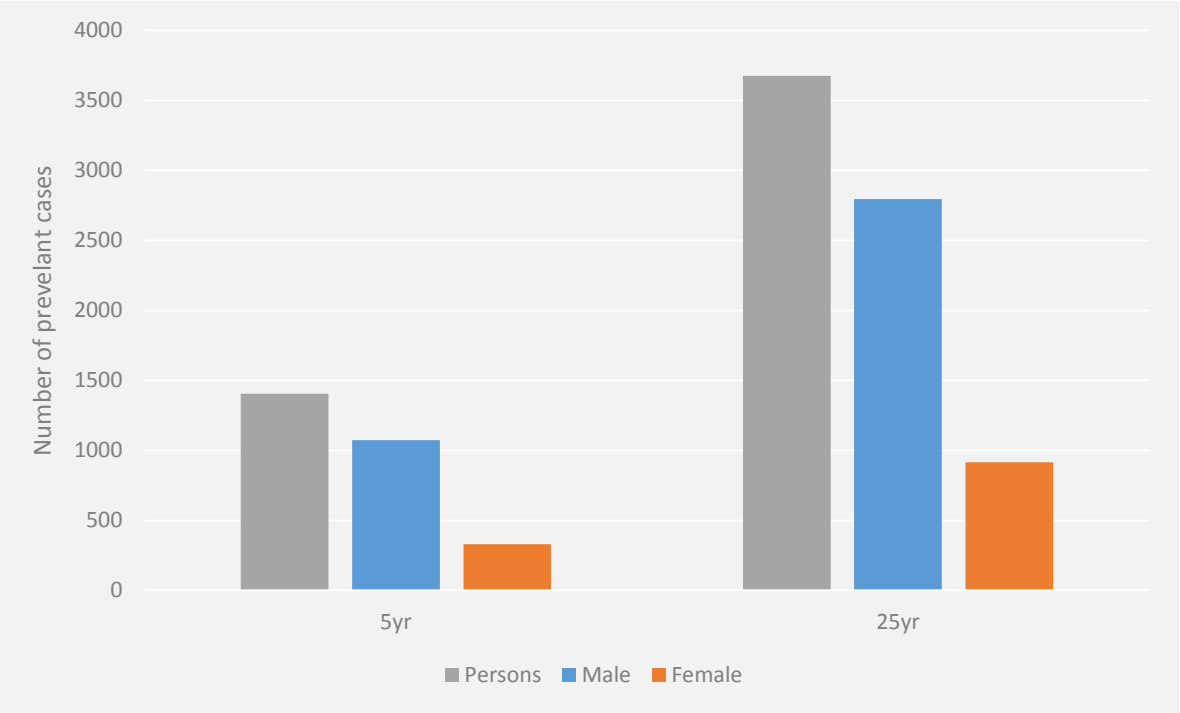


Note: Cancer incidence estimated by the International Agency for Research on Cancer (IARC) for 2012 (GLOBOCAN 2012) except for Queensland which is sourced from Oncology Analysis System, Queensland Cancer Control Analysis Team.

Prevalence

Prevalence represents the number of people living with a cancer and is a measure of the burden of the disease for the individual, families and society. Invasive bladder cancer prevalence is increasing as more people are diagnosed and survival improves. At the end of 2013, more than 1,400 Queenslanders were living with a diagnosis of invasive bladder cancer in the previous five years.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2013
Figure 1.11: Prevalence, by time since diagnosis



INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2013
Table 1.2: Prevalence, by time since diagnosis

	Persons	Male	Female
5 year	1404	1073	331
25 year	3674	2795	915

Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

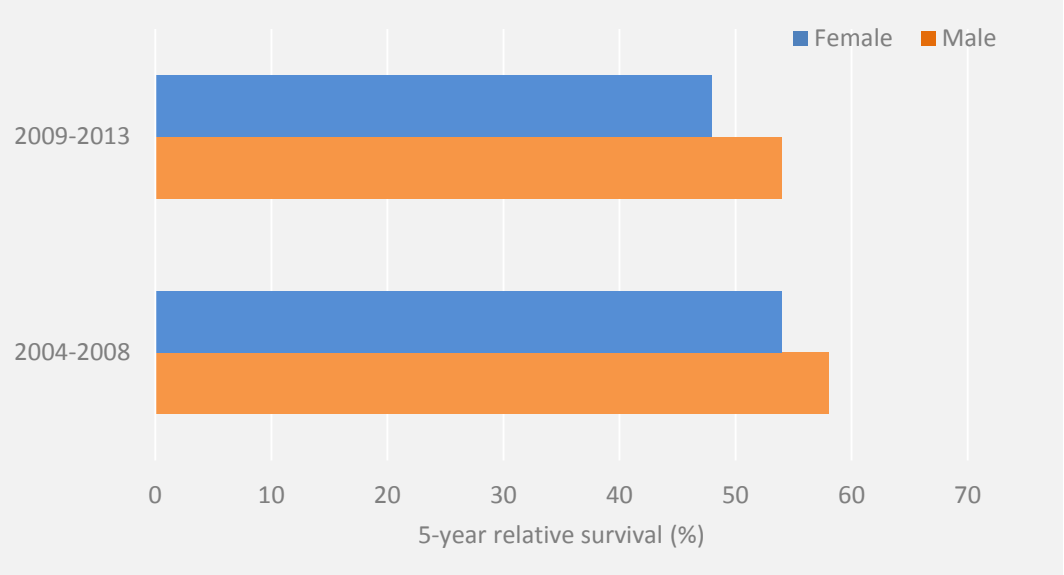
Survival

Relative survival is a measure of the survival of a group of people with a condition, such as cancer, relative to a comparable group from the general population without the condition. For cancer, five-year relative survival represents the proportion of patients alive five years after diagnosis, taking into account age, gender and year of diagnosis.

The five-year relative survival for invasive bladder cancer between 2009-2013 was 48% for females and 54% for males compared to the 2004-2008 period of 54% for females and 58% for males.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2008 AND 2009-2013

Figure 1.12: 5-year relative survival



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Part 2

Bladder cancer overview by hospital and health service

Patient characteristics

In this section an overview of incidence and mortality is presented for the fifteen Hospital and Health Services (HHS) in Queensland for the time period 2011-2013.

The median age for invasive bladder patients in Queensland was 75 years with a range of 56-78 years across HHS. Invasive bladder cancer was more common in males representing between 43-100% of incidence across the state. The majority of invasive bladder cancer patients resided in Metro South and Metro North who contributed 43% of the total incidence. Socioeconomic status and other factors varied across Queensland.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2011-2013

Table 2.1: Patient characteristics by **HHS of residence**

	Incidence annual average n (col%)	Median age	% Male	% Disadvantaged	% Indigenous	% With comorbidity	% Public
Metro South	102 (22%)	74yrs	79%	15%	0%	38%	43%
Metro North	97 (21%)	76yrs	74%	10%	1%	49%	50%
Gold Coast	59 (13%)	78yrs	71%	8%	1%	25%	59%
Sunshine Coast	41 (9%)	75yrs	78%	15%	0%	37%	56%
Wide Bay	35 (7%)	77yrs	76%	85%	0%	42%	52%
Townsville	26 (6%)	70yrs	77%	29%	5%	36%	49%
Darling Downs	24 (5%)	74yrs	79%	38%	1%	42%	56%
Cairns and Hinterland	23 (5%)	71yrs	74%	46%	3%	31%	49%
Central Queensland	21 (4%)	74yrs	78%	25%	0%	44%	47%
West Moreton	16 (3%)	69yrs	71%	41%	0%	27%	37%
Mackay	15 (3%)	75yrs	73%	27%	0%	47%	51%
South West	2 (0%)	71yrs	43%	14%	0%	57%	43%
North West	2 (0%)	56yrs	71%	71%	29%	29%	0%
Torres and Cape	1 (0%)	62yrs	100%	0%	0%	0%	0%
Central West	1 (0%)	58yrs	100%	0%	0%	33%	100%
Qld Unknown	3 (0%)	75yrs	70%	0%	0%	30%	40%
Queensland	**469 (100%)**	**75yrs**	**75%**	**24%**	**1%**	**39%**	**50%**

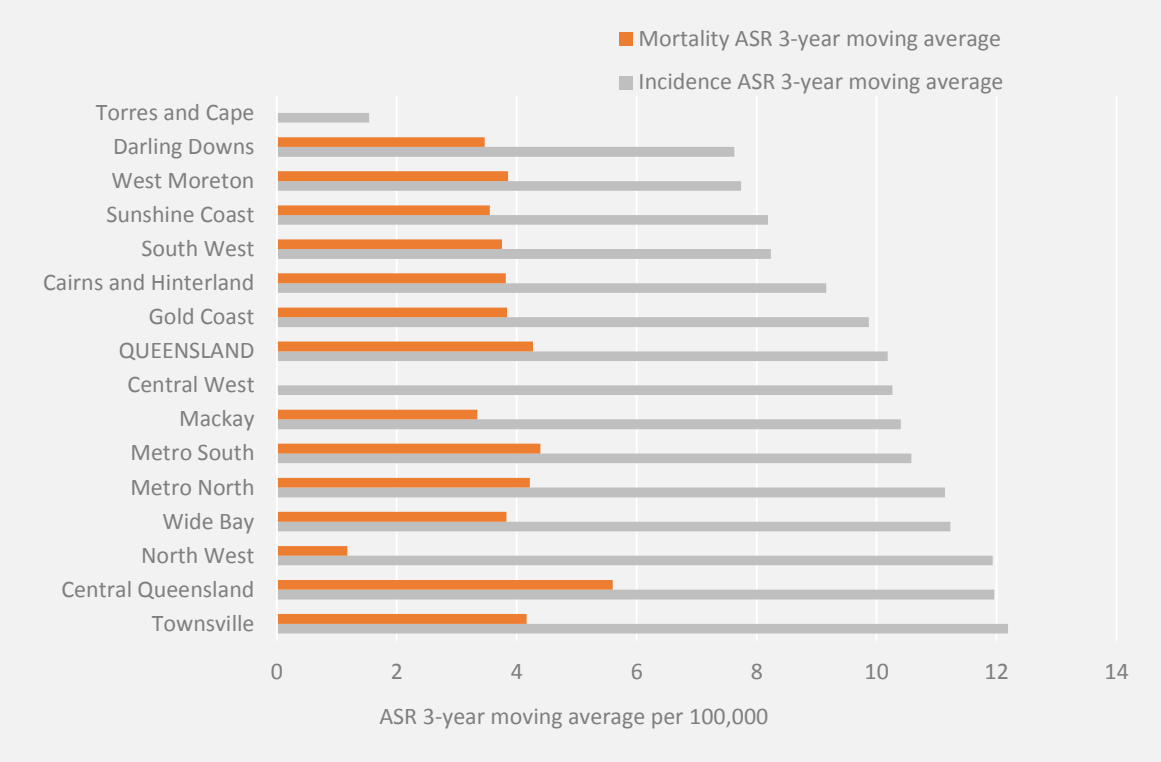
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Note: In the interest of completeness, annual average numbers have been included for those with fewer than 16 cases. Numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. Annual average numbers have been rounded up to the nearest whole number for those with less than one, therefore the totals may not add up. Qld unknown HHS is where patient address is unknown in Queensland.

Incidence and mortality

At the Hospital and Health Service level age-standardised incidence and mortality rates for invasive bladder cancer vary across the state. Reasons for the variations are diverse and complex and include exposure to environmental factors, socioeconomic status, access to health services and chance. It should be noted that remote Hospital and Health Services have small populations and estimates of mortality rates based on such small numbers may not be as accurate as those for areas with larger populations.

The age-standardised incidence rates are highest in the Townsville Hospital and Health Services with 12 per 100,000 diagnosed, while mortality rates are highest in Central Queensland with approx. 6 per 100,000 deaths. Torres and Cape York experienced the lowest age-standardised incidence rates in the state while the North West experienced the lowest mortality rates (besides Central West and Torres & Cape York that had no bladder cancer mortality).

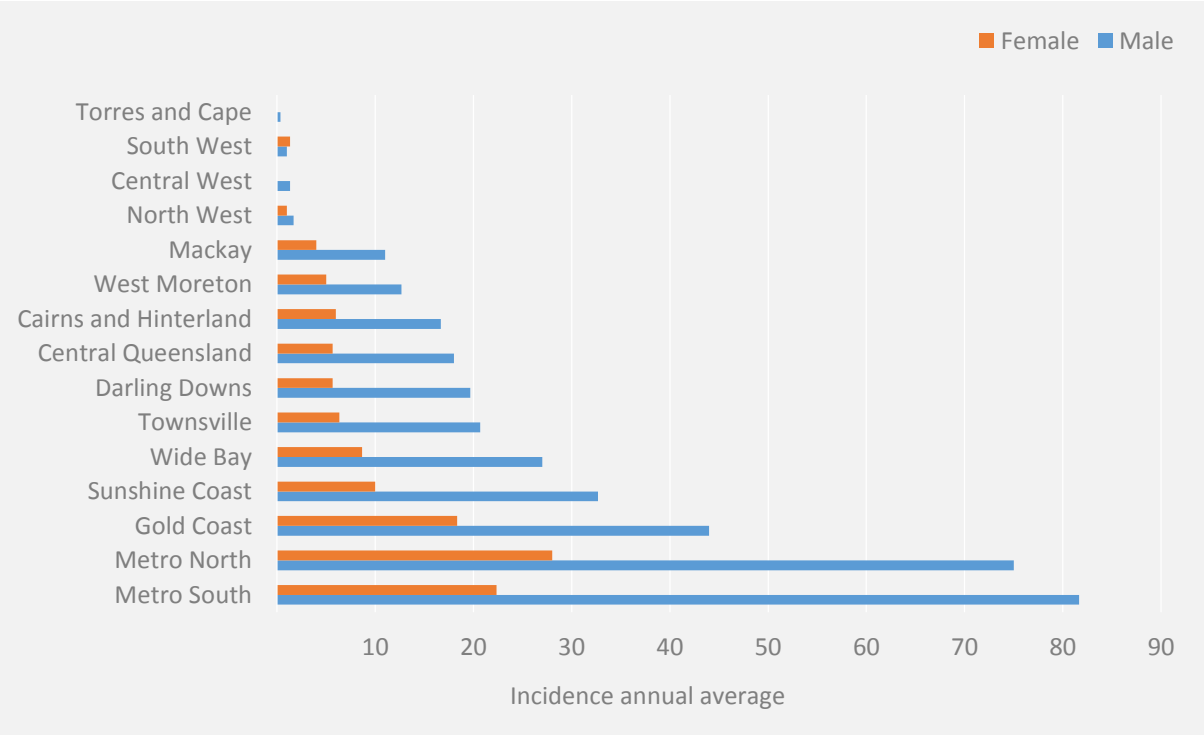
INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2011-2013
Figure 2.1: Age standardised rate 3-year moving average by **HHS of residence**



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Note: In the interest of completeness, moving average numbers have been included for those with fewer than 16 cases. Numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. Moving average numbers have been rounded up to the nearest whole number for those with less than one, therefore the totals may not add up.

Invasive bladder cancer annual incidence (2011-2013) is highest in Metro South and Metro North HHS accounting for 22% and 21% for the state's incidence respectively.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2011-2013
Figure 2.2: Annual average incidence by **HHS of Residence**

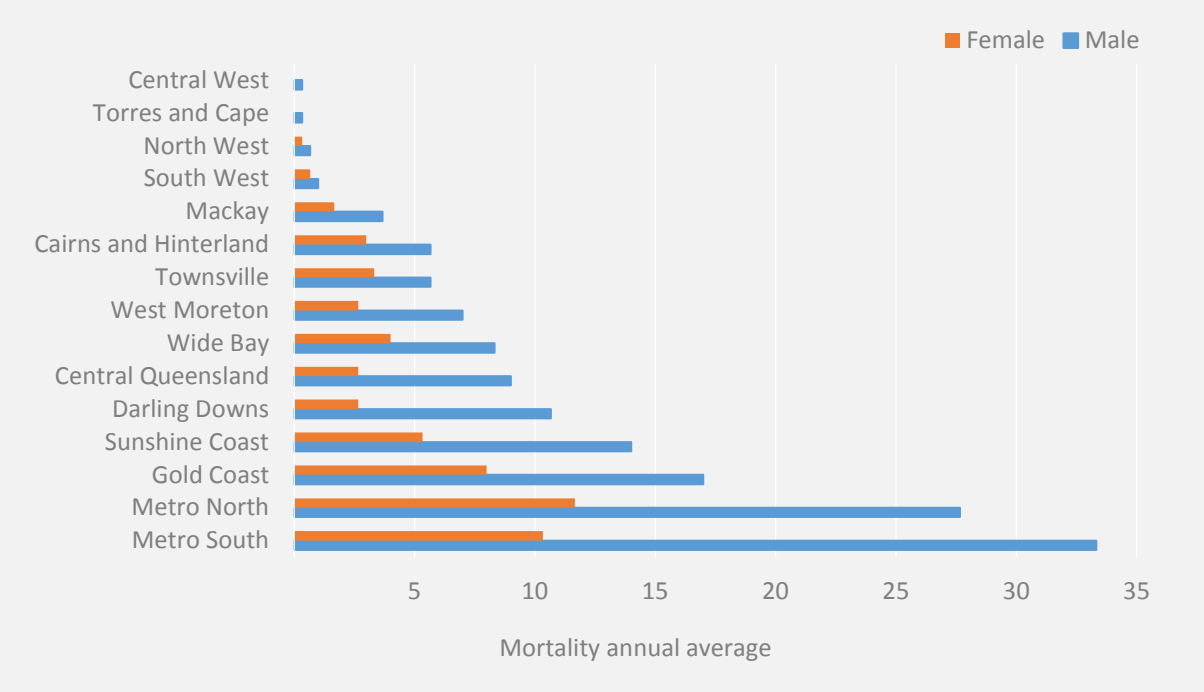


Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Note: In the interest of completeness, annual average numbers have been included for those with fewer than 16 cases. Numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. Annual average numbers have been rounded up to the nearest whole number for those with less than one, therefore the totals may not add up.

Similar to incidence, the average annual mortality (2011-2013) is highest in Metro South and Metro North HHS accounting for 21% and 17% of the state's mortality respectively.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2011-2013

Figure 2.3: Annual average mortality by **HHS of Residence**

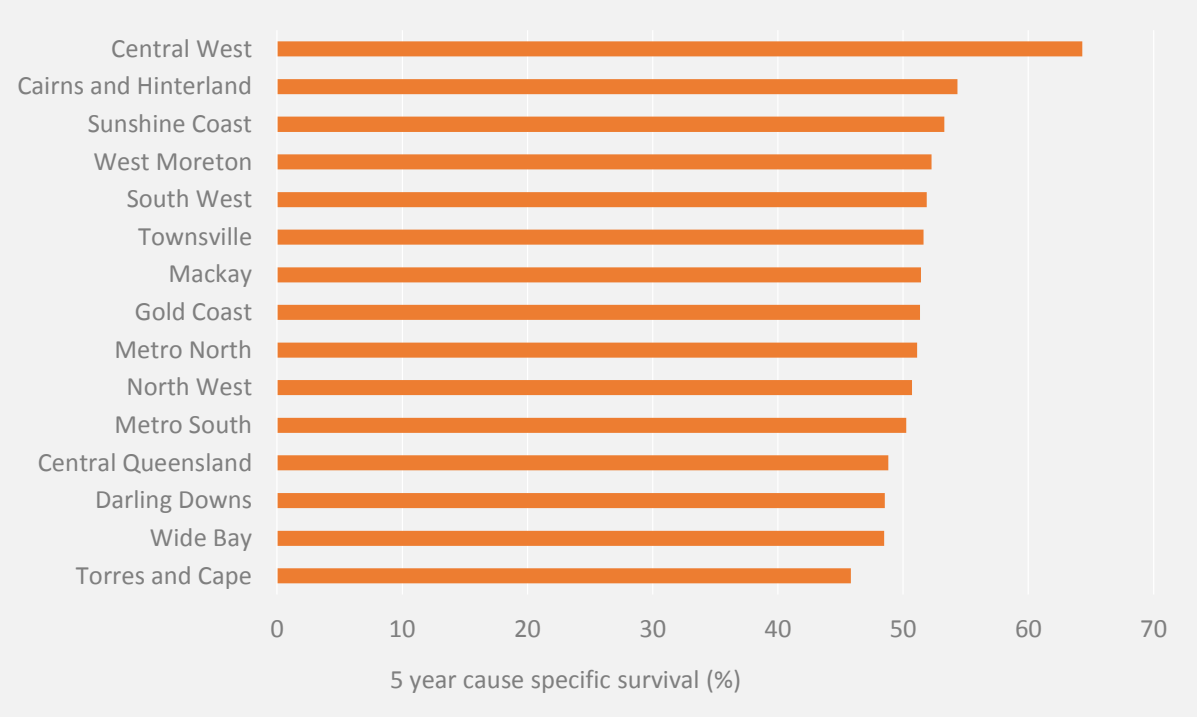


Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Note: In the interest of completeness, annual average numbers have been included for those with fewer than 16 cases. Numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. Annual average numbers have been rounded up to the nearest whole number for those with less than one, therefore the totals may not add up.

Survival

There is some regional variation in cause specific 5 yr. survival of Queensland invasive bladder cancer across the state. The Torres Strait and Cape York Hospital and Health Services represented the lowest 5 year survival percentage of 46% and the Central West Hospital and Health Service had the highest at 63%.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 1982-2013
Figure 2.4: Cause specific survival by **HHS of residence**



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Part 3

Surgical overview 2004 – 2013: Cystectomy

Introduction

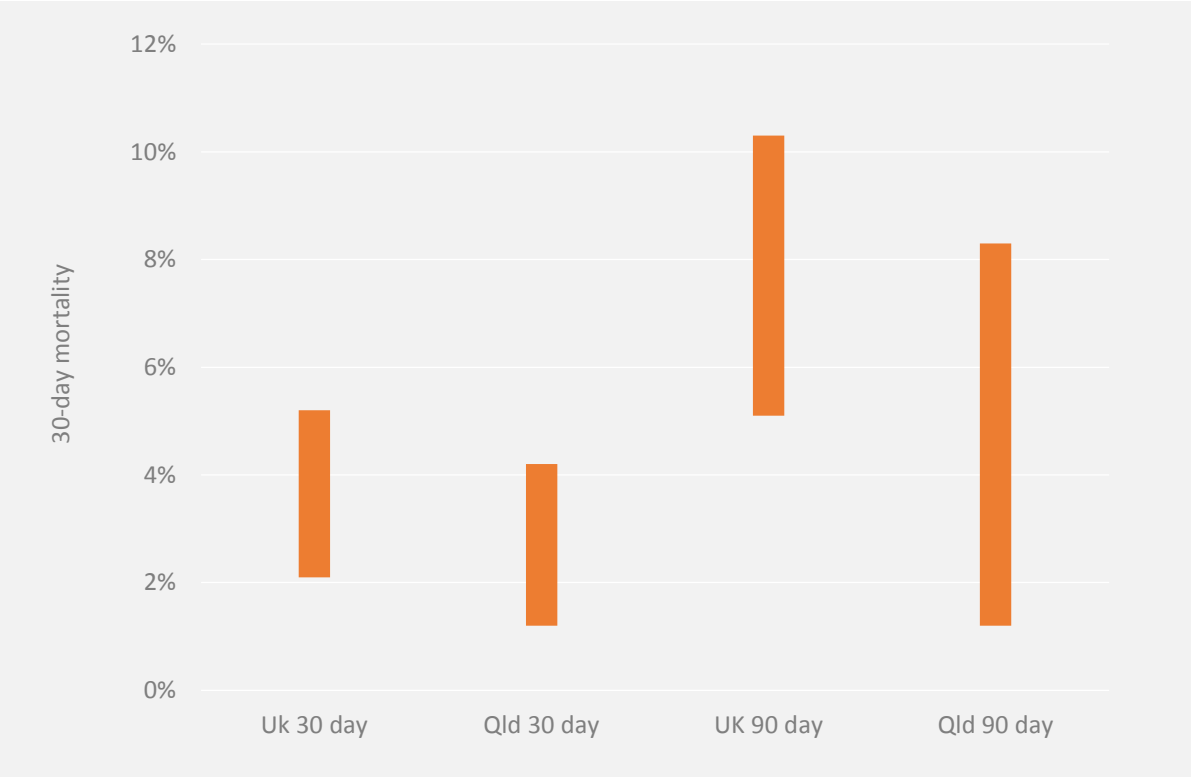
Cystectomy is a complex surgery primarily performed for patients diagnosed with invasive bladder cancer. Studies have shown that patients undergoing complex surgeries have better outcomes at hospitals that perform such procedures in large volumes.[1] Most of these studies were conducted in the US and UK, where average hospital volumes are larger than in Australia. Results from similar studies in this country have been inconsistent, possibly due to heterogeneity in the range of volumes as well as in the types of surgeries and outcomes examined.

A study published in the December 2010 edition of the European Urology journal based on radical cystectomy surgical mortality in the UK found a significant decrease in both 30 day (5.2 to 2.1%) and 90 day (10.3 to 5.1%) postoperative mortality rates after centralisation was implemented.[2] The Maryland Health Services Cost Review Commission database showed that undergoing cystectomy at a high volume centre was associated with reduced inpatient mortality, reduced ICU stay and lower cost.[3]

Compared to the United Kingdom, Queensland has a lower 30 day and 90 day postoperative mortality rate for cystectomy of 1.1% and 4.2% respectively.

INVASIVE BLADDER CANCER

Figure 3.1: Cystectomy 30 and 90 day postoperative mortality rate variance for UK and Queensland



[1] Gruen RL, Pitt V, Green S, Parkhill A, Campbell D, Jolley D. The effect of provider case volume on cancer mortality: Systematic Review and Meta-analysis. CA Cancer J Clin 2009; 59: 192-211.

[2] Hounsome LS, Verne J, McGrath JS, Gillatt DA. Trends in Operative Caseload and Mortality Rates after Radical Cystectomy for Bladder Cancer in England for 1998–2010. EUROPEAN UROLOGY 2015; 67: 1056-1062

[3] Gorin MA, Kates M, Mullins JK, Pierorazio PM, Matlaga BR, Schoenberg MP, Bivalacqua TJ.
Impact of hospital volume on perioperative outcomes and costs of radical cystectomy: analysis of the Maryland Health Services Cost Review Commission database. Can J Urol. 2014 Feb: 21(1):7102-7.

Patient characteristics

Of the Queensland patients with invasive bladder cancer diagnosed between 2004-2013, 86% underwent surgery but only 18% underwent a cystectomy. The median age for cystectomy is 67 years, compared to 80 years for those who did not undergo surgery.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

Table 3.1: Patient characteristics for bladder cohort

	Had surgery (86%)		**No surgery (14%)**	**Queensland**
	Cystectomy	Had excision		
Incidence	838 (18%)	3123 (68%)	656 (14%)	4617 (100%)*
Median age at diagnosis	67yrs	76yrs	80yrs	75yrs
% Male	76%	76%	69%	75%
% With comorbidity	45%	35%	42%	38%
% Indigenous	1%	1%	2%	1%
% Disadvantaged	24%	25%	27%	25%
% Regional & Remote	40%	38%	38%	38%
% Histological verification	100%	94%	28%	86%

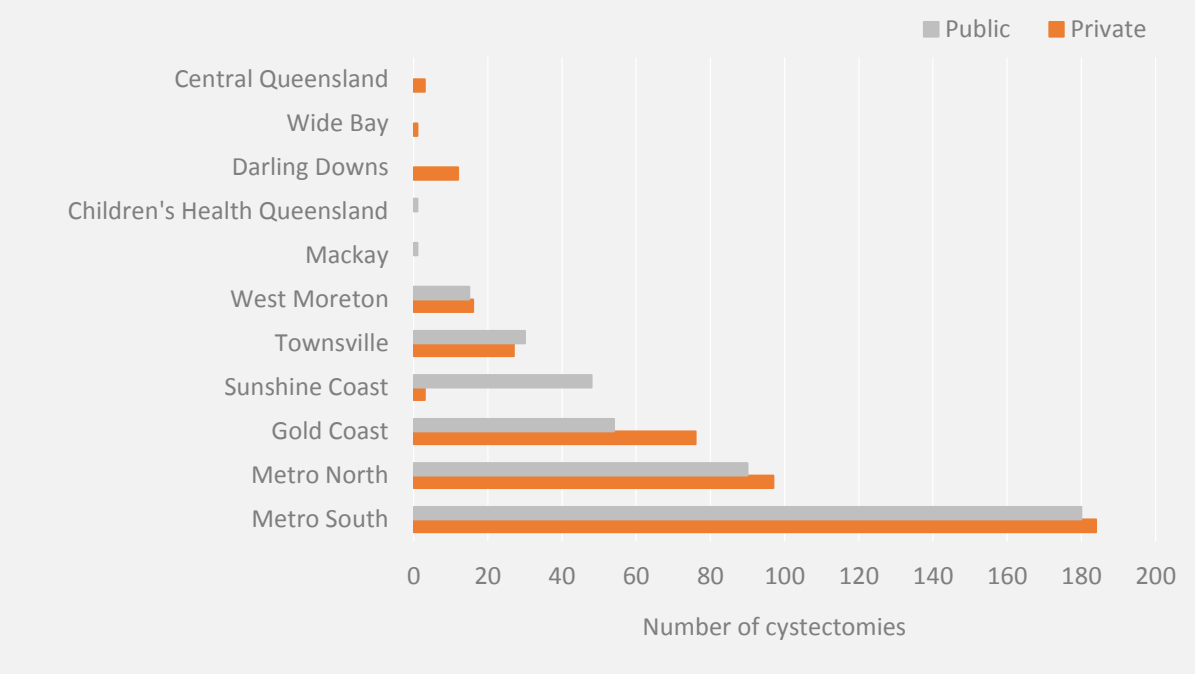
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

**To assign a surgery record to a person with cancer the earliest diagnosis in the cancer group is used. For example, if a person was diagnosed with a primary trigone of bladder cancer in 2012 and a primary bladder neck cancer in 2014, then the surgery record that is linked to the cancer in the trigone diagnosed in 2012 will be reported. Therefore population incidence is slightly higher at 4775 cases.*

Hospital and health service

Metro South HHS performed the most cystectomies for patients diagnosed between 2004-2013, accounting for 43% of the total, followed by Metro North HHS with 22%. Half of all cystectomies were performed in the public health sector, but the proportion varies across health services. In most HHS more surgeries were performed in the private sector.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 3.2: Number of cystectomies by **HHS performing surgery** and sector (public or private)



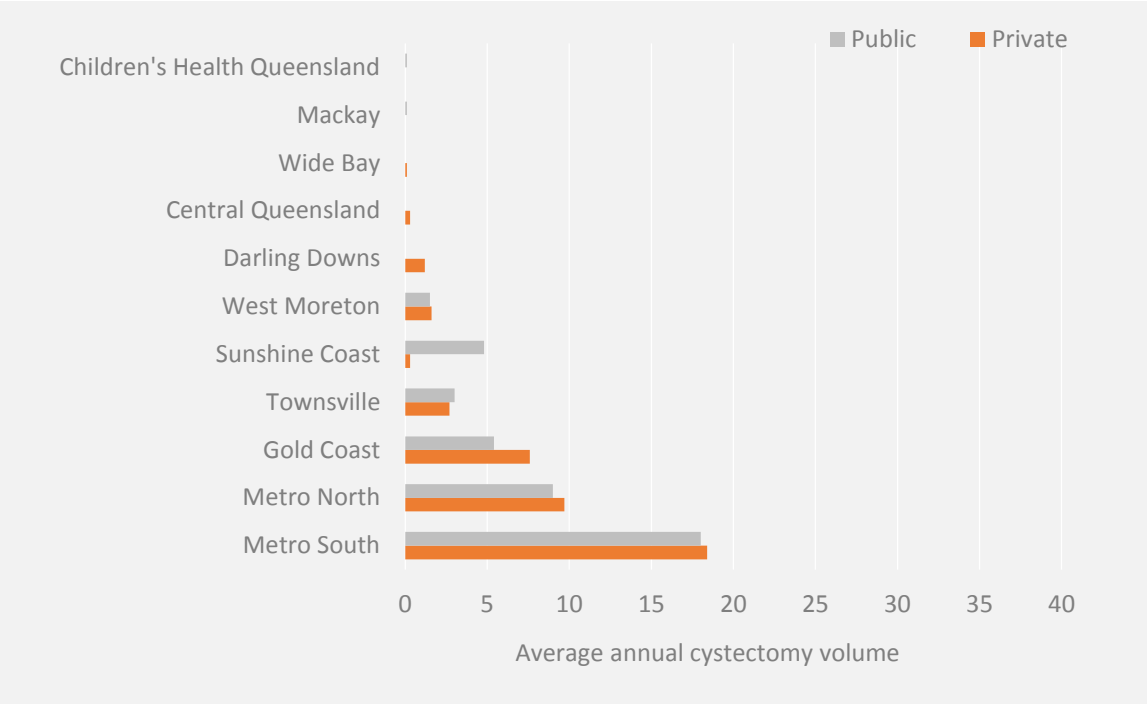
INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Table 3.2: Number of cystectomies by **HHS performing surgery** and sector (public or private)

	Public	**Private**	**All**
	n (row%)	**n (row%)**	**n (col%)**
Metro South	180 (49%)	184 (51%)	364 (43%)
Metro North	90 (48%)	97 (52%)	187 (22%)
Gold Coast	54 (42%)	76 (58%)	130 (16%)
Townsville	30 (53%)	27 (47%)	57 (7%)
Sunshine Coast	48 (94%)	3 (6%)	51 (6%)
West Moreton	15 (42%)	16 (58%)	31 (4%)
Darling Downs	0 (0%)	12 (100%)	12 (2%)
Central Queensland	0 (0%)	3 (100%)	3 (0%)
Children's Health Queensland	1 (100%)	0 (0%)	1 (0%)
Mackay	1 (100%)	0 (0%)	1 (0%)
Wide Bay	0 (0%)	1 (100%)	1 (0%)
Queensland	**419 (50%)**	**419 (50%)**	**838 (100%)**

Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

Figure 3.3: Annual average cystectomy volume by **HHS performing surgery** and sector (public or private)

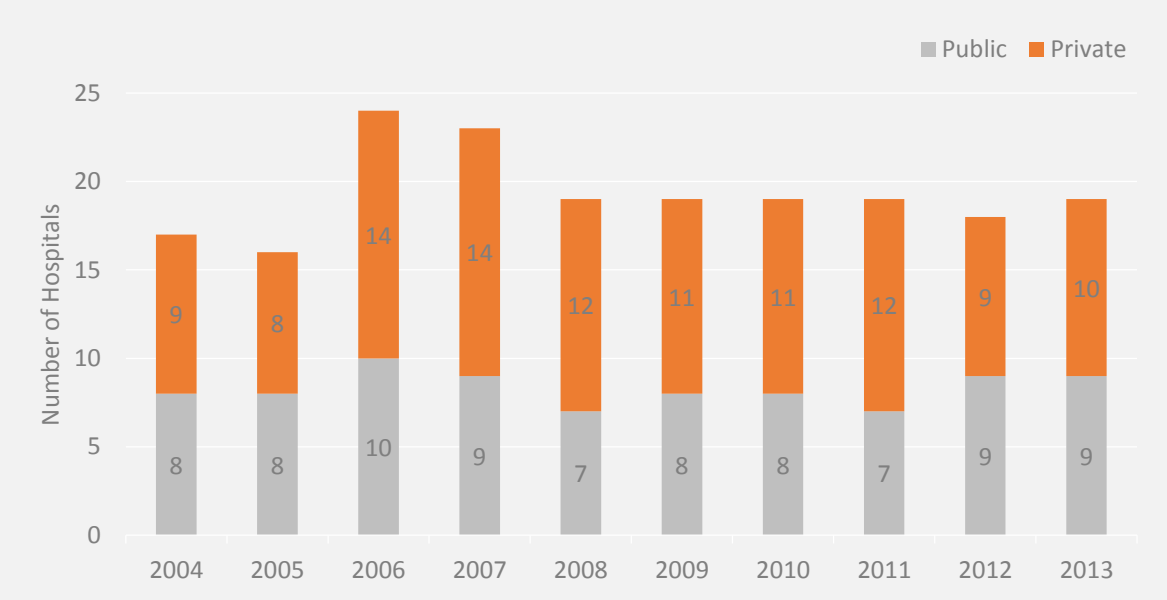


Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Note: In the interest of completeness, annual average numbers have been included for those with fewer than 16 cases. Numbers < 16 should be interpreted with caution due to the poor reliability of rate calculations based on small numbers. Annual average numbers have been rounded up to the nearest whole number for those with less than one, therefore the totals may not add up.

Hospitals performing cystectomies 2004-2008 vs 2009-2013

Over the ten year period there were 17 private hospitals and 11 public hospitals performing a total of 838 cystectomies with exactly half (419 procedures) undertaken in each sector.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 3.4: *Number of hospitals performing cystectomies each year by hospital type*



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

As cystectomy is a major procedure with risk of perioperative morbidity and postoperative mortality, it is important that those patients who are fit and eligible should receive a surgery in an environment where the risks of a poor outcome have been minimised. When deciding whether to perform cystectomy there are important considerations aside from surgical expertise, such as the service capability of the hospital and the appropriate expertise in offering perioperative and postoperative care and support for the patient. Surgeons involved with this surgery are encouraged to have specialist training and continue to submit surgical cases and outcomes related to this surgery for regular audit.

Postoperative mortality

A total of 838 cystectomies were performed on invasive bladder cancer patients diagnosed between 2004-2013, across 28 Queensland hospitals. On average, individual hospital cystectomy volumes ranged from 0.1 to 11.5 cases per year. Three hospitals performed more than 7 per year and accounted 33% of all cystectomies in the state. 57% of hospitals performed less than 2 cystectomies on cancer patients per year. On average nineteen public and private hospitals performed cystectomies each year.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

Table 3.3: Cystectomy patient characteristics and postoperative mortality

	Queensland	Public	Private
Number of cystectomies	838	419	419
Number of hospitals	28	11	17
Median length of stay (days)	13	13	13
ASA score 3^{+}	34%	38%	29%
1 yr. cause specific survival	88%	86%	87%
2 yr. cause specific survival	77%	74%	80%
Number of inpatient deaths	7	4	3
Number of 30 day deaths	9	4	5
Number of 90 day deaths	35	21	14
Inpatient mortality	0.80%	1.00%	0.70%
30-day mortality	1.10%	1.00%	1.20%
90-day mortality	4.20%	5.00%	3.30%
Annual volume	<1 - 11	<1- 6.8	<1 – 5.1

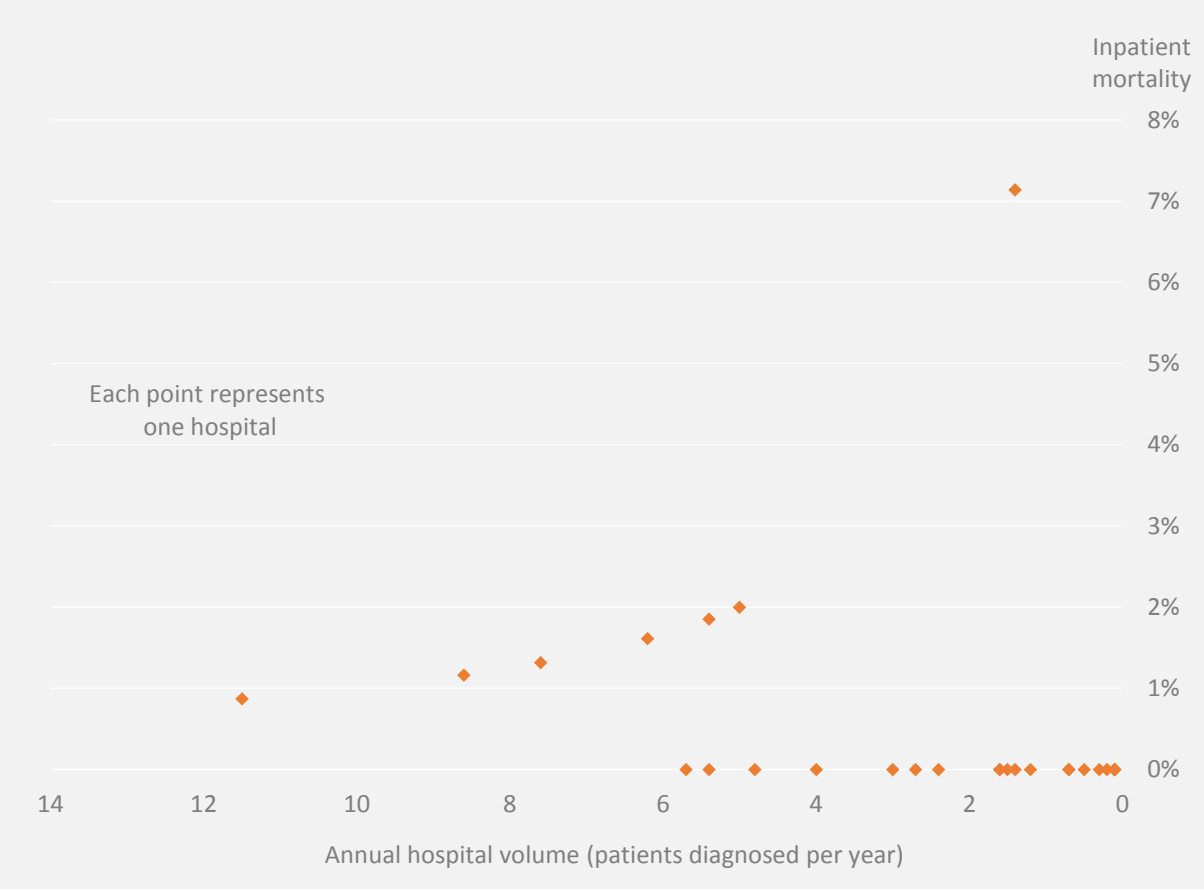
Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

Seven patients (0.8%) died as an inpatient, nine patients (1.1%) died within 30 days of surgery, and thirty-five patients (4.2%) died within 90 days of surgery. The 30 and 90 day postoperative mortality rates per hospital ranged from 0 - 4.2% and 0 - 8.3% respectively.

In multivariate analysis, the risk of 30 day, 90 day postoperative death increased with age. Socioeconomic status was not a significant determinant of surgical mortality.

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

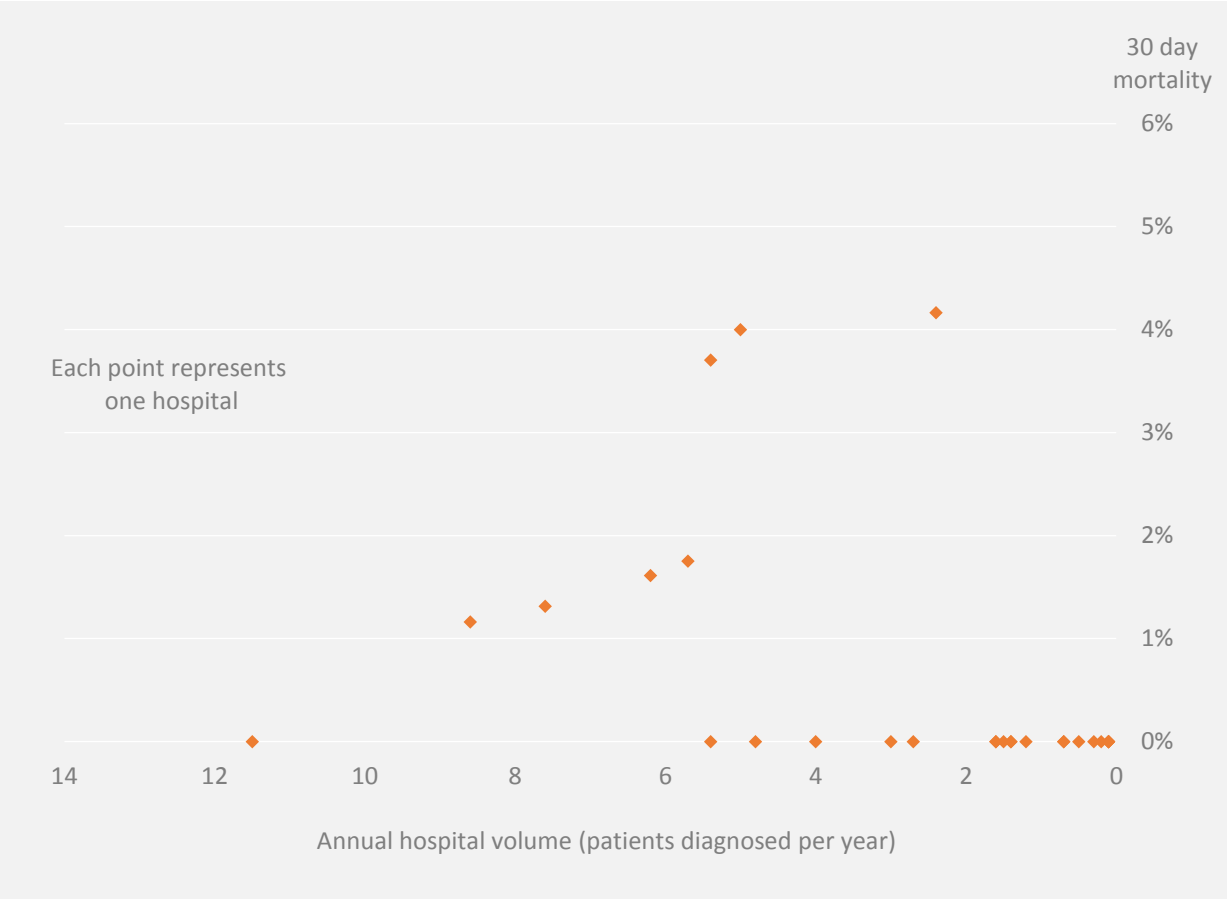
Figure 3.5: Cystectomy annual average volume and **inpatient** postoperative mortality



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

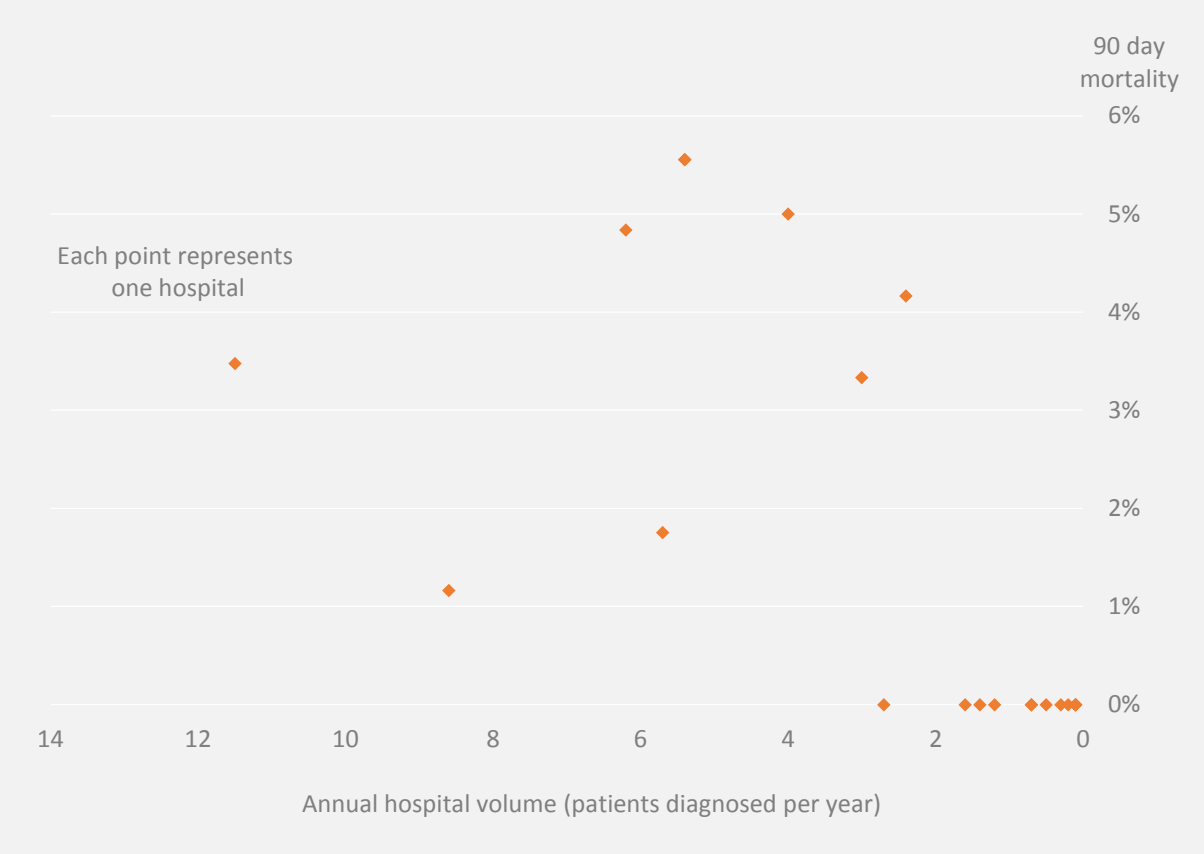
Figure 3.6: Cystectomy annual average volume and **30 day** postoperative mortality



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

Figure 3.7: Cystectomy annual average volume and **90 day** postoperative mortality

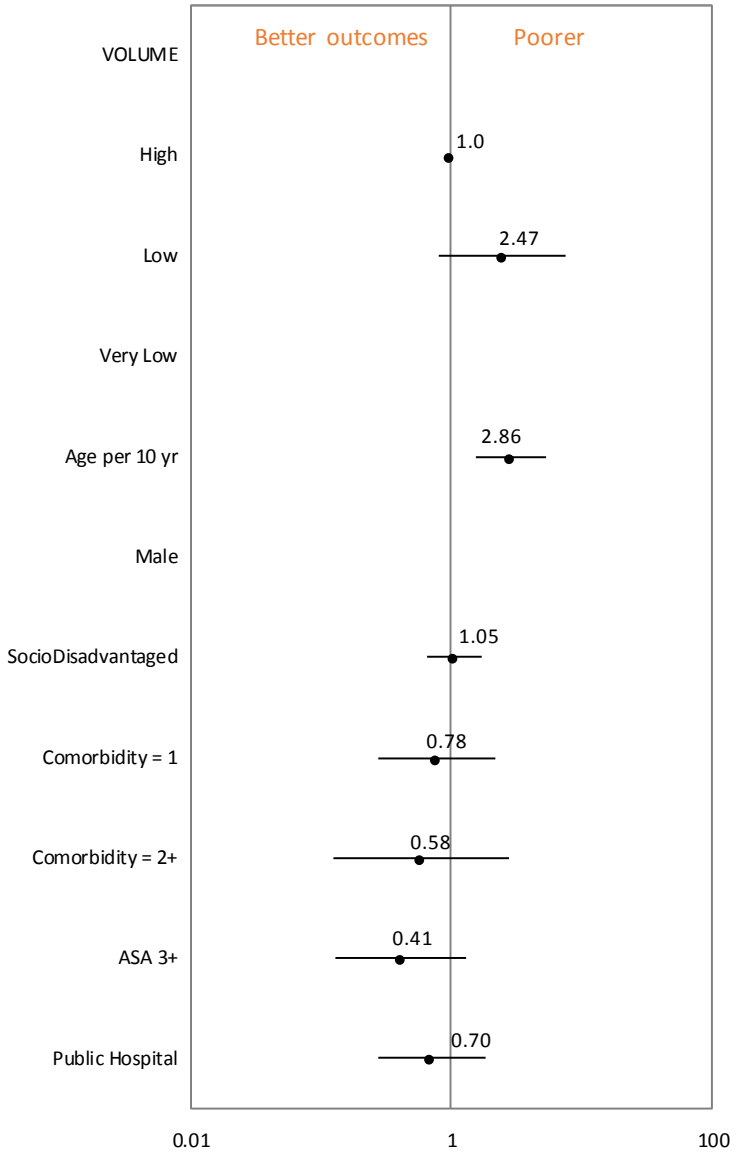


Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013

Figure 3.8: Relative risk of **30 day** mortality post cystectomy

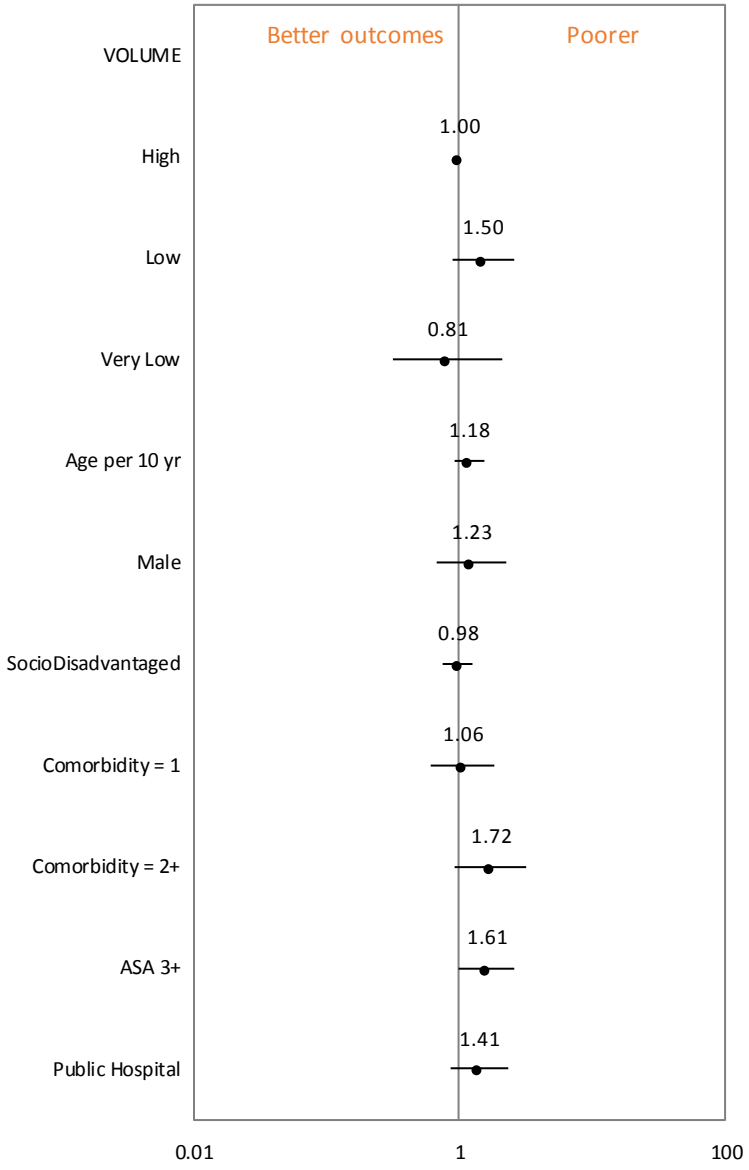
Very low volume < 2 cystectomies
Low volume 2-7 cystectomies
High volume > 7 cystectomies



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Notes:
1. Values are hazard ratios (HR) from multivariate Cox proportional hazards model; bars represent 95% confidence intervals
2. Where confidence intervals do not cross 1 the result is statistically significant
3. There were no deaths in very low volume and female groups therefore a Hazard Ratio is unable to be calculated

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2013
Figure 3.9: Relative risk of **90 day** mortality post cystectomy

Very low volume < 2 cystectomies
Low volume 2-7 cystectomies
High volume > 7 cystectomies



Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team
Notes
1. Values are hazard ratios (HR) from multivariate Cox proportional hazards model; bars represent 95% confidence intervals
2. Where confidence intervals do not cross 1 the result is statistically significant

Cause specific survival

Cause specific survival at 1 year and 2 years for those undergoing cystectomy has remained stable between the 2004-2008 and 2009-2013. However 5 year cause survival has improved from 60% to 71% in the later time period. These results compare favourably to similar population based studies published in Australia and internationally.[X1] A recent report of cystectomy outcomes in NSW showed 5 year cause specific survival of 59.6[X]%. A review of the Ontario Cancer Registry reported 5 year cause specific survival for radical cystectomy performed between 1994-2008 to be 36%[x2] while another population based study from the Netherlands reported a survival of 44.1% for patients treated between 1997 and 2002.[X3]

INVASIVE BLADDER CANCER; YEAR OF DIAGNOSIS 2004-2008 AND 2009-2013

Table 3.4: Cause specific survival after undergoing cystectomy

Cause specific survival	2004-2008	2009-2013
1-yr	86%	89%
2-yr	75%	79%
5-yr	60%	71%

Source: Oncology Analysis System (OASys), Queensland Cancer Control Analysis Team

[x1] Manish I. Patel, Albert Bang, David Gillatt† and David P. Smith Contemporary radical cystectomy outcomes in patients with invasive bladder cancer: a population-based study. Version of Record online: 2 SEP 2015 DOI: 10.1111/bju.13152.*

[X2] Booth, Christopher M, Pathological factors associated with survival benefit from adjuvant chemotherapy (ACT): a population-based study of bladder cancer Journal: BJU international ISSN: 1464-4096 Date: 01.09.2015 Volume: 116 Issue: 3 Page: 373-381

[X3]Tina Hsu et al. Treatment and outcome in muscle invasive bladder cancer: a population-based survey World journal of urology, 08/2010, Volume 28, Issue 4

Part 4

Cystectomy surgery recommendations

Improving care

The Partnership has identified some areas for improvement in the quality of care invasive bladder cancer patients in Queensland receive. These include:

- High proportion of invasive bladder cancer patients underwent cystectomy with surgeons who performed relatively few operations for invasive bladder cancer each year
- High proportion of surgery for invasive bladder cancer occurring in centres where multidisciplinary team review and management and audit are not common practice

As a consequence, The Partnership proposes that the following *guiding practice statements* be considered to reduce unwanted variation in practice.

The statements are a guide to the optimal care and management of patient's invasive bladder cancer. They are intended to improve patient outcomes by facilitating consistent care based on evidence and best practice across the state. They set out the key requirements for the provision of optimal care which need to be considered at points of the care pathway.

The population distribution and geographic barriers in Queensland require innovative approaches to the management of invasive bladder cancer to ensure rural and remote patients are offered equitable access to cancer services. The outcomes described in this report reflect the surgery only and not the overall management of this disease.

These statements are not rules and do not carry a sense of prescription. They represent the 'what', rather than seeking to prescribe the 'how'. Recognising that services should be responsive to the needs of different patients at different phases, the guiding practice statements draw on Queensland evidence, best practice and encourage local solutions. For example, while multidisciplinary care is an essential part of treatment planning, how it is organised depends on the local situation.

Guiding practice statements summary

Cancer Centres of Choice

Consideration should be given to surgical treatment of bladder cancer patients in a 'cancer centre of choice'.

Patients with invasive bladder cancer should receive cancer care where:

- Specialist surgical teams are established
- Patients are reviewed and managed by multi-disciplinary teams (MDTs)
- Intensive care, interventional radiology and MERT are available
- Credentialed pathologists are involved in the review of diagnosis
- Specialist surgical teams routinely participate in audit and feedback
- Access to specialist palliative interventions when required is available

Multidisciplinary Team (MDT) Meetings

All patients being considered for cystectomy should be discussed at a MDT meeting. Hospitals performing cystectomy are encouraged to participate in prospective data collection using a proposed dataset through the QOOL system.

Multidisciplinary care is recognised as the gold standard for patients with cancer and was identified as a key strategy in the Cancer care statewide health service strategy[9]. Queensland Health has committed to the provision of multidisciplinary care for all patients with cancer with the development of the Queensland Oncology Online system (QOOL) to support multidisciplinary meetings, administration and prospective collection of an agreed minimum dataset for all cancers and the development of an Oncology Analysis System (OASys). These resources are available to all hospitals, both public and private, and to all clinicians across Queensland. The Treating cancer in Queensland public hospitals report (Queensland Health, 2006) found that patients with documented evidence of a MDT review were more likely to receive a wider range of treatment options including radiotherapy and chemotherapy. MDT review also increased the likelihood of patients receiving a documented cancer stage.

The opportunity exists to establish prospective data collection through the multidisciplinary team using an agreed dataset, for all newly diagnosed cases of bladder cancer in Queensland.

9 Queensland Health. Queensland Cancer Control Strategic Directions 2005-2010. Queensland Health, Brisbane, 2006

Hospital resources

Cystectomy should be performed in centres with appropriate support services.

This includes

- Intensive care units
- Medical emergency response teams (MERT)
- Interventional radiologists
- Credentialed pathologists

Ongoing Review

The Partnership plan to review cystectomy in QLD again with the inclusion of neoadjuvant and adjuvant therapies.

Appendix

Glossary

Age-standardised incidence/mortality rate (ASR)

The number of new cases or deaths per 100,000 that would have occurred in a given population if the age distribution of that population was the same as that of the Australian population in 2001 and if the age-specific rates observed in the population of interest had prevailed. In international comparisons, the World Standard Population was used as the reference population.

Except where noted, incidence and mortality rates are standardised to the Australian age-specific population in 2001.

Annual average

Annual average refers to the sum of numbers divided by the number of years being reported. In this report annual average numbers have been rounded up to the nearest whole number for those with less than 1.

ASA score

American Society of Anaesthetic (ASA) physical status classification system for assessing the fitness of a patient prior to surgery.

Hierarchies by ASA Group

- Normal/Mild Disease: ASA 1-2
- Severe Disease: ASA 3-6

When two or more different ASA scores are coded on the same date in the admissions data, only one ASA score is chosen. The choice of the ASA score is based on the type of anaesthesia in the following order of selection: General > Sedation > Neuraxial > Regional > Intravenous Regional > Infiltration > Local.

For example, if General Anaesthesia ASA 2 and Sedation ASA 3, are coded on the same date, the General Anaesthesia score of 2 is chosen.

Comorbidity

A clinical condition that has the potential to significantly affect a cancer patient's prognosis after diagnosis with cancer.

Comorbidity is derived from hospital admissions data following the Quan algorithm1 for classifying ICD-10 coded conditions, modified to exclude metastasis, which is represented by a separate and distinct metastasis dimension.

Comorbidity is limited to conditions coded in any admission episode between 12 months before and 12 months after the date of cancer diagnosis.

For any given cancer diagnosis, comorbidity is restricted to conditions other than the primary cancer. For example: a breast cancer can be a comorbidity to a lung cancer diagnosis and vice versa, if they are diagnosed within 12 months of each other.

Benign tumours are not considered comorbidities.

Co-morbidity list

AIDS	Acute myocardial	Cancer
Cerebrovascular disease	Congestive heart failure	Chronic obstructive pulmonary disease
Dementia	Diabetes	Diabetes + complications
Hemiplegia or Paraplegia	Mild liver disease	Moderate/severe liver disease
Peptic ulcer	Peripheral vascular disease	Renal disease
Rheumatoid disease		

Cystectomy

The relevant procedures used to define a bladder cancer patient that had a cystectomy in this report are:

Segmental Cystectomy

ICD-10-AM code	ICD-10-AM procedure description
37000-00	Laparoscopic partial excision of bladder
37000-01	Partial excision of bladder

Radical Cystectomy

37014-00	Total excision of bladder

Excision

The relevant procedures used to define a bladder cancer patient that had an excision in this report are:

ICD-10-AM code	ICD-10-AM procedure description
3684002	Endoscopic resection of a single lesion of bladder <= 2 cm or tissue of bladder
3684003	Endoscopic destruction of a single lesion of bladder <= 2 cm or tissue of bladder
3684504	Endoscopic resection of a single lesion of bladder > 2 cm in diameter
3684505	Endoscopic resection of multiple lesions of bladder
3684506	Endoscopic destruction of a single lesion of bladder > 2 cm in diameter
3684507	Endoscopic resection of bladder neck
3702000	Laparoscopic excision of bladder diverticulum
3702001	Excision of bladder diverticulum
9036000	Other excision of lesion of bladder

High volume hospital

Hospitals performing a yearly average of > 7 bladder cancer cystectomies between 2004-2013.

Histological verification

Confirmation of cancer through clinical or histological tests.

Hospital and Health Services (HHS) of residence

Hospital and Health Service of residence is a geographic area defined by a collection of Statistical Areas Level 2 (SA2s) where the patient resides at time of diagnosis. Queensland unknown residence includes addresses reported as overseas, unknown, or not fixed.

Hospital and Health Services (HHS) of surgery

Hospital and Health Service of surgery is a geographic area defined by a collection of Statistical Areas Level 2 (SA2s) where the surgery is performed, the term Hospital and Health Service is synonymous with a group of Queensland Health facilities and staff responsible for providing and delivering health resources and services to an area.

Incidence (new cases)

The number of new cases of cancer diagnosed in a defined population during a specified time period. For example, 2013 incidence is the number of cancers which were first diagnosed between 1 January 2013 and 31 December 2013

Indigenous status

A measure of whether a person identifies as being of Aboriginal or Torres Strait Islander origin.

Inpatient death

Any patient who dies in hospital after undergoing cystectomy surgery.

Invasive bladder cancer

Invasive bladder cancer is defined as any tumour that has penetrated or invaded the basement membrane including:

Submucosa, lamina propria, stroma, muscluaris mucosa (T1)

Muscle coat (T2)

Serous coat (T3)

Perivesical fat or adventitia (T4)

Low volume hospital

Hospitals performing a yearly average of 2- 7 bladder cancer cystectomies between 2004-2013.

Median age (yrs)

The age that divides a population into halves: one older than the median, the other younger than the median.

Median length of stay (days)

Median time between the admission and discharge date of cancer surgery.

Mortality (deaths)

The number of deaths attributed to cancer in a defined population during a specified time period regardless of when the diagnosis of cancer was made.

Prevalence

The number of Queenslanders with a diagnosis of cancer who were alive on 31 December 2013.

Private hospital

All other hospitals that are not Queensland Health hospitals.

Public hospital

Queensland Health hospitals.

Remoteness

The relative remoteness of residence at time of diagnosis, based on the Australian Standard Geographical Classification (ASGC). In this report, remoteness is classified into four groups: Major City, Inner Regional, Outer Regional, and Remote & Very Remote.

Postoperative Mortality

30 day

30 day postoperative mortality has been defined as any patient who dies within 30 days of undergoing cystectomy surgery. If two or more hospitals perform a surgery on the same patient the death is assigned to the hospital that performed the most recent surgery.

90 day

90-day postoperative mortality has been defined as any patient who dies within 90 days of undergoing cystectomy surgery. If two or more hospitals perform a surgery on the same patient the death is assigned to the hospital that performed the most recent surgery.

In-Hospital

In-hospital postoperative mortality has been defined as any patient who dies in hospital after undergoing cystectomy surgery.

Survival

All cause survival

All-cause crude survival: the percentage of cancer cases still alive after a specified period of time from diagnosis.

Cause specific survival

The percentage of a specified cause of death due to cancer in the absence of other causes of death.

Relative survival

Relative survival is a measure of the survival of a group of persons with a condition, such as cancer, relative to a comparable group from the general population without the condition.

Sex

Refers to the biological and physiological characteristics that define men and women.

Socioeconomic status

Socioeconomic classification is based on the Socio-Economic Indexes for Areas (SEIFA), a census-based measure of social and economic well-being developed by the Australian Bureau of Statistics (ABS) and aggregated at the level of Statistical Areas Level 2 (SA2s).

The ABS uses SEIFA scores to rank regions into ten groups or deciles numbered 1 to 10, with 1 being the most disadvantaged group and 10 being the most affluent group. This ranking is useful at the national level, but the number of people in each decile often becomes too small for meaningful comparisons when applied to a subset of the population. For this reason, this document further aggregates SEIFA deciles into 3 socioeconomic groups:

SEIFA Group	Decile	Percentage of population (approximate)

Affluent	1-2	20%
Middle	3-8	60%
Disadvantaged	9-10	20%

The proportion of cases in each group will vary depending on the subset of the population being examined. For example, the proportion in the Disadvantaged group may be higher than 20% when the data is limited to cancers that are more common in poor compared to rich people

Statistical Analysis

The effect of hospital volume on postoperative mortality and 1-year survival for postoperative survivors was estimated through multivariate Cox proportional hazards regression, controlling for case-mix and within-hospital clustering to account for the correlation of outcomes in patients treated by the same hospital.

Very low volume

Hospitals performing a yearly average of < 2 cystectomies for bladder cancer between 2004-2013.

Volume

Number of surgeries performed.

FOR MORE INFORMATION

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