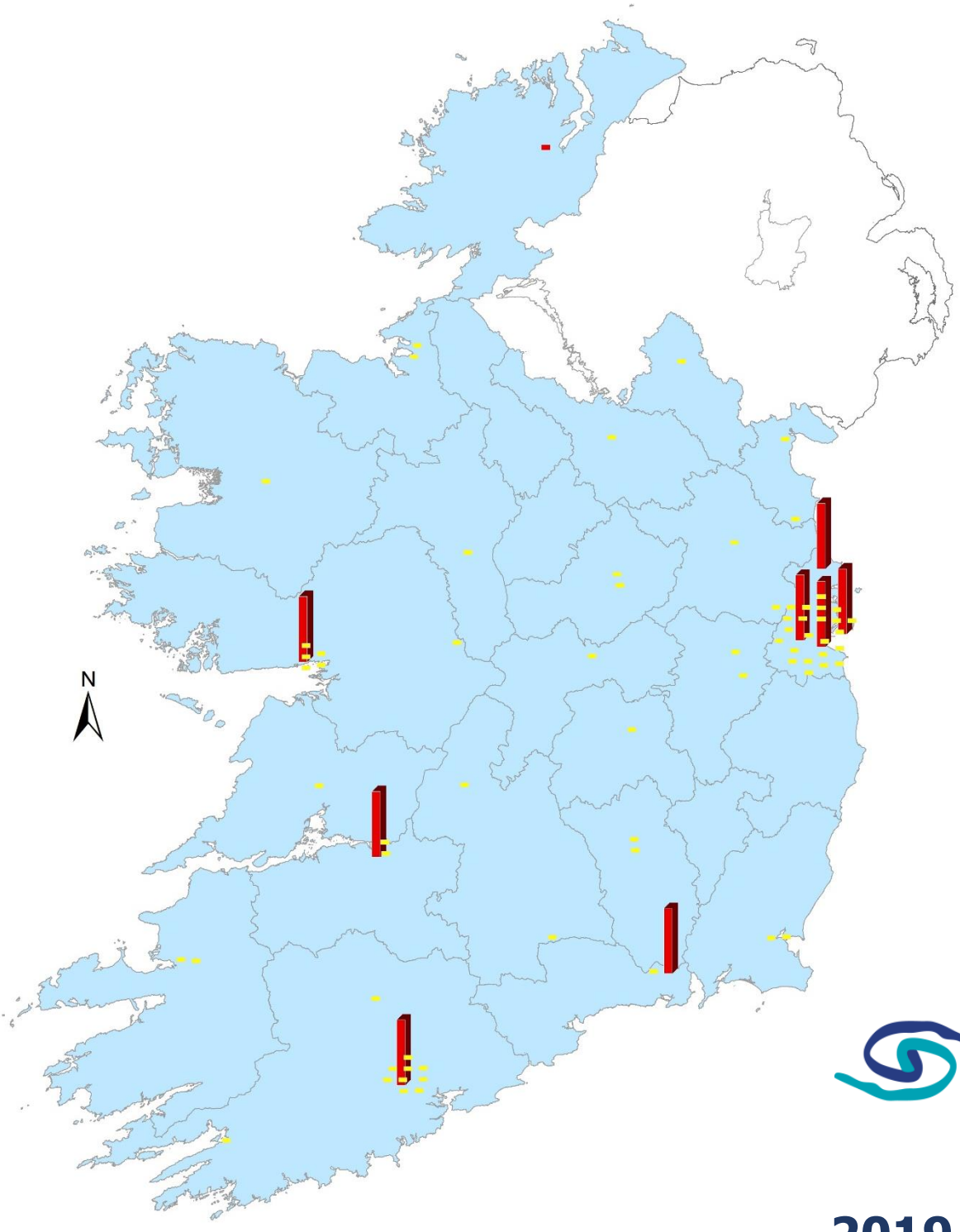
Cancer care and survival in relation to centralisation of Irish cancer services:
an analysis of National Cancer Registry data 1994-2015



National Cancer Registry Ireland

2019

Key to cover map: Locations of the eight designated cancer centres are shown as red columns (plus a further 'satellite' site as a red square), other public or private hospitals involved in cancer diagnosis or treatment during 2008-2015 as yellow squares.

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Contents

Cancer care and survival in relation to centralisation of Irish cancer services: an analysis of National Cancer Registry data 1994-2015

Summary and overview

Key points

- In 2007, implementing a recommendation of the National Cancer Strategy for Ireland published in 2006, the Health Service Executive's National Cancer Control Programme (NCCP) initiated a programme of centralisation of publicly-funded cancer services (in particular surgical services) to a smaller number of high-volume, specialist centres with the aim of optimising treatment and improving survival outcomes.
- Of the cancer types included in phase one of NCCP surgical centralisation (*Summary Table 1*) – cancers of the oesophagus, stomach, rectum, pancreas, lung, breast, prostate and brain / central nervous system – the majority show clear evidence of recent centralisation (or existing centralisation), especially relating to surgical treatment.
- Patients in designated centres are generally more likely to receive surgical treatment, radiotherapy, chemotherapy and multi-modality treatment than patients in non-designated public hospitals.
- Treatment/diagnosis in designated centres is, overall, associated with higher survival outcomes than for patients in non-designated public hospitals, even after accounting for differences in age, cancer stage and deprivation status of patients.
- Treatment in private hospitals is also, overall, associated with good survival outcomes and high use of appropriate treatment modalities. The extent to which centralisation may have occurred among private hospitals has not been examined.
- Differences in the appropriateness or quality of treatment, or unmeasured differences in general patient health affecting suitability for treatment, are likely to be contributing to survival differences between hospital categories.
- It should also be emphasised that differences in treatment or survival between categories do not necessarily apply to all individual hospitals within a category, as most private or non-designated hospitals treat very small numbers (while a few hospitals treat more substantial numbers) of cancer patients annually.
- At national scale, the expectation is that centralisation, combined with specialisation and standardisation of diagnostic and treatment services within or across designated cancer centres, has benefited patients. However, centralisation is not the only factor contributing to survival improvements nationally, as more general improvements in treatment across all hospital categories and in early detection have also been underway.
- Further work to more fully explore and explain the findings here is needed, including: factors contributing to survival differences between hospital categories; the relative contributions of centralisation, general improvements in treatment, and improvements in screening/ early detection to cancer survival improvements nationally; updating of analyses as centralisation progresses (including additional cancer types); economic implications of centralisation; referral patterns and treatment quality for patients in non-designated public hospitals.

Background and methodology

- In 2007, implementing a recommendation of the National Cancer Strategy for Ireland published in 2006 [1], the Health Service Executive's National Cancer Control Programme (NCCP) initiated a programme of centralisation of publicly-funded cancer services (in particular surgical services) to a smaller number of high-volume, specialist centres (*Summary Table 1*) with the aim of optimising treatment and improving survival outcomes.

Summary Table 1. NCCP-designated cancer centres by cancer type (excluding radiation oncology centres).

		St. James's[1]	Mater[1]	St. Vincent's[1]	Beaumont[1]	Cork[2]	Galway[2]	Limerick[2]	Waterford[2]	Other†
Lung	rapid access clinic	●	●	●	●	●	●	●	●	
	surgery	●	●			●	●			
Breast	symptomatic disease	●	●	●	●	●	●	●	●	Letterkenny (Galway satellite)
	surgery	●	●	●	●	●	●	●	●	Letterkenny
Prostate	rapid access clinic	●	●	●	●	●	●	●	●	
	surgery	●	●	●	●	●	●			
Upper GI	surgery	●			●	●	●			
Pancreas	surgery			●		●				
Rectal	surgery	●	●	●	●	●	●	●	●	Letterkenny
Neuro-oncology					●	●				

● Designated centre. [1]Dublin. [2]Cork, Galway, Limerick and Waterford University Hospitals.
†Letterkenny Hospital is a designated satellite of Galway University Hospital

- This report analyses National Cancer Registry data for the main cancer types included in phase one of the surgical centralisation programme, to assess patterns and trends of treatment and survival, by hospital category and nationally, in relation to centralisation (including contextual data from 1994 onwards).
- Analyses presented in this report cover 201,000 individual invasive cancers (or any invasive or non-invasive tumours of the central nervous system) diagnosed in 196,000 individual patients during the years 1994 to 2015. The cancer sites included are those initially targeted by the NCCP for centralisation of services: oesophagus, stomach, rectum, pancreas, lung, breast, prostate and brain/central nervous system. Invasive cases included here represent just over half (54%) of all invasive cancers (other than non-melanoma skin cancer) diagnosed in Ireland during 1994-2015.
- Analyses are presented for designated cancer centres in comparison with other public hospitals and with private hospitals, categorised on the basis where a patient first had their surgery or tissue-based diagnosis, if applicable (prioritising surgery over biopsy over other treatments or consultations). Analyses relate to the eight cancer centres established in 2008 (St James's, Mater, St Vincent's and Beaumont University Hospitals, Dublin, and Cork, Galway, Limerick and Waterford University Hospitals) and further examine the subspecialisation of cancer surgery outlined in the first phase of NCCP surgical centralisation. Four surgical centres have been designated for upper gastrointestinal cancers, two for pancreatic cancer, eight (plus one satellite) for rectal and breast cancers, six for prostate cancer, and two neuro-oncology centres for

brain / central nervous system tumours (*Summary Table 1*). Patients assigned to centres or to other public hospitals for analysis purposes here include a mix of publicly-funded and privately-insured patients.

- Descriptive statistics are presented on proportions of patients treated or seen in the three hospital categories, and proportions of patients in each hospital category receiving surgery, radiotherapy, chemotherapy or hormone therapy, annually and by broader diagnosis period (1994-2000, 2001-2007 and 2008-2015). Joinpoint modelling is used for formal assessment of trends in distribution of cases and in proportions receiving each treatment modality.
- Cause-specific survival of patients is compared between diagnosis periods and between hospital types, both as descriptive statistics on five-year survival and (for hospital comparisons) as models adjusted for age, sex, stage and an area-based measure of deprivation. The Pobal HP index of deprivation for 2006 [2], at Electoral District scale, is used, but re-expressed as population quintiles (i.e. five categories each covering 20% of the Irish 2006 population).
- Findings are presented as averages based on combined data for all hospitals within a given category, for a given cancer, and do not necessarily apply to all individual hospitals within a category. Within the private and non-designated public hospital categories, most hospitals treat very small numbers of cancer patients while a limited number treat more substantial numbers, which is likely to influence outcomes.
- This report focuses on centralisation activity up to 2014/2015, and it is anticipated that patterns will have further changed more recently and will further change once final-phase implementation of centralisation has taken place.

Patterns of centralisation

- For the majority of cancer types examined, there was clear evidence of recent centralisation of services (2008 onwards), especially relating to surgical treatment (*Summary Table 2* & *Figure 1*).
- Recent centralisation (assessed from proportions of public-hospital patients involved and degree of change compared with the pre-2008 period) appears to have been most marked for breast cancer patients and for surgical pancreatic, rectal, stomach and lung cancer patients.
- Although evidence of recent centralisation was weaker for oesophageal and prostate cancers, high proportions of cases (especially surgical cases) were nevertheless treated in designated centres in the most recent years.
- For brain and other central nervous system (CNS) tumours, treatment was already highly centralised, and modest recent decreases in the proportions of surgical patients treated in the two neuro-oncology centres mainly involve children treated by the Department of Paediatric Neurosurgery of Temple Street Children's University Hospital (at Temple Street or at Our Lady's Hospital for Sick Children, Crumlin) and small numbers of less complex neurosurgical procedures at non-centres.
- Increases in proportion of patients treated in private hospitals was also seen over time for most cancers.
- This report focuses on centralisation activity up to 2014/2015, and patterns are likely to have further changed in the interim and to further change once final-phase implementation of centralisation occurs.

Summary Table 2. Patterns of centralisation by broad diagnosis period: percentages of 2008-2015 cases first treated or diagnosed in designated cancer centres, and change in relative terms compared with 2001-2007.

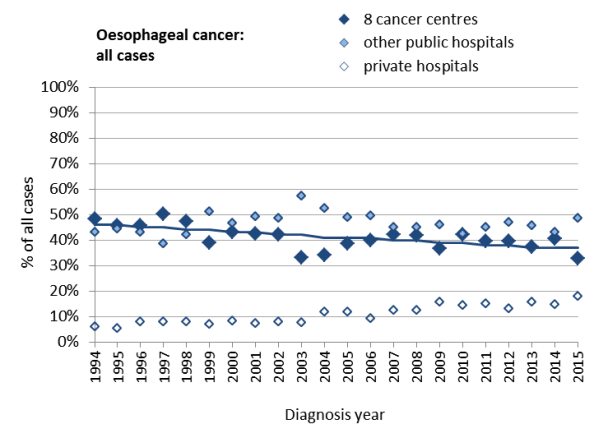
Cancer	number of centres	% of cases first treated or diagnosed in centres				% of public-hospital cases first treated or diagnosed in centres			
		all cases		surgical cases		all cases		surgical cases	
Oesophagus	8	39%	=			46%	+		
	4 surgical	28%	=	**63%**	++	33%	+	**68%**	++
Stomach	8	43%	++			**50%**	++		
	4 surgical	32%	++	**54%**	++++	37%	++	**59%**	++++
Rectal	8+1 surgical	47%	+++	**52%**	+++	**58%**	+++	**63%**	++++
Pancreatic	8	44%	+			**53%**	++		
	2 surgical	16%	++++	44%	+++++	19%	++++	**61%**	+++++
Lung	8 rapid access	**58%**	++			**64%**	++		
	4 surgical	39%	+++	**80%**	+++	43%	+++	**90%**	+++
Breast	8+1	**70%**	++++	**68%**	++++	**92%**	++++	**92%**	++++
Prostate	8 rapid access	42%	++			**63%**	+++		
	6 surgical	42%	+++	31%	- -	**62%**	+++	**60%**	++
Brain/CNS (malignant)	8	**80%**	+			**85%**	+		
	2 neuro-oncology	**72%**	+	**91%**	-	**77%**	+	**96%**	-
Brain/CNS (benign/uncertain)	8	**74%**	- -			**78%**	- -		
	2 neuro-oncology	**65%**	- -	**94%**	-	**69%**	- -	**96%**	-

*For general cancer services, 8 centres have been designated, but further details vary by cancer type: 4 specific surgical centres have been designated for upper gastrointestinal cancers (oesophagus and stomach); 8 surgical centres (+ 1 satellite) for rectal cancer; 8 centres as rapid access clinics and 4 surgical centres for lung cancer; 8 centres (+ 1 satellite) as both rapid access clinics and surgical centres for breast cancer; 8 centres as rapid access clinics and 6 as surgical centres for prostate cancer; and 2 neuro-oncology centres for brain/CNS tumours.

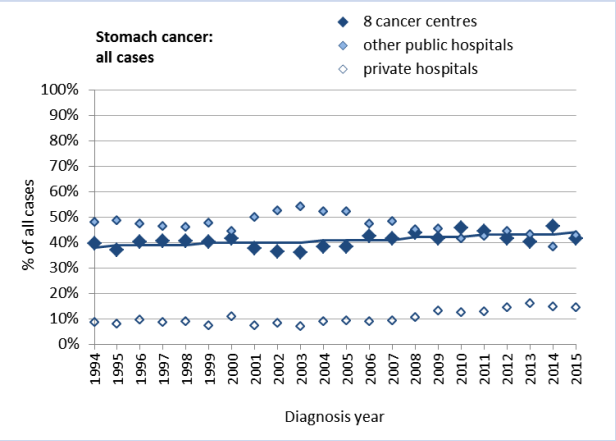
"+" <10%, "++"10-24%, "+++" 25-49%, "++++" 50-99%, "+++++" ≥100% relative increase in proportion of cases treated in centres compared with 2001-2007 diagnosis period. Similarly, minus signs indicate same scale but for relative decreases. "=" no change.

Summary Figure 1 Trends in proportion of cases first treated in HSE cancer centres

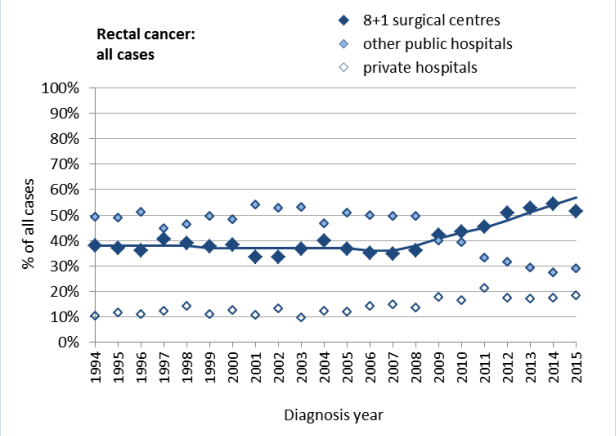
All cases – main cancer centres
(by hospital of first surgery > biopsy > other treatment)



	Period	APC[5]	95% CI	Trend
8 centres[1]	**-1.1%**	-1.7%,-0.6%	↓	**-1.1%**

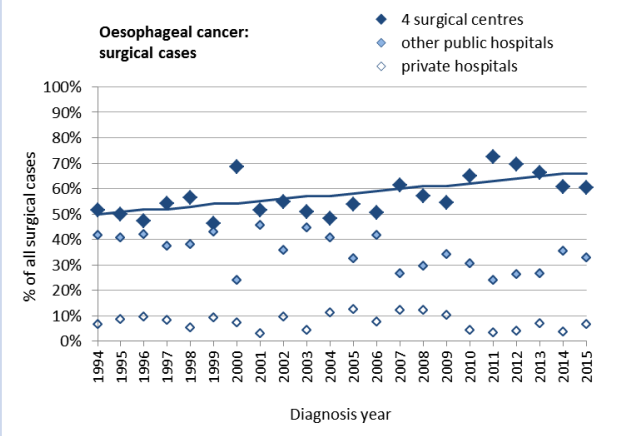


	Period	APC	95% CI	Trend
8 centres[1]	1994-2015	**+0.6%**	+0.2%,+1.0%	↑

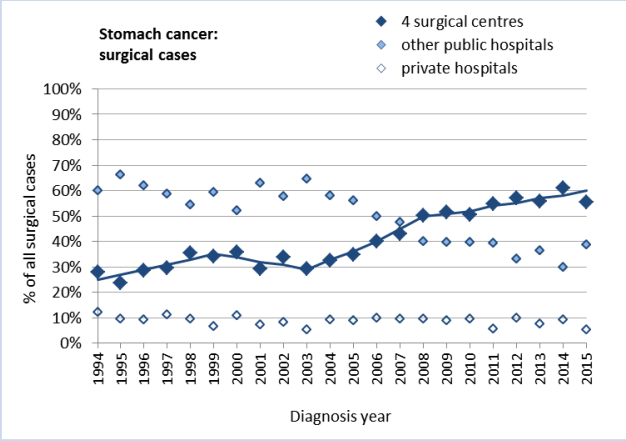


	Period	APC	95% CI	Trend
8+1 centres[2]	1994-2007	-0.4%	-1.4%,+0.7%	=
	2007-2015	**+5.7%**	+4.0%,+7.5%	↑

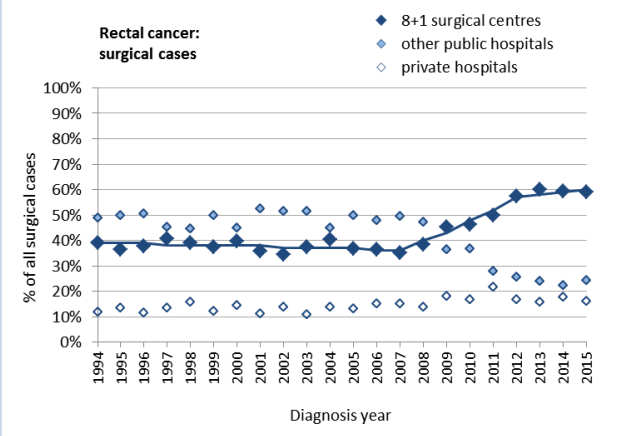
Surgical cases – designated surgical centres
(by hospital of first surgery)



	Period	APC[5]	95% CI	Trend
4 surgical centres[3]	1994-2015	**+1.4%**	+0.6%,+2.1%	↑



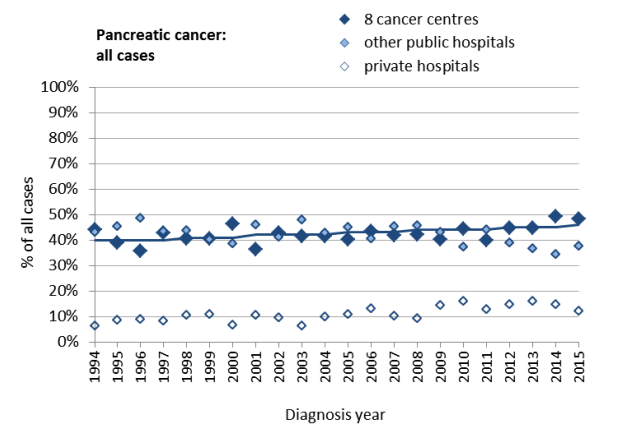
	Period	APC	95% CI	Trend
4 surgical centres[3]	1994-1999	**+6.9%**	+0.9%,+13%	↑
	1999-2003	-4.6%	-16%,+8.9%	=
	2003-2008	**+11.1%**	+3.5%,+19%	↑
	2008-2015	**+2.7%**	+0.5%,+4.9%	↑



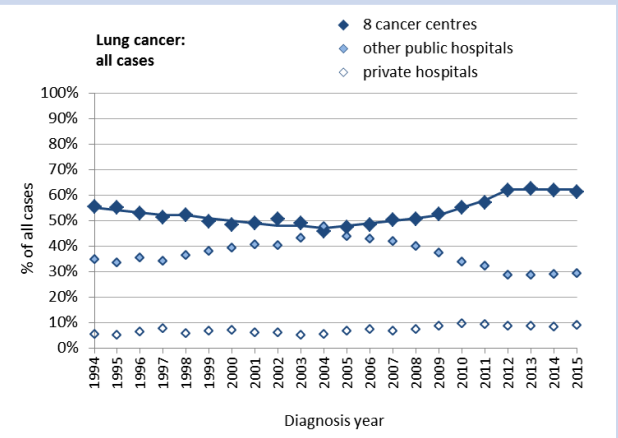
	Period	APC	95% CI	Trend
8+1 surgical centres[2]	1994-2007	-0.6%	-1.3%,+0.2%	=
	2007-2012	**+9.5%**	+5.5%,+14%	↑
	2012-2015	+1.7%	-2.6%,+6.3%	=

Summary Figure 1 Trends in proportion of cases first treated in HSE cancer centres

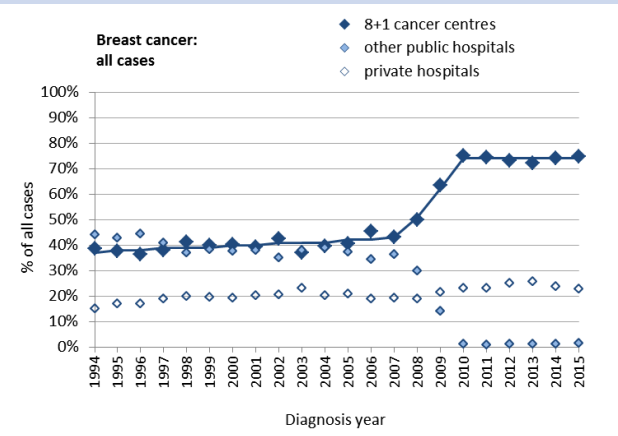
All cases – main cancer centres
(by hospital of first surgery > biopsy > other treatment)



	Period	APC[5]	95% CI	Trend
8 centres[1]	1994-2015	**+0.7%**	+0.2%,+1.2%	↑

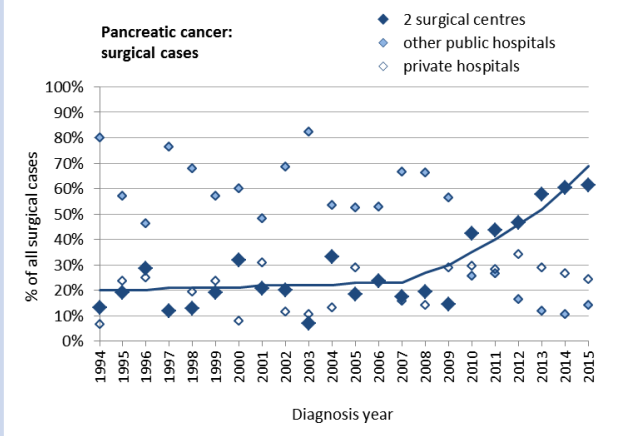


	Period	APC	95% CI	Trend
8 centres[1]	1994-2004	**-1.6%**	-2.1%,-1.1%	↓
	2004-2009	**+2.1%**	+0.1,+4.2%	↑
	2009-2012	**+5.9%**	+0.6,+11%	↑
	2012-2015	+0.1%	-2.1%,-2.3%	=

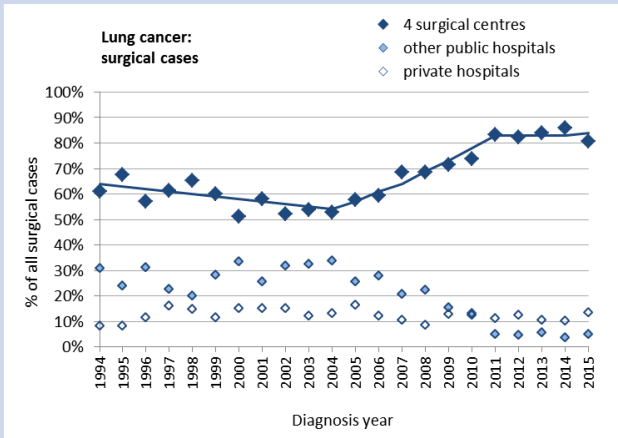


	Period	APC	95% CI	Trend
8+1 centres[2]	1994-2007	**+1.0%**	+0.2%,+1.9%	↑
	2007-2010	**+20%**	+9.6%,+32%	↑
	2010-2015	-0.2%	-1.6%,+1.1%	=

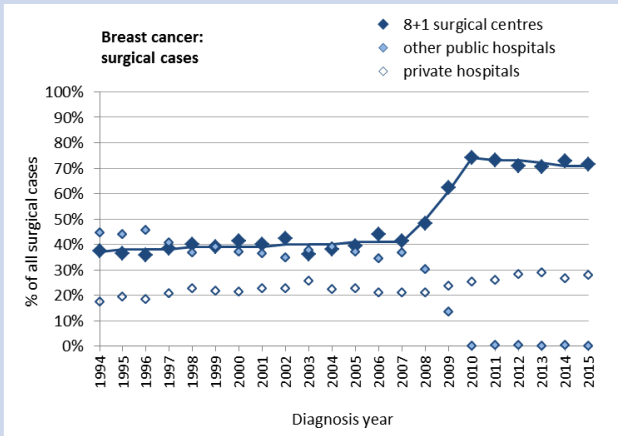
Surgical cases – designated surgical centres
(by hospital of first surgery)



	Period	APC[5]	95% CI	Trend
2 surgical centres[3]	1994-2007	+1.2%	-5.2%,+8.1%	=
	2007-2015	**+14.6%**	+8.2%,+21%	↑



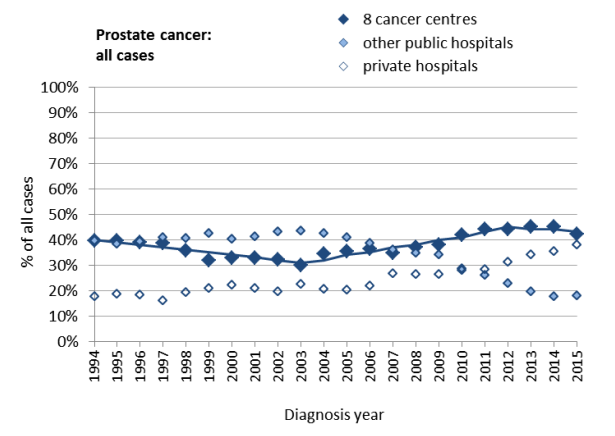
	Period	APC	95% CI	Trend
4 surgical centres[3]	1994-2004	**-1.8%**	-3.4%,-0.3%	↓
	2004-2011	**+6.4%**	+3.8%,+9.0%	↑
	2011-2015	+0.4%	-2.1%,+2.9%	=



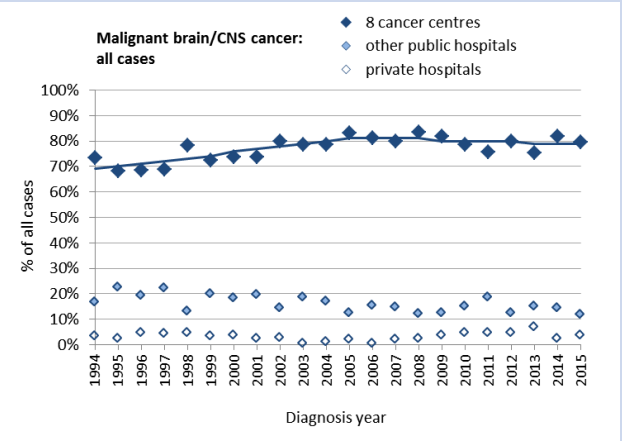
	Period	APC	95% CI	Trend
8+1 surgical centres[2]	1994-2007	+0.8%	-0.1%,+1.7%	=
	2007-2010	**+21%**	+9.5%,+34%	↑
	2010-2015	-0.7%	-2.2%,+0.8%	=

Summary Figure 1 Trends in proportion of cases first treated in HSE cancer centres

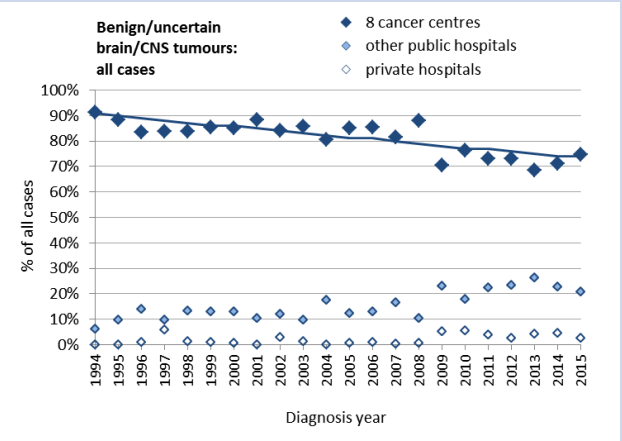
All cases – main cancer centres
(by hospital of first surgery > biopsy > other treatment)



	Period	APC[5]	95% CI	Trend
8 centres[1]	1994-2003	**-2.8%**	-4.2%,-1.4%	↓
	2003-2012	**+4.1%**	+2.9%,+5.3%	↑
	2012-2015	-1.0%	-5.5%,+3.6%	=

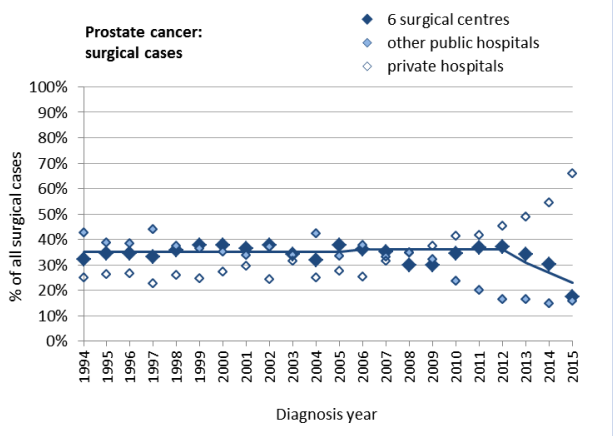


	Period	APC	95% CI	Trend
8 centres[1]	1994-2005	**+1.5%**	+0.7%,+2.3%	↑
	2005-2015	-0.3%	-1.0%,+0.4%	=

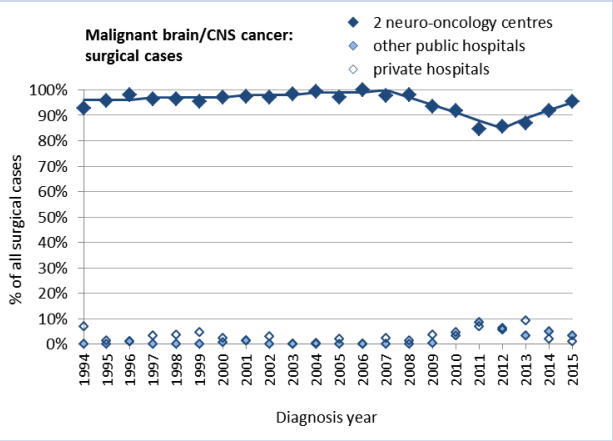


	Period	APC	95% CI	Trend
8 centres[1]	1994-2015	**-1.0%**	-1.4%,-0.6%	↓

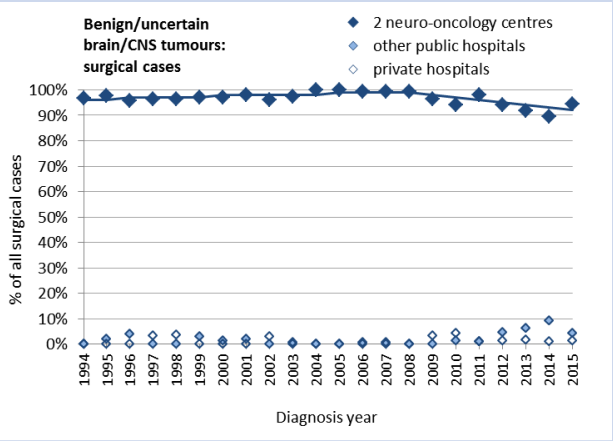
Surgical cases – designated surgical centres
(by hospital of first surgery)



	Period	APC[5]	95% CI	Trend
6 surgical centres[3]	1994-2012	+0.2%	-0.6%,+1.0%	=
	2012-2015	**-13.9%**	-25%,-1.2%	↓



	Period	APC[2]	95% CI	Trend
2 centres[4]	1994-2007	**+0.3%**	+0.1%,+0.5%	↑
	2007-2012	**-3.0%**	-4.6%,-1.4%	↓
	2012-2015	**+3.6%**	+0.9%,+6.4%	↑



	Period	APC[4]	95% CI	Trend
2 centres[1]	1994-2008	**+0.2%**	0.0%,+0.4%	↑
	2008-2015	**-1.1%**	-1.8%,-0.5%	↓

[1] 8 centres designated for a range of cancers, and as lung and prostate cancer rapid access clinics, but not specifically for all cancer types.
[2] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for rectal & breast cancer surgery and for symptomatic breast disease.
[3] Centres designated for site-specific surgery for these cancers. [4] Neuro-oncology centres designated for brain / CNS tumours.
Note: In surgical/neuro-oncology centre graphs for sites other than rectum and breast, other cancer centres are included in the "other public hospital" category.
[4] APC = estimated annual % change (relative) across the period specified assessed by Joinpoint analysis [3, 4]: significant increase (↑), decrease (↓) or no significant change (=).

Variation of patient age, deprivation status and cancer stage by hospital category

- Patients seen or treated in the cancer centres during 2008-2014 were younger on average than those in other public hospitals, generally by 1-4 years (comparing median ages) but by 8 years for brain/CNS cancers and by 14 years for benign/uncertain brain/CNS tumours. This may in part reflect differences in referral patterns by age. Comparisons between the centres and private hospitals were less consistent (patients in the centres were slightly younger for oesophageal, stomach and stomach cancer and for brain/CNS tumours, slightly older for rectal, pancreatic and breast cancer, and the same age for prostate cancer).
- Patients treated or diagnosed in cancer centres tended to include a higher proportion of earlier-stage cases than other public hospitals; differences between the cancer centres and private hospitals varied by cancer type.
- A substantially higher proportion of patients in private hospitals (25-38% depending on cancer type) were from the least deprived population quintile than in the cancer centres (14-21%), and the proportion was lowest in other public hospitals (8-14%); while the proportion of patients from the most deprived population quintile was lower for private hospitals (8-13%) than for the cancer centres (20-31%) or other public hospitals (23-34%).

Variation of treatment by hospital category

Summary Table 3. Treatment comparisons: percentages of 2008-2014 cases in each hospital category who received surgery, radiotherapy, chemotherapy or any tumour-directed therapy within a year after diagnosis.
Ce = designated centre, OP = other public, Pr = private.
Bold = hospital categories with the highest proportion of patients receiving treatment

Cancer	Number of centres	Surgery			Radiotherapy			Chemotherapy			Any treatment		
		Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr
Oesophagus	8	**39%**	15%	11%	49%	47%	**57%**	45%	43%	**60%**	77%	65%	**78%**
	4 surgical	**54%**	13%	11%	50%	47%	**57%**	51%	41%	**60%**	**84%**	64%	78%
Stomach	8	**55%**	27%	26%	**19%**	14%	17%	43%	36%	**55%**	**74%**	56%	71%
	4 surgical	66%	27%	26%	**22%**	13%	17%	48%	34%	**55%**	**83%**	55%	71%
Rectal	8+1 surgical	**80%**	64%	72%	**50%**	37%	38%	54%	49%	**55%**	90%	84%	**91%**
Pancreatic	8	18%	6%	**29%**	13%	7%	**17%**	35%	32%	**52%**	46%	35%	**65%**
	2 surgical	**41%**	6%	29%	**17%**	9%	**17%**	39%	32%	**52%**	61%	37%	**65%**
Lung	8 rapid access	**28%**	1%	24%	40%	38%	**44%**	35%	31%	**44%**	73%	50%	**78%**
	4 surgical	**38%**	3%	24%	37%	42%	**44%**	34%	33%	**44%**	**78%**	55%	**78%**
Breast	8+1	83%	77%	**95%**	68%	71%	**79%**	47%	40%	**52%**	97%	90%	**98%**
Prostate	8 rapid access	22%	21%	**39%**	**45%**	44%	38%	-	-	-	76%	**78%**	76%
	6 surgical	21%	22%	**39%**	**45%**	43%	38%	-	-	-	75%	**78%**	76%
Brain/CNS (malignant)	8	**56%**	12%	52%	**65%**	29%	59%	28%	36%	**45%**	**82%**	42%	77%
	2 neuro-oncology	**56%**	12%	52%	**69%**	26%	59%	41%	20%	**45%**	**88%**	35%	77%
Brain/CNS (benign/uncertain)	8	**68%**	9%	25%	6%	1%	**33%**	-	-	-	**71%**	13%	55%
	2 neuro-oncology	**68%**	9%	25%	7%	2%	**33%**	-	-	-	**79%**	10%	55%

Hormonal data (breast and prostate cancer) are not plotted separately; chemotherapy data are not shown for prostate cancer and benign/uncertain brain/CNS tumours (<2% of cases received chemotherapy as primary treatment).

- In general, the proportions of patients receiving different treatment modalities (surgery, radiotherapy, chemotherapy, multimodal treatment or overall treatment) increased over time, both for patients in what are now designated centres and overall.
- Across most cancers and treatment modalities examined, patients in designated centres were generally more likely to receive treatment compared with patients in other public hospitals, the main exceptions being prostate cancer and, pre-2008, breast cancer. However, cautious interpretation is needed as patients considered better candidates for treatment may be more likely to be referred to centres.
- Comparisons between private hospitals and the cancer centres differed by cancer type and treatment modality, except for higher use of chemotherapy, on average, by private hospitals.

Variation of survival by hospital category

Summary Table 4. Summary of cause-specific survival of cancer patients diagnosed 2008-2014, by category of hospital where first treated or diagnosed. Ce = designated centre, OP = other public, Pr = private.
See *Summary Figure 3* for further details.

Cancer	Number of centres	[1]5-year survival 2008-2014			[2]Comparison with 2001-2007			[3]Adjusted HR relative to centre (2008-2014 cases)			P-value for comparison with centre		
		Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr
Oesophagus	8	**28%**	16%	19%	↑	↑	↑	1.00	**1.28**	0.91	-	***	ns
	4 surgical	**36%**	15%	19%	↑	↑	↑	1.00	**1.53**	1.07	-	***	ns
Stomach	8	**32%**	24%	22%	↑	↑	↑	1.00	**1.23**	1.12	-	***	ns
	4 surgical	**36%**	23%	22%	↑	↑	↑	1.00	**1.44**	**1.30**	-	***	**
Rectal	8+1 surgical	63%	52%	**65%**	↑	↑	↑	1.00	**1.23**	**0.81**	-	***	**
Pancreatic	8	10%	6%	**11%**	↑	↑	↑	1.00	**1.11**	0.90	-	*	ns
	2 surgical	**19%**	6%	11%	↑	↑	↑	1.00	**1.29**	1.06	-	***	ns
Lung	8 rapid access	**23%**	5%	**23%**	↑	↑	↑	1.00	**1.36**	**0.89**	-	***	**
	4 surgical	**29%**	7%	23%	↑	↑	↑	1.00	**1.44**	1.00	-	***	ns
Breast	8+1	85%	81%	**93%**	↑	↑	↑	1.00	**1.23**	**0.68**	-	**	***
Prostate	8 rapid access	91%	88%	**95%**	↑	↑	↑	1.00	**1.31**	**0.73**	-	***	***
	6 surgical	91%	87%	**95%**	↑	↑	↑	1.00	**1.32**	**0.73**	-	***	***
Brain/CNS (malignant)	8	**28%**	12%	19%	↑	↑	↑	1.00	**1.45**	1.06	-	***	ns
	2 neuro-oncology	**28%**	18%	19%	↑	↓	↑	1.00	**1.20**	1.06	-	*	ns
Brain/CNS (benign/uncertain)	8	**96%**	84%	93%	↑	↑	↑	1.00	**1.92**	1.93	-	*	ns
	2 neuro-oncology	**97%**	86%	93%	↑	↑	↑	1.00	**2.19**	2.21	-	**	ns

[1]Crude five-year cause-specific survival (not adjusted for age or other factors) – see later columns for adjusted comparisons between hospital types.
[2]Statistically significant improvement ↑ in survival compared with 2001-2007 (↑ non-significant improvement, ↓ non-significant reduction), adjusted for age, sex (except prostate cancer) and stage (except brain/CNS tumours).
[3]Hazard ratio adjusted for patient age, sex, stage and deprivation quintile: HR >1 indicates higher mortality (lower survival), HR<1 lower mortality (higher survival) relative to designated centres (reference level HR = 1.00).
*P<0.05 ** P<0.01 ***P<0.001 for comparison between hospitals (ns = not significant P>0.05)

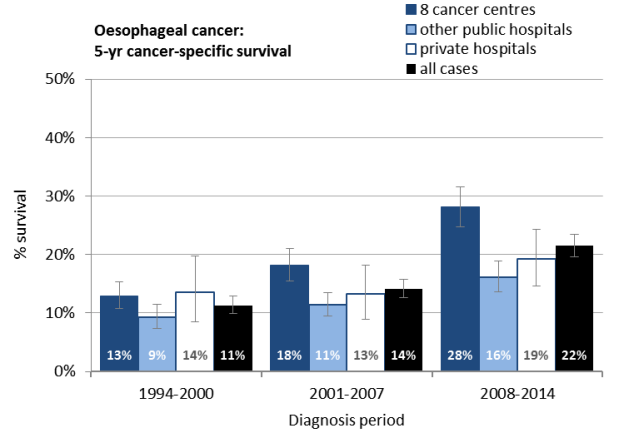
- Cause-specific survival of patients improved over time, both nationally and within most hospital categories, for the majority of the cancers and other tumours analysed (*Summary Table 4 & Figure 2*).
- For all cancer/tumour types examined, patients first treated or diagnosed in designated cancer centres had higher survival, overall, than those seen in other public hospitals, even after adjustment for patient age, sex, stage and deprivation. However, as with treatment comparisons, cautious interpretation is needed as this variation could, in part, reflect different referral patterns for patients considered better candidates for treatment. In addition, survival of patients in some non-designated public hospitals may also be high.
- Survival variation between designated centres and private hospitals depended on the cancer or tumour type involved. For rectal, breast and prostate cancers survival of patients in the private hospitals was on average significantly better than in the surgical centres for these cancers, but for stomach cancer, survival of patients in the private hospitals averaged significantly poorer than in the surgical centres.
- Statistical models indicated that stage differences helped explain substantial proportions of the differences seen in survival, while differences in average deprivation status of patients appeared to have a smaller influence. Substantial survival differences between hospitals still remain after adjustment for stage, deprivation, age and sex, suggesting that differences in the appropriateness or quality of treatment, or unmeasured differences in general patient health affecting suitability for treatment, are likely to be contributing to survival differences between hospital categories.

Further work

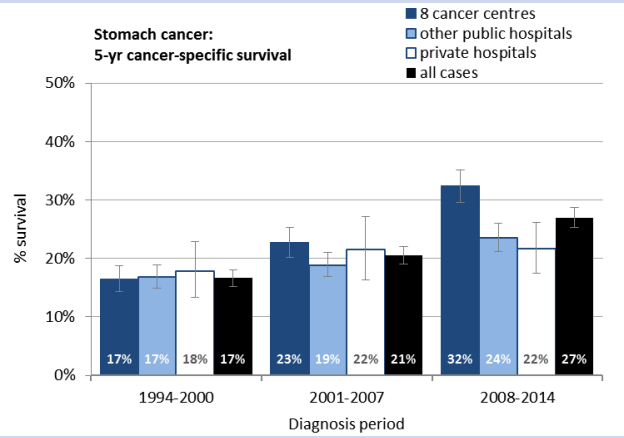
- More work is needed to explore the reasons for survival differences between patients in hospitals. This might require collation of comparable data on other health conditions (comorbidities) and on general health of patients (e.g. functional status) across hospital categories.
- Analyses specifically attempting to quantify and apportion contributions of different factors (including centralisation, treatment advances and population-based screening) to ongoing survival improvements among Irish cancer patients would be useful, but there are significant methodological challenges.
- Centralisation of services for the cancers included in this report began earlier for some cancers (earliest, from, 2007, for breast cancer) than for others (notably oesophageal cancer), and updated analyses once several further years have elapsed might be more informative regarding the extent to which centralisation has been achieved for the full range of cancers involved.
- Further work is needed to characterise more fully the group of public-hospital cancer patients who are not treated within the designated centres, to assess the factors influencing referral or non-referral of public patients to the cancer centres, and to monitor the quality and appropriateness of treatment (including palliative care) for patients not referred. Also, the economic implications of centralisation should be assessed.
- The analyses presented here could be replicated for additional cancers for which centralisation of services may be under consideration, or for cancer types not currently being considered for centralisation.

Summary Figure 2 Five-year cause-specific survival (by hospital category and period of diagnosis)

Main cancer centres
(by hospital of first surgery > biopsy > other treatment)

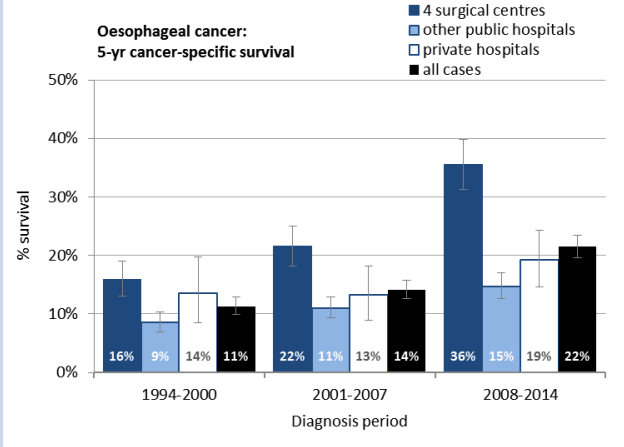


2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.28**	1.13-1.44	<0.001
	Private	0.91	0.77-1.08	0.281

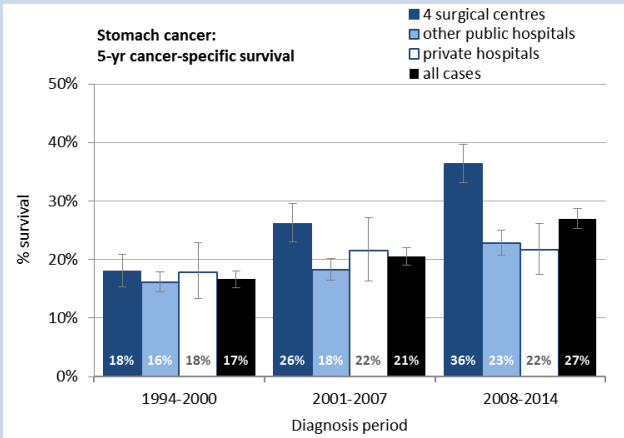


2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.23**	1.10-1.36	<0.001
	Private	1.12	0.99-1.33	0.068

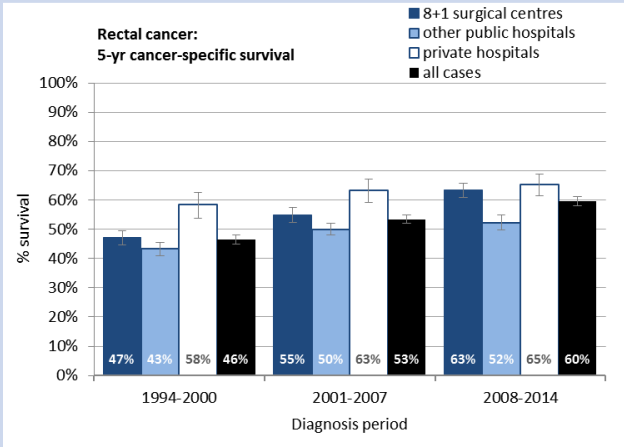
Designated surgical centres
(by hospital of first surgery)



2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	4 centres[4]	1.00	-	-
	Other public	**1.53**	1.34-1.76	<0.001
	Private	1.07	0.89-1.29	0.678



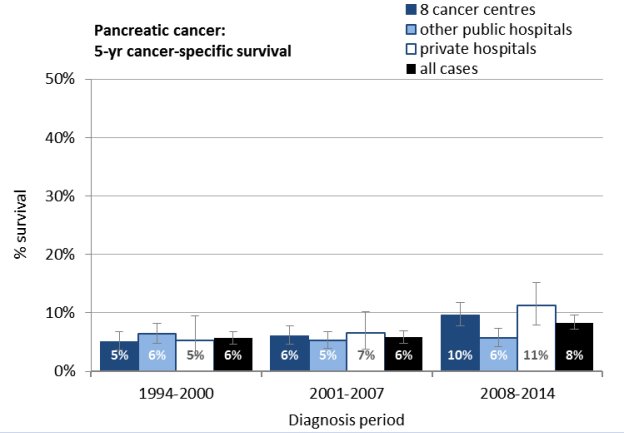
2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	4 centres[3]	1.00	-	-
	Other public	**1.44**	1.29-1.61	<0.001
	Private	**1.30**	1.11-1.52	0.001



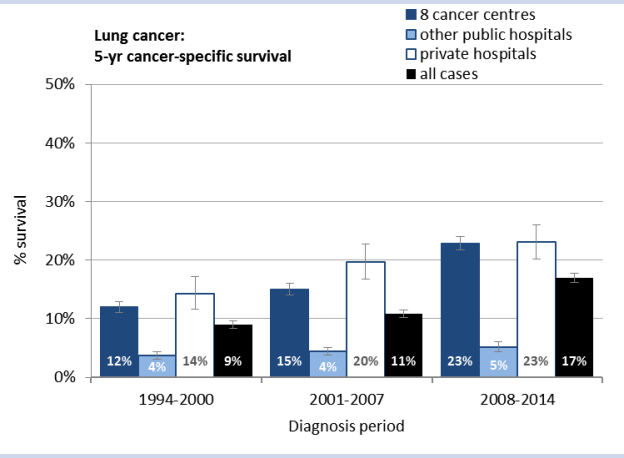
2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	8+1 centres[2]	1.00	-	-
	Other public	**1.23**	1.10-1.38	<0.001
	Private	**0.81**	0.69-0.95	0.009

Summary Figure 2 Five-year cause-specific survival (by hospital category and period of diagnosis)

Main cancer centres
(by hospital of first surgery > biopsy > other treatment)

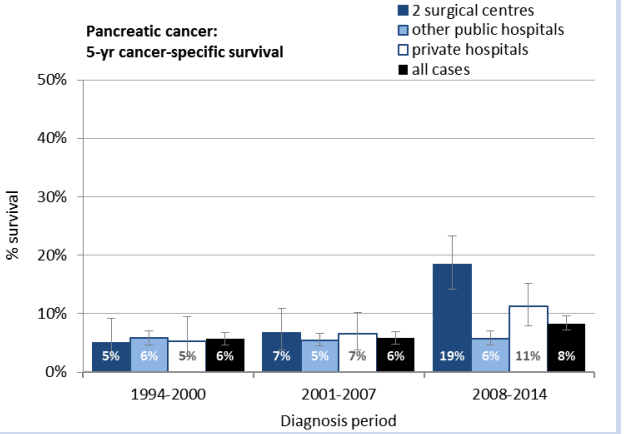


2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.11**	1.00-1.22	0.042
	Private	0.90	0.78-1.03	0.124

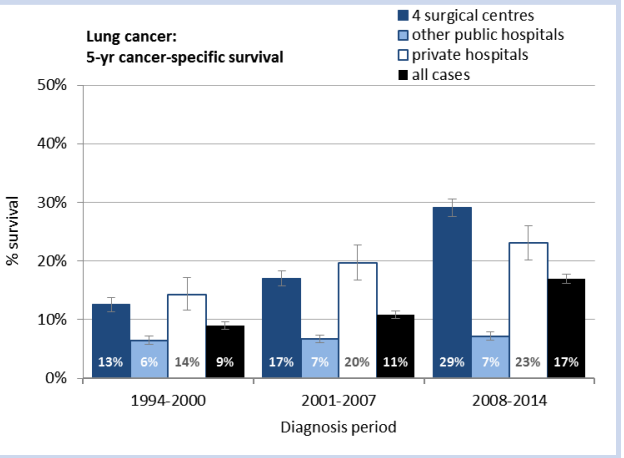


2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.36**	1.29-1.42	<0.001
	Private	**0.89**	0.82-0.97	0.007

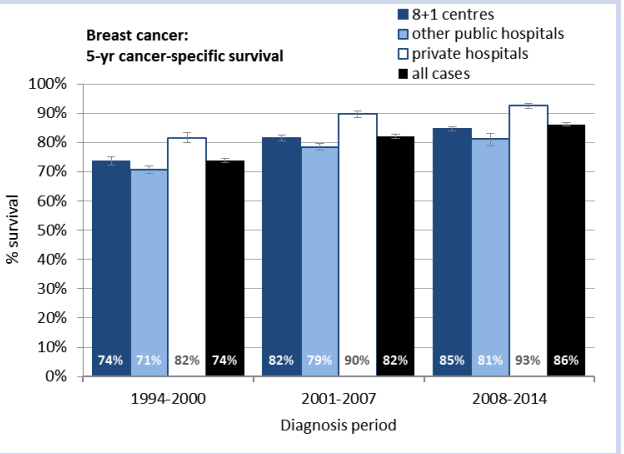
Designated surgical centres
(by hospital of first surgery)



2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	2 centres[3]	1.00	-	-
	Other public	**1.29**	1.12-1.49	<0.001
	Private	1.06	0.89-1.26	0.536



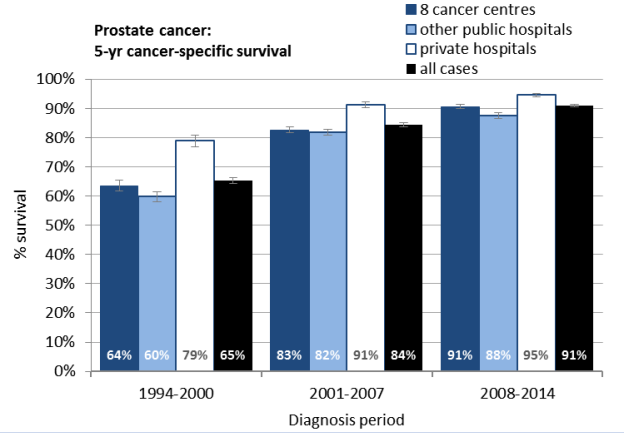
2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	4 centres[3]	1.00	-	-
	Other public	**1.44**	1.37-1.51	<0.001
	Private	1.00	0.92-1.09	0.960



2008-2013[5] adj for age, sex, stage, deprivation	Hospital type	HR[4]	95% CI	P
	8+1 centres[2]	1.00	-	-
	Other public	**1.23**	1.06-1.45	0.007
	Private	**0.68**	0.58-0.79	<0.001

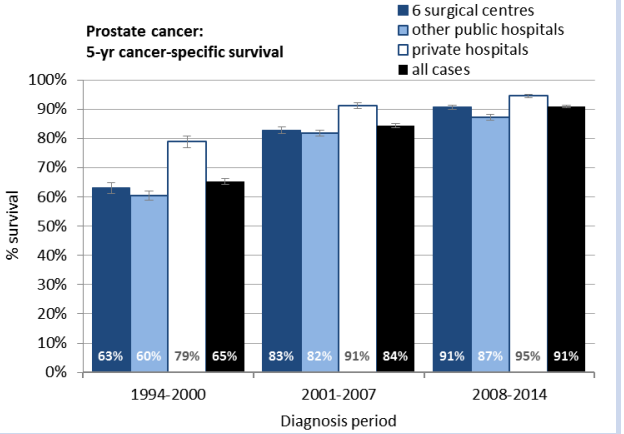
Summary Figure 2 Five-year cause-specific survival (by hospital category and period of diagnosis)

Main cancer centres
(by hospital of first surgery > biopsy > other treatment)

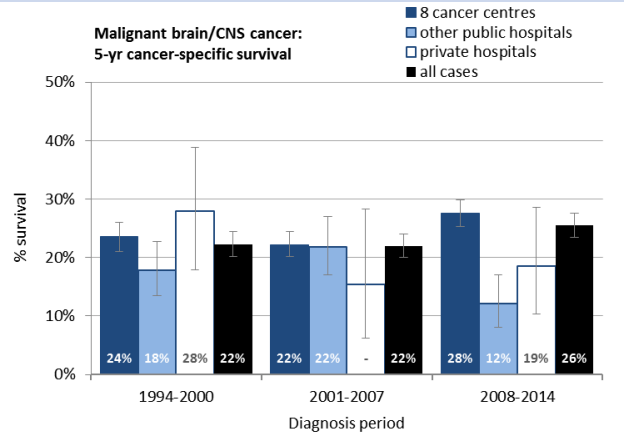


2008-2013[5]	Hospital type	HR[4]	95% CI	P
adj for age,	8 centres[1]	1.00	-	-
stage,	Other public	**1.31**	1.16-1.48	<0.001
deprivation	Private	**0.73**	0.62-0.85	<0.001

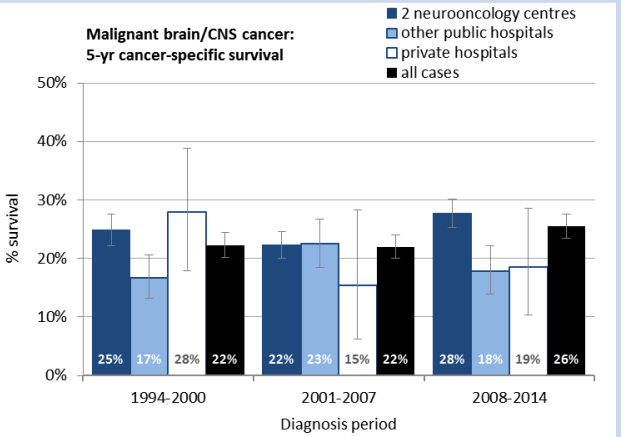
Designated surgical centres
(by hospital of first surgery)



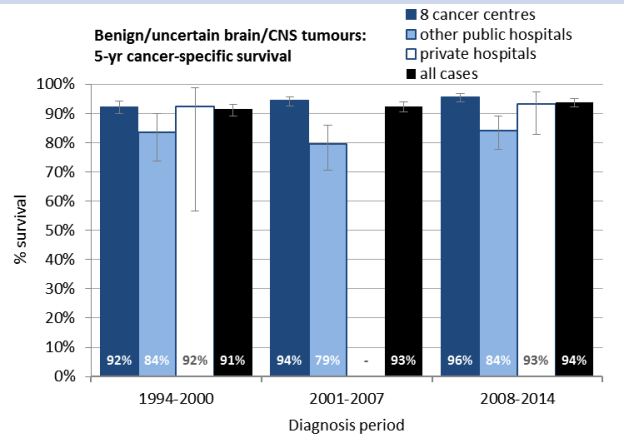
2008-2013[5]	Hospital type	HR[4]	95% CI	P
adj for age,	6 centres[2]	1.00	-	-
stage,	Other public	**1.32**	1.16-1.49	<0.001
deprivation	Private	**0.73**	0.62-0.88	<0.001



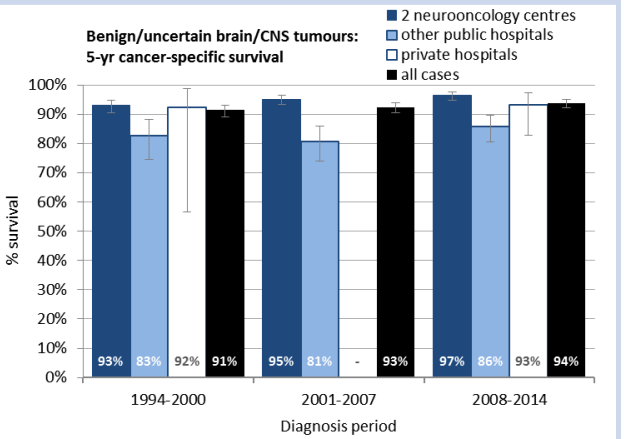
2008-2014	Hospital type	HR[4]	95% CI	P
adjusted for	8 centres[1]	1.00	-	-
age, sex,	Other public	**1.45**	1.22-1.73	<0.001
deprivation	Private	1.06	0.82-1.38	0.646



2008-2014	Hospital type	HR[4]	95% CI	P
adjusted for	2 centres[3]	1.00	-	-
age, sex,	Other public	**1.20**	1.03-1.40	0.018
deprivation	Private	1.06	0.82-1.38	0.659



2008-2014[5]	Hospital type	HR[4]	95% CI	P
adjusted for	8 centres[1]	1.00	-	-
age, sex,	Other public	**1.92**	1.12-3.29	0.018
deprivation	Private	1.93	0.58-6.46	0.284



2008-2014[5]	Hospital type	HR[4]	95% CI	P
adjusted for	2 centres[2]	1.00	-	-
age, sex,	Other public	**2.19**	1.22-3.94	0.009
deprivation	Private	2.21	0.65-7.50	0.203

[1] 8 centres designated for a range of cancers and as rapid access clinics for lung and prostate cancer.
[2] 8 centres (+ Letterkenny satellite to University College Hospital Galway) designated for rectal and breast cancer surgery and for breast cancer symptomatic disease.
[3] Centres designated for surgery for the specific cancer site.
[4] HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres) excluding 2014 data for stage adjustment (different TNM edition); stage not available for brain/CNS tumours.

Introduction

The Health Service Executive's (HSE) National Cancer Control programme (NCCP) is responsible for overseeing national services for the treatment of cancer. These treatments include surgery, radiotherapy and systemic anti-cancer therapy. An early priority for the NCCP was the establishment of designated cancer centres for cancer surgery. In 2007, implementing recommendations of the National Cancer Strategy for Ireland published in 2006 [1], the NCCP initiated a programme of centralisation of publicly-funded cancer services (particularly surgical services) to a smaller number of high-volume, specialist centres (phase one of NCCP surgical centralisation). The rationale for this was that a range of international studies have provided evidence (albeit not always consistent) that good cancer outcomes are associated with high-quality, specialist treatment, with surgical specialisation and surgical volumes particularly critical. In the context of Ireland's small population, it was also clear at the time that a large number of hospitals (relative to our population size) were treating cancer patients with, perhaps, inadequate surgical caseloads or specialisation to assure optimal outcomes. The initial focus of the centralisation programme was on selected cancer types for which, in most cases, there was evidence that surgical specialisation and caseloads were important.

In this report, data collected by the National Cancer Registry are used to provide descriptive statistics on place of treatment, proportions treated and survival for cancer patients in Ireland from a perspective of ten years following the start of the centralisation process. Context in terms of longer-term treatment and survival patterns and trends (since 1994), and patterns and trends for other categories of hospitals (and nationally), is provided, to assist with interpretation of the findings relating to the period 2008 onwards. The report is not a formally commissioned audit or evaluation of the process and outcomes of cancer centralisation in Ireland. Rather, it is part of the National Cancer Registry's ongoing (and expanding) programme of work to use routinely-collected registry data to inform and assist cancer prevention and cancer care policies at a national level. We hope the information presented here will also be of interest to clinical, public health and wider audiences.

Analyses here focus on designated cancer centres in comparison with other public hospitals and with private hospitals, categorised on the basis where a patient first had their surgery or diagnosis (prioritising surgery over biopsy over other treatments or consultations – see Methods chapter). Analyses relate to the eight main cancer centres established in 2008 and further examine the subspecialisation of cancer surgery outlined in the first phase of NCCP surgical centralisation (Tables i-1, i-2). Four surgical centres have been designated for upper gastrointestinal cancers, two for pancreatic cancer, nine for rectal and breast cancers, six for prostate cancer, and two neuro-oncology centres for brain / central nervous system tumours.

Table i-1
Designated cancer centre in each Hospital Group and the former HSE administrative area for each

Hospital Group	Cancer Centre	HSE Region
RCSI	*Beaumont University Hospital*	*HSE Dublin – North East*
Ireland East	*Mater University Hospital*	*HSE Dublin – North East*
	St Vincent's University Hospital	*HSE Dublin – Mid Leinster*
Dublin Midlands	*St James's University Hospital*	*HSE Dublin – Mid Leinster*
South/Southwest	*Cork University Hospital*	*HSE South*
	Waterford Regional Hospital	*HSE South*
Saolta University	*Galway University Hospital*	*HSE West*
	(satellite: Letterkenny General Hospital)	
Midwest	*University Hospital Limerick*	*HSE West*

The services provided in the designated cancer centres are summarised in Table i-2.

Table i-2
NCCP-designated cancer centres by cancer type
(https://www.hse.ie/eng/services/list/5/cancer/about/services/)

		[1] St. James's	[1] Mater	[1] St. Vincent's	[1] Beaumont	[2] Cork	[2] Galway	[2] Limerick	[2] Waterford	* SLRON	† Other
Lung	rapid access clinic	●	●	●	●	●	●	●	●		
	surgery	●	●			●	●				
Breast	symptomatic breast disease	●	●	●	●	●	●	●	●		Letterkenny (Galway satellite)
	surgery	●	●	●	●	●	●	●	●		Letterkenny
Prostate	rapid access clinic	●	●	●	●	●	●	●	●		
	surgery	●	●	●	●	●	●				
Upper GI	surgery	●			●	●	●				
Pancreas	surgery			●		●					
Rectal	surgery	●	●	●	●	●	●	●	●		Letterkenny
Neuro-oncology					●	●					
Radiation oncology						●	●	○ Mater Private Limerick	○ Whitfield	●	

*SLRON St. Luke's Radiation Oncology Network, which has locations at St. Luke's hospital Rathgar, and on the campuses of St. James's Hospital and Beaumont hospital.
[1]Dublin.
[2]Cork, Galway, Limerick and Waterford University Hospitals.
†Letterkenny Hospital (Co Galway) is a designated satellite of Galway University Hospital
● Designated centre.
○ Contracted service.

The precise number of centres designated for each hospital varies by cancer type (as described in the HSE information summarised earlier), and for lung and prostate cancers a further distinction is made between a smaller number of centres designated for surgery and a larger number designated for rapid access clinics.

It should be borne in mind that the timing of the move towards centralisation has varied by cancer type, earliest for breast cancer and most recently for oesophageal cancer, as noted in these extracts from a list of NCCP achievements on the HSE website [7]:

2012
- *Developed a national programme for oesophageal cancer in one national centre with three satellites*

2011
- *Centralisation of all lung cancer surgery in four designated cancer centres*
- *Developed a single national programme for the management of brain and other central nervous system tumours operating on two sites*

2010
- *Established a national centre for pancreatic cancer operating on two sites*

2009-2013
- *Establishment of Rapid Access Clinics for patients strongly suspected of having prostate cancer or lung cancer in all eight designated cancer centres*

2007-2009
- *Reorganisation of symptomatic breast cancer diagnostic and surgical services into the eight cancer centres (with a satellite from the Galway Cancer Centre at Letterkenny General Hospital)*

Analyses in this report focus on centralisation activity up to 2014/2015, and it is anticipated that patterns will have further changed in the interim period and will further change once final-phase implementation of centralisation has taken place.

Findings in relation to treatment and survival variation by hospital type are presented as averages based on aggregate (combined) data for all hospitals within a given category, for a given cancer, and do not necessarily

apply to all individual hospitals within a category. Some private or non-designated hospitals treat very few (while others treat more substantial numbers of) cancer patients annually.

Presentation of annual trends in caseload distribution and in use of specific treatment modalities in this report allows the precise timing of centralisation, by cancer type, to be taken in to account. Some summary statistics for broader diagnosis cohort are also provided, but the information presented for the most recent cohort (patients diagnosed during 2008-2015) may be more informative for those cancers (notably breast cancer) for which centralisation started earliest.

Through this report, the main focus in terms of assignment of hospital category is on overall treatment or diagnosis of cancers, i.e. cases are assigned to a 'first' or 'main' hospital using an algorithm taking all NCRI-registered treatments or other hospital encounters into account. This algorithm prioritises the first hospital where a patient had excisional surgery or, if there is no excisional surgery, the first hospital where a biopsy is taken. If there no surgery or biopsy, other treatments or hospital encounters are taken into account, in the sequence specified in the *Methods* chapter. This approach is intended to capture, as far as is practicable from NCRI data, the most relevant 'early encounter' in terms of treatment or planning of further treatment. Each case is counted under only one hospital category (that which applies to the 'first' hospital as defined for surgery or overall). Thus a patient who has excisional surgery in one hospital, but is referred for more complex surgery to a different hospital, is counted only under the first hospital (and relevant hospital category). But a patient who has a biopsy, confirming cancer, in one hospital, but has their first definitive surgery in a different hospital, is counted under the latter (and its hospital category).

Equivalent analyses for surgically treated cases are more straightforward, being based on (only) the first hospital where definitive, excisional surgery takes place.

Reorganisation of public radiotherapy services is not covered in this report, as the range of cancers involved is larger and publicly funded patients in some regions are treated in private radiotherapy facilities (thus hospital-type definitions are less straightforward than for the non-radiotherapy centres). However, if the only treatment or other hospital encounter in NCRI records for a given cancer patient is at a radiotherapy facility on the campus of a designated cancer centre, the case is assigned to that centre. (Otherwise, other treatments or hospital encounters are used in preference to assign a 'first' hospital.)

Analyses here do not take into account 'public' versus 'private health insurance' status of individual patients. Comprehensive information on this aspect is not available to NCRI, and status may vary for individual patients at different points in their diagnosis and treatment pathway. Treatments paid for by private health insurance may take place either in private hospitals/clinics or, with reimbursement to public funds, in publicly funded hospitals (including designated cancer centres). For this reason, the patterns and trends described relate to the institutions involved, and case numbers and proportions in the 'designated centre' and 'other public hospital' categories, will include some privately-insured patients.

Analyses here are based on 201,000 individual cancers (or benign/uncertain-behaviour tumours of the central nervous system) diagnosed in 196,000 individual patients during the years 1994 to 2015. The invasive cancers included, those initially targeted by the NCCP for centralisation of services, represent just over half (54%) of all invasive cancers (other than non-melanoma skin cancer) diagnosed in Ireland during 1994-2015.

Equivalent analyses could be undertaken for further cancer types for which centres have not (or not yet) been formally designated, which would provide further context for assessment of the extent to which centralisation may be contributing to treatment or survival improvements as opposed to reflecting wider improvements in cancer care in Ireland. Many cancers not included in this report are also treated in the cancer centres, but in general the cancers involved are not considered by the NCCP to require such specialised services, with some exceptions (mainly rarer cancers). However, for practical reasons, the present report deals only with the cancer types detailed above.

For the cancers presented here, findings relate largely to cancers in adult patients. Paediatric cancer treatment is already highly centralised (and further centralisation is underway), mainly involving three paediatric centres (Our Lady's Children's Hospital Crumlin, Temple Street Children's University Hospital, and

the National Children's Hospital at Tallaght Hospital) which are not included within the NCCP 'cancer centre' definition used for the purposes of this report. However, for brain and central nervous system tumours one of the NCCP centres (Beaumont Hospital) is involved for a high proportion of both adult and childhood cases, particularly those receiving radiotherapy.

Patterns of centralisation

Summary

- For the majority of cancer types examined, there was clear evidence of recent centralisation of services (2008 onwards), especially relating to surgical treatment.
- Recent centralisation (assessed from proportions of public-hospital patients involved and degree of change compared with the pre-2008 period) appears to have been most marked for breast cancer patients and for surgical pancreatic, rectal, stomach and lung cancer patients.
- Although evidence of recent centralisation was weaker for oesophageal and prostate cancers, high proportions of cases (especially surgical cases) were nevertheless treated in designated centres in the most recent years.
- For brain and other central nervous system (CNS) tumours, treatment was already highly centralised, and modest recent decreases in the proportions of surgical patients treated in the two neuro-oncology centres mainly involve children treated by the Department of Paediatric Neurosurgery of Temple Street Children's University Hospital (at Temple Street or at Our Lady's Hospital for Sick Children, Crumlin) and small numbers of less complex neurosurgical procedures at non-centres.
- Increases in proportion of patients treated in private hospitals was also seen over time for most cancers.
- This report focuses on centralisation activity up to 2014/2015, and patterns are likely to have further changed in the interim and to further change once final-phase implementation of centralisation occurs.
- *Note*: All comparisons are based on hospital category, not on patient status (publicly funded or privately insured) – figures for cancer centres and other public hospitals include some private patients.

Table 1.1 Percentages of 2008-2015 cases first treated or diagnosed in designated cancer centres, and change in relative terms compared with the previous seven-year period. Proportions ≥50% are highlighted in **bold**.

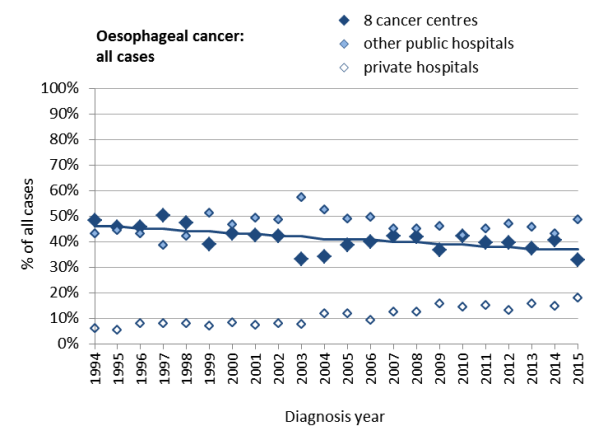
		% of cases first treated or diagnosed in centres				% of public-hospital cases first treated or diagnosed in centres			
Cancer	**Number of centres***	**all cases**		**surgical cases**		**all cases**		**surgical cases**	
Oesophagus	8	39%	=			46%	+		
	4 surgical	28%	=	**63%**	++	33%	+	**68%**	++
Stomach	8	43%	++			**50%**	++		
	4 surgical	32%	++	**54%**	++++	37%	++	**59%**	++++
Rectal	8+1 surgical	47%	+++	**52%**	+++	**58%**	+++	**63%**	++++
Pancreatic	8	44%	+			**53%**	++		
	2 surgical	16%	++++	44%	+++++	19%	++++	**61%**	+++++
Lung	8 rapid access	**58%**	++			**64%**	++		
	4 surgical	39%	+++	**80%**	+++	43%	+++	**90%**	+++
Breast	8+1	**70%**	++++	**68%**	++++	**92%**	++++	**92%**	++++
Prostate	8 rapid access	42%	++			**63%**	+++		
	6 surgical	42%	+++	31%	- -	**62%**	+++	**60%**	++
Brain/CNS (malignant)	8	**80%**	+			**85%**	+		
	2 neuro-oncology	**72%**	+	**91%**	-	**77%**	+	**96%**	-
Brain/CNS (benign/uncertain)	8	**74%**	- -			**78%**	- -		
	2 neuro-oncology	**65%**	- -	**94%**	-	**69%**	- -	**96%**	-

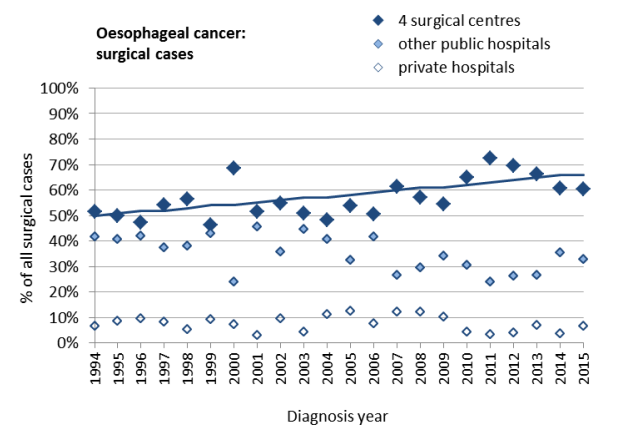
*For general cancer services, 8 centres have been designated, but further details vary by cancer type: 4 specific surgical centres have been designated for upper gastrointestinal cancers (oesophagus and stomach); 8 surgical centres (+ 1 satellite) for rectal cancer; 8 centres as rapid access clinics and 4 surgical centres for lung cancer; 8 centres (+ 1 satellite) as both rapid access clinics and surgical centres for breast cancer; 8 centres as rapid access clinics and 6 as surgical centres for prostate cancer; and 2 neuro-oncology centres for brain/CNS tumours.

"+" <10%, "++"10-24%, "+++" 25-49%, "++++" 50-99%, "+++++" ≥100% relative increase in proportion of cases treated in centres compared with 2001-2007 diagnosis period. Similarly, minus signs indicate same scale but for relative decreases. "=" no change.

Oesophageal cancer

Figure 1.1 Trends in proportion of cases first treated in HSE cancer centres: Oesophageal cancer
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





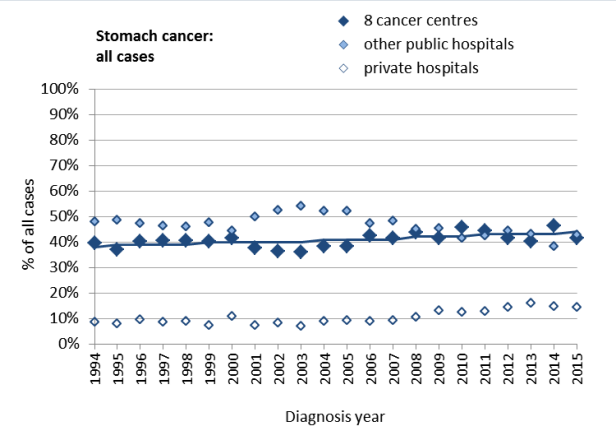
	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**-1.1%**	-1.7%,-0.6%	↓
4 surgical centres[2]	1994-2015	**+1.4%**	+0.6%,+2.1%	↑

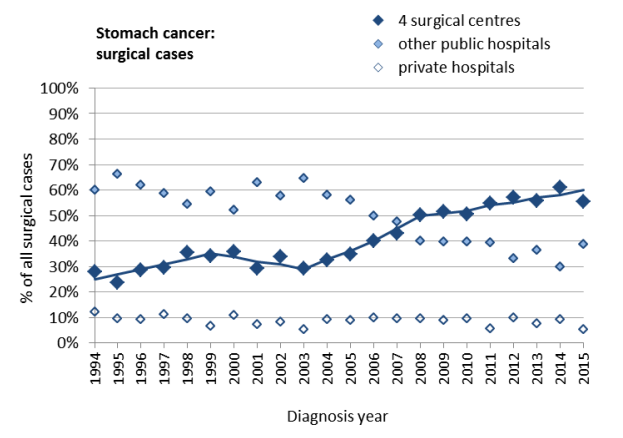
[1] 8 centres designated for a range of cancers but not specifically for particular cancer types.
[2] Centres designated for site-specific surgery for upper gastrointestinal cancers. (Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all oesophageal cancer cases first treated or diagnosed in the eight cancer centres fell significantly, by on average 1.1% annually in relative terms, between 1994 and 2015 (*Figure 1.1*).
- Likewise, for the four centres designated specifically for upper gastrointestinal cancer surgery, the proportion of all cases fell significantly, by 0.8% annually in relative terms, between 1994 and 2015 (details not shown).
- In contrast to trends for all cases, the proportion of surgical cases treated in the four surgical centres increased significantly, by 1.1% annually in relative terms (or 1.4% annually for public-hospital cases), between 1994 and 2015 (*Figure 1.1*).
- By broader period of diagnosis, the proportion of cases seen or treated in the eight cancer centres fell slightly between the periods 1994-2000 (46% of all cases or 51% of public-hospital cases) and 2008-2015 (39% of all cases or 46% of public-hospital cases) (*Appendix 1* – also next points).
- For the four surgical centres, the proportion of all cases fell from 31% of all cases or 35% of public-hospital cases diagnosed during 1994-2000 to 28% of all cases or 33% of public-hospital cases diagnosed during 2008-2015.
- The proportion of cases treated or diagnosed in private hospitals doubled between the periods 1994-2000 (7%) and 2008-2015 (15%).
- The proportion of cases that had their first surgery in the four surgical centres increased from 53% during 1994-2000 (or 58% of public-hospital cases) to 63% during 2008-2015 (or 68% of public-hospital cases).
- The proportion of surgical cases that had their first surgery in private hospitals fell slightly between the period 1994-2000 (8%) and 2008-2015 (7%).
- *Overall, there is clear evidence of recent centralisation of surgical treatment of oesophageal cancer, although centralisation is not evident for general treatment and diagnosis of this cancer*.

Stomach cancer

Figure 1.2 Trends in proportion of cases first treated in HSE cancer centres: Stomach cancer
left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**+0.6%**	+0.2%,+1.0%	↑

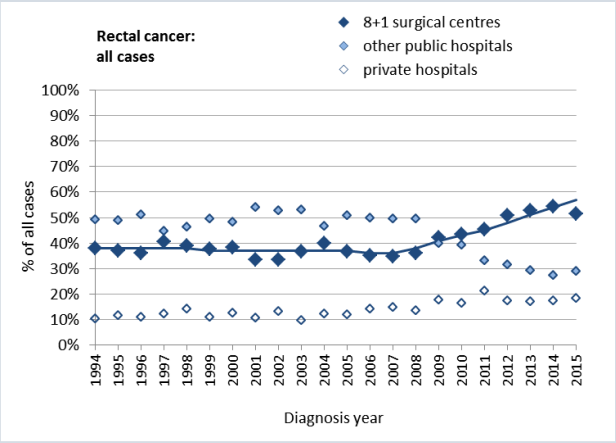
	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-1999	**+6.9%**	+0.9%,+13%	↑
	1999-2003	-4.6%	-16%,+8.9%	=
	2003-2008	**+11.1%**	+3.5%,+19%	↑
	2008-2015	**+2.7%**	+0.5%,+4.9%	↑

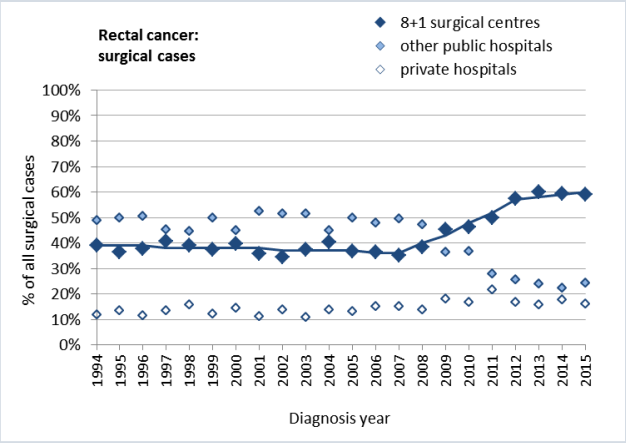
[1] 8 centres designated for a range of cancers but not specifically for particular cancer types.
[2] Centres designated for site-specific surgery for upper gastrointestinal cancers. (Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all stomach cancer cases first treated or diagnosed in the eight cancer centres (*Figure 1.2*), or in the four centres designated specifically for upper gastrointestinal cancer surgery (not shown), increased between 1994 and 2015.
- The proportion of surgical cases treated in the four surgical centres increased significantly between 1994 and 2015, but with the steepest increase occurring between 2003 and 2008 (*Figure 1.2*).
- By broader period of diagnosis, the proportion of cases seen or treated in the eight cancer centres increased slightly between the periods 1994-2000 (40% of all cases or 46% of public-hospital cases) and 2008-2015 (43% of all cases or 50% of public-hospital cases) (*Appendix 1* – also next points).
- The proportion treated in the four surgical centres increased from 25% of all cases or 29% of public-hospital cases diagnosed during 1994-2000 to 32% of all cases or 37% of public-hospital cases diagnosed during 2008-2015.
- The proportion of cases treated or diagnosed in private hospitals also increased between the periods 1994-2000 (9%) and 2008-2015 (13%).
- The proportion of surgical cases treated in the four surgical centres increased from 31% during 1994-2000 (or 34% of public-hospital cases) to 54% during 2008-2015 (or 59% of public-hospital cases).
- The proportion of surgical cases treated in private hospitals fell slightly between the periods 1994-2000 (10%) and 2008-2015 (8%).
- *Overall, there is clear evidence of recent centralisation of stomach cancer services, strongest for surgical treatment.*

Rectal cancer

Figure 1.3 Trends in proportion of cases first treated in HSE cancer centres: Rectal cancer
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	-0.4%	-1.4%,+0.7%	=
	2007-2015	**+5.7%**	+4.0%,+7.5%	↑

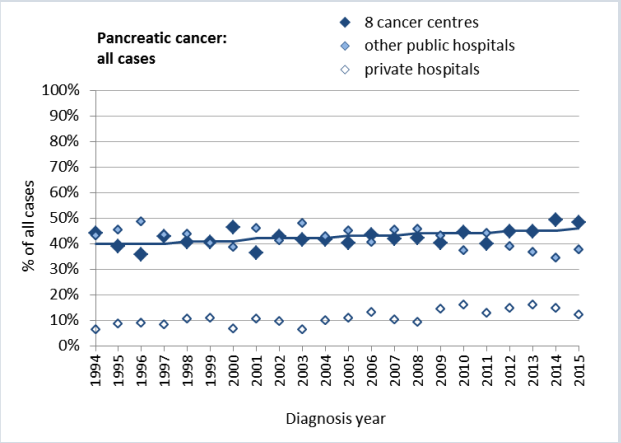
	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	-0.6%	-1.3%,+0.2%	=
	2007-2012	**+9.5%**	+5.5%,+14%	↑
	2012-2015	+1.7%	-2.6%,+6.3%	=

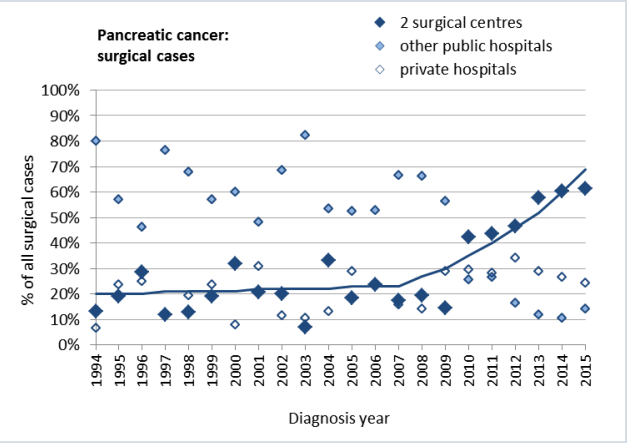
[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for site-specific surgery for rectal cancer.
[2] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all rectal cancer cases first treated or diagnosed in the eight centres (plus Letterkenny satellite) designated for this cancer showed no significant change during 1994-2007, but increased markedly post-2007, with an average increase by 5.7% annually in relative terms between 2007 and 2015 (*Figure 1.3*). (The proportion of centrally treated cases among all public-hospital cases increased by 8.8% annually between 2007 and 2012 – details not shown.)
- The proportion of all surgical rectal cancer cases treated in the eight surgical centres (plus Letterkenny satellite) showed similar, but more marked, trends to those shown by all cases, with significant increases between 2007 and 2012 by on average 9.5% annually in relative terms (*Figure 1.3*) (or 10.5% annually among public-hospital cases – not shown).
- By broader diagnosis-period, the eight cancer centres plus Letterkenny accounted for 47% of all rectal cancer patients and 58% of public-hospital patients during 2008-2015, compared with 38% of all patients and 44% of public-hospital patients during 1994-2000 (*Appendix 1* – also next points).
- The proportion of patients first treated or diagnosed in private hospitals increased from 12% to 17%, between the periods 1994-1999 and 2010-2015.
- The eight cancer centres plus Letterkenny (satellite) accounted for 52% of all surgical cases and 63% of public-hospital surgical cases during 2008-2015, compared with 39% of surgical cases patients and 45% of public-hospital patients during 1994-2000.
- The proportion of surgical patients first treated in private hospitals increased from 13% to 17% between the periods 1994-2000 and 2008-2015.
- *Conclusion: Strong evidence of recent centralisation of both general rectal cancer services and rectal cancer surgery.*

Pancreatic cancer

Figure 1.4 Trends in proportion of cases first treated in HSE cancer centres: Pancreatic cancer
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**+0.7%**	+0.2%,+1.2%	↑

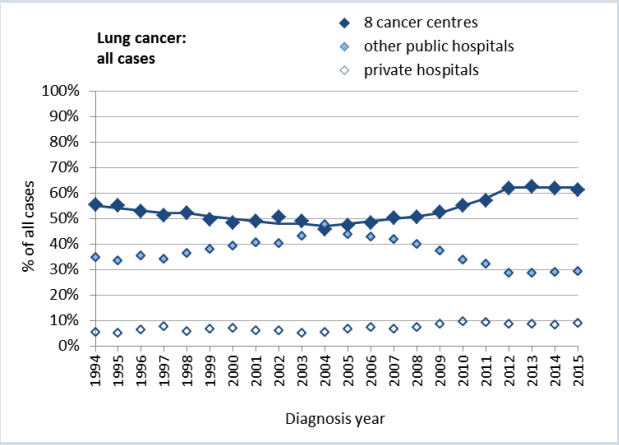
	Period	APC[3]	95% CI	Trend
2 surgical centres[2]	1994-2007	+1.2%	-5.2%,+8.1%	=
	2007-2015	**+14.6%**	+8.2%,+21%	↑

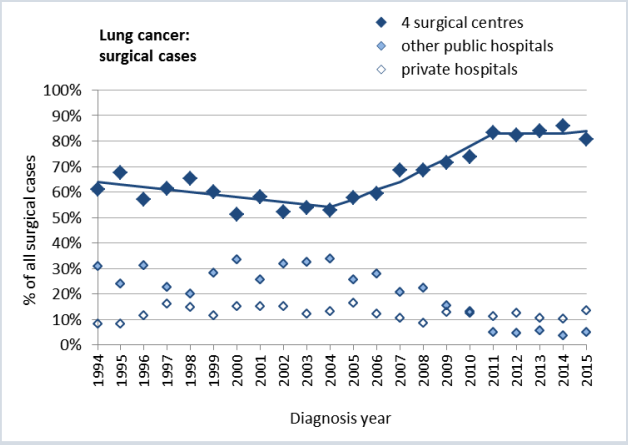
[1] 8 centres designated for a range of cancers but not specifically for particular cancer types.
[2] Centres designated for site-specific surgery for pancreatic cancer. (Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all pancreatic cancer cases first treated or diagnosed in the eight cancer centres increased slowly but significantly during 1994-2015, by on average 0.7% annually in relative terms (*Figure 1.4*) (or 0.8% annually among public-hospital cases – details not shown).
- The proportion of all cases first treated or diagnosed in the two surgical centres designated for this cancer showed no change during 1994-2008, then increased by on average 13% annually in relative terms between 2008 and 2015 (details not shown).
- The proportion of all surgical pancreatic cancer cases treated in the two surgical centres showed no significant change between 1994 and 2007 but increased steeply between 2007 and 2015 by, on average 15% annually in relative terms (*Figure 1.4*).
- The fitted Joinpoint trend based on public-hospital surgical cases was similar but more complex, suggesting a steeper (but non-significant) increase between 2008 and 2011 in the proportion treated in the two centres (details not shown).
- By broader diagnosis period, the eight cancer centres accounted for 44% of all pancreatic cancer patients and 53% of public-hospital patients during 2008-2015, only a small increase compared with 41% of all patients and 49% of public-hospital patients during 1994-2000 (*Appendix 1* – also next points).
- However, the two surgical centres designated for this cancer accounted for 16% of all patients and 19% of public-hospital patients during 2008-2015, a more marked increase from 9% and 11%, respectively, during 1994-2000.
- The proportion of patients first treated or diagnosed in private hospitals increased from 9% to 14% between the periods 1994-1999 and 2010-2015.
- The two designated surgical centres accounted for 44% of all surgical cases and 61% of public-hospital surgical cases during 2008-2015, compared with only 19% of all patients and 23% of public-hospital patients during 1994-2000.
- The proportion of surgical patients first treated in private hospitals increased from 16% to 27% between the periods 1994-2000 and 2008-2015.
- *Conclusion: Strong evidence of recent centralisation of general pancreatic cancer services and, especially, pancreatic cancer surgery.*

Lung cancer

Figure 1.5 Trends in proportion of cases first treated in HSE cancer centres: Lung cancer
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2004	**-1.6%**	-2.1%,-1.1%	↓
	2004-2009	**+2.1%**	+0.1,+4.2%	↑
	2009-2012	**+5.9%**	+0.6,+11%	↑
	2012-2015	+0.1%	-2.1%,-2.3%	=

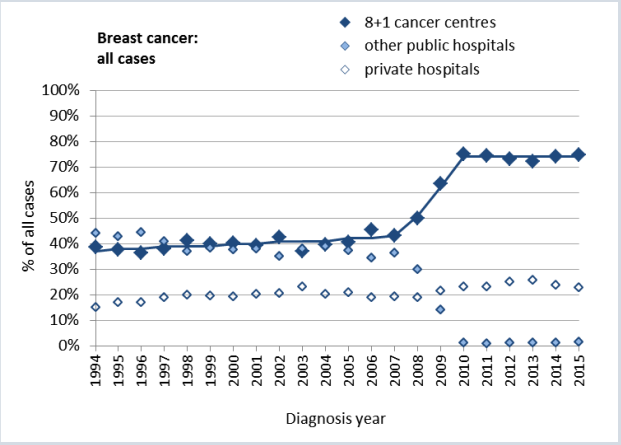
	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-2004	**-1.8%**	-3.4%,-0.3%	↓
	2004-2011	**+6.4%**	+3.8%,+9.0%	↑
	2011-2015	+0.4%	-2.1%,+2.9%	=

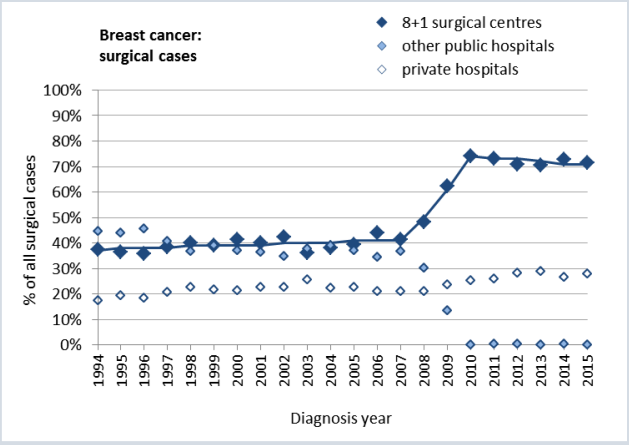
[1] 8 centres designated for a range of cancers and as rapid access clinics for lung cancer.
[2] Centres designated for site-specific surgery for lung cancer. (Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all lung cancer cases first treated or diagnosed in the eight cancer centres fell significantly during 1994-2004, but increased significantly during 2004-2009 and, especially, 2009-2012 (by on average 5.9% annually), before levelling off (*Figure 1.5*).
- The proportion of all cases seen or treated in the four surgical centres designated for this cancer showed a similar trend, with an initial decrease during 1994-2004, followed by a significant increase (averaging 5.4% annually) during 2004-2012, before stabilising (details not shown).
- The proportion of surgical cases treated in the four surgical centres fell significantly between 1994 and 2004, then increased steeply and significantly between 2004 and 2011, after which the proportion stabilised (*Figure 1.5*).
- By broader period of diagnosis, the proportion of cases seen or treated in the eight cancer centres increased slightly between the periods 1994-2000 (52% of all cases or 59% of public-hospital cases) and 2008-2015 (58% of all cases or 64% of public-hospital cases) (*Appendix 1* – also next points).
- The proportion treated in the four centres designated specifically for lung cancer surgery also increased more slightly, from 32% of all cases or 36% of public-hospital cases diagnosed during 1994-2000 to 39% of all cases or 43% of public-hospital cases diagnosed during 2008-2015.
- The proportion of cases treated or diagnosed in private hospitals also increased between the periods 1994-2000 (6%) and 2008-2015 (9%).
- The proportion of surgical cases treated in the four surgical centres increased more markedly, from 61% during 1994-2000 (or 69% of public-hospital cases) to 80% during 2008-2015 (or 90% of public-hospital cases).
- The proportion of surgical cases treated in private hospitals was unchanged between 1994-2000 and 2008-2015 (both 12%).
- *Conclusion: Strong evidence of recent centralisation of lung cancer surgery, with more modest evidence of centralisation of general lung cancer services.*

Breast cancer

Figure 1.6 Trends in proportion of cases first treated in HSE cancer centres: Breast cancer
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	**+1.0%**	+0.2%,+1.9%	↑
	2007-2010	**+20.3%**	+9.6%,+32%	↑
	2010-2015	-0.2%	-1.6%,+1.1%	=

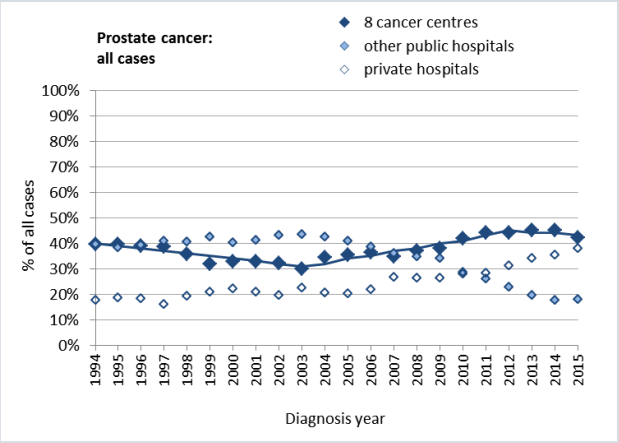
	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	+0.8%	-0.1%,+1.7%	=
	2007-2010	**+21.1%**	+9.5%,+34%	↑
	2010-2015	-0.7%	-2.2%,+0.8%	=

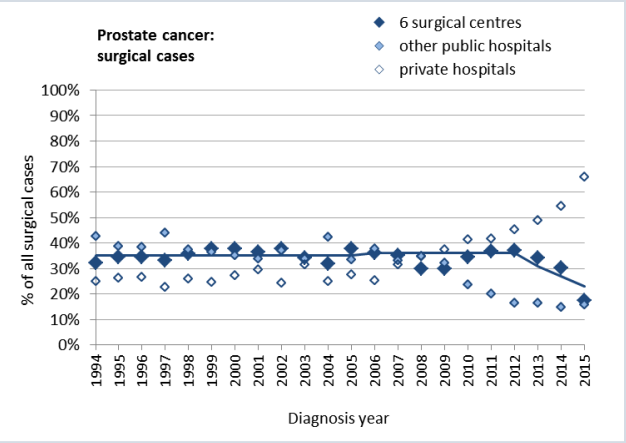
[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for breast cancer surgery and for symptomatic breast disease.
[2] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all breast cancer cases first treated or diagnosed in the eight designated breast centres (plus Letterkenny satellite) increased steeply and significantly between 2007 and 2010, following a more gradual earlier increase (*Figure 1.6*). The proportion has remained essentially static from 2010 onwards, at >70% of all patients and >95% of public-hospital patients.
- The proportion of surgical cases treated in the centres showed almost identical trends to those shown by all cases: a gradual increase during 1994-2007, a very steep increase 2007-2010, with relatively stable proportions 2010-2015 (70-74% of all surgical patients and >99% of public-hospital surgical patients) (*Figure 1.6*).
- By broader period of diagnosis, the proportion of cases seen or treated in the centres increased markedly between the periods 2001-2007 (41% of all cases or 53% of public-hospital cases) and 2008-2015 (70% of all cases or 92% of public-hospital cases) (*Appendix 1* – also next points). This followed much smaller increases between 1994-2000 and 2001-2007.
- The proportion of cases treated or diagnosed in private hospitals increased only moderately between the periods 1994-2000 (18%) and 2008-2015 (23%), but a substantial proportion of privately-insured patients will have been treated in public hospitals.
- The proportion of surgical cases treated in the centres increased markedly between the periods 2001-2007 (40% of all cases or 52% of public-hospital cases) and 2008-2015 (68% of all cases or 92% of public-hospital cases), following a much smaller increase between 1994-2000 and 2001-2007. This pattern almost exactly mirrors that shown by all cases (not surprising since surgical cases accounted for 85% of all breast cancers).
- The proportion of surgical cases treated in private hospitals increased between the periods 1994-2000 (20%) and 2008-2015 (26%).
- *Conclusion: Very strong evidence of centralisation of both overall services and surgery for breast cancer.*

Prostate cancer

Figure 1.7 Trends in proportion of cases first treated in HSE cancer centres: Prostate cancer
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical centres designated for this cancer – by hospital of first surgery)





	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2003	**-2.8%**	-4.2%,-1.4%	↓
	2003-2012	**+4.1%**	+2.9%,+5.3%	↑
	2012-2015	-1.0%	-5.5%,+3.6%	=

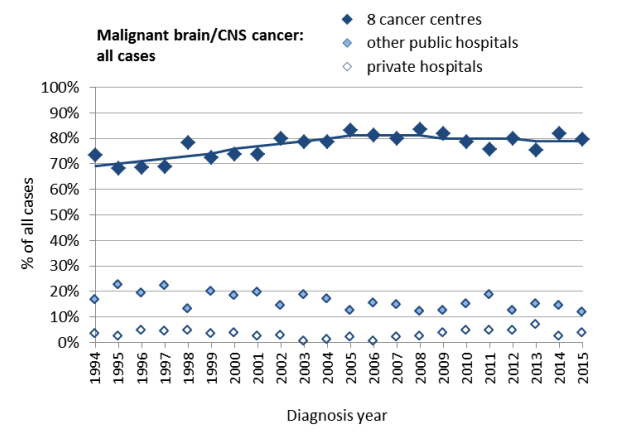
	Period	APC[3]	95% CI	Trend
6 surgical centres[2]	1994-2012	+0.2%	-0.6%,+1.0%	=
	2012-2015	**-13.9%**	-25%,-1.2%	↓

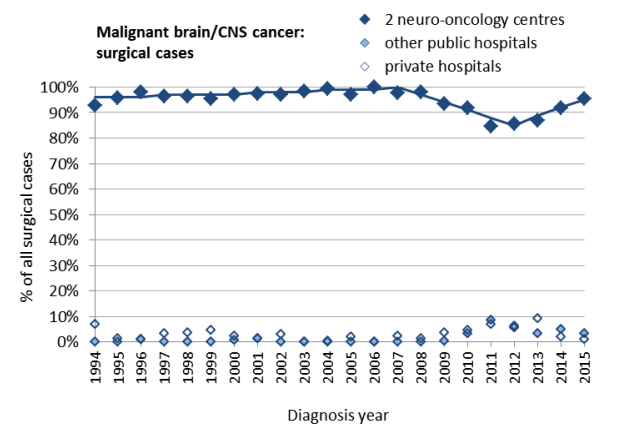
[1] 8 centres designated for a range of cancers and as rapid access clinics for prostate cancer.
[2] Centres designated for site-specific surgery for prostate cancer. (Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all prostate cancer cases first treated or diagnosed in the eight cancer centres increased significantly between 2003 and 2012 (following an earlier decrease) and has stabilised more recently at about 45% of all patients or 70% of public-hospital patients (*Figure 1.7*).
- The proportion first treated or diagnosed in the six surgical centres designated for this cancer showed a similar trend (details not shown).
- The proportion of all surgical cases treated in the six surgical centres showed no significant trend during 1994-2012, but fell significantly during 2012-2015 (*Figure 1.7*). However, the fitted Joinpoint trend for the proportion of public-hospital surgical cases treated in the six centres is more complex, indicating no trend from 1996 to 2009, followed by a non-significant increase from 2009 to 2012 then a non-significant decrease from 2012 to 2015.
- By broader period of diagnosis, the proportion of cases seen or treated in the eight centres increased moderately between the periods 2001-2007 (34% of all cases or 45% of public-hospital cases) and 2008-2015 (42% of all cases or 63% of public-hospital cases) (*Appendix 1* – and next points). Little change had been seen between 1994-2000 and 2001-2007.
- The proportion of cases treated or diagnosed in private hospitals increased between 2001-2007 (22%) and 2008-2015 (31%).
- The proportion of surgical cases treated in the six surgical centres fell between the periods 2001-2007 (36%) and 2008-2012 (31%), but this masked an increase in the proportion of public-hospital surgical cases treated in the six centres from 50% to 60% comparing the same periods.
- The proportion of surgical cases treated in private hospitals increased more markedly between 2001-2007 (28%) and 2008-2015 (47%).
- The somewhat unexpected recent trends seen for prostate cancer – the marked increase in proportions of all cases (and surgical cases) treated in private hospitals and the recent drop in proportions of surgical cases treated in designated surgical centres – may be a reflection of 'public' patients being referred from designated centres to private hospitals for robotic-assisted prostatectomy.
- *Conclusion: Moderately strong evidence of centralisation of general services and of surgery for prostate cancer, at least among patients treated in public hospitals.*

Malignant brain/central nervous system cancer

Figure 1.8 Trends in proportion of cases first treated in HSE cancer centres: malignant brain/CNS cancers
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical or other centres defined for particular cancer types – by hospital of first surgery)





	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2005	**+1.5%**	+0.7%,+2.3%	↑
	2005-2015	-0.3%	-1.0%,+0.4%	=

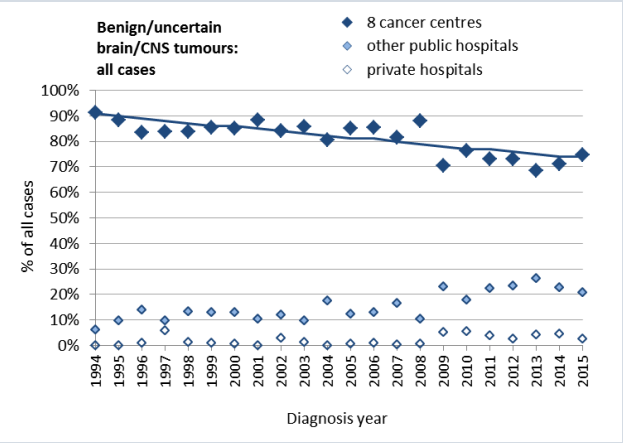
	Period	APC[3]	95% CI	Trend
2 centres[2]	1994-2007	**+0.3%**	+0.1%,+0.5%	↑
	2007-2012	**-3.0%**	-4.6%,-1.4%	↓
	2012-2015	**+3.6%**	+0.9%,+6.4%	↑

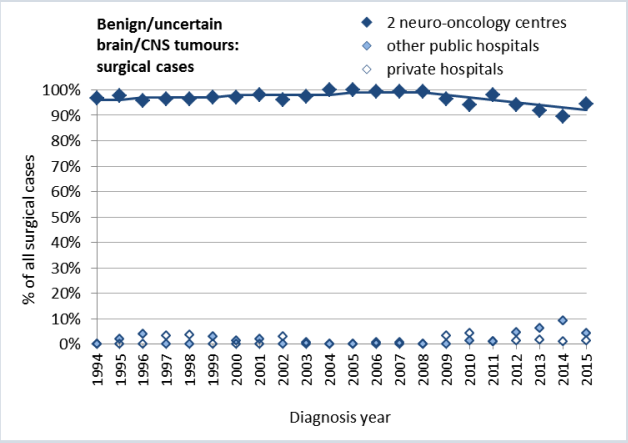
[1] 8 centres designated for a range of cancers but not specifically for particular cancer types.
[2] 2 neuro-oncology centres designated for brain / central nervous system tumours. (Note: In neuro-oncology centre graphs, cancer centres that are not designated neuro-oncology centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of all brain/CNS cancer cases first treated or diagnosed in the eight cancer centres increased significantly between 1994 and 2003, but showed no clear trend more recently (*Figure 1.8*) and averaged about 80% of all patients or 85% of public-hospital patients during 2008-2014.
- The proportion first treated or diagnosed in the two neuro-oncology centres designated for these tumours showed an ongoing increase during 1994-2015 (details not shown).
- The proportion of all surgical cases treated in the neuro-oncology centres showed a slight but statistically significant increase during 1994-2007, followed by a significant decrease during 2007-2012 and a significant increase during 2012-2015 (*Figure 1.8*). The proportion of public-hospital surgical cases treated in the two centres showed no trend during 1994-2009; this was followed by a non-significant decrease during 2009-2012 and a significant increase during 2012-2015 (details not shown).
- By broader period of diagnosis, the proportion of cases seen or treated in the eight cancer centres increased slightly between the periods 1994-2000 (72% of all cases or 79% of public-hospital cases) and 2001-2007 (79% of all cases or 83% of public-hospital cases) (*Appendix 1* – and next points). Little further increase was seen between 2001-2007 and 2008-2015.
- The proportion of cases seen or treated in the two neuro-oncology centres likewise increased slightly between the periods 1994-2000 (63% of all cases or 69% of public-hospital cases) and 2001-2007 (71% of all cases or 75% of public-hospital cases), again with little further increase from 2001-2007 to 2008-2015.
- The proportion of cases treated or diagnosed in private hospitals was very low (2-4%) in all three periods.
- The proportion of all surgical cases treated in the two neuro-oncology centres fell between the periods 2001-2007 (98%) and 2008-2012 (91%); between the same periods, the proportional of public-hospital surgical cases treated in the two centres fell from virtually 100% to 96%.
- The proportion of surgical cases treated in private hospitals was very low (1-4%) in all three periods.
- Modest recent decreases in the proportions of surgical patients treated in the two neuro-oncology centres mainly involve children treated by the Department of Paediatric Neurosurgery of Temple Street Children's University Hospital (at Temple Street or at Our Lady's Hospital for Sick Children, Crumlin) and small numbers of less complex neurosurgical procedures at non-centres. Decreases in the proportion of other patients treated or diagnosed in the eight centres partly reflect patients seen in the three paediatric cancer centres (Temple Street, Crumlin and the National Children's Hospital at Tallaght).
- *Conclusion: No evidence of recent centralisation of general or surgical services for brain/CNS cancers but neuro-oncology services were already highly centralised.*

Benign/uncertain brain/central nervous system tumours

Figure 1.9 Trends in proportion of cases first treated in HSE cancer centres: benign/uncertain brain/CNS tumours
(left) all cases (by hospital of first surgery > biopsy > other treatment);
(right) surgical cases (based on surgical or other centres defined for particular cancer types – by hospital of first surgery)





	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**-1.0%**	-1.4%,-0.6%	↓

	Period	APC[3]	95% CI	Trend
2 centres[2]	1994-2008	**+0.2%**	0.0%,+0.4%	↑
	2008-2015	**-1.1%**	-1.8%,-0.5%	↓

[1] 8 centres designated for a range of cancers but not specifically for particular cancer types.
[2] 2 neuro-oncology centres designated for brain / central nervous system tumours. (Note: In neuro-oncology centre graphs, cancer centres that are not designated neuro-oncology centres are included in the "other public hospital" category.)
[3] APC = estimated annual % change (relative) across the period specified: significant increase (↑), decrease (↓) or no significant change (=).

- The proportion of benign/uncertain brain/CNS tumours first treated or diagnosed in the eight cancer centres fell significantly between 1994 and 2015 (*Figure 1.9*), and averaged about 74% of all patients or 78% of public-hospital patients during 2008-2014.
- The proportion first treated or diagnosed in the two neuro-oncology centres designated for these tumours was relatively stable during 1994-2003 but fell significantly between 2003 and 2015 (details not shown).
- The proportion of all surgical cases treated in the two neuro-oncology centres showed a slight but statistically significant increase during 1994-2008, followed by a significant decrease during 2008-2015 (*Figure 1.9*). The proportion of public-hospital surgical cases treated in the two centres showed no significant trend during 1994-2009, followed by a non-significant decrease during 2009-2015 (details not shown).
- By broader period of diagnosis, the proportion of cases seen or treated in the eight cancer centres decreased between the periods 2001-2007 (84% of all cases or 87% of public-hospital cases) and 2008-2015 (74% of all cases or 78% of public-hospital cases) (*Appendix 1* – and next points).
- The proportion of cases seen or treated in the two neuro-oncology centres likewise decreased between the periods 2001-2007 (78% of all cases or 80% of public-hospital cases) and 2008-2015 (65% of all cases or 69% of public-hospital cases).
- The proportion of cases treated or diagnosed in private hospitals was very low (1-4%) in all three periods.
- The proportion of all surgical cases treated in the two neuro-oncology centres fell between the periods 2001-2007 (99%) and 2008-2012 (94%); between the same periods, the proportion of public-hospital surgical cases treated in the two centres fell from 99% to 96%.
- The proportions of surgical cases treated in other public hospitals and private hospitals were very low (1-4%) in all three periods.
- Modest recent decreases in the proportions of surgical patients treated in the two neuro-oncology centres mainly involve children treated by the Department of Paediatric Neurosurgery at Temple Street Children's University Hospital. Decreases in the proportion of other patients treated or diagnosed in the eight centres partly reflect patients seen in the paediatric cancer centres (not included in the definition here).
- *Conclusion: No evidence of recent centralisation of surgical services, but services were already highly centralised.*

Variation of patient age, deprivation status and cancer stage by hospital category

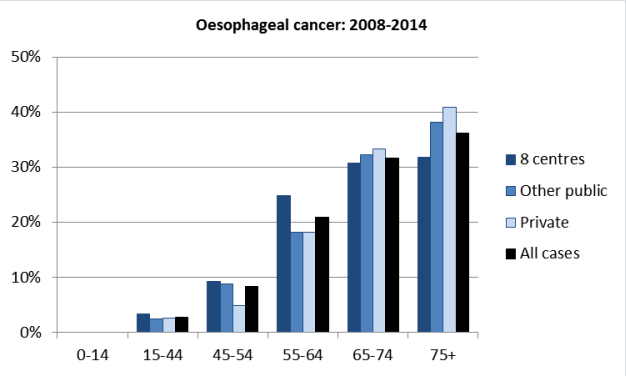
Summary

- Patients seen or treated in the cancer centres during 2008-2014 were younger on average than those in other public hospitals, generally by 1-4 years (comparing median ages) but by 8 years for brain/CNS cancers and by 14 years for benign/uncertain brain/CNS tumours. This may in part reflect differences in referral patterns by age. Comparisons between the centres and private hospitals were less consistent (patients in the centres were slightly younger for oesophageal, stomach and stomach cancer and for brain/CNS tumours, slightly older for rectal, pancreatic and breast cancer, and the same age for prostate cancer).
- Patients treated or diagnosed in cancer centres tended to include a higher proportion of earlier-stage cases than other public hospitals; differences between the cancer centres and private hospitals varied by cancer type.
- A substantially higher proportion of patients in private hospitals (25-38% depending on cancer type) were from the least deprived population quintile than in the cancer centres (14-21%), and the proportion was lowest in other public hospitals (8-14%); while the proportion of patients from the most deprived population quintile was lower for private hospitals (8-13%) than for the cancer centres (20-31%) or other public hospitals (23-34%).
- *Note*: All comparisons are based on hospital category, not on patient status (publicly funded or privately insured) – thus figures for cancer centres, and to lesser extent other public hospitals, include any private patients whose first treatment/diagnosis was in a public hospital.

Fuller details are summarised below by hospital category and cancer type, for age at diagnosis (*Figure 2.1*), deprivation (*Figure 2.2*) and stage (*Figure 2.3*).

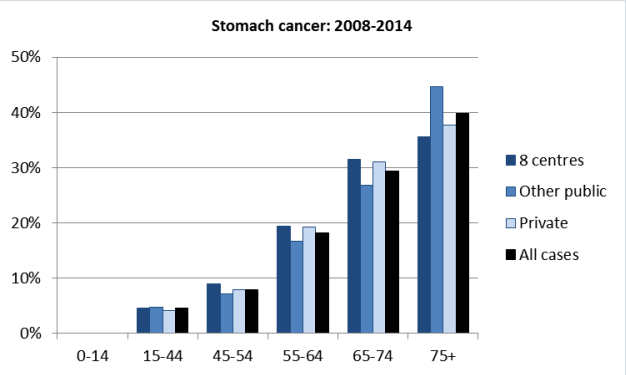
Age (2008-2014)

Figure 2.1 Comparisons of age at diagnosis by hospital category, 2008-2014



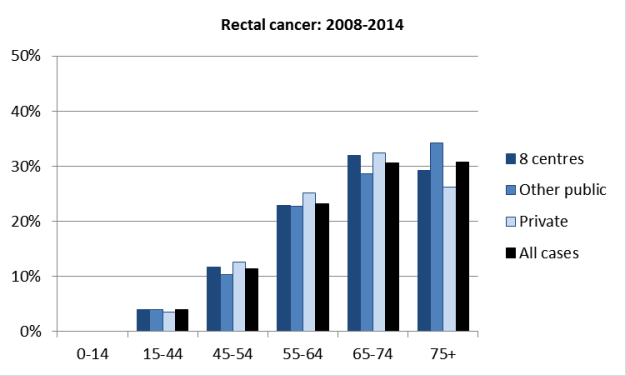
Oesophageal cancer:

- Median age of patients at diagnosis was 68 years for the eight cancer centres, 71 for other public hospitals and 72 for private hospitals.
- The centres had the highest proportion of patients aged 55-64; other public hospitals and the private hospitals had the highest proportion of patients aged 75+.



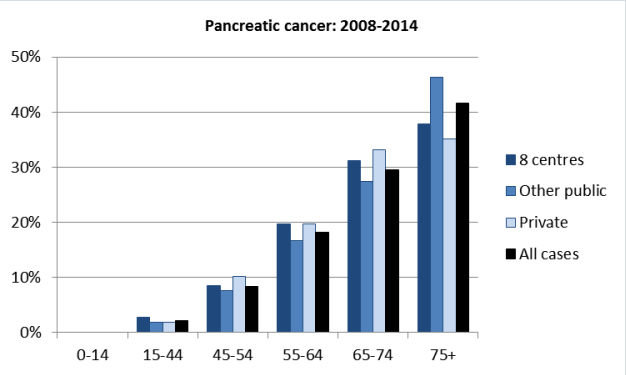
Stomach cancer:

- Median age at diagnosis was 70 years for the eight cancer centres, 73 for other public hospitals and 71 for private hospitals.
- The 'other public' category had the highest proportion, and the eight centres the lowest proportion, of patients aged 75+.



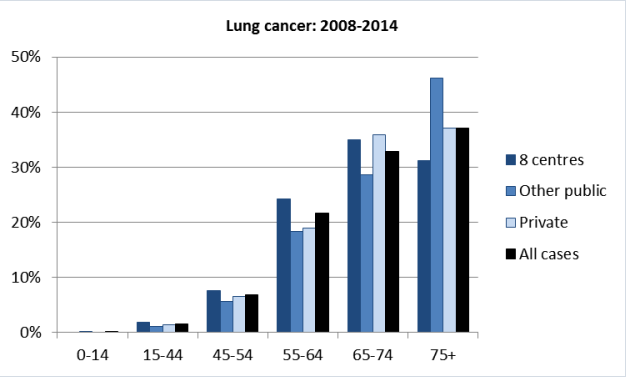
Rectal cancer:

- Median age at diagnosis was 68 for the eight cancer centres, 69 for other public hospitals and 67 for private hospitals.
- The 'other public' category had the highest proportion, and private hospitals the lowest proportion, of patients aged 75+.



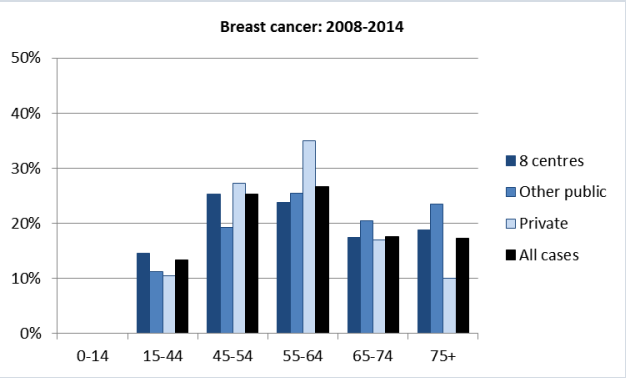
Pancreatic cancer:

- Median age at diagnosis was 71 for the eight cancer centres, 73 for other public hospitals and 69 for private hospitals.
- The 'other public' category had the highest proportion, and private hospitals the lowest proportion, of patients aged 75+.



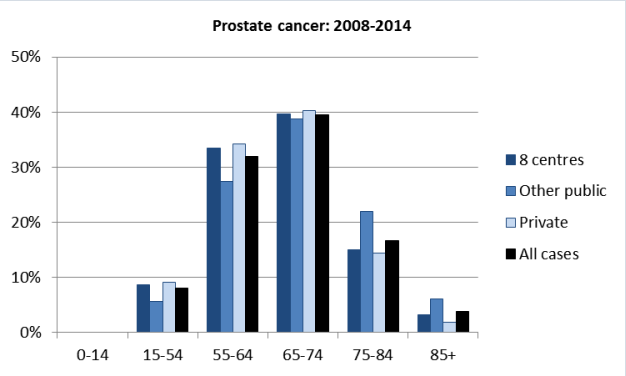
Lung cancer:

- Median age at diagnosis was 69 for the eight cancer centres, 73 for other public hospitals and 71 for private hospitals.
- The 'other public' category had the highest proportion, and the eight centres the lowest proportion, of patients aged 75+.



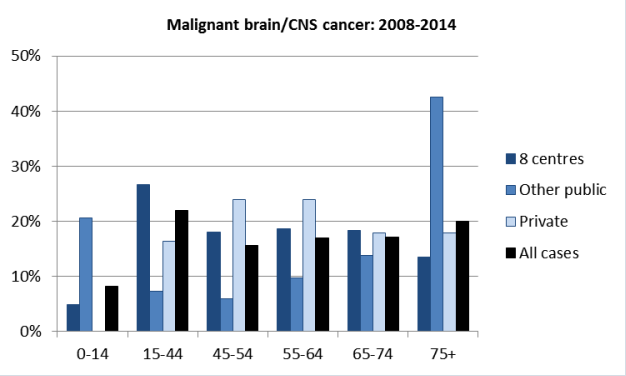
Breast cancer:

- Median age at diagnosis was 59 for the eight cancer centres, 62 for other public hospitals and 58 for private hospitals.
- The proportion of patients aged 45-64 was highest (and aged 75+ lowest) in private hospitals, while the proportion of patients aged <55 was higher in the eight centres than in other public hospitals.



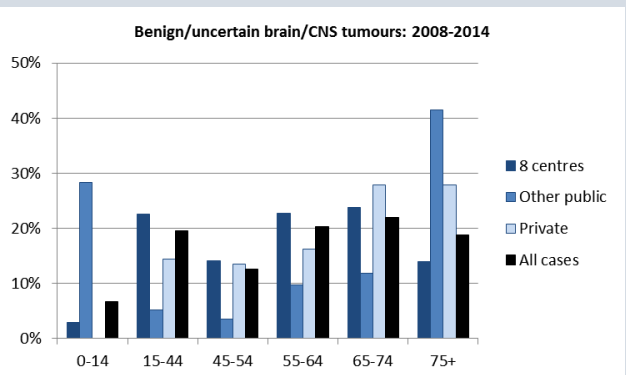
Prostate cancer:

- Median age at diagnosis was 66 for the eight cancer centres, 69 for other public hospitals and 66 for private hospitals.
- The proportions of patients aged 75-84 and 85+ were highest in other public hospitals and lowest in private hospitals.



Malignant brain/CNS cancer:

- Median age at diagnosis was 60 for the eight cancer centres, 68 for other public hospitals and 66 for private hospitals.
- The proportion of patients aged 75+ was highest in other public hospitals.
- Other public hospitals also had the highest proportion aged under 15, but this reflects patients first treated in paediatric centres (not included within the 'cancer centre' definition for purposes of this report).

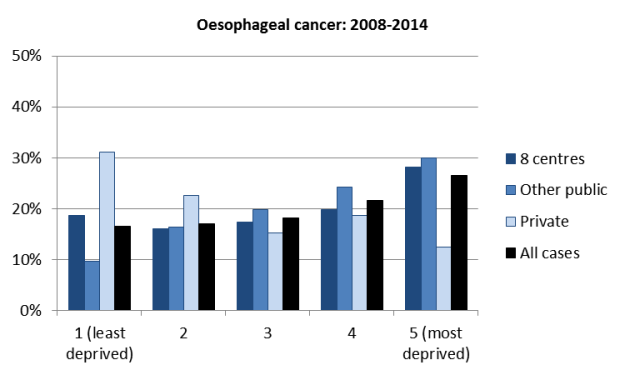


Benign/uncertain brain/CNS tumours:

- The median age at diagnosis during 2008-2014 was 55 for the eight cancer centres, 69 for other public hospitals and 57 for private hospitals.
- As for malignant brain/CNS cancers, the proportion of patients aged 75+ was highest in other public hospitals, which also had the highest proportion aged under 15 (treatment in paediatric centres)

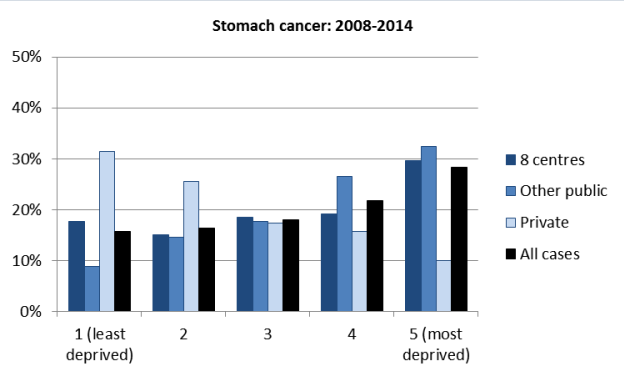
Deprivation status (2008-2014)

Figure 2.2 Comparisons of deprivation status by hospital category, 2008-2014



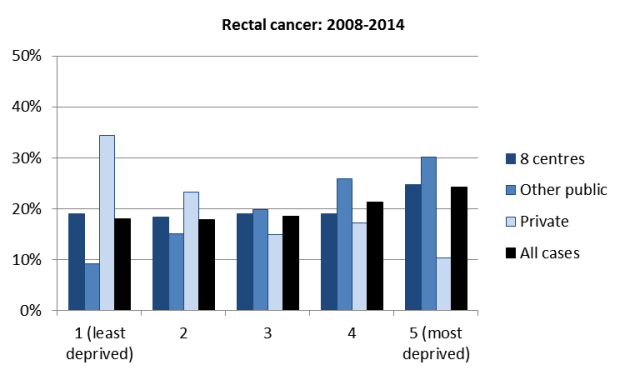
Oesophageal cancer:

- 19% of patients in the eight centres and only 10% in other public hospitals, compared with 31% in private hospitals, were from the least deprived quintile (i.e. the least deprived 20% of the general population based on average socioeconomic characteristics by electoral district of residence).
- In contrast, 28% of patients in the centres, 30% of those in other public hospitals but only 12% of those in private hospitals were from the most deprived quintile.



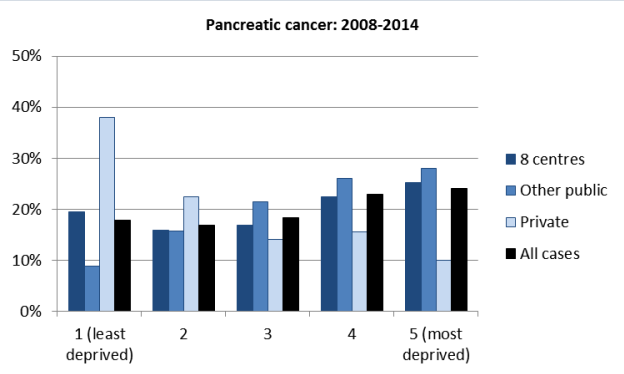
Stomach cancer:

- 18% of patients in the eight centres and 9% in other public hospitals, but 31% in private hospitals, were from the least deprived quintile.
- 30% of patients in the centres, 32% of those in other public hospitals but only 10% of those in private hospitals were from the most deprived quintile.



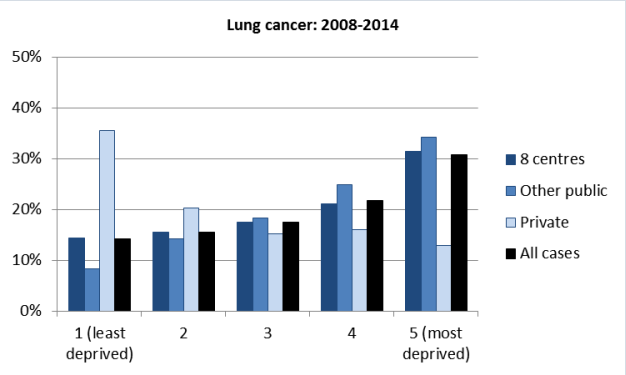
Rectal cancer:

- 19% of patients in the eight centres, 9% in other public hospitals, but 34% in private hospitals, were from the least deprived quintile.
- 25% of patients in the centres, 30% of those in other public hospitals but only 10% of those in private hospitals were from the most deprived quintile.



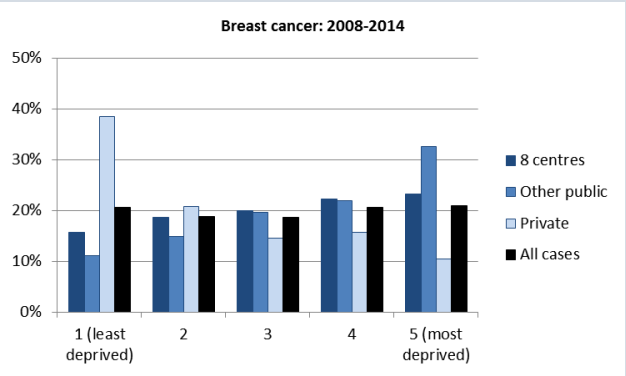
Pancreatic cancer:

- 20% of patients in the eight centres, 9% in other public hospitals, but 38% in private hospitals, were from the least deprived quintile.
- 25% of patients in the centres, 28% of those in other public hospitals but only 10% of those in private hospitals were from the most deprived quintile.



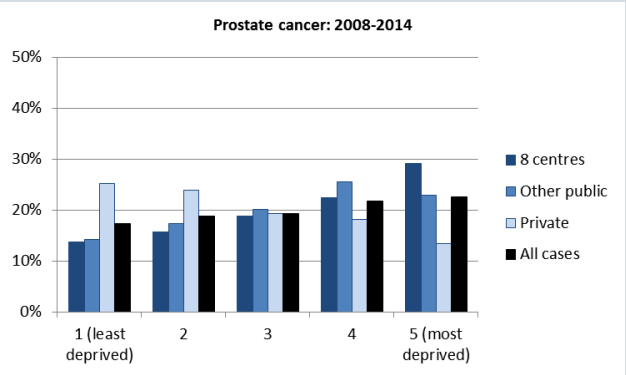
Lung cancer:

- 14% of patients in the eight centres, 8% in other public hospitals, but 36% in private hospitals, were from the least deprived quintile.
- 31% of patients in the centres, 34% of those in other public hospitals but only 13% of those in private hospitals were from the most deprived quintile.



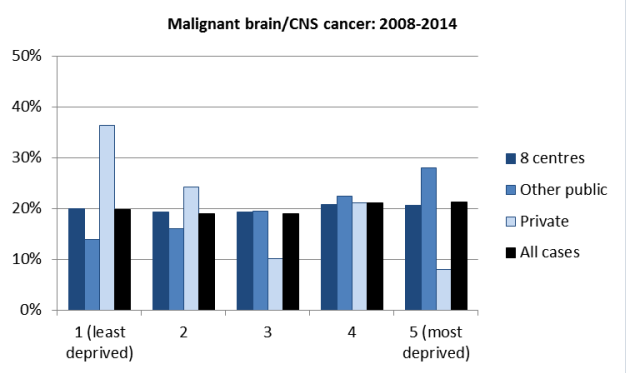
Breast cancer:

- 16% of patients in the eight centres, 11% in other public hospitals, but 38% in private hospitals, were from the least deprived quintile.
- 23% of patients in the centres, 33% of those in other public hospitals but only 10% of those in private hospitals were from the most deprived quintile.



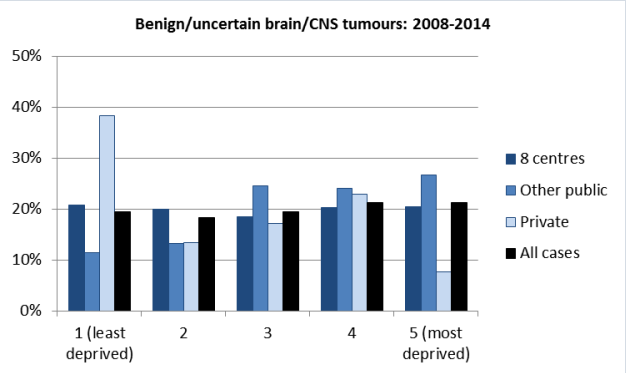
Prostate cancer:

- 14% of patients in the eight centres, also 14% in other public hospitals, but 25% in private hospitals, were from the least deprived quintile.
- 29% of patients in the centres, 23% of those in other public hospitals but only 13% of those in private hospitals were from the most deprived quintile.



Malignant brain/CNS cancer:

- 20% of patients in the eight centres, 14% in other public hospitals, but 36% in private hospitals, were from the least deprived quintile.
- 21% of patients in the centres, 28% of those in other public hospitals but only 8% of those in private hospitals were from the most deprived quintile.

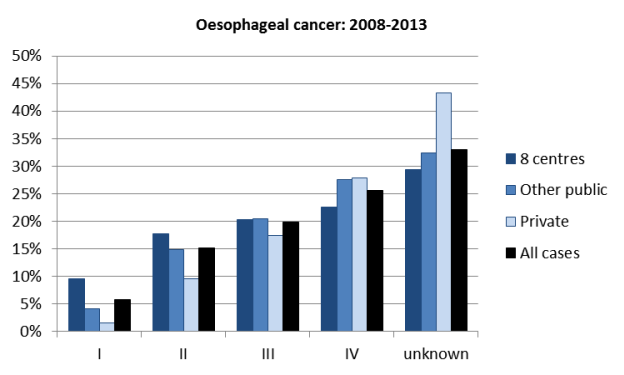


Benign/uncertain brain/CNS tumours:

- 21% of patients in the eight centres, 11% in other public hospitals, but 38% in private hospitals, were from the least deprived quintile.
- 20% of patients in the centres, 27% of those in other public hospitals but only 8% of those in private hospitals were from the most deprived quintile.

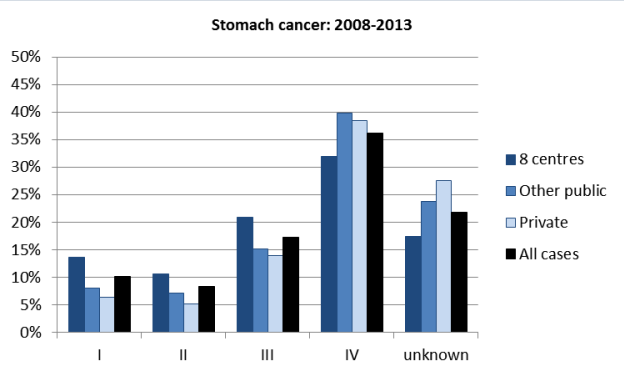
Stage (2008-2013)

Figure 2.3 Comparisons of stage (TNM 5th edition) at diagnosis by hospital category, 2008-2013



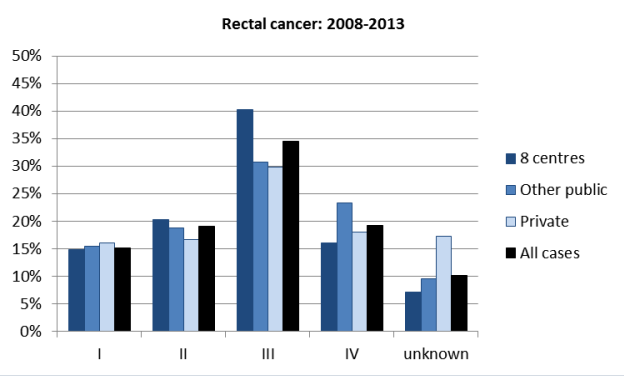
Oesophageal cancer:

- The highest proportion of known-stage cases in all hospital categories were diagnosed at stage IV, but these were outnumbered by unknown or unspecified stage.
- Early-stage cancers were more frequent in the eight centres than in other public hospitals or private hospitals.



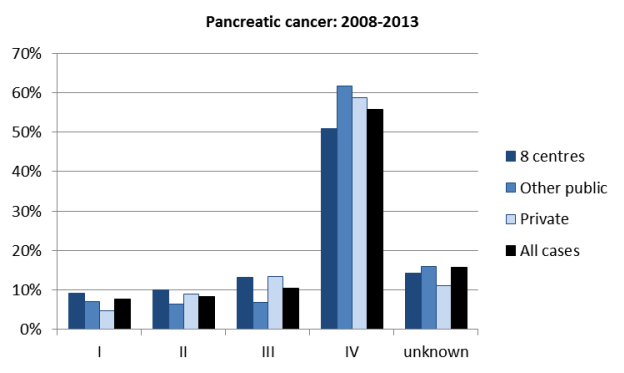
Stomach cancer:

- The highest proportion of cases in all hospital categories were diagnosed at stage IV.
- Stage I-III cancers were more frequent in relative terms in the eight centres than in other public hospitals or private hospitals.



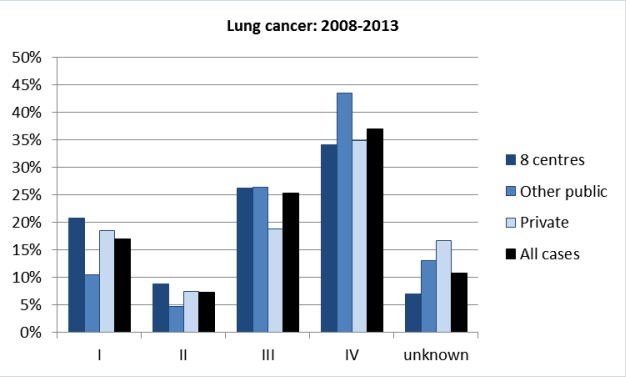
Rectal cancer:

- The highest proportion of cases in all hospital categories presented at stage III.
- The eight centres had the lowest proportions of stage IV and unknown-stage cases.



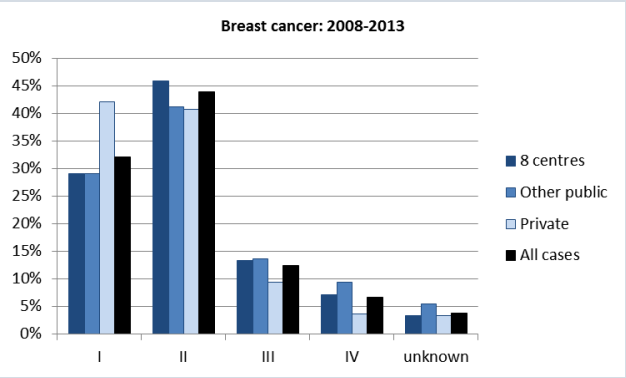
Pancreatic cancer:

- The highest proportion of cases in all hospital categories presented at stage IV, but the proportion of stage IV cases was lowest for the eight centres.



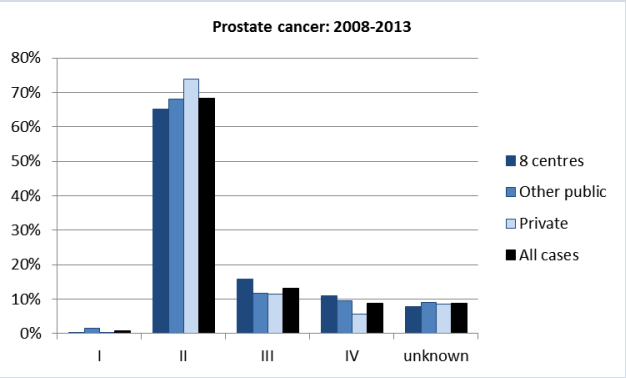
Lung cancer:

- The highest proportion of cases in all hospital categories presented at stage IV, and the 'other public' category had the highest proportion of stage IV.



Breast cancer:

- Stage II accounted for the highest proportion of cases overall and in public hospitals, but stage I slightly exceeded stage II cases in private hospitals.
- Stage III and IV cases were least frequent, in proportional terms, in private hospitals.



Prostate cancer:

- The vast majority of patients presented at stage II (TNM 5th edition), across all hospital categories.
- Private hospitals had the highest proportion of stage II but the lowest proportion of stage IV patients.

Variation of treatment by hospital category

Summary

- In general, the proportions of patients receiving different treatment modalities (surgery, radiotherapy, chemotherapy, multimodal treatment or overall treatment) increased over time, both for patients in what are now designated centres and overall.
- Across most cancer types and treatment modalities examined, patients in designated centres were generally more likely to receive treatment compared with patients in other public hospitals, the main exceptions being prostate cancer and, pre-2008, breast cancer. However, cautious interpretation is needed as cases considered better candidates for treatment may be more likely to be referred to centres.
- Comparisons between private hospitals and the cancer centres differed by cancer type and treatment modality, except for higher use of chemotherapy, on average, by private hospitals.
- *Note*: All comparisons are based on hospital category, not on patient status (publicly funded or privately insured) – figures for cancer centres (especially) and other public hospitals include some private patients.

Table 3.1 Percentages of 2008-2014 cases in each hospital category (Ce = designated centre, OP = other public, Pr = private) who received surgery, radiotherapy, chemotherapy or any tumour-directed therapy within a year after diagnosis. For each treatment modality, the hospital category with the highest proportion of patients receiving treatment is highlighted in **bold**.

Cancer	Number of centres	Surgery			Radiotherapy			Chemotherapy			Any tumour-dir'd treatment		
		Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr
Oesophagus	8	**39%**	15%	11%	49%	47%	**57%**	45%	43%	**60%**	77%	65%	**78%**
	4 surgical	**54%**	13%	11%	50%	47%	**57%**	51%	41%	**60%**	**84%**	64%	78%
Stomach	8	**55%**	27%	26%	**19%**	14%	17%	43%	36%	**55%**	**74%**	56%	71%
	4 surgical	**66%**	27%	26%	**22%**	13%	17%	48%	34%	**55%**	**83%**	55%	71%
Rectal	8+1 surgical	**80%**	64%	72%	**50%**	37%	38%	54%	49%	**55%**	90%	84%	**91%**
Pancreatic	8	18%	6%	**29%**	13%	7%	**17%**	35%	32%	**52%**	46%	35%	**65%**
	2 surgical	**41%**	6%	29%	**17%**	9%	**17%**	39%	32%	**52%**	61%	37%	**65%**
Lung	8 rapid access	**28%**	1%	24%	40%	38%	**44%**	35%	31%	**44%**	73%	50%	**78%**
	4 surgical	**38%**	3%	24%	37%	42%	**44%**	34%	33%	**44%**	**78%**	55%	**78%**
Breast	8+1	83%	77%	**95%**	68%	71%	**79%**	47%	40%	**52%**	97%	90%	**98%**
Prostate	8 rapid access	22%	21%	**39%**	**45%**	44%	38%	-	-	-	76%	**78%**	76%
	6 surgical	21%	22%	**39%**	**45%**	43%	38%	-	-	-	75%	**78%**	76%
Brain/CNS (malignant)	8	**56%**	12%	52%	**65%**	29%	59%	28%	36%	**45%**	**82%**	42%	77%
	2 neuro-oncology	**56%**	12%	52%	**69%**	26%	59%	41%	20%	**45%**	**88%**	35%	77%
Brain/CNS (benign/uncertain)	8	**68%**	9%	25%	6%	1%	**33%**	-	-	-	**71%**	13%	55%
	2 neuro-oncology	**68%**	9%	25%	7%	2%	**33%**	-	-	-	**79%**	10%	55%

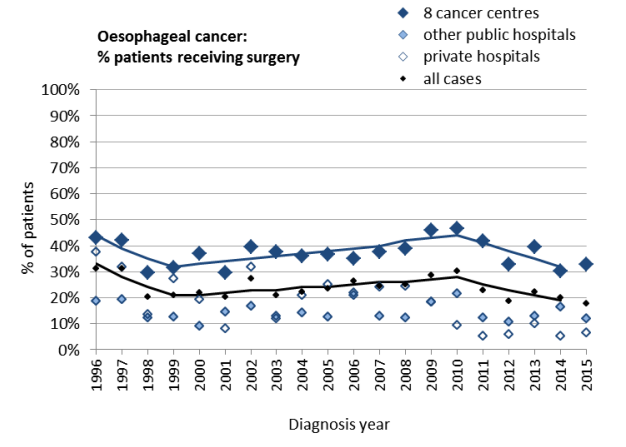
Hormonal data (breast and prostate cancer) are not plotted separately; chemotherapy data are not shown for prostate cancer and benign/uncertain brain/CNS tumours (<2% of cases received chemotherapy as primary treatment).

The proportions of patients in each hospital category (and overall) who received each main treatment modality (surgery, radiotherapy or chemotherapy) are summarised below by diagnosis year for each cancer type (*Figures 3.1 to 3.9*). Proportions of patients receiving multi-modal therapy (two or more treatment modalities) and receiving any tumour-directed treatment are also summarised. These trend analyses are based on the same eight centres for each cancer type, rather than on surgical or other centres designated specifically for particular cancer types. (However, further details in relation to site-specific centres are summarised in *Table 3.1* for the period 2008-2014 combined.)

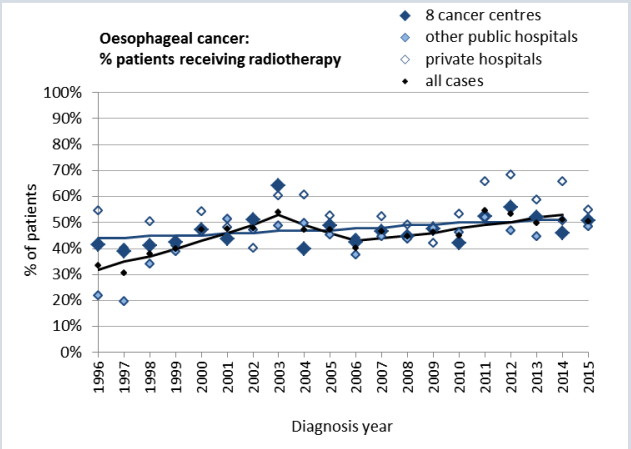
Treatments relate to the first year after diagnosis and data for 2015 are excluded from the trend calculations as they are likely to be less complete than for other years. Trend analyses are presented here for the eight main cancer centres, not for surgical or other centres designated for specific cancers.

Oesophageal cancer

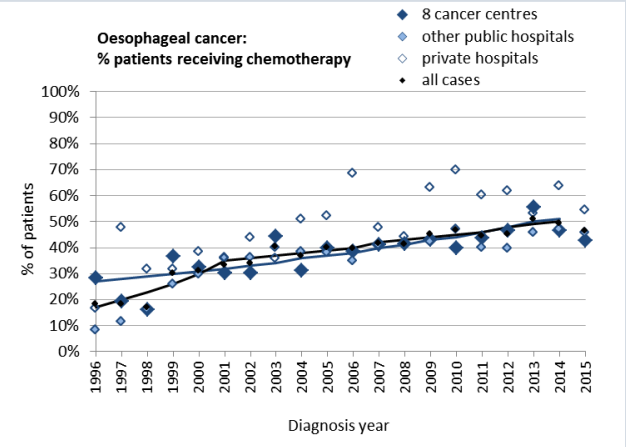
Figure 3.1 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Oesophageal cancer



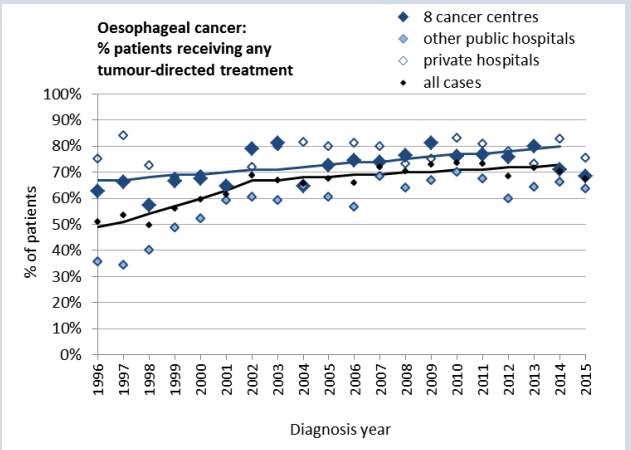
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-1999	-10.2%	-25%,+7.6%	=
	1999-2010	**+3.0%**	+0.4%,+5.7%	↑
	2010-2014	-7.5%	-17%,+2.7%	=
Other public	1996-2014	-0.1%	-2.3%,+2.2%	=
Private	1996-2014	**-6.3%**	-9.7%,-2.8%	↓
National	1996-1999	-13.7%	-28%,+3.1%	=
	1999-2010	+2.6%	-0.0%,+5.3%	=
	2010-2014	-8.9%	-8.9%,-18%	=



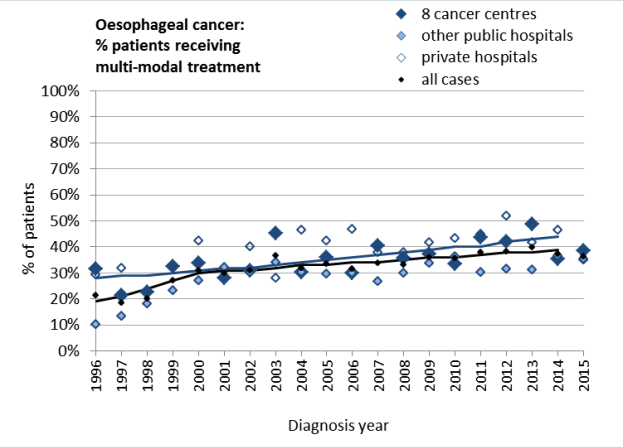
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	+0.9%	-0.3%,+2.0%	=
Other public	1996-2000	**+23.5%**	+8.3%,+41%	↑
	2000-2014	-0.0%	-1.2%,+1.1%	=
Private	1996-2014	**+1.8%**	+0.5%,+3.1%	↑
National	1996-2003	**+7.4%**	+3.9%,+11%	↑
	2003-2006	-6.9%	-24%,+14%	=
	2006-2014	**+2.7%**	+0.7%,+0.48%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+3.7%**	+2.4%,+5.1%	↑
Other public	1996-2000	**+42.3%**	+25%,+62%	↑
	2000-2014	**+2.0%**	+1.2%,+2.9%	↑
Private	1996-2014	**+3.2%**	+1.3%,+5.1%	↑
National	1996-2001	**+15.9%**	+8.3%,+2.4%	↑
	2001-2014	**+2.8%**	+1.8%,+3.7%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+1.0%**	+0.3%,+1.7%	↑
Other public	1996-2001	**+12.8%**	+5.8%,+20%	↑
	2001-2014	+0.8%	-0.1%,+1.7%	=
Private	1996-2014	+0.3%	-0.3%,+0.9%	=
National	1996-2002	**+5.4%**	+2.8%,+8.0%	↑
	2002-2014	**+0.7%**	+0.1%,+1.3%	↑



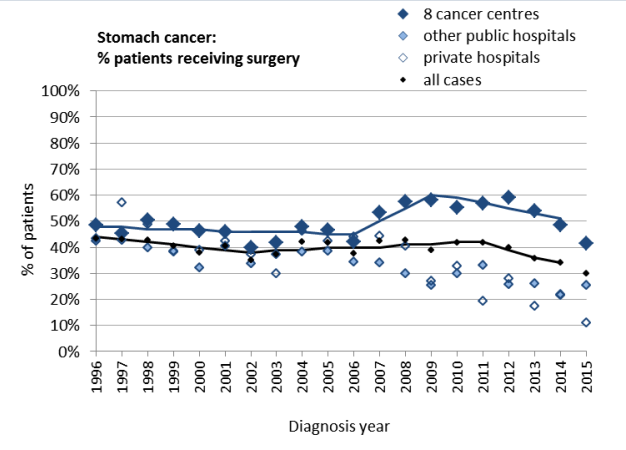
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+2.5%**	+1.1%,+3.9%	↑
Other public	1996-2000	**+29.8%**	+13%,+49%	↑
	2000-2014	**+0.8%**	-0.3%,+2.0%	↑
Private	1996-2014	**+2.2%**	+0.9%,+3.5%	↑
National	1996-2000	**+13.0%**	+3.7%,+23%	↑
	2000-2014	**1.8%**	+0.9%,+2.7%	↑

[1] 8 centres designated for a range of cancers but not specifically oesophageal cancer.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

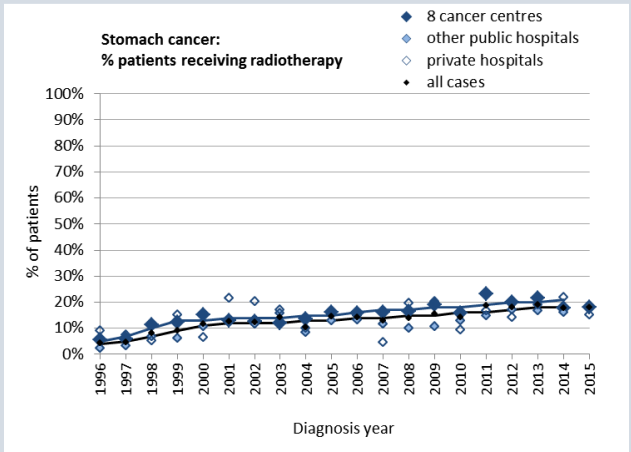
- The main trends in proportions of oesophageal cancer patients having surgery were an increase among patients in the four centres designated for upper GI surgery and an ongoing decline in private hospitals (*Appendix 1*). Trends for the eight cancer centres were unclear but included a significant increase between 1999 and 2010 (*Figure 3.1*).
- Use of surgery was highest in designated centres, especially in the four surgical centres: during 2008-2014, 54% of patients there had surgery, compared with only 13% of patients in other public hospitals, 11% in private hospitals and 24% overall (*Table 3.1* & *Appendix 2*).
- Radiotherapy use showed a significant increase during 1996-2014 among patients in private hospitals, with a non-significant increase in the eight cancer centres and more complex trends in other public hospitals and nationally (*Figure 3.1*).
- Use of radiotherapy was highest for private hospital patients (57% during 2008-2014) compared with the centres (c50%) and other public hospitals (47%) (*Table 3.1* & *Appendix 2*).
- Chemotherapy use increased significantly throughout 1996-2014 for the eight centres and private hospitals, while trends for other public hospitals and nationally involved steep increases up to c2001 then slower (but still significant) subsequent increases (*Figure 3.1*). These trends were also evident from comparisons by broader diagnosis period, including for the four surgical centres (*Appendix 2*).
- Use of chemotherapy was highest for private hospital patients (60% during 2008-2014) compared with the centres (45% for the 8 cancer centres and 51% for surgical centres) and other public hospitals (41-43%) (*Table 3.1* & *Appendix 2*).
- Use of multimodal therapy increased across all hospital types, and was most frequent in the centres and private hospitals (*Figure 3.1* & *Appendix 2*).

Stomach cancer

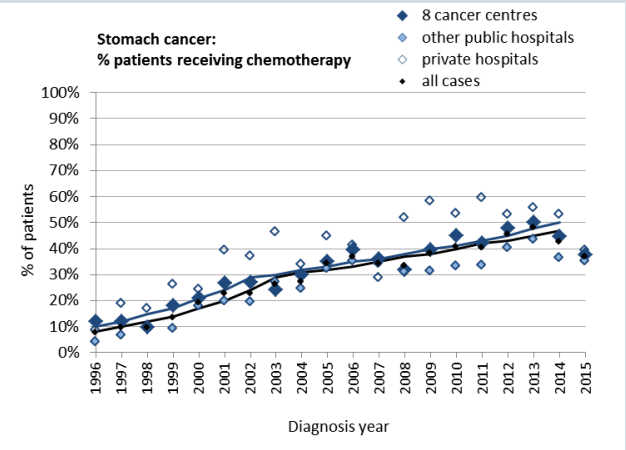
Figure 3.2 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Stomach cancer



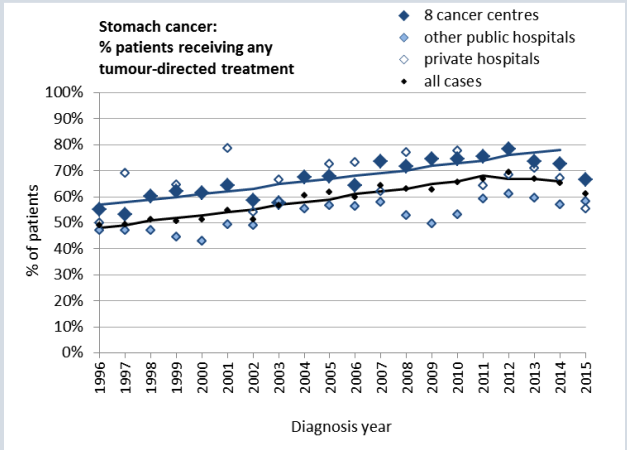
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2006	-0.6%	-2.3%,+1.1%	=
	2006-2009	+10.3%	-7.2%,+3.1%	=
	2009-2014	-3.2%	-6.7%,+0.4%	=
Other public	1996-2014	**-2.7%**	-3.5%,-1.9%	↓
Private	1996-2014	**-4.1%**	-5.7%,-2.4%	↓
National	1996-2002	-2.2%	-4.5%,+0.1%	=
	2002-2011	+1.1%	-0.4%,+2.7%	=
	2011-2014	**-7.3%**	-14%,-0.5%	↓



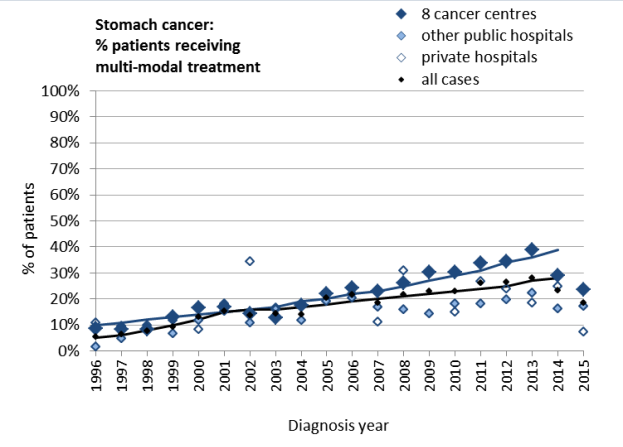
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-1999	+32.5%	-1.6%,+79%	=
	1999-2014	**+3.4%**	+1.7%,+5.1%	↑
Other public	1996-2000	**+46.4%**	+2.5%,+109%	↑
	2000-2014	**+2.6%**	+0.1%,+5.2%	↑
Private	1996-2014	**+3.2%**	0.0%,+6.4%	↑
National	1996-2000	**+28.8%**	+9.6%,+51%	↑
	2000-2014	**+3.4%**	+2.0%,+4.9%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2002	**+18.5%**	+7.8%,+30%	↑
	2002-2014	**+4.7%**	+2.7%,+6.6%	↑
Other public	1996-2003	**+25.6%**	+15%,+38%	↑
	2003-2014	**+3.3%**	+1.2%,+5.5%	↑
Private	1996-2001	**+27.2%**	+2.5%,+58%	↑
	2001-2014	**+3.3%**	+1.0,+5.7%	↑
National	1996-2003	**+20.3%**	+13%,+28%	↑
	2003-2014	**+4.4%**	+2.9%,+5.9%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+1.8%**	+1.3%,+2.2%	↑
Other public	1996-2014	**+1.4%**	+0.8%,+2.0%	↑
Private	1996-2014	+0.6%	-0.3%,+1.5%	=
National	1996-2011	**+2.3%**	+1.9%,+2.7%	↑
	2011-2014	-0.9%	-4.3%,+2.6%	=



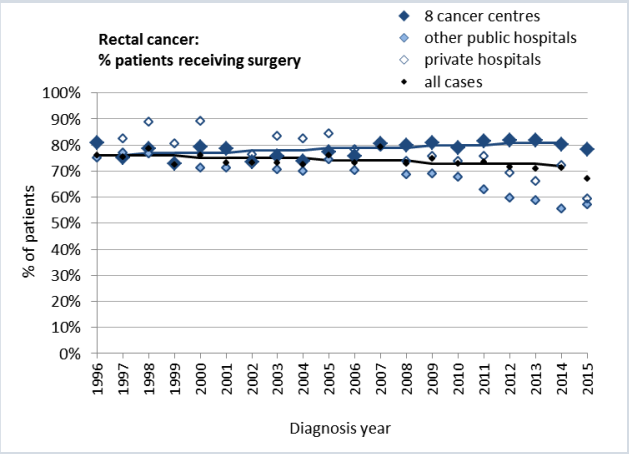
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+7.7%**	+1.1%,+3.9%	↑
Other public	1996-2001	**+34.6%**	+7.1%,+69%	↑
	2001-2014	+2.3%	-0.5%,+5.2%	=
Private	1996-2014	+3.2%	-0.1%,+6.7%	=
National	1996-2001	**+23.5%**	+9.3%,+39%	↑
	2001-2014	**+5.0%**	+3.2%,+6.8%	↑

[1] 8 centres designated for a range of cancers but not specifically stomach cancer.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

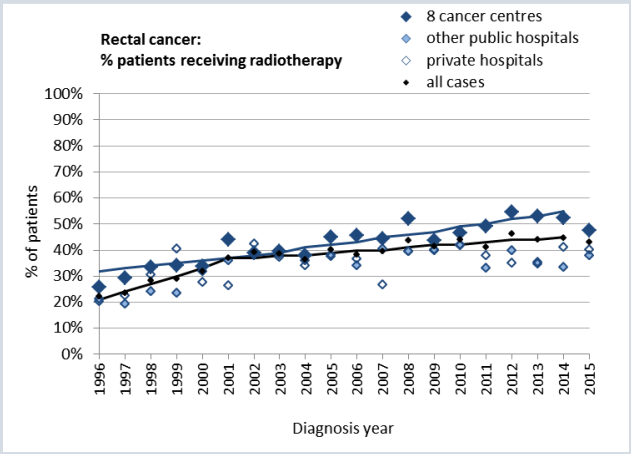
- The main trends in proportions of stomach cancer patients having surgery were an increase (post-2006/2007) among patients in the four centres designated for upper GI surgery, and in the eight cancer centres, and an ongoing decline in other public hospitals and private hospitals (*Figure 3.2*, *Appendix 2*).
- Use of surgery was highest in designated centres, especially in the four surgical centres: during 2008-2014, 66% of patients there had surgery, compared with only 27% of patients in other public hospitals, 26% in private hospitals and 39% overall (*Table 3.1* & *Appendix 2*).
- Radiotherapy use increased over time in all hospital categories, but overall and in public hospitals (including centres) the increase was steepest between 1996 and 1999/2000 (*Figure 3.2*).
- Use of radiotherapy was highest for the patients in the four surgical hospitals (22% during 2008-2014) compared with private hospitals (17%), other public hospitals (13%) and all patients (16%) (*Table 3.1* & *Appendix 2*).
- Chemotherapy use increased significantly throughout 1996-2014, with about a threefold increase overall and for all hospital categories, with the steepest increases seen between 1996 and 2001-2003 (2003 nationally) (*Figure 3.2*).
- Use of chemotherapy was highest for private hospital patients (55% during 2008-2014) compared with the centres (43% for the 8 cancer centres and 48% for surgical centres) and other public hospitals (34-36%) (*Table 3.1* & *Appendix 2*).
- Use of multimodal therapy increased across all hospital types, over the period 1996-2004 (about a threefold increase overall) and was most frequent in the centres (especially the surgical centres) and private hospitals (*Figure 3.2*, *Table 3.1* & *Appendix 2*).

Rectal cancer

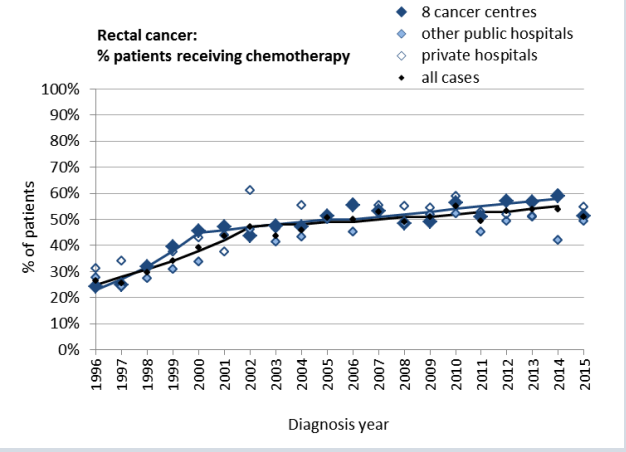
Figure 3.3 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Rectal cancer



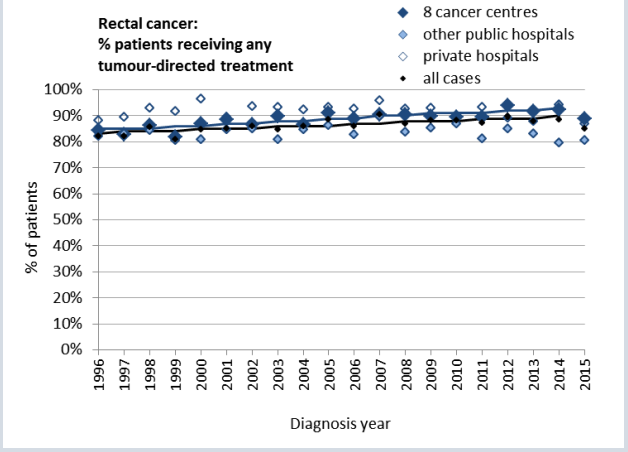
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+0.4%**	+0.1%,+0.6%	↑
Other public	1996-2004	**-1.1%**	-1.8%,-0.4%	↓
	2004-2007	+2.9%	-3.4%,+9.6%	=
	2007-2014	**-4.6%**	-5.7%,-3.4%	↓
Private	1996-2014	**-1.2%**	-1.6%,-0.7%	↓
National	1996-2014	**-0.3%**	-0.6%,-0.0%	↓



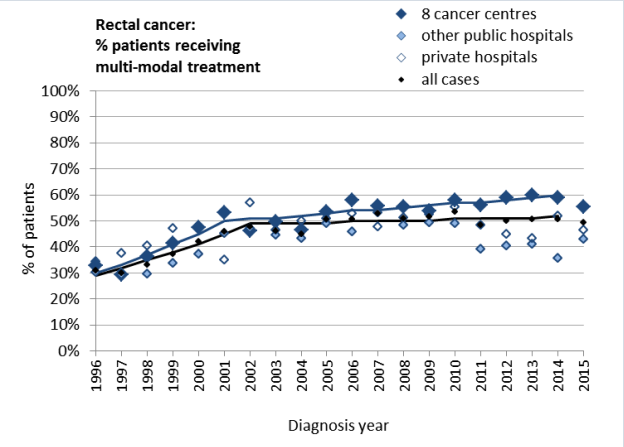
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+3.1%**	+2.4%,+3.8%	↑
Other public	1996-2002	**+13.2%**	+7.6%,+19%	↑
	2002-2014	-0.4%	-1.8%,+1.1%	=
Private	1996-2014	**+1.6%**	+0.1%,+3.0%	↑
National	1996-2001	**+11.2%**	+6.7%,+16%	↑
	2001-2014	**+1.6%**	+1.0%,+2.3%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2000	**+19.0%**	+8.4%,+31%	↑
	2000-2014	**+1.7%**	+1.0%,+2.5%	↑
Other public	1996-2002	**+11.8%**	+5.5%,+18.4%	↑
	2002-2014	0.8%	-0.8%,+2.4%	=
Private	1996-2002	**+11.3%**	+5.1%,+18%	↑
	2002-2014	+0.2%	-0.9%,+1.4%	=
National	1996-2002	**+11.3%**	+7.6%,+15%	↑
	2002-2014	**+1.2%**	+0.5%,+2.0%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**0.5%**	+0.4%,+0.7%	↑
Other public	1996-2014	+0.1%	-0.2%,+0.5%	=
Private	1996-2014	-0.0%	-0.3%,+0.2%	=
National	1996-2014	**+0.4%**	+0.2%,+0.6%	↑



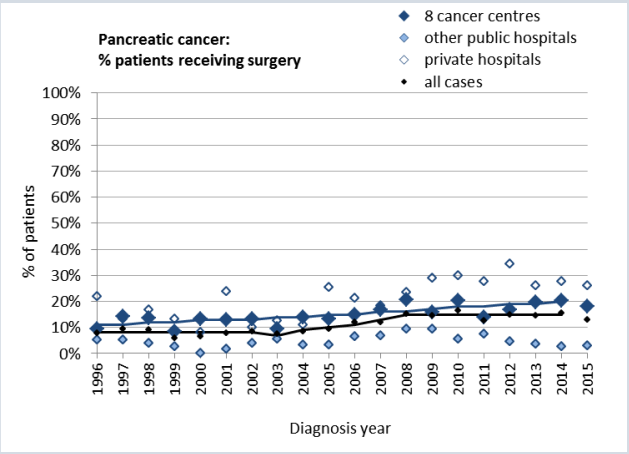
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2001	**+10.7%**	+5.3%,+16%	↑
	2001-2014	**+1.4%**	+0.7%,+2.2%	↑
Other public	1996-2007	**+5.1%**	+3.1%,+7.1%	↑
	2007-2014	**-5.1%**	-9.5%,-1.6%	↓
Private	1996-2014	+0.8%	-0.3%,+1.9%	=
National	1996-2002	**+9.0%**	+5.6%,+12%	↑
	2002-2014	+0.5%	-0.3%,+1.2%	=

[1] 8 centres designated for a range of cancers but excluding Letterkenny satellite.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

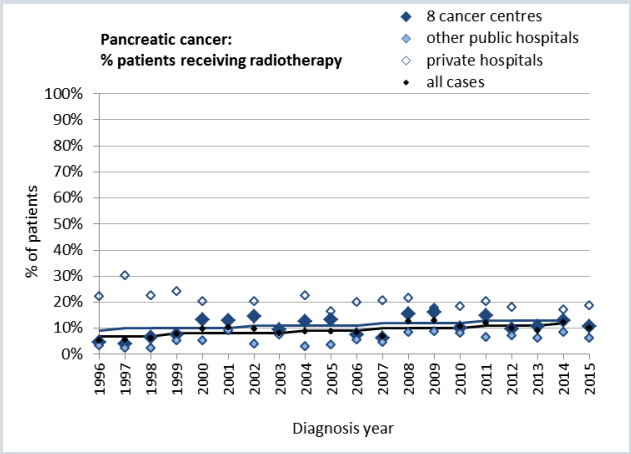
- The proportion of rectal cancer patients having surgery increased slightly (but significantly) among patients in the designated centres between 1996 and 2014, but there was an ongoing decline both nationally and in the private hospitals, and a recent decline in other public hospitals (*Figure 3.3*).
- Use of surgery was highest in designated centres: during 2008-2014, 80% of patients there had surgery, compared with 64% of patients in other public hospitals, 72% in private hospitals and 73% overall (*Table 3.1* & *Appendix 2*).
- The recent decline in surgery use among patients assigned to the 'other public hospital' category (and perhaps private hospitals) may reflect, in part, recent centralisation of rectal cancer surgery.
- Radiotherapy use increased significantly over time in all hospital categories (by on average 3.1% annually in the eight centres), but overall and in the 'other public hospital' category the increase was steepest between 1996 and 2001/2002 (*Figure 3.3*).
- Use of radiotherapy was highest for the patients in designated centres (50% during 2008-2014) compared with other public hospitals (37%), private hospitals (38%) and all patients (43%) (*Table 3.1* & *Appendix 2*).
- Chemotherapy use increased significantly throughout between 1996 and 2000-2002 in all hospital categories and nationally, with less marked increases (still significant for the centres and national) subsequently (*Figure 3.3*).
- Use of chemotherapy was slightly higher for patients in private hospital (55% during 2008-2014) and the designated centres (54%) compared with other public hospitals (49%) (*Table 3.1* &*Appendix 2*).
- Use of multimodal therapy increased across all hospital types, most steeply between 1996 and 2001/2002, and was most frequent in the designated centres (57% of cases during 2008-2014) compared with private hospitals (50%) and other public hospitals (44%) (*Figure 3.3*, *Table 3.1* &*Appendix 2*).

Pancreatic cancer

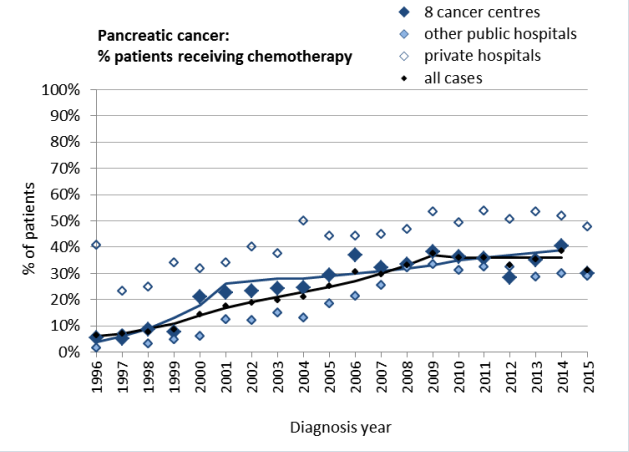
Figure 3.4 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Pancreatic cancer



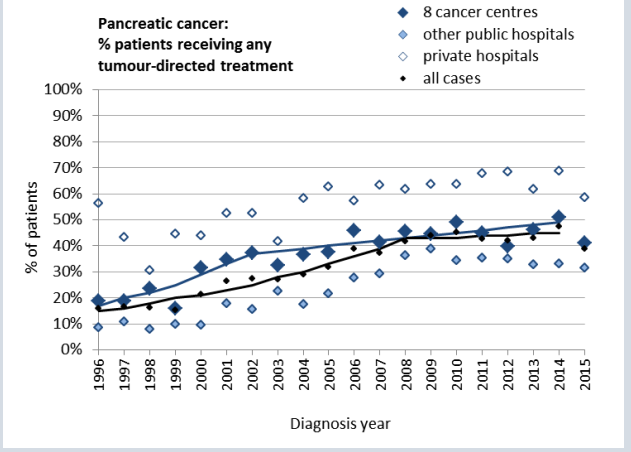
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+3.3%**	+1.9%,+4.8%	↑
Other public	-	-	-	-
Private	1996-2014	**+4.2%**	+2.0%,+6.4%	↑
National	1996-2003	-1.8%	-7.5%,+4.3%	=
	2003-2008	**+14.9%**	+1.6%,+30%	↑
	2008-2014	0.0%	-4.6%,+4.8%	=



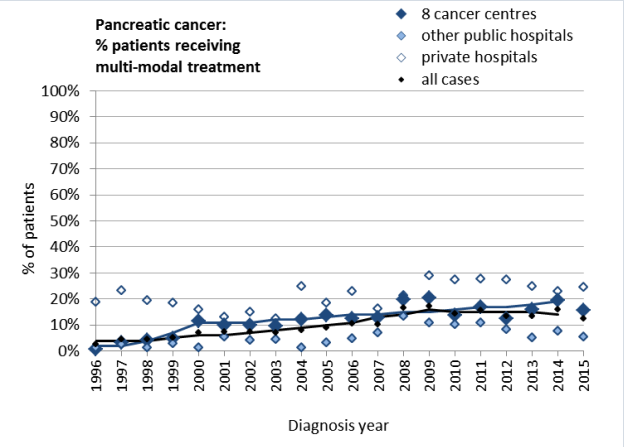
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	+2.1%	-1.0%,+5.2%	=
Other public	1996-2014	**+3.9%**	+0.9%,+7.4%	↑
Private	1996-2014	**-2.2%**	-3.8%,-0.5%	↓
National	1996-2014	**+3.1%**	+1.2%,+4.9%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2001	**+43.8%**	+16%,+78%	↑
	2001-2014	**+3.3%**	+1.1%,+5.4%	↑
Other public	1996-2008	**+19.1%**	+15%,+24%	↑
	2008-2014	-0.9%	-5.4%,+4.0%	=
Private	1996-2014	**+3.0%**	+1.9%,+4.0%	↑
National	1996-2001	**+25.2%**	+14%,+38%	↑
	2001-2009	**+10.0%**	+6.8%,+13%	↑
	2009-2014	-0.2%	-3.6%,+3.3%	=



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2002	**+13.9%**	+4.2%,+24%	↑
	2002-2014	**+2.3%**	+0.6%,+4.2%	↑
Other public	1996-2009	**+12.6%**	+10%,+15%	↑
	2009-2014	-3.4%	-8.6%,+2.1%	=
Private	1996-2014	**+2.3%**	+1.4%,+3.2%	↑
National	1996-2008	**+9.0%**	+7.3%,+11%	↑
	2008-2014	+1.0%	-1.6%,+3.6%	=



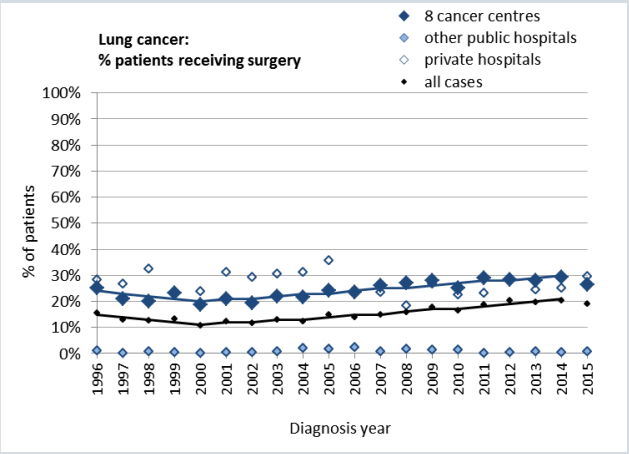
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2000	+61.9%	-9.5%,+185%	=
	2000-2014	**+4.2%**	+1.2%,+7.2%	↑
Other public	1996-2001	+28.4%	-14%,+91%	=
	2001-2005	-11.6%	-56%,+79%	=
	2005-2008	+65.2%	-26%,+270%	=
	2008-2014	-9.9%	-19%,+0.5%	=
Private	1996-2014	**+2.5%**	+0.8%,+4.1%	↑
National	1996-2009	**+12.1%**	+9.1%,+15%	↑
	2009-2014	-1.7%	-8.0%,+5.1%	=

[1] 8 centres designated for a range of cancers but not specifically pancreatic cancer.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

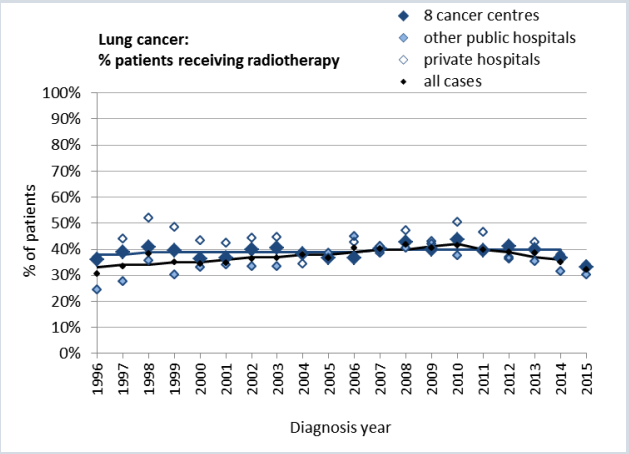
- The proportion of pancreatic cancer patients having surgery increased significantly among patients in the eight cancer centres and in private hospitals between 1996 and 2014, while the fitted trend for all cases nationally showed a significant, steep increase in surgery between 2003 and 2008 (*Figure 3.4*). No trend could be assessed for the lower proportions treated surgically in other public hospitals.
- Use of surgery was highest in the two designated surgical centres, followed by private hospitals, especially in the most recent period: during 2008-2014, 41% of patients in the two centres had surgery, compared with 29% in private hospitals, only 6% of patients in other public hospitals and 15% overall. (*Table 3.1* & *Appendix 2*). Broadly similar but less marked variation by hospital type was seen in earlier periods.
- Radiotherapy use increased significantly over time overall and in the 'other public hospital' category, but this trend was less strong (and was not significant) in the eight centres, and radiotherapy use fell significantly among private hospital patients (*Figure 3.4*).
- The proportion of pancreatic cancer cases receiving radiotherapy was, consistently across all years, higher for the cancer centres than for other public hospitals, but lower than or equal to the proportion for private hospitals; during 2008-2015, 17% of patients in the two surgical centres and 17% of those in private hospitals had radiotherapy (*Table 3.1* & *Appendix 2*).
- Chemotherapy use has increased significantly from 1996 onwards in all hospital categories and nationally, with the steepest increase among public-hospital patients and nationally occurring in the earlier years (up to 2008/2009 and, especially, up to 2001) (*Figure 3.4*).
- Use of chemotherapy was slightly higher for patients in private hospital (52% during 2008-2014) and the designated centres (39%) compared with other public hospitals (32%) (*Table 3.1* & *Appendix 2*).
- Use of multimodal therapy has increased across all hospital types, most steeply in earlier years, and was most frequent among patients in the two surgical centres (28% during 2008-2014) and private hospitals (26%) compared with the 'other public hospital' group (10%) (*Figure 3.4*, *Table 3.1* & *Appendix 2*).

Lung cancer

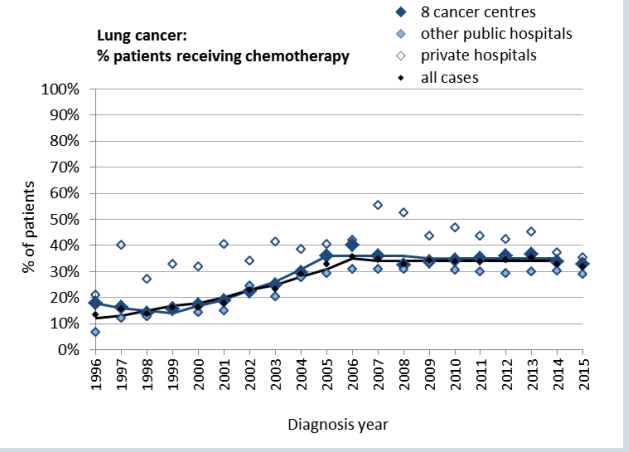
Figure 3.5 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Lung cancer



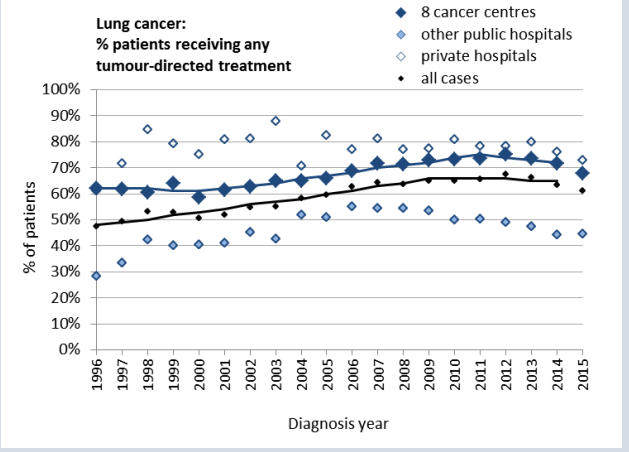
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2000	-4.0%	-10%,+2.9%	=
	2000-2014	**+2.9%**	+2.0%,+3.8%	↑
Other public	-	-	-	-
Private	1996-2014	-1.0%	-2.3%,+0.3%	=
National	1996-2000	**-7.0%**	-12%,-1.7%	↓
	2000-2014	**+4.6%**	+3.9%,+5.3%	↑



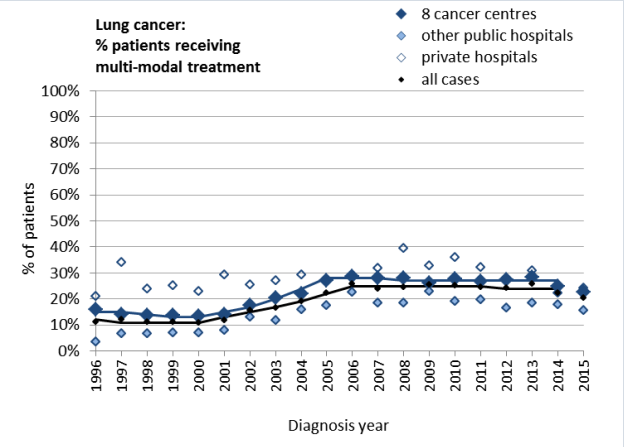
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	+0.3%	-0.2%,+0.8%	=
Other public	1996-2007	**+4.1%**	+2.5%,+5.8%	↑
	2007-2014	**-3.4%**	-6.1%,-0.7%	↓
Private	1996-2014	-0.3%	-1.3%,+0.7%	=
National	1996-2010	**+1.7%**	+1.1%,+2.3%	↑
	2010-2014	**-3.7%**	-7.2%,-0.1%	↓



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-1999	-6.8%	-20%,+8.8%	=
	1999-2005	**+16.7%**	+10%,+23%	↑
	2005-2014	-0.3%%	-1.6%,+1.1%	=
Other public	1996-2005	**+14.1%**	+10%,+18%	↑
	2005-2014	-0.2%	-2.4%,+2.0%	=
Private	1996-2008	**+4.6%**	+2.1%,+7.2%	↑
	2008-2014	-3.9%	-8.6%,+1.1%	=
National	1996-2006	**+11.1%**	+9.2%,+13%	↑
	2006-2014	-0.3%	-1.8%,+1.2%	=



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2000	-0.6%	-2.4%,+1.1%	=
	2000-2011	**+1.9%**	+1.6%,+2.3%	↑
	2011-2014	-1.3%	-2.9%,+0.3%	=
Other public	1996-2007	**+4.8%**	+3.5%,+6.1%	↑
	2007-2014	**-3.1%**	-5.0%,-1.1%	↓
Private	1996-2014	-0.0%	-0.5%,+0.5%	=
National	1996-2009	**+2.5%**	+2.0%,+3.0%	↑
	2009-2014	-0.2%	-1.6%,+1.3%	=



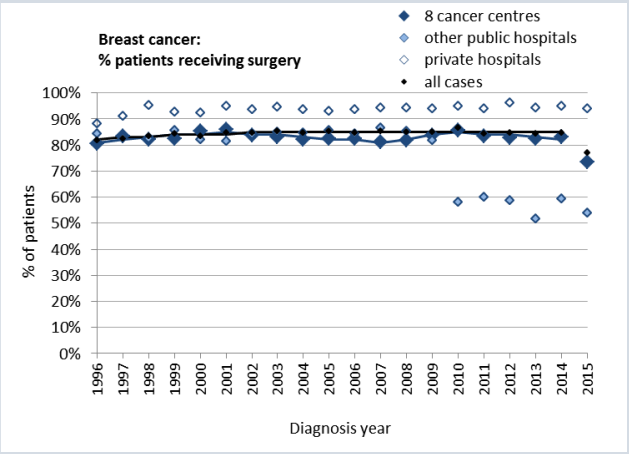
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2000	-4.9%	-1.3%,+2.0%	=
	2000-2005	**+17.2%**	+10%,+25%	↑
	2005-2014	-0.4%	-1.6%,+0.7%	=
Other public	1996-2006	**+16.9%**	+13%,+21%	↑
	2006-2014	-2.0%	-5.0%,+1.2%	=
Private	1996-2010	**+2.6%**	+0.5%,+4.7%	↑
	2010-2014	-8.3%	-18%,+2.8%	=
National	1996-2000	-1.0%	-8.2%,+6.9%	=
	2000-2006	**+14.9%**	+10%,+20%	↑
	2006-2014	-0.8%	-2.1%,+0.7%	=

[1] 8 centres designated as rapid access clinics for lung cancer.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

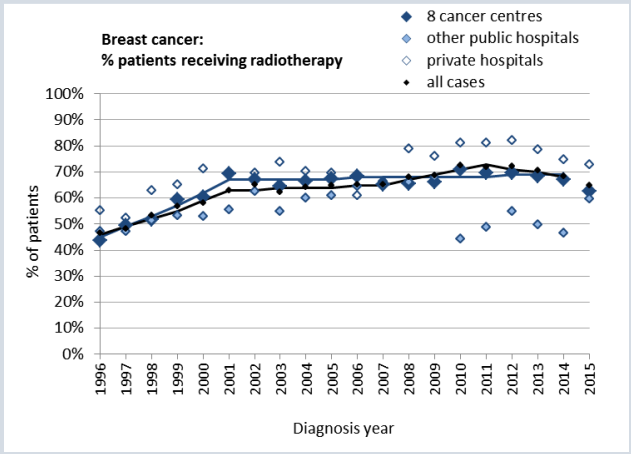
- The proportions of lung cancer patients having surgery increased significantly between 2000 and 2014 among patients in the eight cancer centres, and nationally, following a non-significant decline during 1996-2000 (*Figure 3.5*). No clear trends were evident for patients in other public hospitals or private hospitals.
- Use of surgery was highest in designated centres, especially in the four surgical centres: during 2008-2014, 38% of patients there had surgery, compared with only 3% of patients in other public hospitals, 24% in private hospitals and 19% overall (*Table 3.1* & *Appendix 2*).
- Radiotherapy use showed no significant trends for patients in the eight cancer centres or in private hospitals; in other public hospitals and nationally, there was a significant recent decrease following an earlier increase (*Figure 3.5*).
- Use of radiotherapy was slightly higher for the patients in private hospitals (44% during 2008-2014) compared with the eight cancer centres (37%), other public hospitals (42%) and all patients (39%) (*Table 3.1* & *Appendix 2*).
- Chemotherapy use increased significantly from 1996 or 1999 in all hospital categories, and nationally, before stabilising from 2005-2008 onwards (*Figure 3.5*). A previous NCRI analysis of 1996-2013 data suggested that the national trend was largely a reflection of trends in use of chemotherapy for non-small-cell lung cancers; chemotherapy use is higher for small-cell carcinoma of the lung but trends for this subtype were less clear [7].
- Use of chemotherapy was highest for private hospital patients (44% during 2008-2014) compared with the centres (35% for the 8 cancer centres and 34% for surgical centres) and other public hospitals (31-33%) (*Table 3.1* & *Appendix 2*).
- Use of multimodal therapy increased overall and across most hospital categories, mainly between about 2001 and 2006, and was most frequent in private hospitals and designated centres (*Figure 3.5*, *Table 3.1* & *Appendix 2*).

Breast cancer

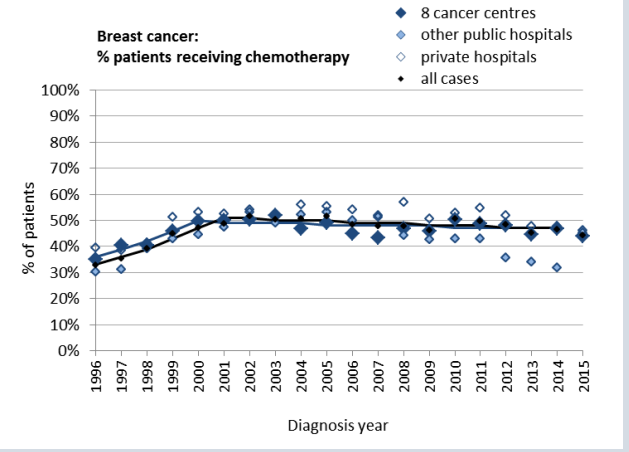
Figure 3.6 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Breast cancer



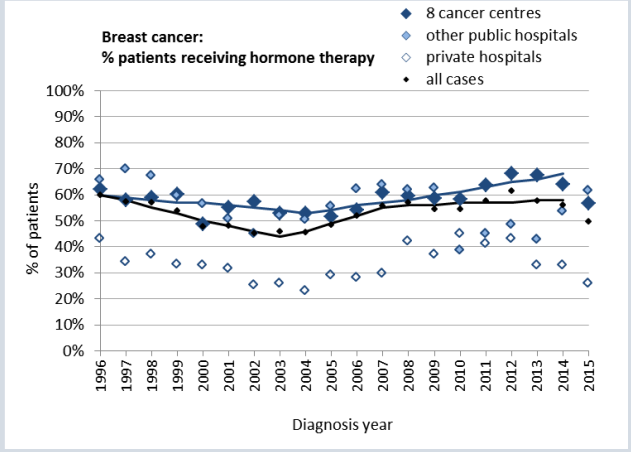
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2001	**+0.9%**	+0.2%,+1.7%	↑
	2001-2007	**-0.8%**	-1.5%,-0.2%	↓
	2007-2010	+1.6%	-0.7%,+3.9%	=
	2010-2014	**-0.8%**	-1.4%,-0.2%	↓
Other public	1996-2008	+0.3%	0.0%,0.0%	=
	2008-2014	**-8.0%**	-12%,-4.4%	↓
Private	1996-2014	**+0.1%**	0.0%,+0.2%	↑
National	1996-2003	**+0.5%**	+0.2%,+0.9%	↑
	2003-2014	-0.1%	-0.2%,+0.1%	=



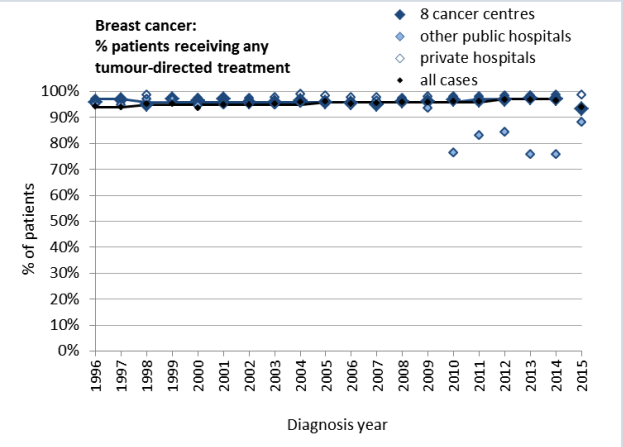
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2001	**+8.3%**	+4.5%,+12%	↑
	2001-2014	+0.2%	-0.2%,+0.7%	=
Other public	1996-2009	**+2.7%**	+2.1%,+3.3%	↑
	2009-2014	-8.6%	-17%,+0.6%	=
Private	1996-2003	**+4.1%**	+0.7%,+7.6%	↑
	2003-2006	-4.6%	-21%,+15%	=
	2006-2010	+6.5%	-2.0%,+16%	=
	2010-2014	-2.0%	-5.7%,+1.8%	=
National	1996-2001	**+6.4%**	+4.4%,+8.5%	↑
	2001-2007	0.6%	-0.7%,+2.0%	=
	2007-2011	**+2.8%**	+0.4%,+5.2%	↑
	2011-2014	-2.0%	-4.2%,+0.3%	=



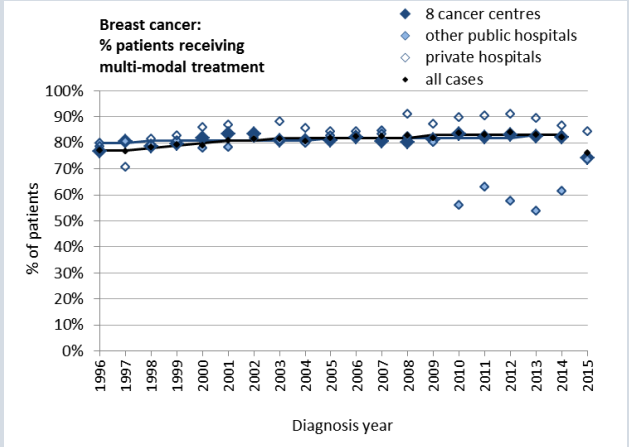
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2000	**+8.6%**	+0.7%,+17%	↑
	2000-2014	-0.4%	-1.1%,+0.2%	=
Other public	1996-2002	**9.2%**	+6.6%,+12%	↑
	2002-2007	-0.9%	-4.1%,+2.4%	=
	2007-2014	**-6.7%**	-10%,+3.2%	↓
Private	1996-2000	**+10.8%**	+3.0%,+19%	↑
	2000-2014	-0.6%	-1.3%,+0.1%	=
National	1996-2001	**+9.1%**	+5.9%,+12%	↑
	2001-2014	-0.7%	-1.1%,+0.2%	=



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2004	-1.6%	-4.0%,+0.8%	=
	2004-2014	**+2.5%**	+1.3%,+3.7%	↑
Other public	1996-2002	**-6.5%**	-9.3%,-3.7%	↓
	2002-2007	**+6.0%**	+0.2%,+12%	↑
	2007-2014	-4.3%	-9.3%,+0.9%	=
Private	1996-2004	**-6.5%**	-10%,-2.8%	↓
	2004-2010	**+11.5%**	+4.1%,+19%	↑
	2010-2014	**-9.1%**	-14%,-3.7%	↓
National	1996-2003	**-4.5%**	-6.2,-2.7%	↓
	2003-2007	+6.0%	-0.9%,+13%	=
	2007-2014	+0.7%	-0.6%,+2.1%	=



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2007	-0.1%	-0.2%,+0.1%	=
	2007-2014	**+0.2%**	+0.1%,+0.4%	↑
Other public	1996-2008	0.0%	-0.2%,+0.2%	=
	2008-2014	**-3.9%**	-6.2%,-1.6%	↑
Private	1996-2014	0.0%	-0.0%,+0.1%	=
National	1996-2014	**+0.1%**	+0.1%,+0.2%	↑



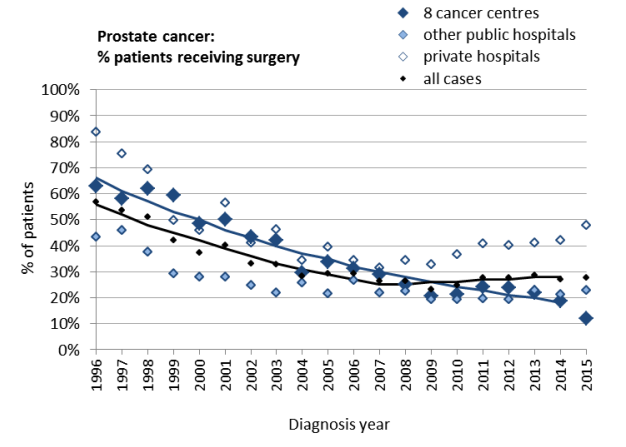
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2004	**+0.2%**	+0.0%,+3%	↑
Other public	1996-2008	**+0.5%**	+0.1%,+0.9%	↑
	2008-2014	**-6.9%**	-10%,-3.2%	↓
Private	1996-2014	**+0.6%**	+0.3%,+0.9%	↑
National	1996-2002	**+1.0%**	+0.5%,+1.6%	↑
	2002-2014	**+0.2%**	+0.1%,+0.3%	↑

[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for symptomatic breast disease and breast cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

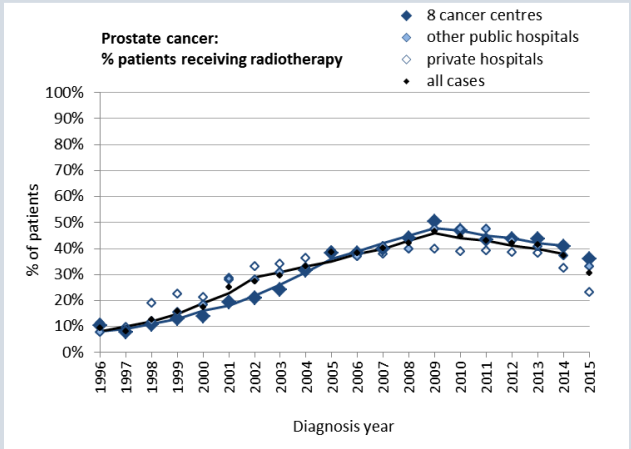
- Trends in the proportions of breast cancer patients having surgery were, in general, relatively minor, with some increases having occurred in earlier years (or across all years for private hospitals) (*Figure 3.6*). The main exception is a recent significant decline in use of surgery among patients primarily seen or treated in the 'other public hospital' category, reflecting almost 100% centralisation of surgical public-hospital cases to the designated surgical centres.
- Use of surgery was highest among patients in private hospitals (95% of 2008-2014 patients) compared with designated centres (83%), other public hospitals (77%) and all patients (85%) (*Table 3.1* & *Appendix 2*). This most likely reflects the more favourable stage profile of breast cancer patients in the private hospitals (median age at diagnosis differs little between hospital categories).
- Trends in radiotherapy use, by hospital category or nationally, were quite complex but overall trends were upwards, especially in the earlier years, with proportions stabilising more recently (though falling markedly among patients in the 'other public hospital' group) (*Figure 3.6*).
- Use of radiotherapy was highest for patients in private hospitals (79% during 2008-2014) compared with designated centres (68%), other public hospitals (61%) and all patients (70%) (*Table 3.1* & *Appendix 2*).
- Trends and hospital variation in breast-conserving surgery (BCS), and radiotherapy in BCS patients, were not assessed for this report. Overall use of BCS (as a percentage of all surgery) has increased over time, and typically 80-90% of BCS cases have follow-on radiotherapy (NCRI unpublished).
- Chemotherapy use increased significantly in all categories, and nationally, from 1996 up to 2000/2002, with proportions stabilising or falling slightly in more recent years (more markedly in the 'other public hospitals' group) (*Figure 3.6*).
- Use of chemotherapy was highest for private hospital patients (52% during 2008-2014) compared with the centres (47%) and other public hospitals (40%) (*Table 3.1* & *Appendix 2*).
- Trends in use of hormonal therapy seem quite complex (*Figure 3.6*) and their reliability is uncertain. Recorded use of hormonal therapy was highest for the centres (63% during 2008-2014) compared with other public hospitals (59%), private hospitals (39%) and all patients (57%) during 2008-2014) (*Appendix 2*). However, hormonal therapy is known to be under-recorded in NCRI data, in large part because it may be prescribed outside of hospital settings or treatment start-dates may be unclear. Data presented here suggest that the problem may be more severe for private hospitals, as the inter-hospital differences seem unlikely to be explained by differences in patient case-mix (receptor status) or treatment strategy.
- Use of multimodal therapy has broadly increased over time, overall and across most hospital categories with the exception of other public hospitals (reflecting referral of almost all public surgical patients to the designated centres) (*Figure 3.6*). Private hospital patients were most likely to have multimodal therapy (89% of 2008-2014 cases), compared with patients in the centres (82%) or other public hospitals (75%) (*Table 3.1* & *Appendix 2*).

Prostate cancer

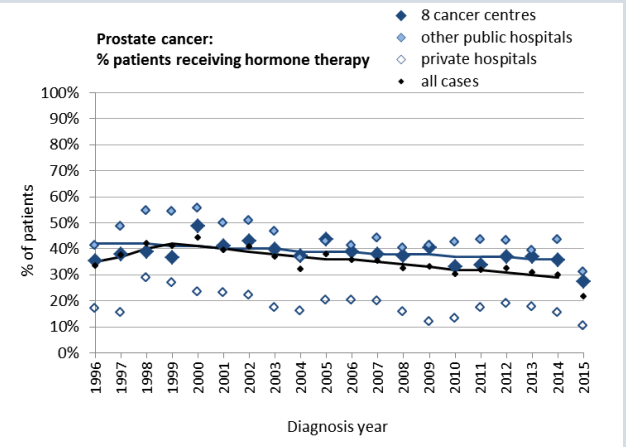
Figure 3.7 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Prostate cancer



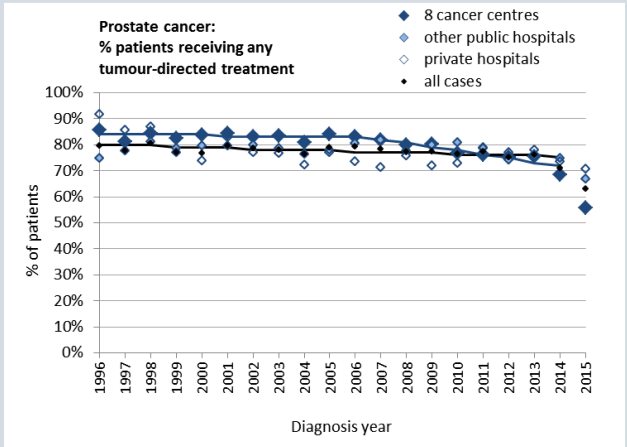
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**-6.9%**	-7.7%,-6.1%	↓
Other public	1996-2002	**-10.0%**	-14%,-5.7%	↓
	2002-2014	-1.7%	-3.6%,+0.3%	=
Private	1996-2006	**-8.8%**	-11%,-6.9%	↓
	2006-2014	**+3.6%**	+0.7%,+6.6%	↑
National	1996-2007	**-7.1%**	-8.3%,-5.9%	↓
	2007-2014	+1.8%	-0.9%,+4.6%	=



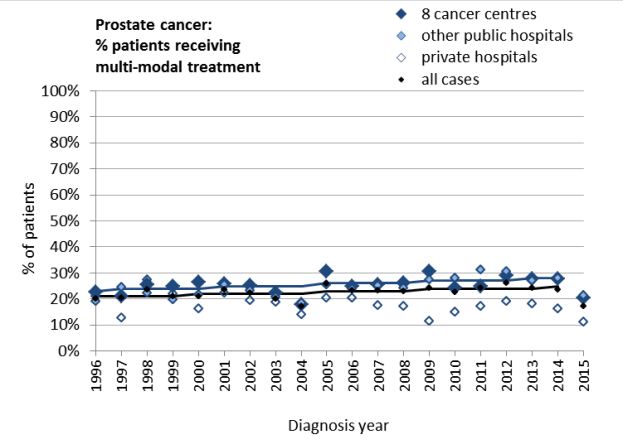
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2005	**+18.4%**	+15%,+22%	↑
	2005-2009	**+7.5%**	+1.0%,+15%	↑
	2009-2014	**-3.1%**	-5.2%,-1.0%	↓
Other public	1996-2001	**+33.2%**	+21%,+47%%	↑
	2001-2010	**+6.8%**	+5.0%,+8.5%	↑
	2010-2014	**-6.2%**	-11%,+1.5%	↓
Private	1996-2002	**+19.1%**	0.0%,0.0%	↑
	2002-2008	**+3.9%**	-0.8%,+8.8%	=
	2008-2014	**-2.9%**	0.0%,0.0%	↓
National	1996-2002	**+24.1%**	+17%.+32%	↑
	2002-2009	**+7.1%**	+4.5%,+9.7%	↑
	2009-2014	**-3.7%**	-6.0%,+1.2%%	↓



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**-0.9%**	-1.7%,-0.1%	↓
Other public	1996-2000	**+6.1%**	+1.1%,+11%	↑
	2000-2004	**-7.9%**	-13%,-2.1%	↓
	2004-2014	+0.4%	-0.7%,+1.5%	=
Private	1996-2014	**-2.8%**	-4.3%,-1.2%	↓
National	1996-1999	+6.3%	-4.9%,+19%	↓
	1999-2014	**-2.3%**	-3.0%,-1.7%	↓



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2007	-0.2%	-0.7%,+0.3%	=
	2007-2014	**-2.0%**	-2.8%,-1.2%	↓
Other public	1996-2014	-0.1%	-0.4%,+0.2%	=
Private	1996-2004	**-2.5%**	-3.9%,-1.0%	↓
	2004-2014	+0.4%	-0.5%,+1.4%	=
National	1996-2014	**-0.3%**	-0.5%,-0.1%	↓



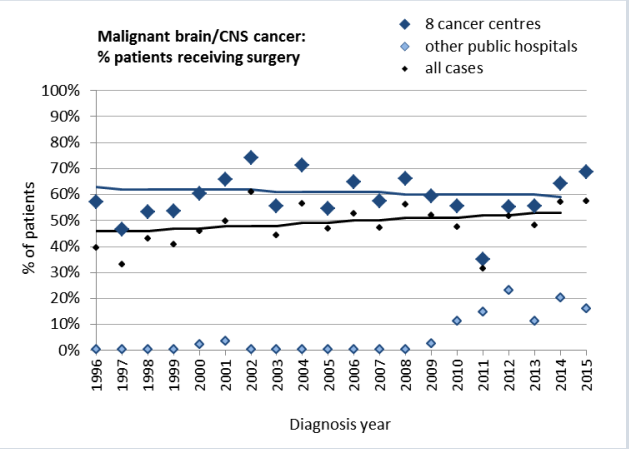
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	+1.0%	-0.0%,+2.0%	=
Other public	1996-2014	**+2.2%**	+1.2%,+3.2%	↑
Private	1996-2014	-1.3%	-2.8%,+0.2%	=
National	1996-2014	**+1.0%**	+0.2%,+1.8%	↑

[1] 8 centres designated as rapid access clinics for prostate cancer.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

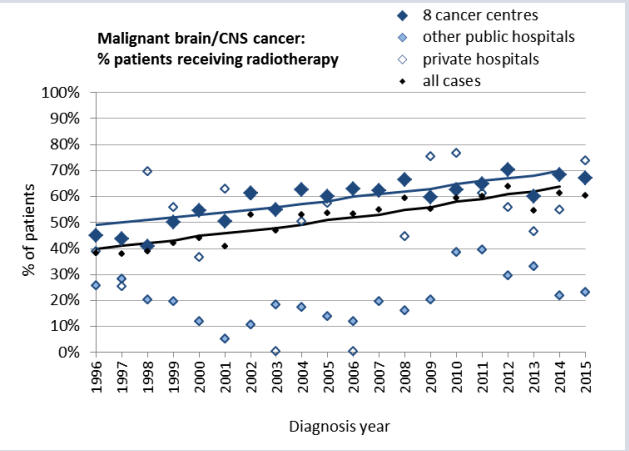
- The proportion of prostate cancers treated surgically has fallen significantly throughout 1996-2014 (by on average 6.9% annually in relative terms) for patients in what are now the eight designated centres for this cancer (*Figure 3.7*). Nationally, and in other hospital categories, the surgical trend has been more complex – an initial decrease, followed either by no significant trend (other public and national) or a significant increase (private hospitals).
- Use of surgery during the period 2008-2014 was much higher among patients in private hospitals (39%) compared with designated surgical centres (21%), other public hospitals (22%) and all patients (27%) (*Table 3.1* & *Appendix 2*).
- Radiotherapy trends during 1996-2014 were broadly concordant across hospital categories: an initial steep increase in the proportion of patients treated, followed by a less steep increase, then a decline (*Figure 3.7*).
- Use of radiotherapy during 2008-2014 was slightly higher for patients in designated surgical centres (45%) compared with other public hospitals (43%), private hospitals (38%) and all patients (42%) (*Table 3.1*). In earlier periods (especially 1996-2000) radiotherapy use was highest for private hospital patients (*Appendix 2*).
- Fewer than 3% of incident prostate cancers annually were treated using chemotherapy, and trends are not presented here.
- Trends in the use of hormonal therapy mainly seem to involve declines (recent or ongoing) (*Figure 3.7*) but their reliability is uncertain. Recorded use of hormonal therapy during 2008-2014 was highest for the 'other public hospital' group (42%) and surgical centres (36%) than for private hospitals (16%). However, as with breast cancer, hormonal therapy for prostate cancer is under-recorded, in large part because it may be prescribed outside of hospital settings or treatment start-dates may be unclear. The much lower proportion of known hormonal therapy among patients treated in private hospitals suggests under-recording may be even more marked there, as these differences seem unlikely to be wholly accounted for by differences in treatment strategy.
- Recorded use of multimodal treatment was highest for surgical centres (at least 27% of 2008-2014 cases) and other public hospitals (at least 28%) than for private hospitals (17%) (*Appendix 2*). However, the reliability of these figures is not clear (given known under-recording of hormonal therapy). Time-trends in use of multimodal therapy (*Figure 3.7*) are likewise not clear, reflecting the complexity of trends seen for specific modalities.

Malignant brain/central nervous system cancer

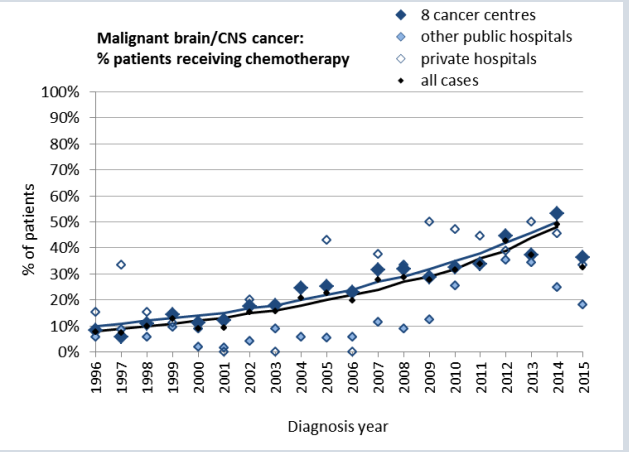
Figure 3.8 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Malignant brain/CNS cancer



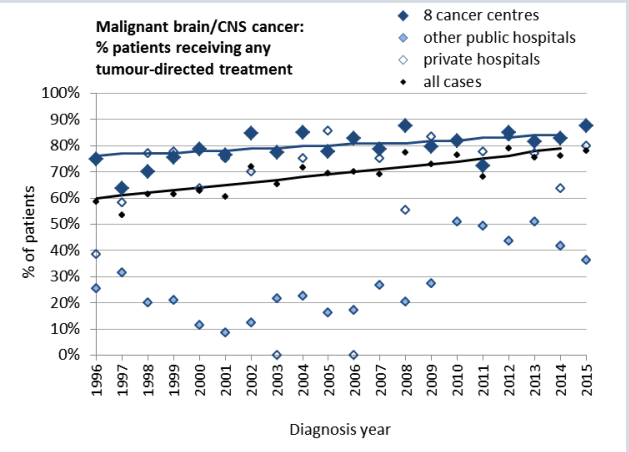
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	-0.3%	-1.7%,+1.1%	=
Other public	-	-	-	-
National	1996-2014	+0.9%	-0.6%,+2.3%	=



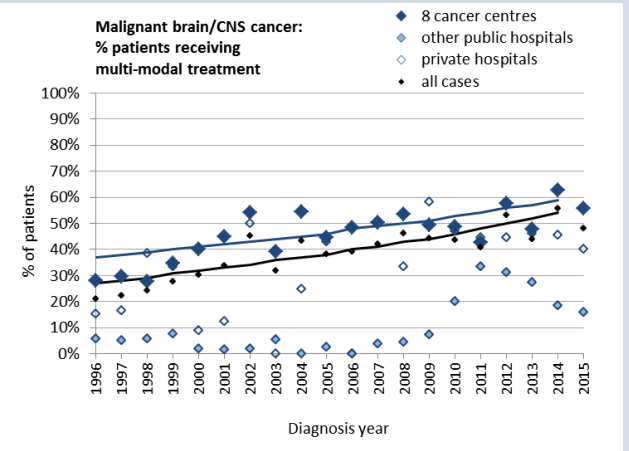
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+2.0%**	+1.3%,+2.7%	↑
Other public	1996-2001	**-20.8%**	-35%,-39%	↓
	2001-2011	**+14.4%**	+6.3%,+23%	↑
	2011-2014	-13.0%	-39%,+23%	=
National	1996-2014	**+2.6%**	+1.9%,+3.3%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+9.6%**	+8.0%,+11.2%	↑
Other public	1996-2006	-2.0%	-12%,+9.4%	=
	2006-2011	**+42.6%**	+10%,+85%	↑
	2011-2014	-6.3%	-28%,+23%	=
National	1996-2014	**+10.3%**	+9.0%,+12%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+0.6%**	0.0%,+1.1%	↑
Other public	1996-2001	-14.1%	-32%,+8%	=
	2001-2014	**+11.2%**	+6.7%,+16%	↑
National	1996-2014	**+1.5%**	+1.0%,+2.0%	↑



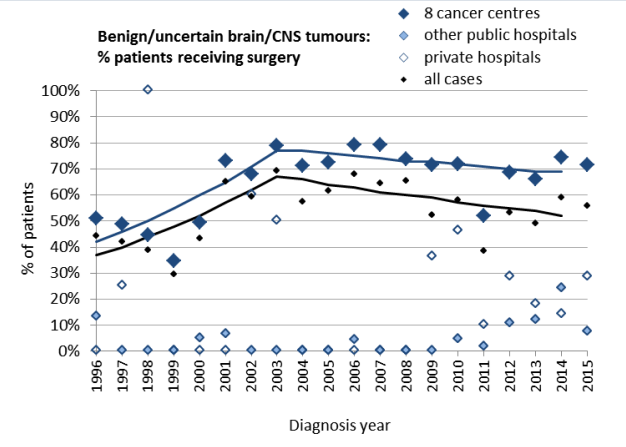
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+2.7%**	+1.3%,+4.1%	↑
National	1996-2014	**+3.8%**	+2.5%,+5.1%	↑

[1] 8 centres designated for a range of cancers but not specifically brain/CNS cancer.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

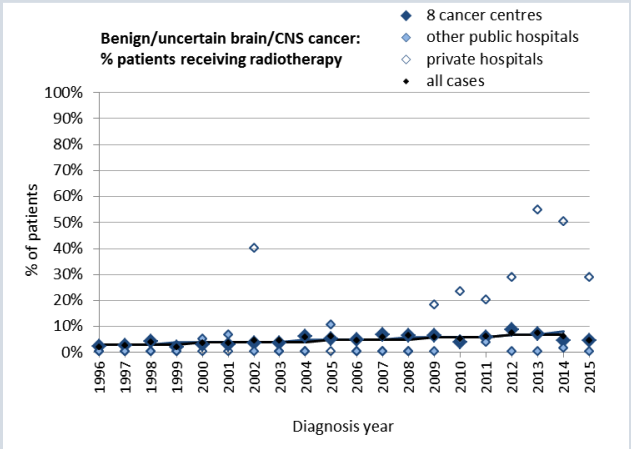
- The proportion of brain/CNS cancers treated surgically showed no clear trends over the period 1996-2014 either nationally or for specific hospital categories (*Figure 3.8*), but with limited evidence of higher use of surgery during the most recent periods (2001-2007 and 2008-2014) compared with 1996-2000 (*Table 3.1* & *Appendix 2*). (Note that the definition of surgery used for brain and meningeal tumours by NCRI includes cases that had craniotomy or craniectomy, even if excision of tumour tissue was not explicitly reported in hospital notes, based on guidance received from clinicians at the major centre. Potentially this may over-count excisional surgery but, conversely, excisional surgery may be under-counted in the earliest years.)
- Use of surgery during the period 2008-2014 was much higher among patients in the two neuro-oncology centres (62%) and private hospitals (52%) compared with other public hospitals (8%); the national average was 49% of all patients in the same period (*Table 3.1* & *Appendix 2*).
- The proportion of patients receiving radiotherapy increased significantly between 1996 and 2014 for patients in the eight cancer centres and nationally (*Figure 3.8*), and data for broader periods suggest a similar trend for the two neuro-oncology centres (*Appendix 2*). Trends were more complex for patients in other public hospitals and could not be assessed (because of sparse data) for those in private hospitals.
- Use of radiotherapy during 2008-2014 was highest for patients in the two neuro-oncology centres (69%), lower for private hospitals (59%) and lowest for other public hospitals (*Table 3.1* & *Appendix 2*).
- All hospital categories, and cases nationally, showed steep increases over time in the proportion of patients receiving chemotherapy, though the increase for the 'other public hospital' group was more recent (*Figure 3.8*).
- Use of chemotherapy during 2008-2014 was highest for patients in the private hospitals (45%) and the two neuro-oncology centres (41%) and lowest in other public hospitals (*Table 3.1* & *Appendix 2*).
- Use of multimodal treatment during 2008-2014 was highest for patients in the two neuro-oncology centres (57%) and the private hospitals (46%), lowest in other public hospitals (*Table 3.1* & *Appendix 2*), and increased significantly during 1994-2014 for the eight cancer centres and overall.

Benign/uncertain brain/central nervous system tumours

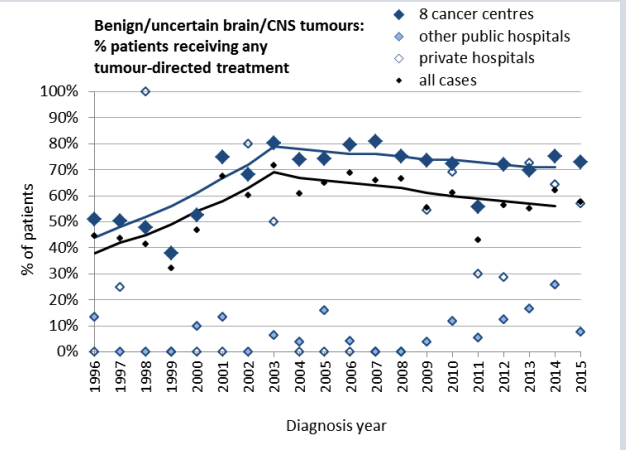
Figure 3.9 Trends in proportion of cases receiving tumour-directed treatment within 1 year after diagnosis, by category of hospital where first treated or diagnosed: Benign/uncertain brain/CNS tumours



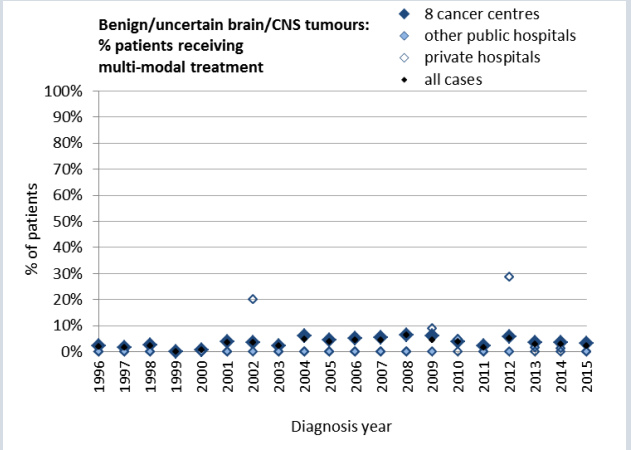
	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2003	**+9.0%**	+2.2%,+16%	↑
	2003-2014	-1.1%	-3.0%,+0.9%	=
National	1996-2003	**+8.9%**	+1.0%,+18%	↑
	2003-2014	-2.2%	-4.8%,+0.4%	=



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2014	**+5.2%**	+2.5%,+8.0%	↑
National	1996-2014	**+5.2%**	+3.5%,+7.0%	↑



	Period	APC[2]	95% CI	Trend
8 centres[1]	1996-2003	**+8.7%**	+2.6%,+15%	↑
	2003-2014	-1.0%	-2.7%,+0.8%	=
National	1996-2003	**+8.7%**	+1.6%,+16%	↑
	2003-2014	-1.8%	-4.0%,+0.4%	=



Trends could not be assessed for multimodal treatment because of sparse data

[1] 2 centres designated for a range of cancers but not specifically brain/CNS tumours.
[2] APC = estimated annual % change (relative) across the period specified, with 95% confidence interval.

- The proportion of benign/uncertain brain/CNS tumours treated surgically increased significantly between 1996 and 2003, followed by a non-significant decline, both nationally and for patients in the eight cancer centres (*Figure 3.9*). Trends could not be assessed in detail for the small numbers of cases in other hospital categories, but there was some evidence of an increase in surgical use within other public hospitals.
- Use of surgery during the period 2008-2014 was much higher among patients in the two neuro-oncology centres (77%) than in other public hospitals (7%) or private hospitals (25%) (*Table 3.1* & *Appendix 2*).
- The proportion of patients receiving radiotherapy increased significantly between 1996 and 2014 for patients in the eight cancer centres and nationally (*Figure 3.9),* and data for broader periods suggest a similar trend for the two neuro-oncology centres (*Appendix 2*). Trends could not be assessed in detail for the small numbers of cases in other hospital categories, but there was some evidence of an increase in radiotherapy use for private-hospital patients.
- Radiotherapy use during 2008-2014 was highest for patients in private hospitals (33%), and markedly lower for the neuro-oncology centres (7%) and other public hospitals (1-2%) (*Table 3.1* & *Appendix 2*).
- Less than 1% of all cases during 1996-2014 had chemotherapy and trends have not been assessed.

- Use of multimodal treatment was rare and during 2008-2014 was highest for patients in the two neuro-oncology centres (5%) and the private hospitals (4%) (*Table 3.1* & *Appendix 2*).

Variation of survival by hospital category

Summary

- Cause-specific survival of patients improved over time, both nationally and within most hospital categories, for the majority of the cancers and other tumours analysed.
- For all cancer/tumour types examined, patients first treated or diagnosed in designated cancer centres had, overall, higher survival than those seen in other public hospitals, even after adjustment for patient age, sex, stage and deprivation. However, as with treatment comparisons, cautious interpretation is needed as this variation could, in part, reflect different referral patterns for patients considered better candidates for treatment. In addition, survival of patients in some non-designated public hospitals may also be high.
- Survival variation between designated centres and private hospitals depended on the cancer or tumour type involved. For rectal, breast and prostate cancers survival of patients in the private hospitals was on average significantly better than in the surgical centres for these cancers, but for stomach cancer, survival of patients in the private hospitals averaged significantly poorer than in the surgical centres.
- Statistical models indicated that stage differences helped explain substantial proportions of the differences seen in survival, while differences in average deprivation status of patients appeared to have a smaller influence. Substantial survival differences between hospitals still remain after adjustment for stage, deprivation, age and sex, suggesting that differences in the appropriateness or quality of treatment, or unmeasured differences in general patient health affecting suitability for treatment, are likely to be contributing to survival differences between hospital categories.
- *Note*: All comparisons are based on hospital category, not on patient status (publicly funded or privately insured) – thus figures for cancer centres, and to lesser extent other public hospitals, include any private patients whose first treatment/diagnosis was in a public hospital.

Table 4.1 Summary of cause-specific survival of cancer patients diagnosed 2008-2014, by category of hospital where first treated or diagnosed (Ce designated centre, OP other public or Pr private).

Cancer	Number of centres	[1]5-year survival 2008-2014			[2]Comparison with 2001-2007			[3]Adjusted HR relative to centre (2008-2014 cases)			P-value for comparison with centre		
		Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr	Ce	OP	Pr
Oesophagus	8	**28%**	16%	19%	↑	↑	↑	1.00	**1.28**	0.91	-	***	ns
	4 surgical	**36%**	15%	19%	↑	↑	↑	1.00	**1.53**	1.07	-	***	ns
Stomach	8	**32%**	24%	22%	↑	↑	↑	1.00	**1.23**	1.12	-	***	ns
	4 surgical	**36%**	23%	22%	↑	↑	↑	1.00	**1.44**	**1.30**	-	***	**
Rectal	8+1 surgical	63%	52%	**65%**	↑	↑	↑	1.00	**1.23**	**0.81**	-	***	**
Pancreatic	8	10%	6%	**11%**	↑	↑	↑	1.00	**1.11**	0.90	-	*	ns
	2 surgical	**19%**	6%	11%	↑	↑	↑	1.00	**1.29**	1.06	-	***	ns
Lung	8 rapid access	**23%**	5%	**23%**	↑	↑	↑	1.00	**1.36**	**0.89**	-	***	**
	4 surgical	**29%**	7%	23%	↑	↑	↑	1.00	**1.44**	1.00	-	***	ns
Breast	8+1	85%	81%	**93%**	↑	↑	↑	1.00	**1.23**	**0.68**	-	**	***
Prostate	8 rapid access	91%	88%	**95%**	↑	↑	↑	1.00	**1.31**	**0.73**	-	***	***
	6 surgical	91%	87%	**95%**	↑	↑	↑	1.00	**1.32**	**0.73**	-	***	***
Brain/CNS	8	**28%**	12%	19%	↑	↑	↑	1.00	**1.45**	1.06	-	***	ns
(malignant)	2 neuro-oncology	**28%**	18%	19%	↑	↓	↑	1.00	**1.20**	1.06	-	*	ns
Brain/CNS	8	**96%**	84%	93%	↑	↑	↑	1.00	**1.92**	1.93	-	*	ns
(benign/uncertain)	2 neuro-oncology	**97%**	86%	93%	↑	↑	↑	1.00	**2.19**	2.21	-	**	ns

[1]Crude five-year cause-specific survival (not adjusted for age or other factors) – see later columns for adjusted comparisons between hospital categories.

[2]Statistically significant improvement ↑ in survival compared with 2001-2007 (↑ non-significant improvement, ↓ non-significant reduction), adjusted for age, sex (except prostate cancer) and stage (except brain/CNS tumours).

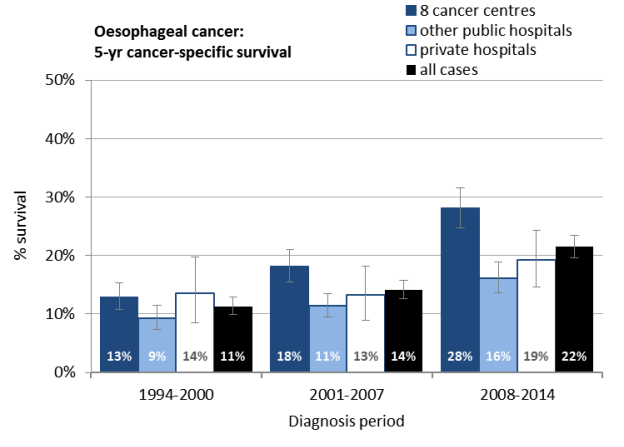
[3]Hazard ratio adjusted for patient age, sex, stage and deprivation quintile: HR >1 indicates higher mortality (lower survival), HR<1 lower mortality (higher survival) relative to designated centres (reference level=1.00).

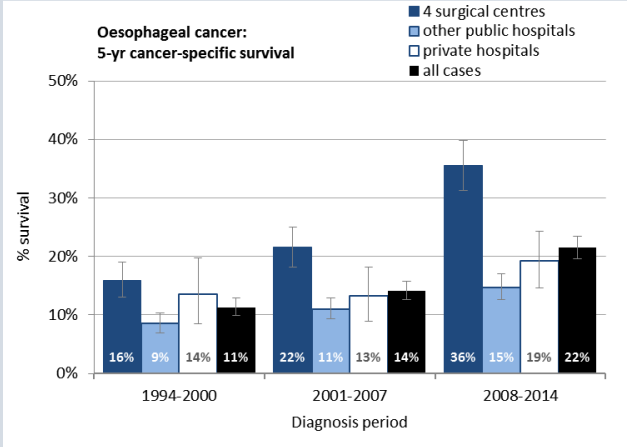
*P<0.05 ** P<0.01 ***P<0.001 for comparison between hospitals (ns = not significant P>0.05)

Cause-specific survival to five years is summarised below (*Figures 4.1 to 4.9*) by diagnosis period and hospital category, with national statistics for context. These figures are for all patients aged 15-99 at diagnosis, not just those who were surgically treated. Cox regression (adjusted for sex and deprivation, stratified for age and stage) is used to compare mortality hazards between diagnosis periods and (for the most recent period) hospital categories.

Oesophageal cancer

Figure 4.1 Five-year cause-specific survival (by hospital category and period of diagnosis): Oesophageal cancer





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.35**	1.21-1.50	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.79**	0.70-0.88	<0.001
Other public	1994-2000	**1.25**	1.13-1.37	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.86**	0.78-0.94	0.002
Private	1994-2000	1.18	0.93-1.48	0.17
	2001-2007	1.00	-	-
	2008-2014	**0.82**	0.67-0.99	0.04
National	1994-2000	**1.27**	1.19-1.36	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.81**	0.76-0.86	<0.001

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.39**	1.24-1.54	<0.001
	Private	1.10	0.94-1.28	0.206

2008-2013 adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.28**	1.13-1.44	<0.001
	Private	0.91	0.77-1.08	0.281

	Period	HR[3]	95% CI	P
4 centres[2]	1994-2000	**1.39**	1.22-1.57	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.69**	0.60-0.79	<0.001
Other public	1994-2000	**1.26**	1.15-1.37	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.90**	0.82-0.97	0.012

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	4 centres[2]	1.00	-	-
	Other public	**1.87**	1.66-2.11	<0.001
	Private	**1.42**	1.20-1.66	<0.001

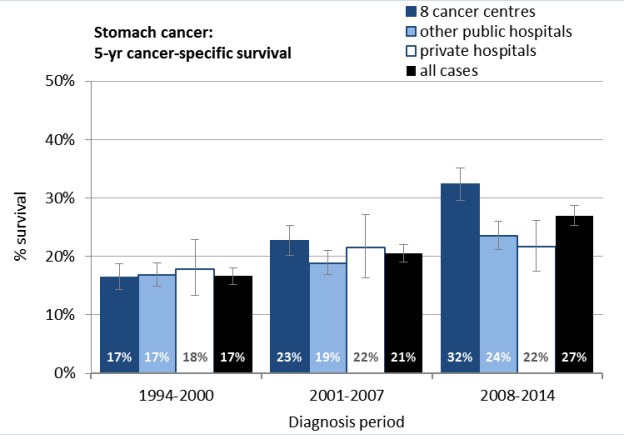
2008-2013 adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	4 centres[2]	1.00	-	-
	Other public	**1.53**	1.34-1.76	<0.001
	Private	1.07	0.89-1.29	0.678

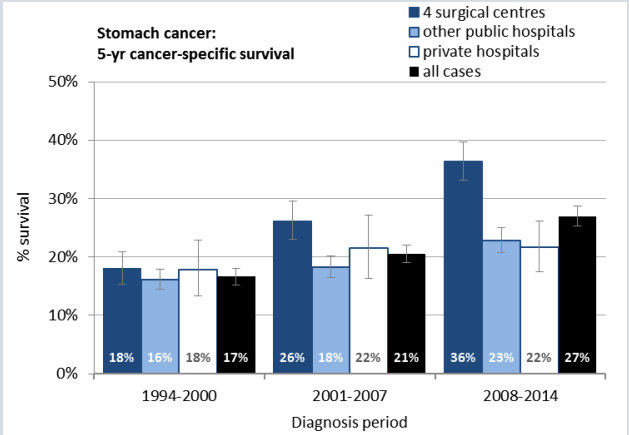
[1] 8 centres designated for a range of cancers but not specifically oesophageal cancer.
[2] 4 centres designated for upper gastrointestinal cancer surgery.
(Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patients in all hospital categories (and nationally) showed statistically significant age/sex-adjusted reductions in oesophageal cancer-related mortality (i.e. survival improvements) between successive diagnosis cohorts.
- These survival improvements appeared most marked among patients first treated or diagnosed in designated centres (in particular, the four centres designated for upper GI cancer surgery).
- Survival during 2008-2014 was significantly higher among patients in designated centres compared with other public hospitals, and in the four designated upper GI centres compared with private hospitals, after adjustment for patient age and sex; these differences remained significant, though were less marked, after adjustment for stage. Adjustment for deprivation had little or no further effect.
- Broadly similar patterns of survival by hospital category were also seen during 1994-2000 and 2001-2017 (effect of age/stage-adjustment not tested).

Stomach cancer

Figure 4.2 Five-year cause-specific survival (by hospital category and period of diagnosis): Stomach cancer





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.28**	1.16-1.40	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.72**	0.65-0.78	<0.001
Other public	1994-2000	**1.15**	1.05-1.24	0.001
	2001-2007	1.00	-	-
	2008-2014	**0.86**	0.78-0.93	<0.001
Private	1994-2000	**1.31**	1.07-1.59	0.008
	2001-2007	1.00	-	-
	2008-2014	0.96	0.80-1.15	0.692
National	1994-2000	**1.21**	1.14-1.28	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.79**	0.74-0.84	<0.001

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.38**	1.26-1.51	<0.001
	Private	**1.32**	1.16-1.50	<0.001

2008-2013 adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.23**	1.10-1.36	<0.001
	Private	1.12	0.99-1.33	0.068

	Period	HR[3]	95% CI	P
4 centres[2]	1994-2000	**1.39**	1.23-1.55	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.69**	0.61-0.77	<0.001
Other public	1994-2000	**1.13**	1.05-1.21	0.001
	2001-2007	1.00	-	-
	2008-2014	**0.87**	0.80-0.93	<0.001

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	4 centres[2]	1.00	-	-
	Other public	**1.65**	1.49-1.81	<0.001
	Private	**1.54**	1.34-1.75	<0.001

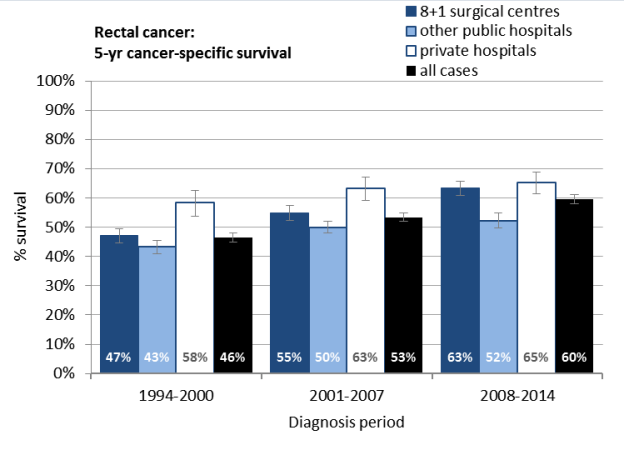
2008-2013 adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	4 centres[2]	1.00	-	-
	Other public	**1.44**	1.29-1.61	<0.001
	Private	**1.30**	1.11-1.52	0.001

[1] 8 centres designated for a range of cancers but not specifically stomach cancer.
[2] 4 centres designated for upper gastrointestinal cancer surgery.
(Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patients in all hospital categories and nationally showed statistically significant age/sex-adjusted reductions in stomach cancer-related mortality (i.e. survival improvements) between diagnosis cohorts 1994-2000 and 2001-2007 and (exception for private hospitals) between 2001-2007 and 2008-2014.
- As seen for oesophageal cancer, these survival improvements appeared to be more marked among patients first treated or diagnosed in designated centres (in particular, the four centres designated for upper GI cancer surgery) than among patients in other public hospitals.
- Survival during 2008-2014 was significantly higher among patients in designated centres compared with other public hospitals and private hospitals, after adjustment for patient age and sex. In general these differences remained significant, though were less marked, after adjustment for stage, but the survival difference between the eight cancer centres and private hospitals appeared to be largely explained by stage. Adjustment for deprivation had little or no further effect.
- Higher survival for patients seen or treated in the centres, compared with other public hospitals, was also evident during 2001-2007 (but not 1994-2000), but no clear variation between centres and private hospitals was evident during these earlier periods (effect of age/stage-adjustment not tested).

Rectal cancer

Figure 4.3 Five-year cause-specific survival (by hospital category and period of diagnosis): Rectal cancer



	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.27**	1.14-1.40	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.72**	0.64-0.80	<0.001
Other public	1994-2000	**1.19**	1.09-1.29	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.91**	0.82-0.99	0.037
Private	1994-2000	**1.22**	1.01-1.48	0.039
	2001-2007	1.00	-	-
	2008-2014	0.90	0.74-1.07	0.239
National	1994-2000	**1.22**	1.15-1.30	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.79**	0.74-0.84	<0.001

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	8+1 centres[2]	1.00	-	-
	Other public	**1.47**	1.32-1.62	<0.001
	Private	0.93	0.80-1.07	0.319

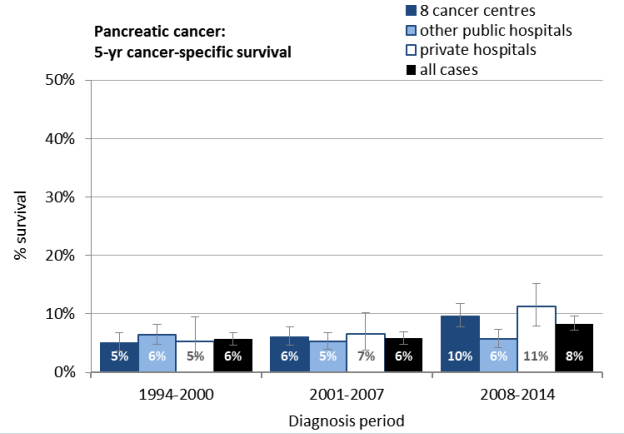
2008-2013 adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	8+1 centres[2]	1.00	-	-
	Other public	**1.23**	1.10-1.38	<0.001
	Private	**0.81**	0.69-0.95	0.009

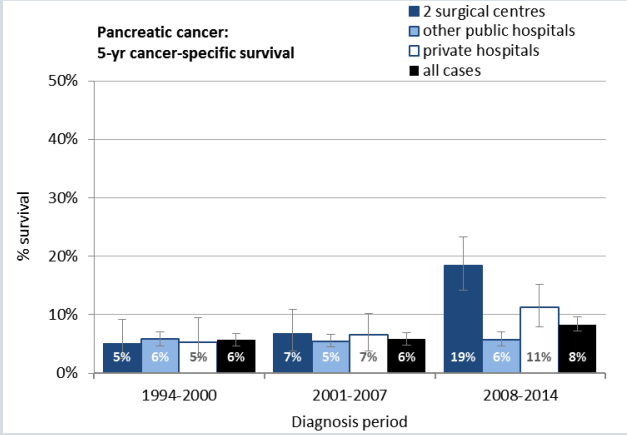
[2] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for rectal cancer surgery.
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patient in all hospital categories (and nationally) showed statistically significant age/sex-adjusted reductions in rectal cancer-related mortality (i.e. survival improvements) between diagnosis cohorts 1994-2000 and 2001-2007 and (with the exception of private hospitals) between 2001-2007 and 2008-2014.
- These survival improvements appeared to be more marked among patients first treated or diagnosed in designated centres than among patients in other public hospitals.
- Survival during 2008-2014 was significantly higher among patients in designated centres compared with other public hospitals, after adjustment for patient age and sex; these differences remained significant, though were less marked, after adjustment for stage.
- Patients in private hospitals appeared to have higher survival, compared with those in the centres, in all three periods examined, and the difference in the most recent period was statistically significant after adjustment for sex, age and stage (not tested formally for earlier periods).
- Adjustment for deprivation had little or no effect on survival comparisons across hospitals.
- Survival differences between centres and other public hospitals appeared to be less marked during 1994-2000 and 2001-2007 (effect of age/stage-adjustment not tested).

Pancreatic cancer

Figure 4.4 Five-year cause-specific survival (by hospital category and period of diagnosis): Pancreatic cancer





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.16**	1.06-1.27	0.001
	2001-2007	1.00	-	-
	2008-2014	**0.81**	0.73-0.87	<0.001
Other public	1994-2000	1.05	0.95-1.14	0.303
	2001-2007	1.00	-	-
	2008-2014	**0.87**	0.79-0.94	0.001
Private	1994-2000	1.12	0.92-1.37	0.246
	2001-2007	1.00	-	-
	2008-2014	**0.78**	0.66-0.92	0.004
National	1994-2000	**1.11**	1.04-1.18	0.001
	2001-2007	1.00	-	-
	2008-2014	**0.82**	0.77-0.86	<0.001

	Hospital type	HR[4]	95% CI	P
2008-2014 adjusted for age, sex	8 centres[1]	1.00	-	-
	Other public	**1.28**	1.17-1.39	<0.001
	Private	0.91	0.80-1.02	0.115

	Hospital type	HR[5]	95% CI	P
2008-2013 adj for age, sex, stage, deprivation	8 centres[1]	1.00	-	-
	Other public	**1.11**	1.00-1.22	0.042
	Private	0.90	0.78-1.03	0.124

	Period	HR[3]	95% CI	P
2 centres[2]	1994-2000	**1.26**	1.03-1.54	0.022
	2001-2007	1.00	-	-
	2008-2014	**0.64**	0.53-0.75	<0.001
Other public	1994-2000	**1.09**	1.01-1.16	0.017
	2001-2007	1.00	-	-
	2008-2014	**0.89**	0.83-0.95	0.001

	Hospital type	HR[4]	95% CI	P
2008-2014 adjusted for age, sex	2 centres[2]	1.00	-	-
	Other public	**1.65**	1.46-1.85	<0.001
	Private	**1.22**	1.04-1.41	0.011

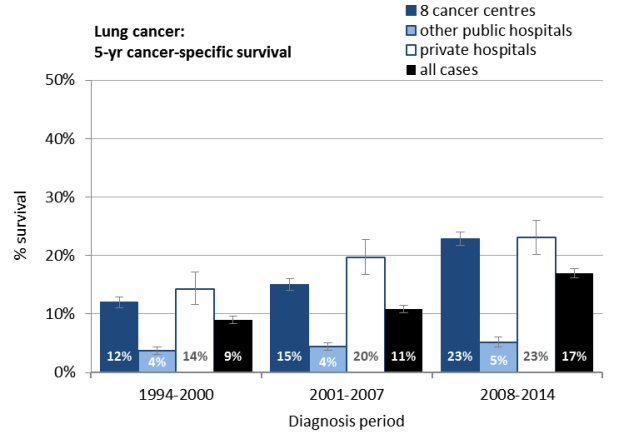
	Hospital type	HR[5]	95% CI	P
2008-2013 adj for age, sex, stage, deprivation	2 centres[2]	1.00	-	-
	Other public	**1.29**	1.12-1.49	<0.001
	Private	1.06	0.89-1.26	0.536

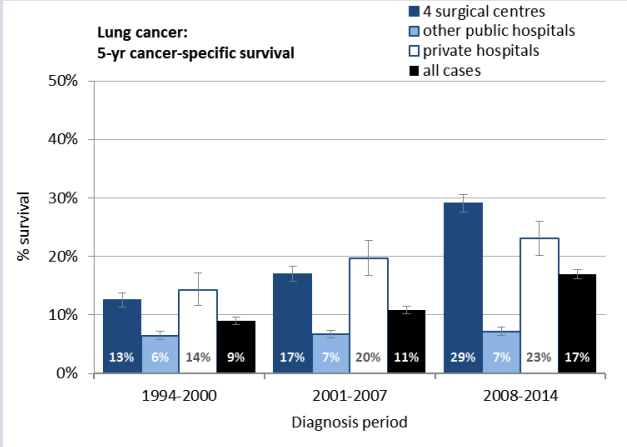
[1] 8 centres designated for a range of cancers but not specifically pancreatic cancer.
[2] 2 centres designated for pancreatic cancer surgery.
(Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patients in all hospital categories (and nationally) showed statistically significant age/sex-adjusted reductions in pancreatic cancer-related mortality (i.e. survival improvements) between diagnosis cohorts 2001-2007 and 2008-2014. Significant improvements were also seen between the 1994-2000 and 2001-2007 cohorts nationally and for the centres.
- These survival improvements appeared to be more marked among patients first treated or diagnosed in designated centres than among patients in other public hospitals.
- Survival during 2008-2014 was significantly higher among patients in designated centres compared with other public hospitals, after adjustment for patient age and sex; these differences remained significant, though were less marked, after adjustment for stage.
- Survival for patients seen or treated in private hospitals during 2008-2014 was significantly higher than for patients in the eight centres (after adjustment for age, sex and stage), but there was no significant stage-adjusted difference compared with the two surgical centres.
- Adjustment for deprivation in general had little or no effect on survival comparisons across hospitals, but appeared to moderate survival differences between private hospitals and the eight centres slightly.

Lung cancer

Figure 4-5 Five-year cause-specific survival (by hospital category and period of diagnosis): Lung cancer





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.13**	1.08-1.17	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.74**	0.70-0.76	<0.001
Other public	1994-2000	**1.15**	1.09-1.19	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.89**	0.85-0.93	<0.001
Private	1994-2000	**1.21**	1.07-1.36	0.002
	2001-2007	1.00	-	-
	2008-2014	**0.86**	0.77-0.96	0.009
National	1994-2000	**1.11**	1.07-1.14	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.77**	0.74-0.78	<0.001

	Hospital type	HR[4]	95% CI	P
2008-2014 adjusted for age, sex	8 centres[1]	1.00	-	-
	Other public	**1.77**	1.69-1.84	<0.001
	Private	0.94	0.87-1.01	0.113

	Hospital type	HR[5]	95% CI	P
2008-2013 adj for age, sex, stage, deprivation	8 centres[1]	1.00	-	-
	Other public	**1.36**	1.29-1.42	<0.001
	Private	**0.89**	0.82-0.97	0.007

	Period	HR[3]	95% CI	P
4 centres[2]	1994-2000	**1.16**	1.09-1.22	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.65**	0.62-0.68	<0.001
Other public	1994-2000	**1.09**	1.05-1.13	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.90**	0.87-0.93	<0.001

	Hospital type	HR[4]	95% CI	P
2008-2014 adjusted for age, sex	4 centres[2]	1.00	-	-
	Other public	**1.99**	1.90-2.07	<0.001
	Private	**1.14**	1.05-1.22	0.001

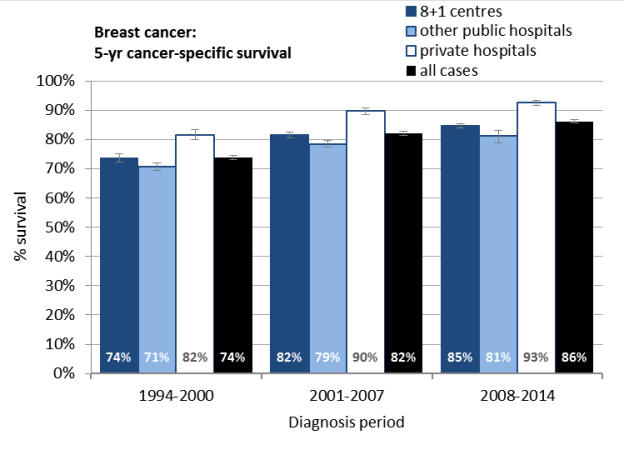
	Hospital type	HR[5]	95% CI	P
2008-2013 adj for age, sex, stage, deprivation	4 centres[2]	1.00	-	-
	Other public	**1.44**	1.37-1.51	<0.001
	Private	1.00	0.92-1.09	0.960

[1] 8 centres designated for lung cancer rapid access clinics and for a range of other cancers.
[2] 4 centres designated for lung cancer surgery.
(Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patient in all hospital categories (and nationally) showed statistically significant age/sex-adjusted reductions in lung cancer-related mortality (i.e. survival improvements) between successive diagnosis cohorts (1994-2000 to 2008-2014).
- These survival improvements were more marked, especially comparing the two most recent periods, among patients first treated or diagnosed in designated centres compared with other public hospitals.
- The broad pattern of (unadjusted) survival among public-hospital patients in all periods was for higher survival in what are now designated centres compared with other public hospitals.
- Survival during 2008-2014 was significantly higher among patients in designated centres compared with other public hospitals, after adjustment for patient age and sex. These differences remained significant, but were less marked, after adjustment for stage; adjustment for deprivation had little further effect.
- Survival variation between private hospitals and designated centres varied somewhat over time, or by centre definition used. Stage-adjusted comparisons for the period 2008-2013 indicated significantly lower mortality hazards (higher survival) for private hospitals compared with the eight cancer centres. This effect was moderated slightly (but still significant) after adjustment for deprivation. Compared with the four surgical centres, private hospitals during 2008-2013 had significantly poorer stage-adjusted ssurvival than the four

Breast cancer

Figure 4.6 Five-year cause-specific survival (by hospital category and period of diagnosis): Breast cancer



	Period	HR[3]	95% CI	P
8+1 centres[2]	1994-2000	**1.43**	1.31-1.54	<0.001
	2001-2007	1.00	-	-
	2008-2014	0.90	0.78-1.03	0.132
Other public	1994-2000	**1.44**	1.33-1.55	<0.001
	2001-2007	1.00	-	-
	2008-2014	0.90	0.79-1.02	0.099
Private	1994-2000	**1.75**	1.50-2.03	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.69**	0.58-0.81	<0.001
National	1994-2000	**1.52**	1.44-1.60	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.75**	0.71-0.79	<0.001

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	8+1 centres[2]	1.00	-	-
	Other public	**1.31**	1.14-1.50	<0.001
	Private	**0.52**	0.45-0.60	<0.001

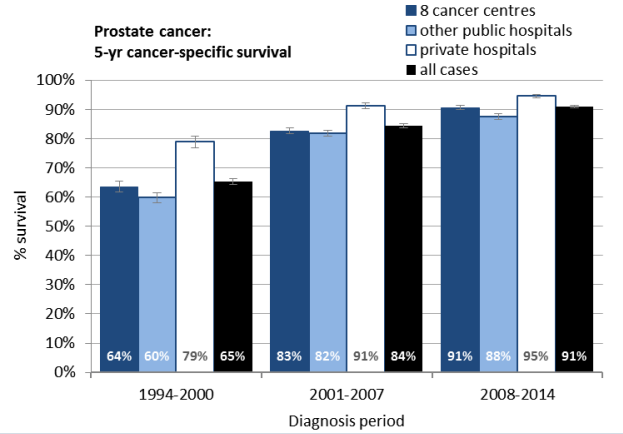
2008-2013 adj for age, sex, stage, deprivation	Hospital type	HR[5]	95% CI	P
	8+1 centres[2]	1.00	-	-
	Other public	**1.23**	1.06-1.45	0.007
	Private	**0.68**	0.58-0.79	<0.001

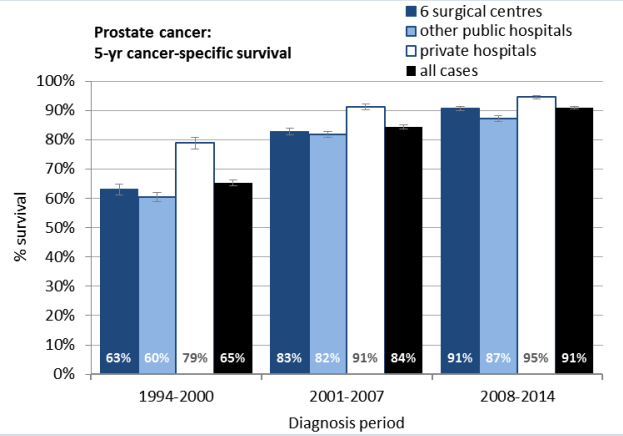
[2]8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for symptomatic breast disease and breast cancer surgery.
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patient in all hospital categories (and nationally) showed statistically significant age/sex-adjusted reductions in breast cancer mortality (i.e. survival improvements) between diagnosis cohorts 1994-2000 and 2001-2007. Further significant (but less marked) reductions were seen between 2001-2007 and 2008-2014, but the reduction was not statistically significant for the 'other public hospital' category.
- The broad pattern across all periods was that survival (unadjusted for age or other factors) was highest among patients treated in private hospitals, and slightly higher among those treated in currently-designated centres than in other public hospitals.
- Survival during 2008-2014 was confirmed as significantly higher among patients in designated centres compared with other public hospitals, but significantly poorer compared with private hospitals, after adjustment for patient age and sex. These differences remained significant, though were somewhat less marked, after adjustment for stage. Further adjustment for deprivation moderated the differences between centres and other public hospitals slightly, but had little or no effect on centre v private hospital comparisons.

Prostate cancer

Figure 4.7 Five-year cause-specific survival (by hospital category and period of diagnosis): Prostate cancer.





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.86**	1.69-2.04	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.62**	0.56-0.68	<0.001
Other public	1994-2000	**2.11**	1.94-2.29	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.71**	0.64-0.78	<0.001
Private	1994-2000	**2.15**	1.83-2.51	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.62**	0.52-0.73	<0.001
National	1994-2000	**2.02**	1.91-2.13	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.64**	0.59-0.68	<0.001

	Period	HR[3]	95% CI	P
6 centres[2]	1994-2000	**2.12**	1.86-2.40	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.60**	0.51-0.68	<0.001
Other public	1994-2000	**1.96**	1.82-2.09	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.70**	0.64-0.76	<0.001

2008-2014 adjusted for age	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	1.06	0.95-1.18	0.290
	Private	**0.54**	0.46-0.62	<0.001

2008-2014 adjusted for age	Hospital type	HR[4]	95% CI	P
	6 centres[2]	1.00	-	-
	Other public	1.08	0.97-1.21	0.154
	Private	**0.54**	0.47-0.62	<0.001

2008-2013 adj for age, stage, deprivation	Hospital type	HR[5]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.31**	1.16-1.48	<0.001
	Private	**0.73**	0.62-0.85	<0.001

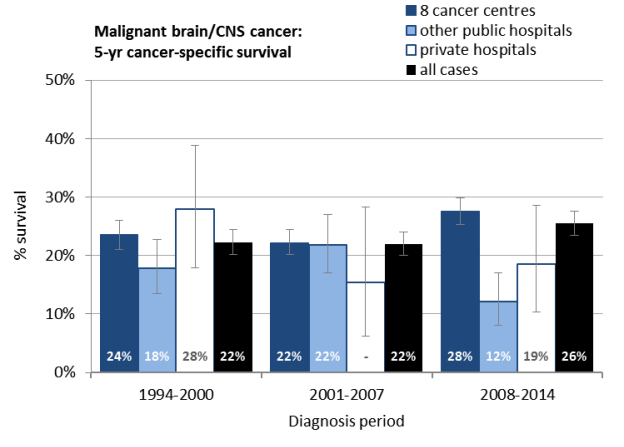
2008-2013 adj for age, stage, deprivation	Hospital type	HR[5]	95% CI	P
	6 centres[2]	1.00	-	-
	Other public	**1.32**	1.16-1.49	<0.001
	Private	**0.73**	0.62-0.88	<0.001

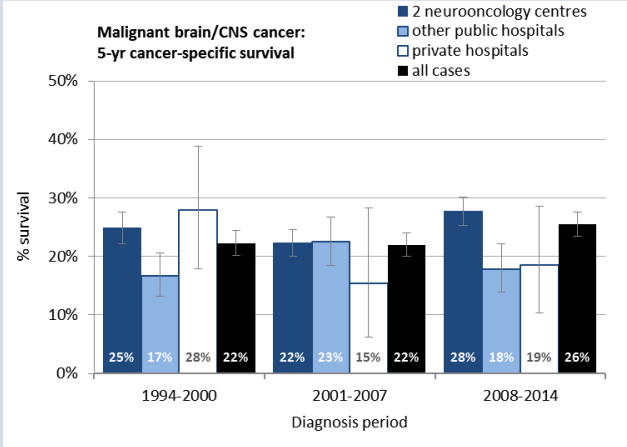
[1] 8 centres designated for prostate cancer rapid access clinics and for a range of cancers.
[2] 6 centres designated for prostate cancer surgery.
(Note: In surgical centre graphs, cancer centres that are not designated surgical centres are included in the "other public hospital" category.)
[3]HR = age-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/stage/deprivation-adjusted hazard ratio (compared with designated centres), excluding 2014 data (different TNM edition).

- Patients in all hospital categories (and nationally) showed statistically significant age/sex-adjusted reductions in prostate cancer mortality (i.e. survival improvements) between successive diagnosis cohorts 1994-2000 to 2008-2014. Survival improvements were particularly marked (a halving of mortality risk overall) between the first two periods, probably largely a reflection of 'lead-time bias' resulting from earlier diagnosis of prostate cancer as PSA testing became widespread.
- No clear-cut differences in survival time-trends by hospital category are evident.
- The broad pattern across all periods was that survival (unadjusted for age or other factors) was highest among patients treated in private hospitals, and slightly higher among those treated in currently-designated centres than in other public hospitals.
- No age-adjusted survival differences were apparent between centres and other public hospitals for 2008-2014, but stage-adjusted figures indicated significantly higher survival for patients in the centres.
- Survival during 2008-2014 was significantly higher among patients in private hospitals compared with designated centres, after adjusting for age, and this difference remained significant (though was substantially weakened) after adjustment for stage. Adjustment for deprivation had little further effect.

Malignant brain/central nervous system cancer

Figure 4.8 Five-year cause-specific survival (by hospital category and period of diagnosis): Malignant brain / central nervous system cancer.





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	**1.21**	1.10-1.32	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.78**	0.71-0.84	<0.001
Other public	1994-2000	**1.22**	1.00-1.47	0.041
	2001-2007	1.00	-	-
	2008-2014	**1.33**	1.09-1.61	0.004
Private	1994-2000	1.07	0.67-1.71	0.773
	2001-2007	1.00	-	-
	2008-2014	0.83	0.53-1.27	0.388
National	1994-2000	**1.22**	1.12-1.31	<0.001
	2001-2007	1.00	-	-
	2008-2014	**0.84**	0.78-0.90	<0.001

	Period	HR[3]	95% CI	P
2 centres[2]	1994-2000	**1.15**	1.04-1.26	0.004
	2001-2007	1.00	-	-
	2008-2014	**0.76**	0.69-0.82	<0.001
Other public	1994-2000	**1.31**	1.12-1.53	0.001
	2001-2007	1.00	-	-
	2008-2014	1.16	0.99-1.35	0.066

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.43**	1.21-1.68	<0.001
	Private	1.03	0.80-1.31	0.821

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	2 centres[2]	1.00	-	-
	Other public	**1.16**	1.00-1.34	0.043
	Private	1.02	0.79-1.29	0.903

2008-2014 adjusted for age, sex, deprivation	Hospital type	HR[5]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.45**	1.22-1.73	<0.001
	Private	1.06	0.82-1.38	0.646

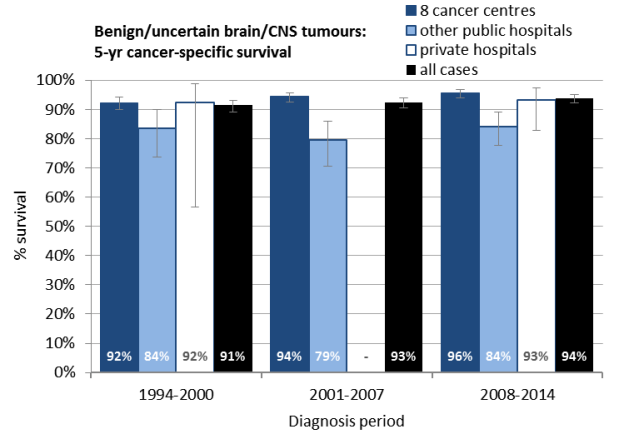
2008-2014 adjusted for age, sex, deprivation	Hospital type	HR[5]	95% CI	P
	2 centres[2]	1.00	-	-
	Other public	**1.20**	1.03-1.40	0.018
	Private	1.06	0.82-1.38	0.659

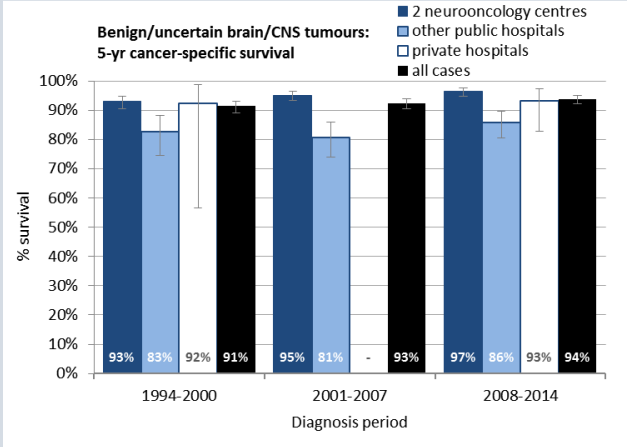
[1] 8 centres designated for a range of cancers but not specifically brain/CNS tumours.
[2] 2 centres designated for neuro-oncology.
(Note: In neuro-oncology centre graphs, cancer centres that are not designated for neuro-oncology are included in "other public hospital".)
[3]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for cancer-related mortality (compared with designated centres)
[5]HR = age/sex/deprivation-adjusted hazard ratio (compared with designated centres).

- Patient in designated centres (and nationally) showed statistically significant age/sex-adjusted reductions in brain/CNS cancer mortality (i.e. survival improvements) between successive diagnosis cohorts 1994-2000 to 2008-2014. This was also seen for the 'other public hospital' category between the first two periods, but there was evidence of an increase in mortality (reduction in survival) between the latter two periods for this group. Private hospitals showed more limited evidence (not statistically significant) of improvement in survival over time.
- Crude survival figures (unadjusted for age or other factors) indicated no consistent patterns over time in survival comparisons between hospital categories. However, in the most recent period, age-adjusted mortality was significantly higher (survival significantly poorer) in the 'other hospital' group compared with designated centres but no difference was seen between private hospitals and the centres. Further adjustment for deprivation had little effect on these findings.

Benign/uncertain brain/central nervous system tumours

Figure 4.9 Five-year cause-specific survival (by hospital category and period of diagnosis): Benign or uncertain-behaviour brain / central nervous system tumours.





	Period	HR[3]	95% CI	P
8 centres[1]	1994-2000	1.47	0.98-2.19	0.059
	2001-2007	1.00	-	-
	2008-2014	**0.63**	0.40-0.97	0.040
Other public	1994-2000	1.16	0.58-2.29	0.663
	2001-2007	1.00	-	-
	2008-2014	0.88	0.51-1.52	0.657
National	1994-2000	1.32	0.94-1.84	0.107
	2001-2007	1.00	-	-
	2008-2014	**0.72**	0.51-0.99	0.047

	Period	HR[3]	95% CI	P
2 centres[2]	1994-2000	**1.57**	1.02-2.40	0.040
	2001-2007	1.00	-	-
	2008-2014	0.62	0.38-1.00	0.052
Other public	1994-2000	1.12	0.61-2.02	0.719
	2001-2007	1.00	-	-
	2008-2014	0.85	0.52-1.37	0.503

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**2.08**	1.24-3.45	0.005
	Private	1.78	0.63-5.00	0.276
2008-2014 adjusted for age, sex, deprivation	Hospital type	HR[5]	95% CI	P
	8 centres[1]	1.00	-	-
	Other public	**1.92**	1.12-3.29	0.018
	Private	1.93	0.58-6.46	0.284

2008-2014 adjusted for age, sex	Hospital type	HR[4]	95% CI	P
	2 centres[2]	1.00	-	-
	Other public	**2.17**	1.25-3.74	0.005
	Private	1.99	0.69-5.71	0.202
2008-2014 adjusted for age, sex, deprivation	Hospital type	HR[5]	95% CI	P
	2 centres[2]	1.00	-	-
	Other public	**2.19**	1.22-3.94	0.009
	Private	2.21	0.65-7.50	0.203

[1] 8 centres designated for a range of cancers but not specifically brain/CNS tumours.
[2] 2 centres designated for neuro-oncology.
(Note: In neuro-oncology centre graphs, cancer centres that are not designated for neuro-oncology are included in "other public hospital".)
[3]HR = age/sex-adjusted hazard ratio for tumour-related mortality (compared with 2001-2007 baseline) – a lower HR indicates higher survival. HRs for diagnosis period were broadly similar (and any statistically significant HRs for diagnosis period remained significant) after adjustment for stage.
[4]HR = age/sex-adjusted hazard ratio for tumour-related mortality (compared with designated centres)
[5]HR = age/sex/deprivation-adjusted hazard ratio (compared with designated centres).

- Patients in both hospital categories (and nationally) showed evidence on ongoing improvements in survival between successive diagnosis cohort, after adjustment for patient age and sex. However, improvements were only statistically significant between 2001-2007 and 2008-2014 nationally and for the eight cancer centres, and between 1994-2000 and 2001-2007 for the two neuro-oncology centres. Insufficient data were available to allow assessment of time-trends for patients in private hospitals.
- Crude survival figures (unadjusted for age or other factors) suggest survival was highest in designated centres and in private hospitals, and lowest in other public hospitals, in all periods examined.
- In the most recent diagnosis period (2008-2014), tumour-related mortality was confirmed as significantly higher (about twice as high) for patients in other public hospitals compared with designated centres, after adjustment for patient age and sex. Private hospitals also showed evidence of poorer survival (compared with the centres) after adjustment for age and sex, but differences were not statistically significant. These comparisons were largely unchanged after further adjustment for deprivation.

Methods

Hospital categories

For the main analyses of patterns of care and survival by hospital type in this report, each patient is assigned to a 'first' or 'main' hospital of treatment/diagnosis:

- prioritising the first hospital in which a patient had tumour-directed (excisional) surgery;
- for non-surgical cases, the first hospital where a patient had a biopsy or other tissue-based or surgical-exploratory investigation is assigned;
- otherwise, the first patients where a patient had the following is assigned (in declining order of priority); chemotherapy / tumour-directed immunotherapy > hormone therapy > undefined medical oncology > other procedure or hospital encounter (excluding radiotherapy) > radiotherapy.

An equivalent algorithm can also be used to identify the first or main surgical hospital. However, for some cancer types included here only a small proportion of cases have definitive (tumour removing or destroying) surgical treatment. Thus, for comparability across cancer types and for practical reasons, more limited analyses are presented for 'hospital of surgery'. For cancers with a high proportion of cases treated surgically, the patterns should be very similar.

Individual hospitals were then assigned to one of the following categories:

- 'Centre' – hospital designated as a cancer centre for centralised treatment of publicly-funded cancer patients (overall definitions based on eight centres defined for a range of cancers, and more specific definitions based on centres designated for specific cancers or specifically for surgery of some cancers).
- 'Other public hospital' – all other publicly-funded (including 'voluntary') hospitals, – mainly but not exclusively acute general hospitals.
- 'Private hospital' – hospital where patients are entirely or largely funded through private health insurance or other private means (but can include some publicly-funded patients under treatment-purchase arrangements).
- 'Other /unknown' – includes hospitals in Northern Ireland, wider UK or elsewhere outside Ireland; unknown hospital; cases with no known hospital (generally cases for which no treatment details were registered by or available to NCRI). For the cancers included in this report, this category accounted for only 1-2% (by cancer type) of all cases diagnosed during 2008-2012 or 1-4% (<2% of all patients) of all cases diagnosed 1994-2015.

The first two categories are hospitals supported entirely or largely by public funds, but patients treated include some patients funded by private health insurance. In the analyses presented in this report, 'private' patients treated in cancer centres contribute to figures for the latter. No distinction is made in these analyses between public and private funding of treatment, only between publicly funded (including 'voluntary') hospitals and private hospitals. A more sophisticated analysis might attempt to analyse 'private patients in public hospitals' separately but data may not be sufficiently complete or reliable and, at the time of writing, linked data (based on HIPE) were not available for all the recent years included in these analyses.

The "Centre" definitions used are as tabulated below by cancer type.

Table m-1
NCCP-designated Cancer Centres by cancer type (excluding radiation oncology centres)

		St. James's	Mater	St. Vincent's	Beaumont	Cork	Galway	Limerick	Waterford	Other†
Lung	rapid access clinic	●	●	●	●	●	●	●	●	
	surgery	●	●			●	●			
Breast	symptomatic breast disease	●	●	●	●	●	●	●	●	Letterkenny (Galway satellite)
	surgery	●	●	●	●	●	●	●	●	Letterkenny
Prostate	rapid access clinic	●	●	●	●	●	●	●	●	
	surgery	●	●	●	●	●	●			
Upper GI	surgery	●			●	●	●			
Pancreas	surgery			●		●				
Rectal	surgery	●	●	●	●	●	●	●	●	Letterkenny
Neuro-oncology					●	●				

†Letterkenny Hospital is a designated satellite of Galway University Hospital
● designated centre

Hospitals not listed above are not counted in statistics presented in this report (except as 'other public hospitals') even if, on an interim basis, they still act as *de facto* centres in a given region/year.

Information on caseloads or outcomes relating to specific hospitals is not provided, either directly or indirectly (e.g. hospital type by region), whether relating to publicly-funded or private hospitals.

Treatment analysis

Time-trends in the proportional distribution of patients across hospital categories, and in the proportions of patients receiving different treatment modalities, are assessed using Joinpoint regression [3,4]. The Joinpoint method assesses whether trends for a given subgroup of patients are best described as a single trend across the full period of analysis, or better described by different trends across different period. The analysis also generates estimates of annual percentage changes (APCs) in relative terms, with 95% confidence intervals, allowing identification of statistically significant trends where present.

Further descriptive comparisons are made of case distributions and treatment by hospital category, between broader diagnosis periods, specifically 1994-2000, 2001-2007 and 2008-2015.

Treatment summaries presented here relate to broad modalities only: tumour-directed surgery, radiotherapy, chemotherapy (including tumour-targeted immunotherapy), hormonal therapy and overall tumour-directed treatment. Finer subtypes (e.g. partial versus whole-organ excision), and detailed summaries of multi-modal treatment (specific combinations of modalities), are not presented, but an overview of multi-modal treatment is provided. Multi-modal treatment is defined for purposes of this report as any combination of two or more of the four main modalities – surgery, radiotherapy, chemotherapy/immunotherapy and hormone therapy. Only treatments (other than diagnostic biopsies) that remove or destroy tumour tissue are included in the definition 'tumour-directed' treatment used here, and treatment intent (e.g. curative, palliative) is not taken into account. Purely supportive or symptom-managing treatments, e.g. insertion of stents, are not included unless they also involve significant removal or destruction of tumour tissue.

Survival analysis

Cohort estimates of cause-specific survival to five years post-diagnosis are presented, by hospital category, for equivalent periods (1994-2000, 2001-2007 and 2008-2014, with follow-up to the end of 2015.) Cases diagnosed in 2015 are excluded from survival estimates to allow at least one full year of follow-up for all patients included.

Cause-specific survival is used here, rather than net or relative survival. The socioeconomic background of patients may differ substantially between hospital categories, and net or relative survival requires comparison of observed (all-cause) survival with expected survival in the same general population, from life tables. Because comprehensive life tables (from the Central Statistics Office) are only available in Ireland for the population as a whole, use of such life tables could lead to the expected survival of patients treated in private hospitals being underestimated and relative survival (the ratio of observed to expected survival) overestimated, exaggerating any differences in survival between private and public hospital patients.

Age, cancer stage and deprivation status of patients

Descriptive statistics are provided for the most recent diagnosis period (2008-2014) on the age, stage breakdown and deprivation status of patients assigned to specific hospital categories, as variation by hospital type could help explain any differences seen in treatment or survival.

For stage, TNM 5th-edition stage is used (applicable to cases registered by NCRI for diagnosis years up to 2013) [5]; 2014 is excluded from stage analyses here as TNM 7th-edition rules [6] applied and stage data would not be comparable with earlier data.

Deprivation is summarised using the Pobal HP deprivation index [2] by electoral district (ED) of patients' residence for census year 2011, reconfigured as population quintiles (from least deprived to most deprived 20% of population) using total census populations by ED for 2011. Assignment of ED to each patient was based on geocoding of addresses, and a deprivation quintile could be assigned to 92% of patients included in analyses for 2008-2014. (For other patients, their address was not precise enough to allow assignment of a specific single ED.)

Formal statistical comparisons of survival between hospital types by Cox regression are adjusted for age-group (0-14, 15-44, 45-54, 55-64, 65-74 and 75+ for most cancer types, or 0-14,15-54,55-64,65-74,75-84 and 85+ for prostate cancer), sex, deprivation quintile and stage (age and stage adjustment is by stratification, to allow for non-proportional hazards). However, factors not captured in the cancer registration data used for these analyses – in particular relating to the general health, performance status and co-morbidities of patients – may also contribute to treatment or survival variations.

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- Report-compilation and most analyses were undertaken by Paul Walsh, with assistance from Joe McDevitt and (for maps) Neil McCluskey.
- Other members of the NCRI staff helped compile and quality-assure the data summarised in this report, or commented on drafts.
- The Central Statistics Office, General Register Office and DEPS provided data used for assessment of survival status of patients.
- This work uses data provided by patients and collected by the health service as part of their care and support.

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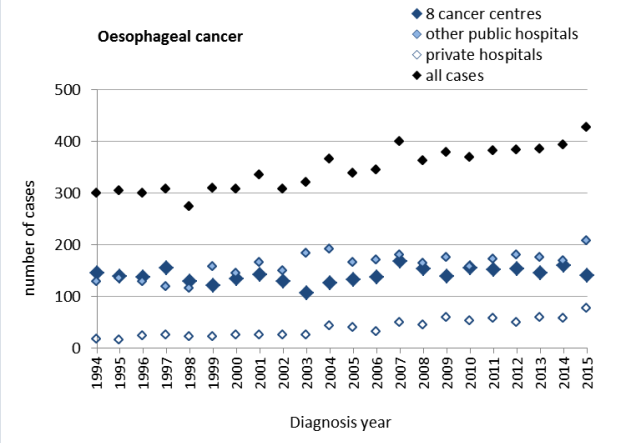
Appendix 1
Patterns of centralisation: further summary figures

Oesophageal cancer

Figure a.1.1 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Oesophageal cancer



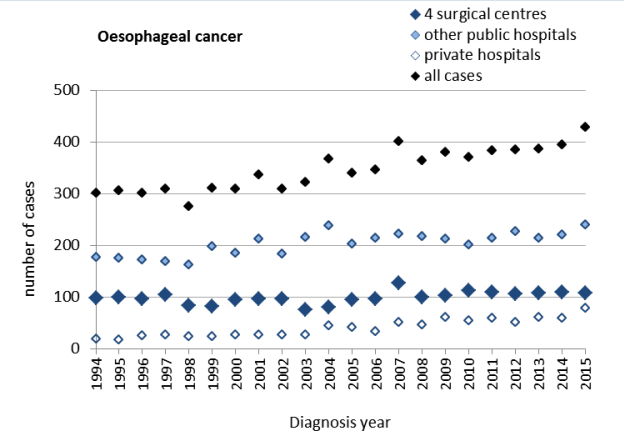


Figure a.1.2 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Oesophageal cancer

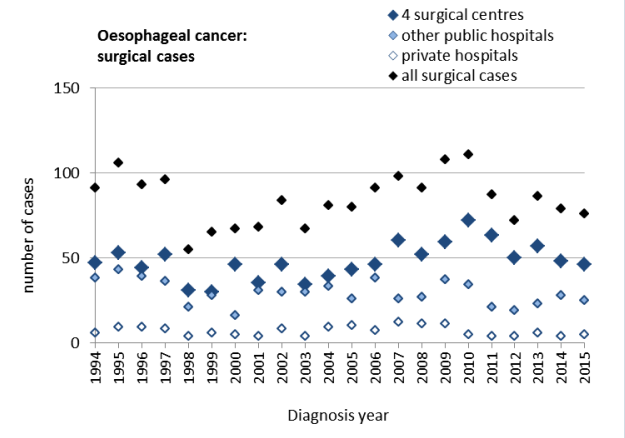
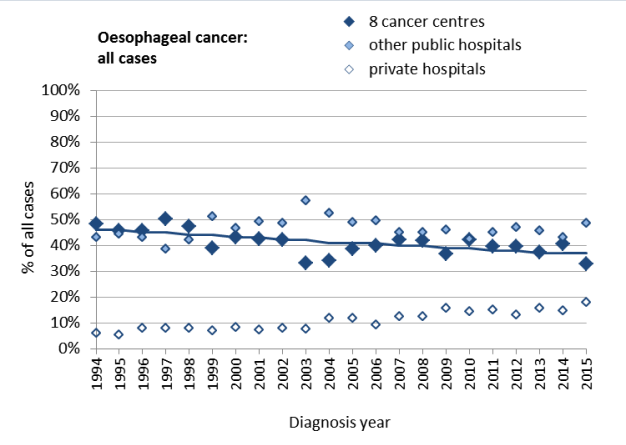
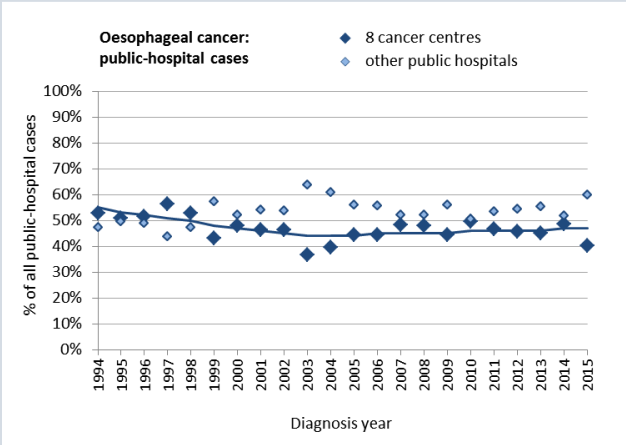


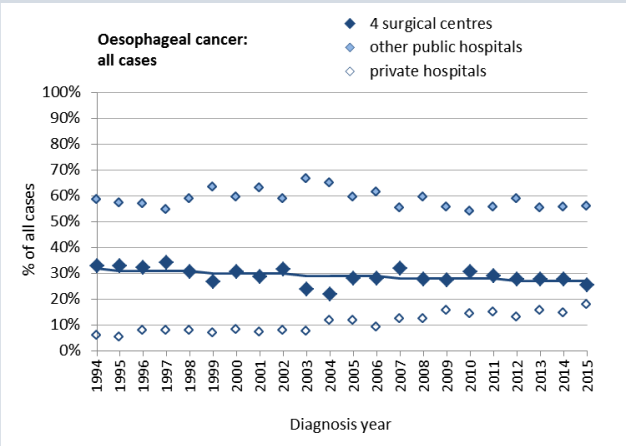
Figure a.1.3 Trends in proportion of *cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Oesophageal cancer



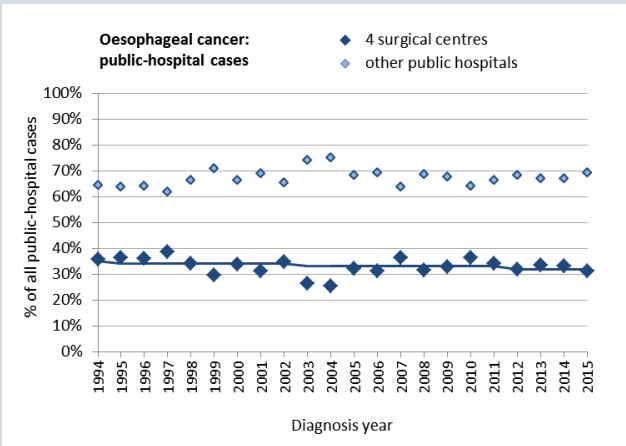
	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**-1.1%**	-1.7%,-0.6%	↓



	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2003	**-2.4%**	-4.3%,-0.6%	↓
	2003-2015	+0.5%	-1.7%,+2.8%	=



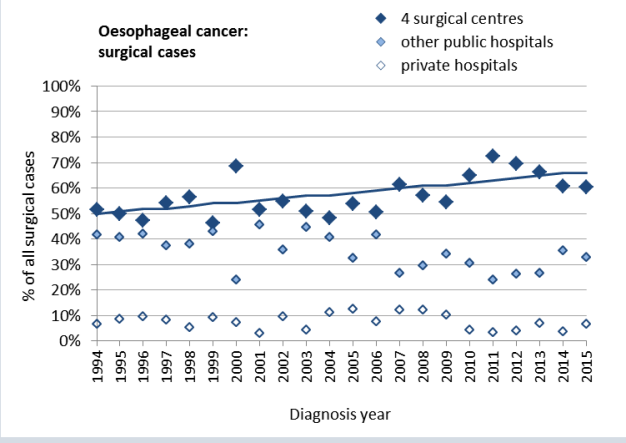
	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-2015	**-0.8%**	-1.4%,-0.2%	↓



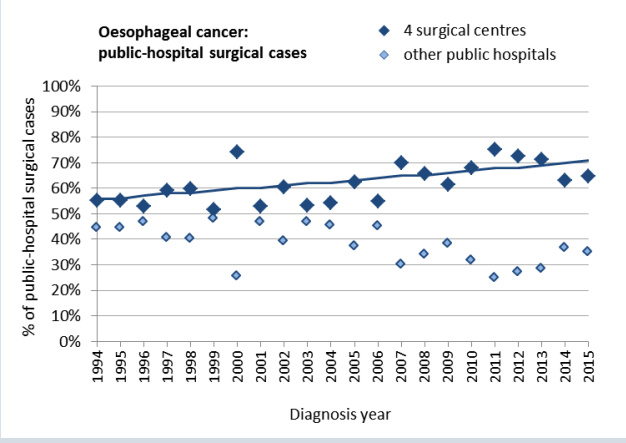
	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-2015	-0.4%	-1.0%,+0.3%	=

[1] 8 centres designated for a range of cancers but not specifically oesophageal cancer.
[2] 4 centres designated for upper gastrointestinal cancer surgery.
[3] APC = estimated annual % change (relative) across the period specified.

Figure a.1.4 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Oesophageal cancer



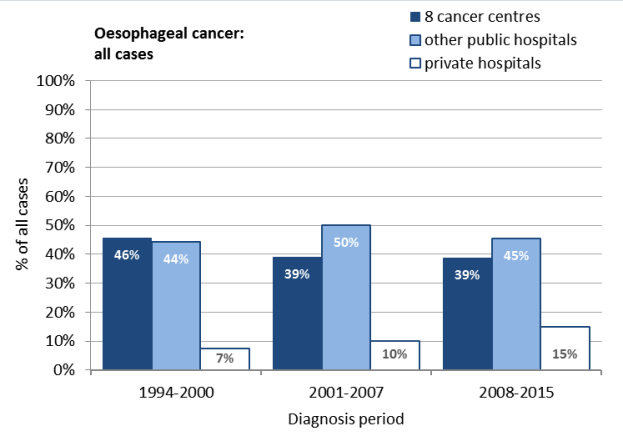
	Period	APC[2]	95% CI	Trend
4 surgical centres[1]	1994-2015	**+1.4%**	+0.6%,+2.1%	↑

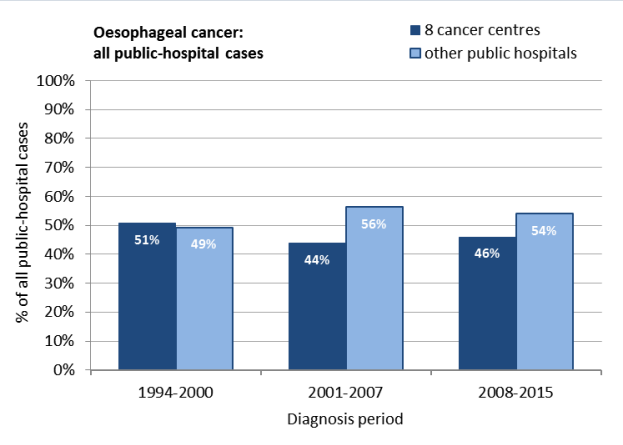


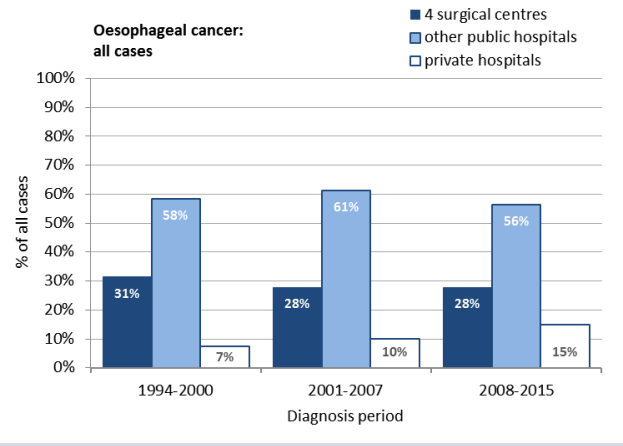
	Period	APC[2]	95% CI	Trend
4 surgical centres[1]	1994-2015	**+1.2%**	+0.5%,+1.9%	↑

[1] 4 centres designated for upper gastrointestinal cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.5 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Oesophageal cancer







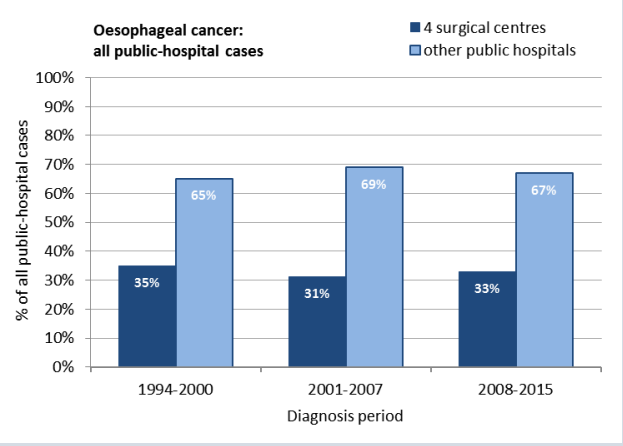
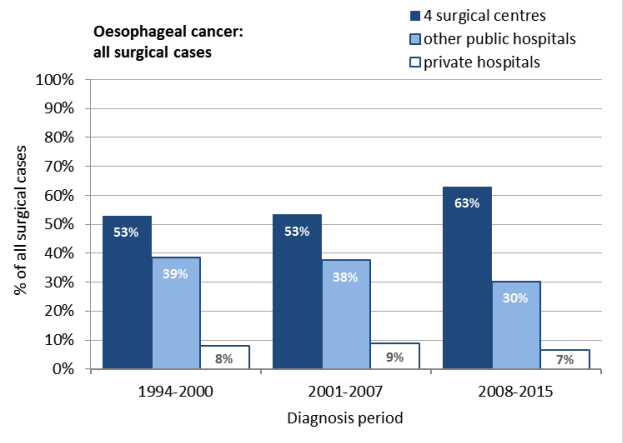
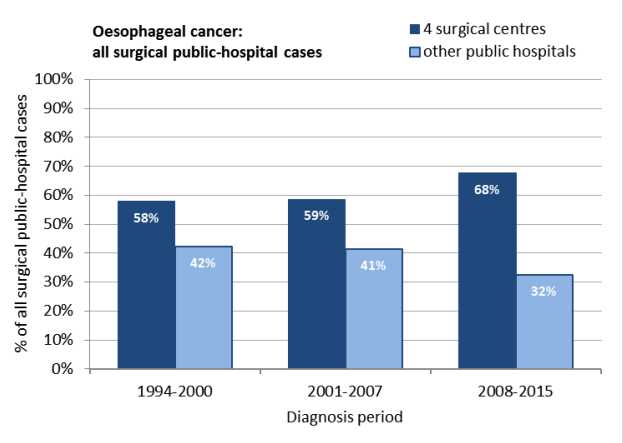


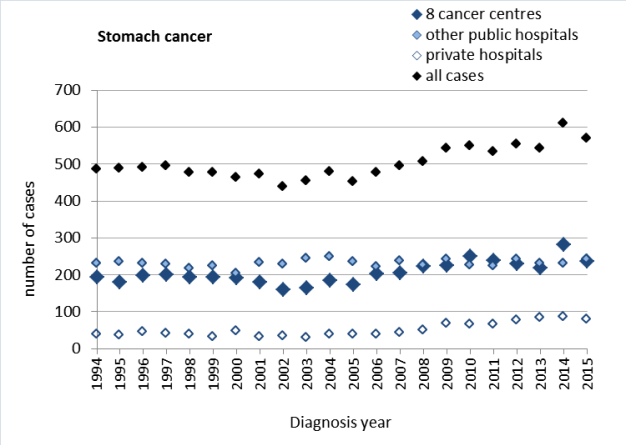
Figure a.1.6 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Oesophageal cancer





Stomach cancer

Figure a.1.7 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Stomach cancer



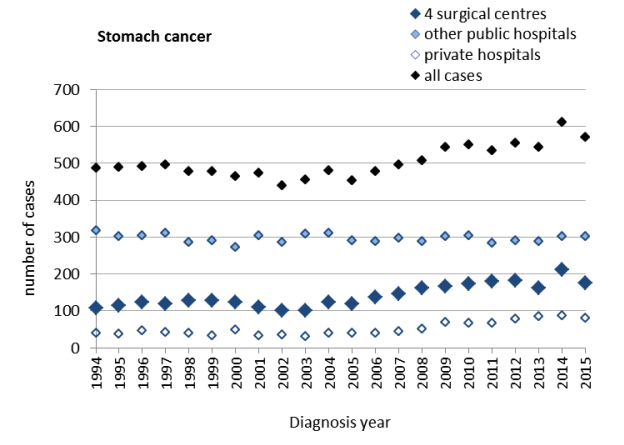


Figure a.1.8 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Stomach cancer

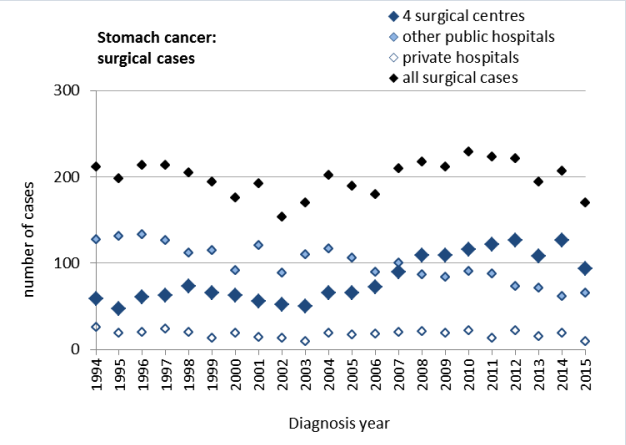
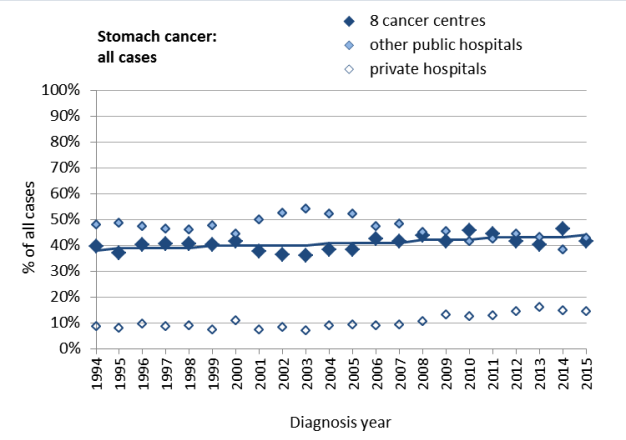
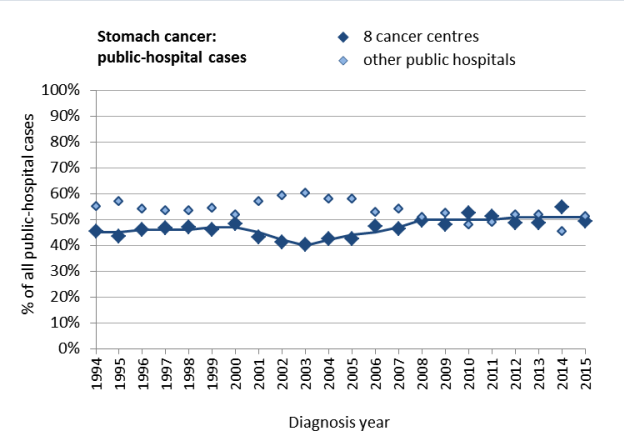


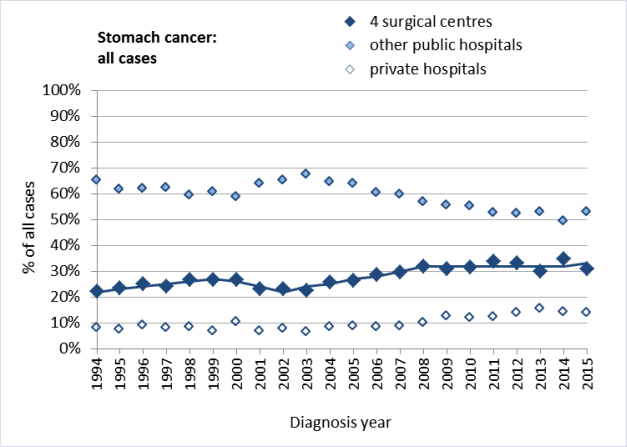
Figure a.1.9 Trends in proportion of *cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Stomach cancer

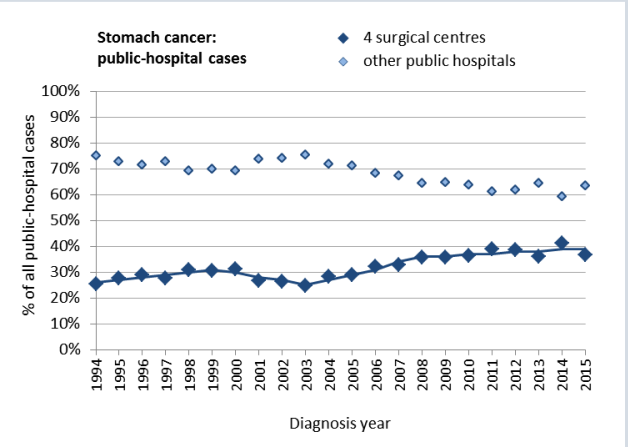




	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**+0.6%**	+0.2%,+1.0%	↑

	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2000	+0.9%	-1.7%,+3.6%	=
	2000-2003	-5.5%	-20%,+12%	=
	2003-2008	+4.5%	-0.6%,+9.8%	=
	2009-2015	+0.5%	-1.3%,+2.3%	=



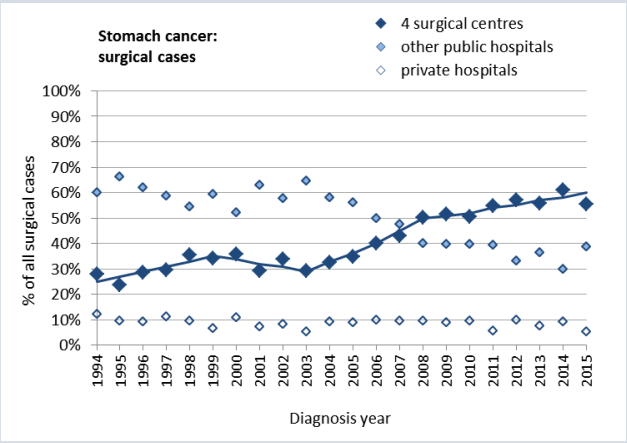


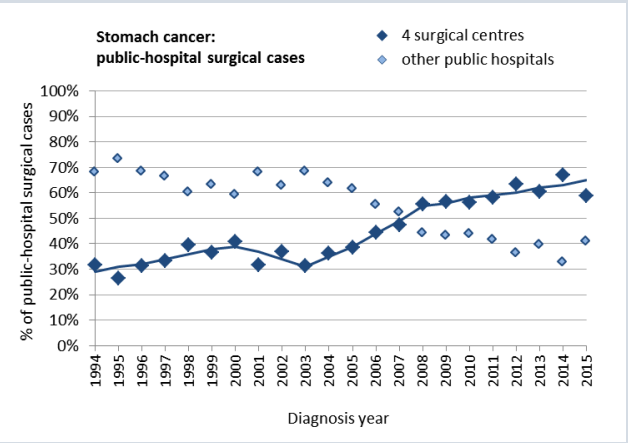
	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-1999	+4.0%	-0.2%,+8.3%	=
	1999-2002	**-6.4%**	-22%,+12%	↓
	2002-2008	**+6.0%**	+1.9%,+10%	↑
	2008-2015	+0.4%	-1.5%,+2.3%	=

	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-1999	+3.7%	-0.3%,+7.9%	=
	1999-2003	-5.1%	-13%,+3.8%	=
	2003-2008	**+7.3%**	+1.9%,+13%	↑
	2008-2015	+1.1%	-0.7%,+2.9%	=

[1] 8 centres designated for a range of cancers but not specifically stomach cancer.
[2] 4 centres designated for upper gastrointestinal cancer surgery.
[3] APC = estimated annual % change (relative) across the period specified.

Figure a.1.10 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Stomach cancer



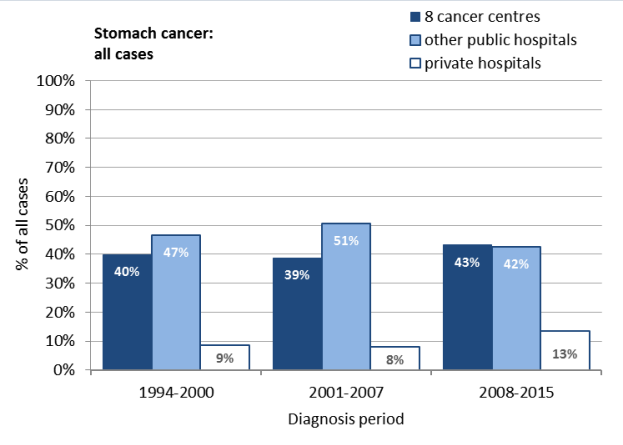


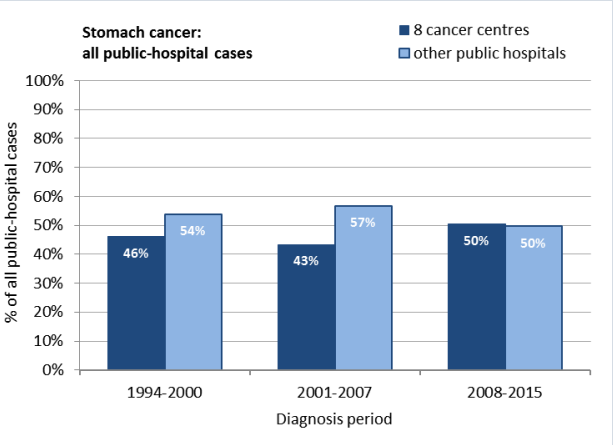
	Period	APC[2]	95% CI	Trend
4 surgical centres[1]	1994-1999	**+6.9%**	+0.9%,+13%	↑
	1999-2003	-4.6%	-16%,+8.9%	=
	2003-2008	**+11.1%**	+3.5%,+19%	↑
	2008-2015	**+2.7%**	+0.5%,+4.9%	↑

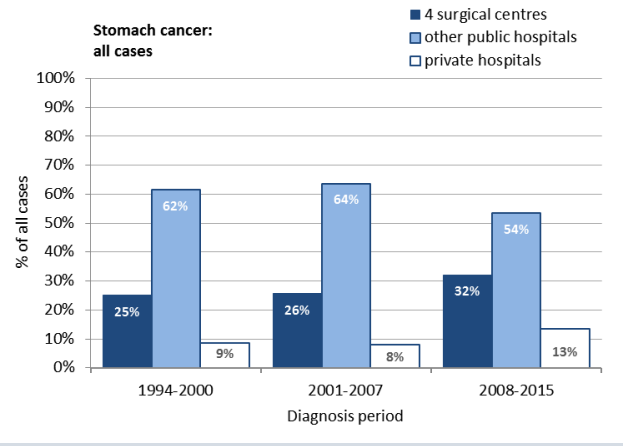
	Period	APC[2]	95% CI	Trend
4 surgical centres[1]	1994-2000	**+5.1%**	0.0%,0.0%	↑
	2000-2003	-7.3%	0.0%,0.0%	=
	2003-2008	**+11.8%**	0.0%,0.0%	↑
	2008-2015	**+2.3%**	0.0%,0.0%	↑

[1] 4 centres designated for upper gastrointestinal cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.11 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Stomach cancer







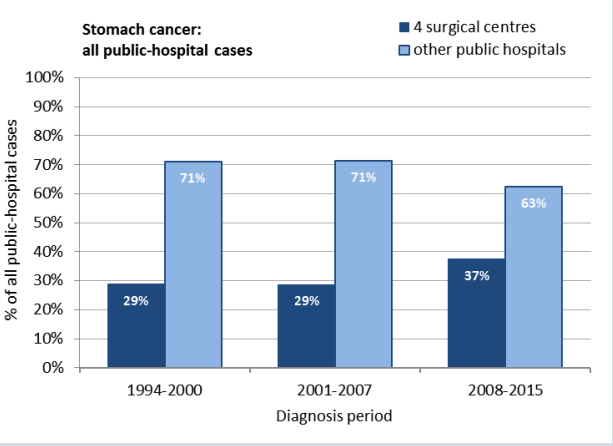
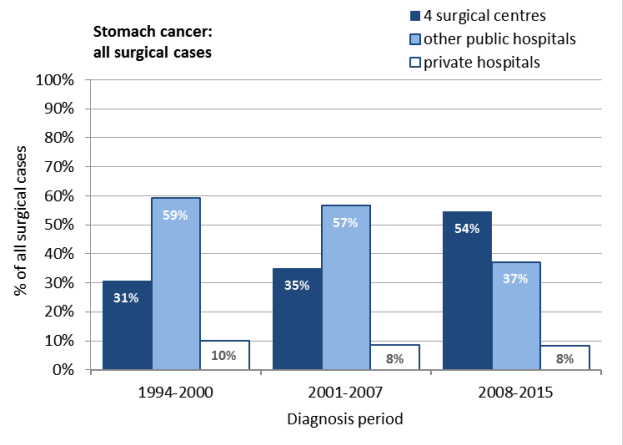
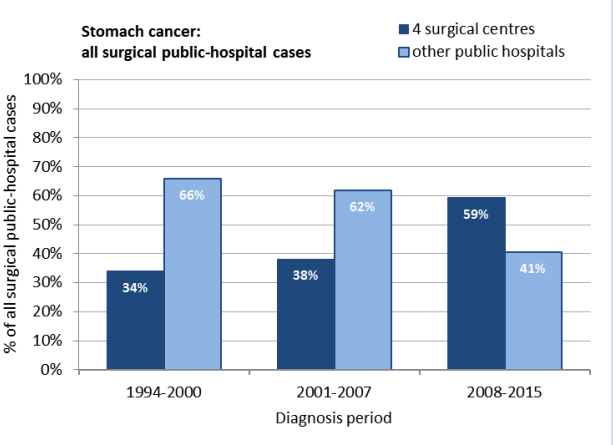


Figure a.1.12 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Stomach cancer





Rectal cancer

Figure a.1.13 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Rectal cancer

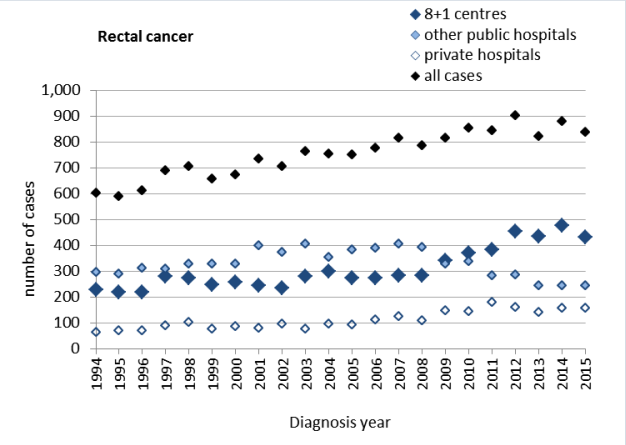


Figure a.1.14 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Rectal cancer

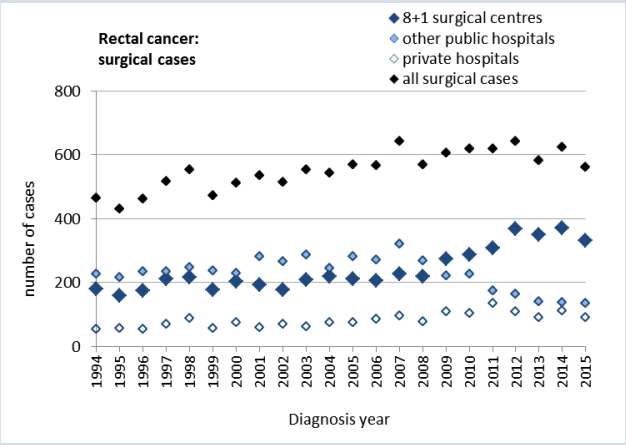
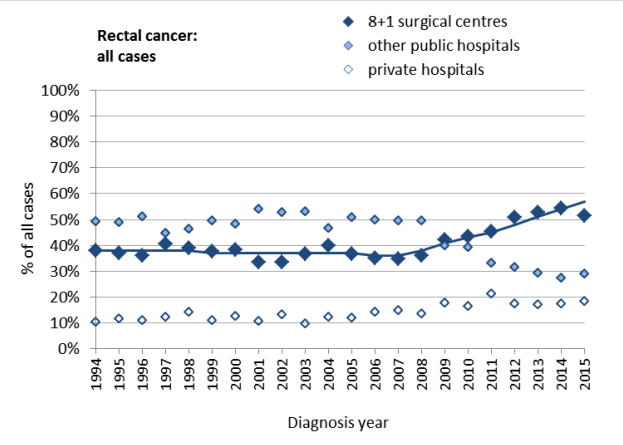
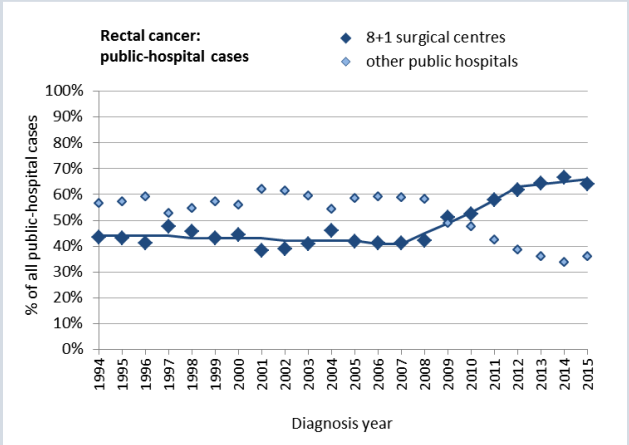


Figure a.1.15 Trends in proportion of *cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Rectal cancer



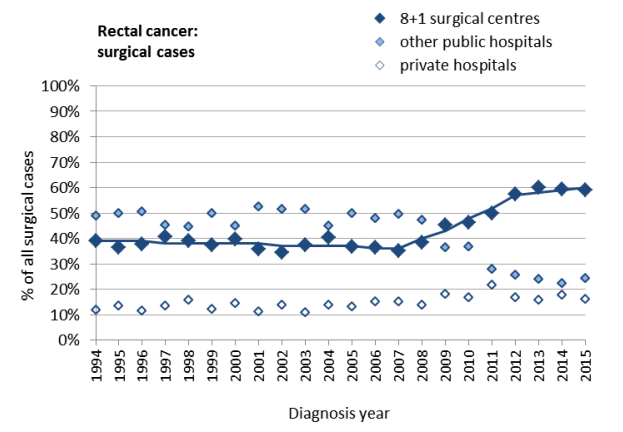
	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	-0.4%	-1.4%,+0.7%	=
	2007-2015	**+5.7%**	+4.0%,+7.5%	↑



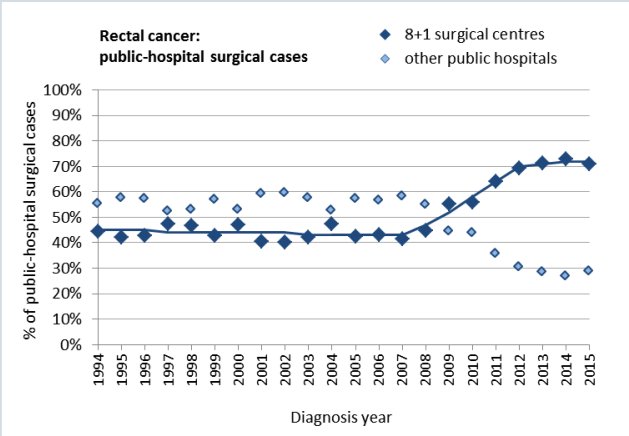
	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	-0.8%	-1.6,+0.4%	=
	2007-2012	**+8.8%**	+3.5%,+14.4%	↑
	2012-2015	1.4%	-4.3%,+7.6%	=

[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for rectal cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.16 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Rectal cancer



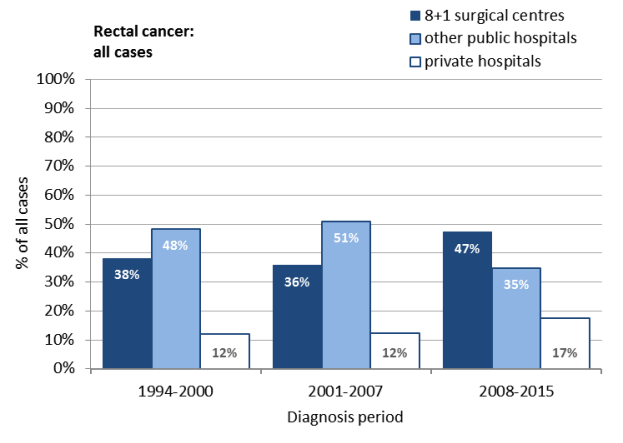
	Period	APC[2]	95% CI	Trend
8+1 surgical centres[1]	1994-2007	-0.6%	-1.3%,+0.2%	=
	2007-2012	**+9.5%**	+5.5%,+14%	↑
	2012-2015	+1.7%	-2.6%,+6.3%	=



	Period	APC[2]	95% CI	Trend
8+1 surgical centres[1]	1994-2007	-0.4%	-1.4%,+0.6%	=
	2007-2012	**+10.5%**	+5.6%,+16%	↑
	2012-2015	+0.9%	-4.0%,+6.1%	=

[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for rectal cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.17 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Rectal cancer



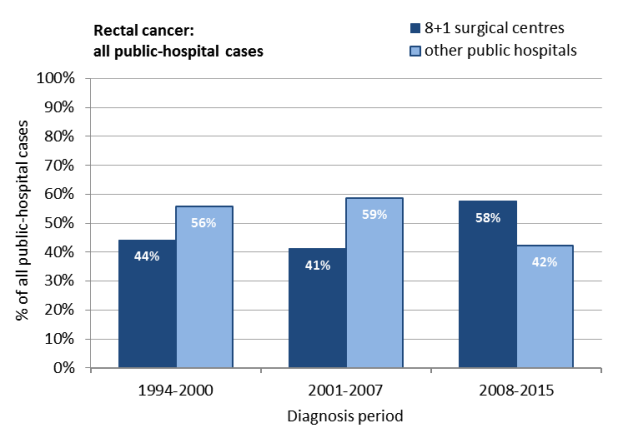
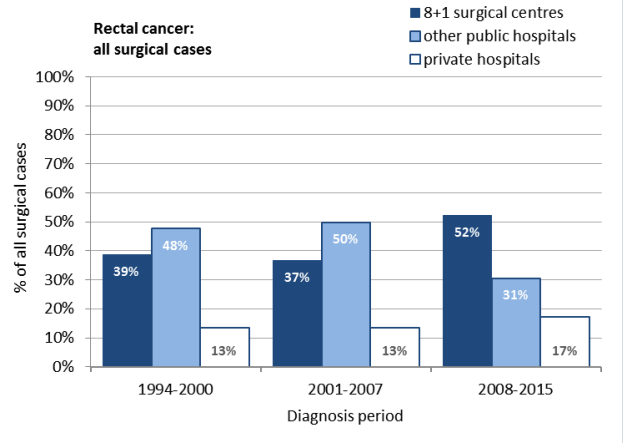
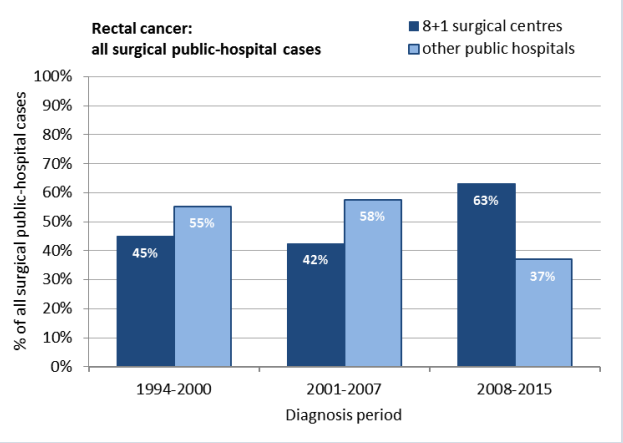


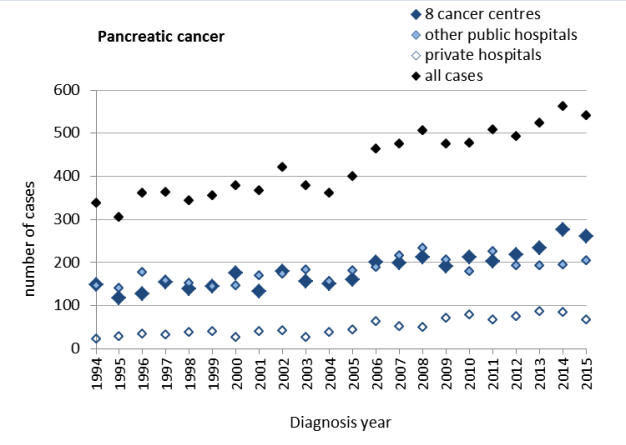
Figure a.1.18 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Rectal cancer





Pancreatic cancer

Figure a.1.19 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Pancreatic cancer



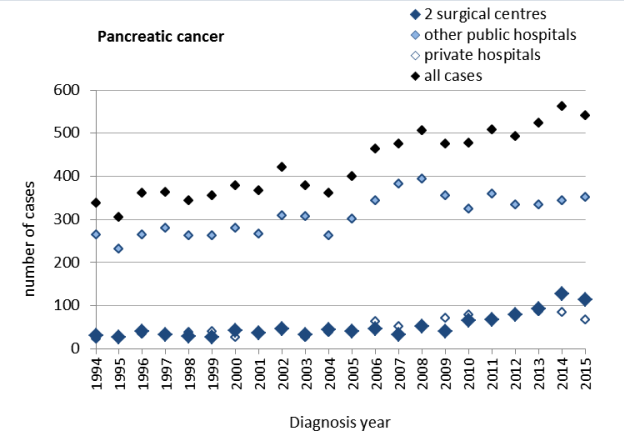


Figure a.1.20 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Pancreatic cancer

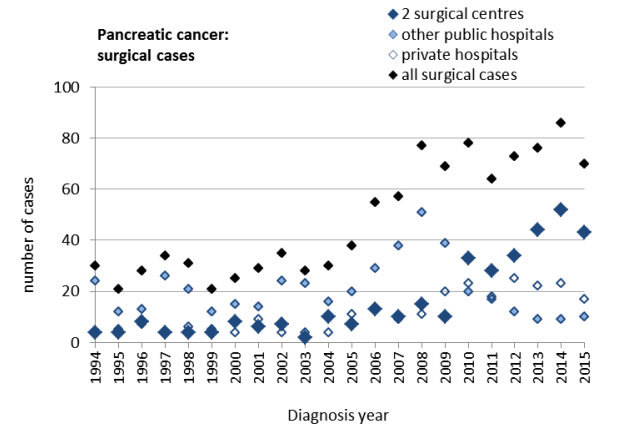
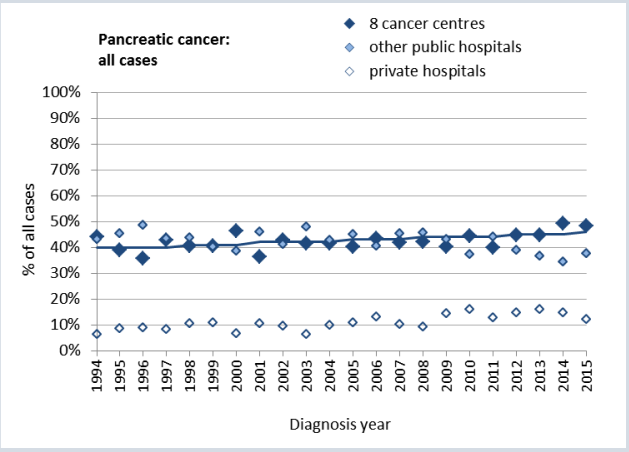
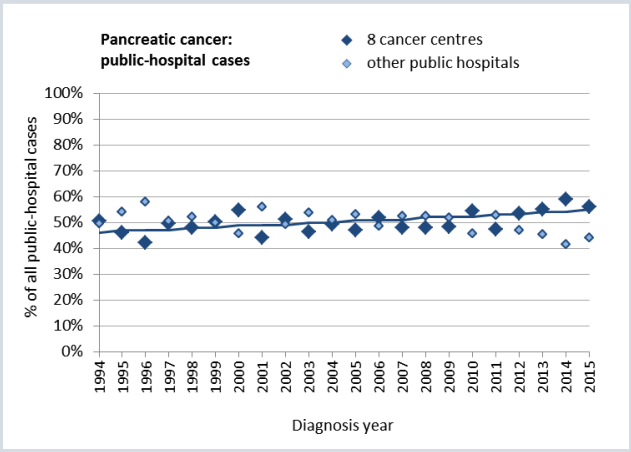


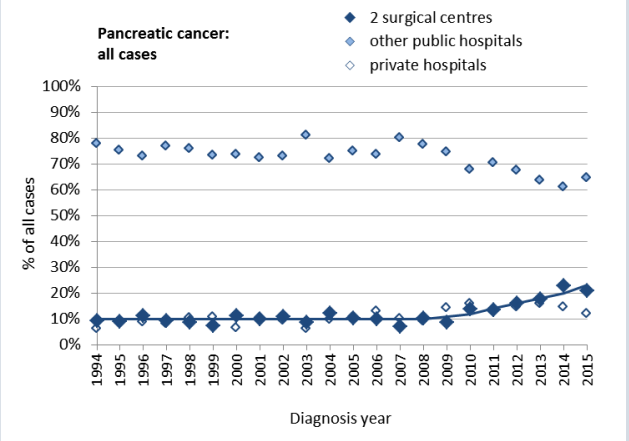
Figure a.1.21 Trends in proportion of *cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Pancreatic cancer



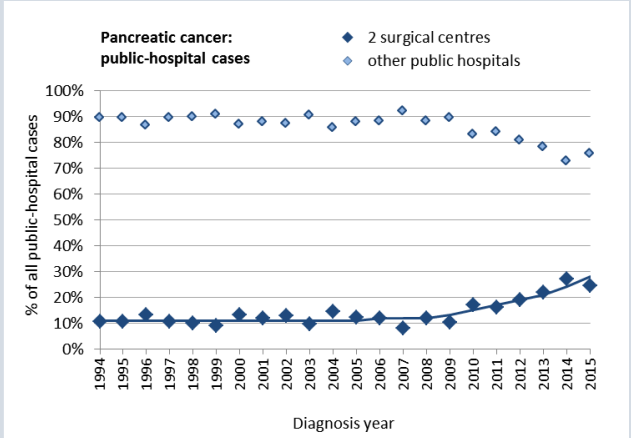
	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**+0.7%**	+0.2%,+1.2%	↑



	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**+0.8%**	+0.3%,+1.3%	↑



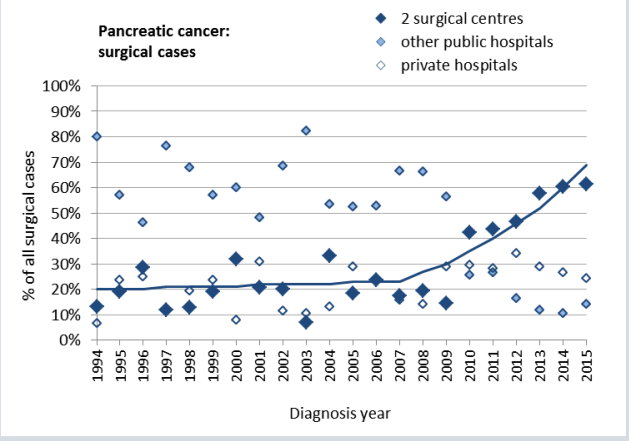
	Period	APC[3]	95% CI	Trend
2 surgical centres[2]	1994-2008	+0.1%	-2.3%,+2.5%	=
	2008-2015	**+13.1%**	+8.1%,+18%	↑



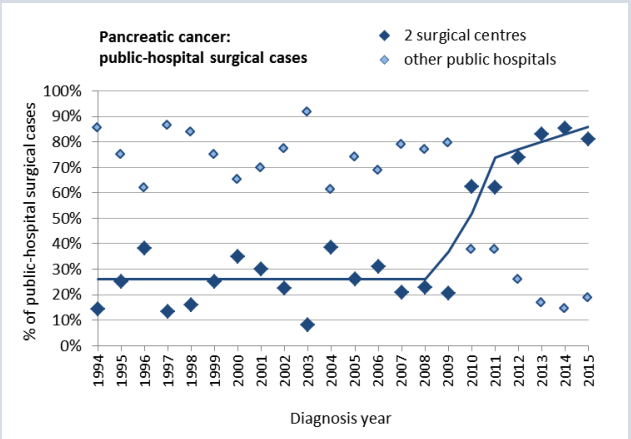
	Period	APC[3]	95% CI	Trend
2 surgical centres[2]	1994-2008	+0.1%	-2.4%,+2.7%	=
	2008-2015	**+13.2%**	+7.9%,19%	↑

[1] 8 centres designated for a range of cancers but not specifically pancreatic cancer.
[2] 2 centres designated for pancreatic cancer surgery.
[3] APC = estimated annual % change (relative) across the period specified.

Figure a.1.22 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Pancreatic cancer



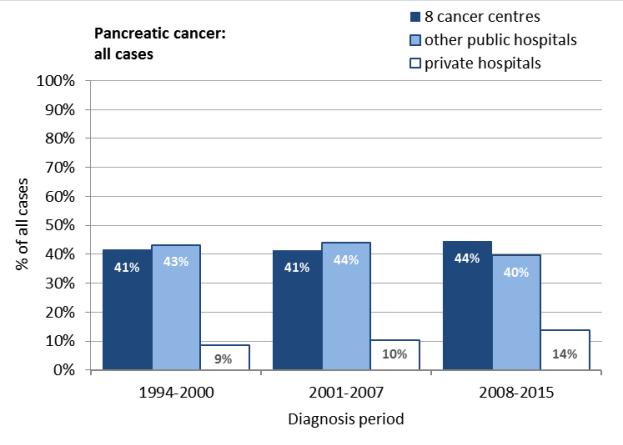
	Period	APC[2]	95% CI	Trend
2 surgical centres[1]	1994-2007	+1.2%	-5.2%,+8.1%	=
	2007-2015	**+14.6%**	+8.2%,+21%	↑

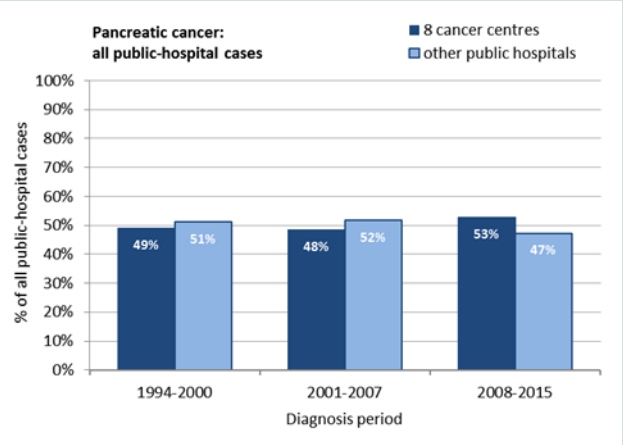


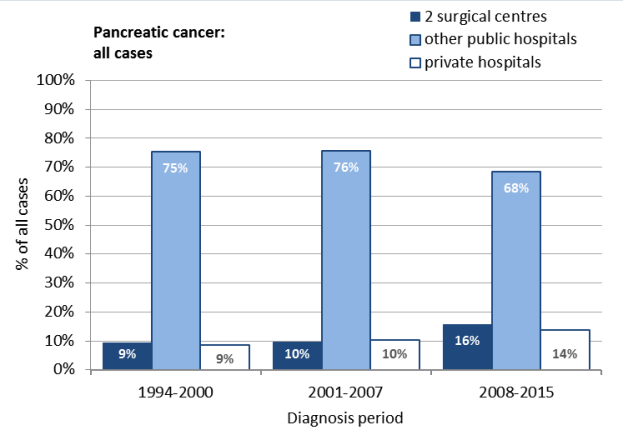
	Period	APC[2]	95% CI	Trend
2 surgical centres[1]	1994-2008	+0.1%	-4.8%,+5.3%	=
	2008-2011	+40.7%	-29%,+181%	=
	2011-2015	+3.9%	-3.7%,+12%	=

[1] 2 centres designated for pancreatic cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.23 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Pancreatic cancer







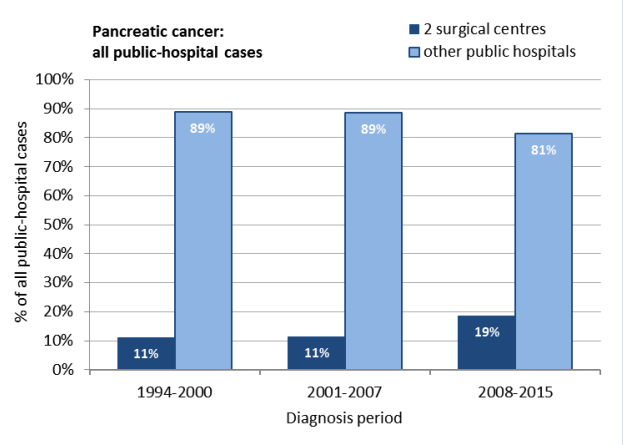
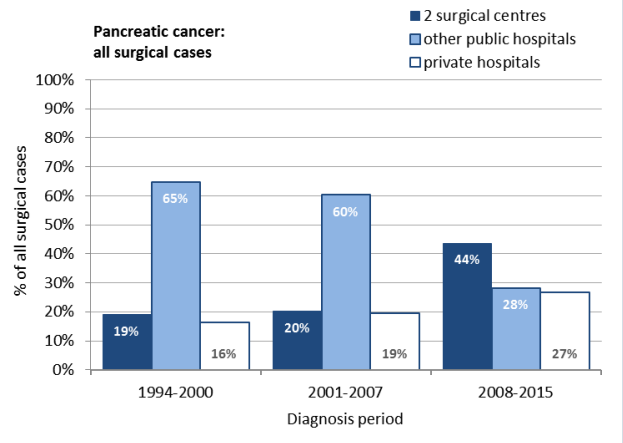
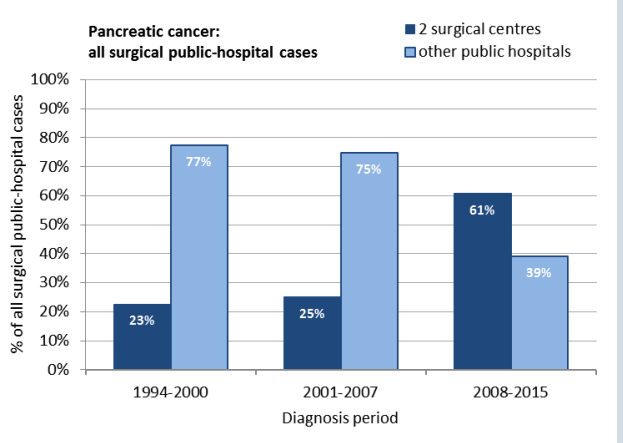


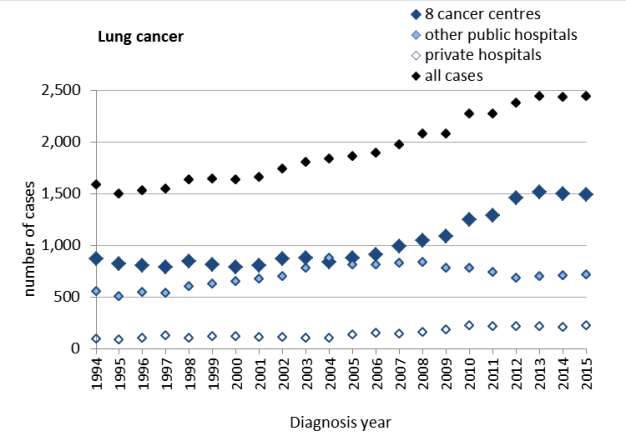
Figure a.1.24 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Pancreatic cancer





Lung cancer

Figure a.1.25 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Lung cancer



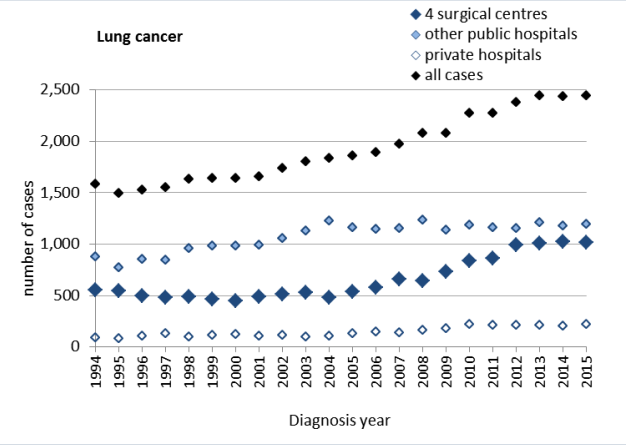


Figure a.1.26 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Lung cancer

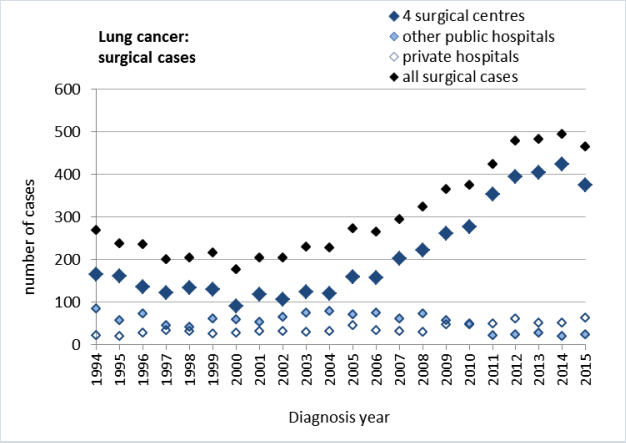
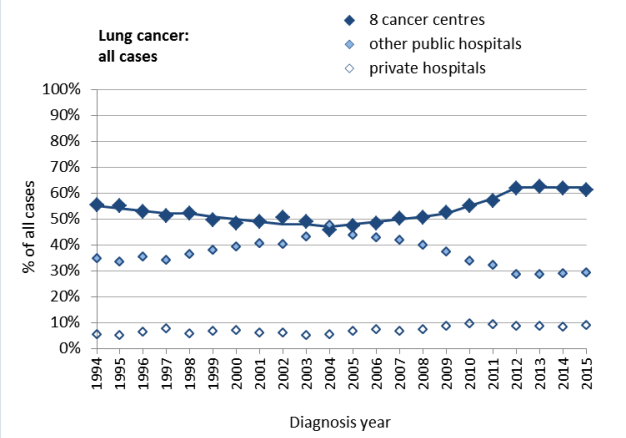
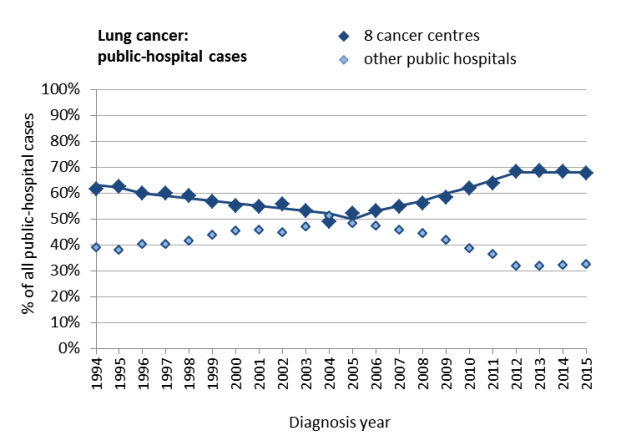


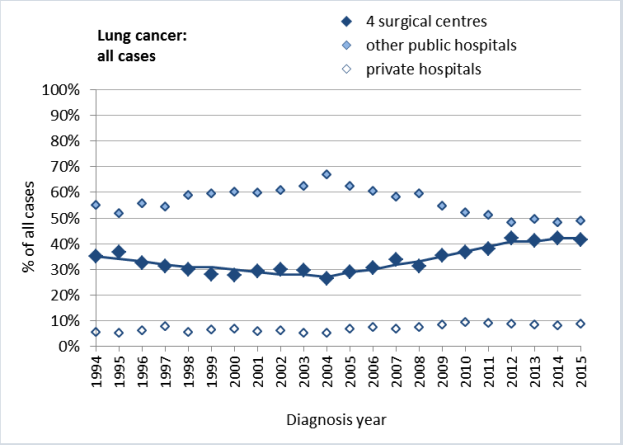
Figure a.1.27 Trends in proportion of *cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Lung cancer

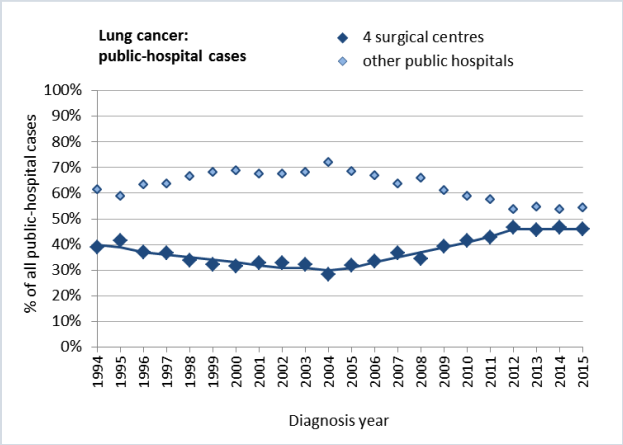




	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2004	**-1.6%**	-2.1%,-1.1%	↓
	2004-2009	**+2.1%**	+0.1,+4.2%	↑
	2009-2012	**+5.9%**	+0.6,+11%	↑
	2012-2015	+0.1%	-2.1%,-2.3%	=

	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2005	**-2.0%**	-2.4%,+1.6%	↓
	2005-2012	**+4.2%**	+3.3%,+5.2%	↑
	2012-2015	+0.3%	-1.6%,+2.3%	=



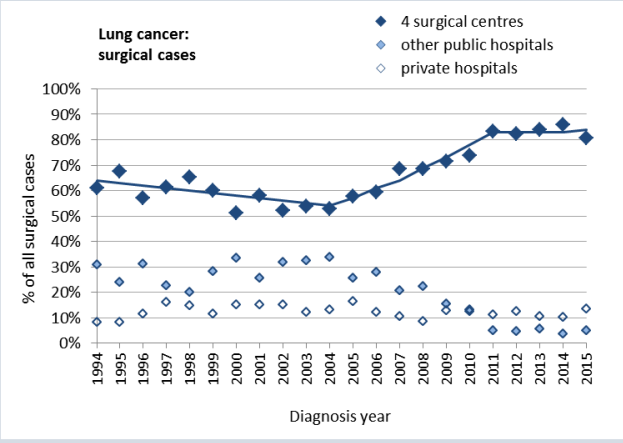


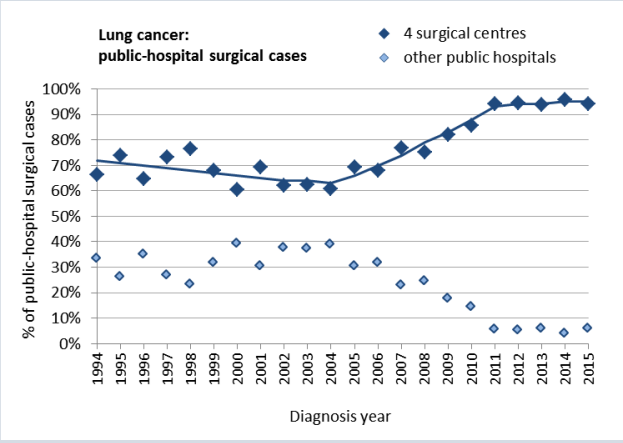
	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-2004	**-2.4%**	-3.6%,-1.2%	↓
	2004-2012	**+5.4%**	+3.4%,+7.3%	↑
	2012-2015	+0.7%	-4.5%,+6.2%	=

	Period	APC[3]	95% CI	Trend
4 surgical centres[2]	1994-2004	**-2.8%**	-3.9%,-1.8%	↓
	2004-2012	**+5.6%**	+3.9%,+7.3%	↑
	2012-2015	+0.2%	-4.3%,+4.9%	=

[1] 8 centres designated for lung cancer rapid access clinics and for a range of other cancers.
[2] 4 centres designated for lung cancer surgery.
[3] APC = estimated annual % change (relative) across the period specified

Figure a.1.28 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Lung cancer



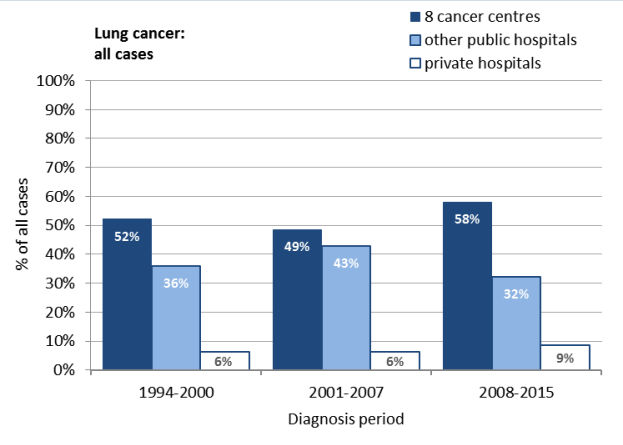


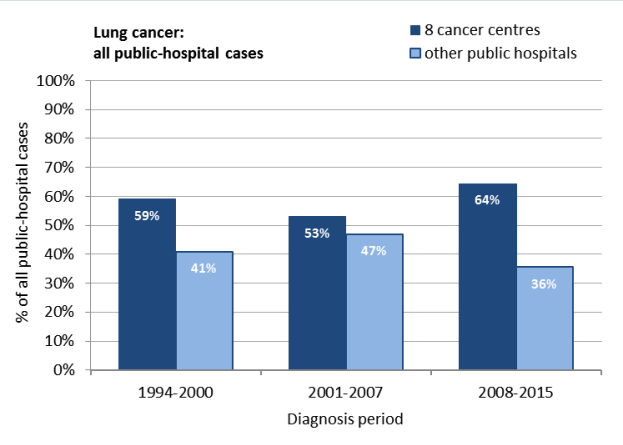
	Period	APC[2]	95% CI	Trend
4 surgical centres[1]	1994-2004	**-1.8%**	-3.4%,-0.3%	↓
	2004-2011	**+6.4%**	+3.8%,+9.0%	↑
	2011-2015	+0.4%	-2.1%,+2.9%	=

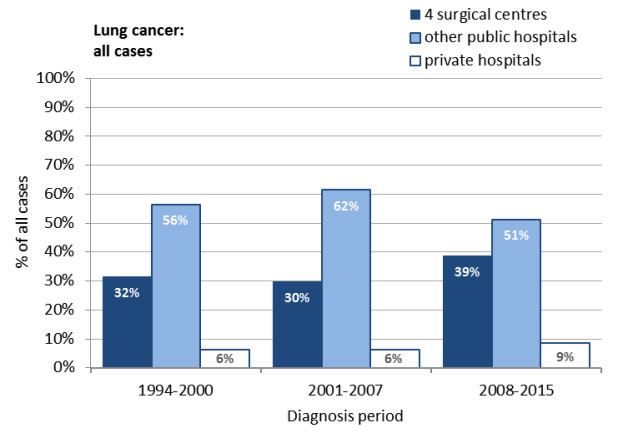
	Period	APC[2]	95% CI	Trend
4 surgical centres[1]	1994-2004	-1.5%	-3.0%,+0.1%	=
	2004-2011	**+5.9%**	+3.6%,+8.3%	↑
	2011-2015	+0.4%	-1.1%,+2.0%	=

[1] 4 centres designated for lung cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.29 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Lung cancer







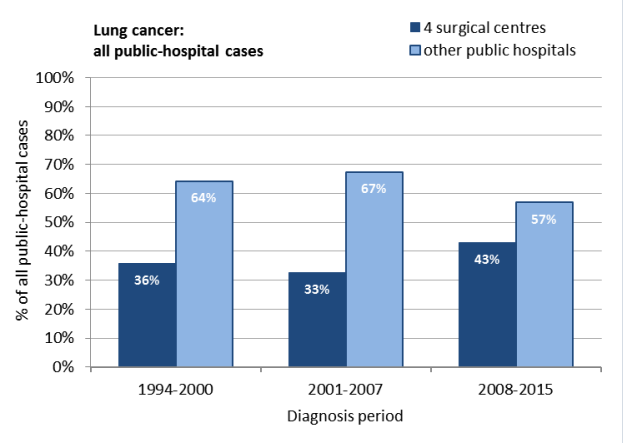
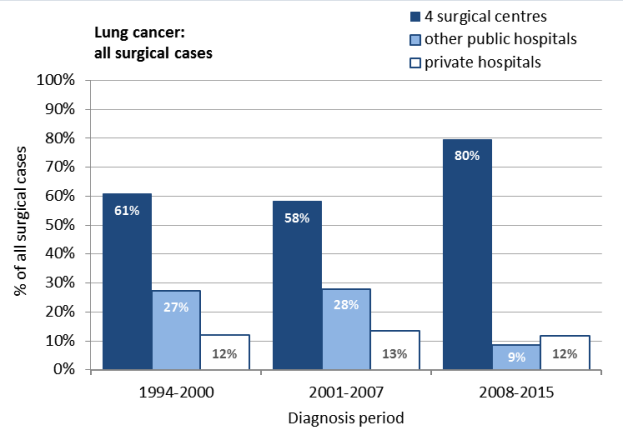
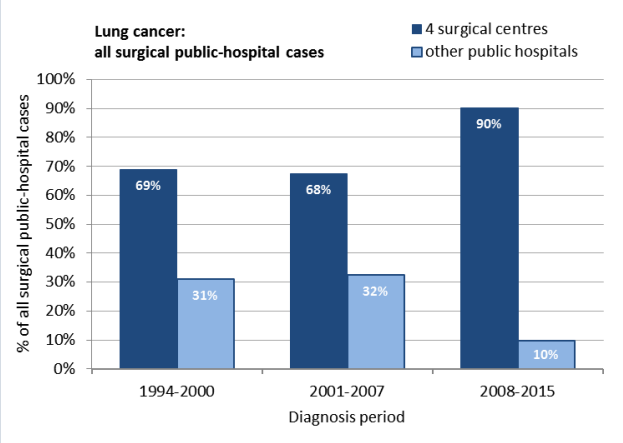


Figure a.1.30 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Lung cancer





Breast cancer

Figure a.1.31 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Breast cancer

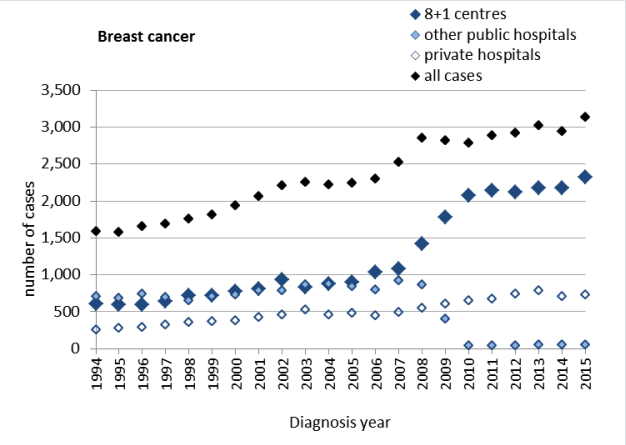


Figure a.1.32 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Breast cancer

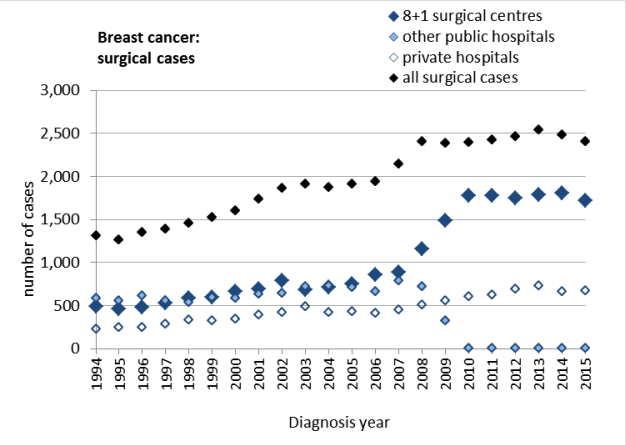
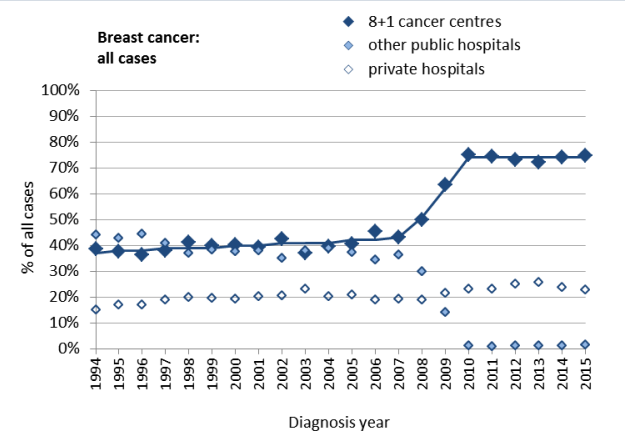
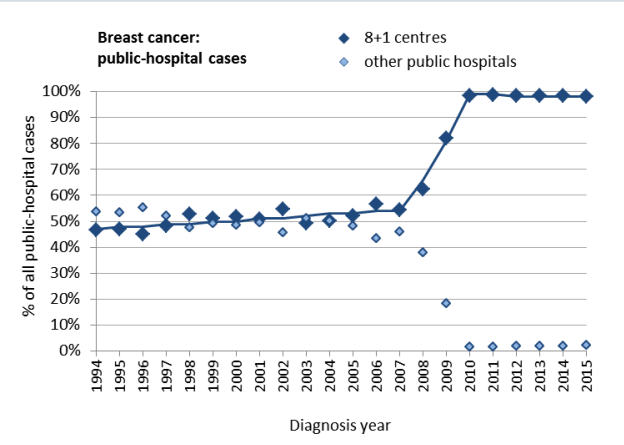


Figure a.1.33 Trends in proportion of *cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Breast cancer



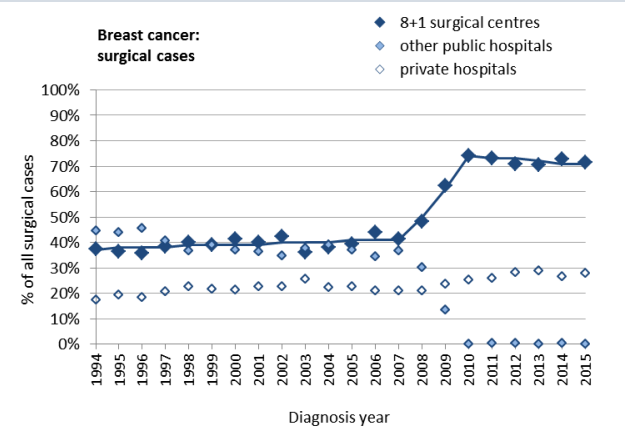


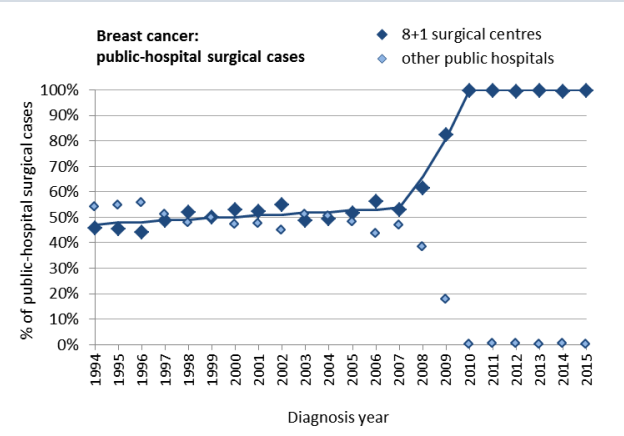
	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	**+1.0%**	+0.2%,+1.9%	↑
	2007-2010	**+20.3%**	+9.6%,+32%	↑
	2010-2015	-0.2%	-1.6%,+1.1%	=

	Period	APC[2]	95% CI	Trend
8+1 centres[1]	1994-2007	**+1.0%**	+0.4%,+1.7%	↑
	2007-2010	**+22.1%**	+14%,+31%	↑
	2010-2015	-0.1%	-0.4%,+0.2%	=

[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for symptomatic breast disease and breast cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified

Figure a.1.34 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Breast cancer



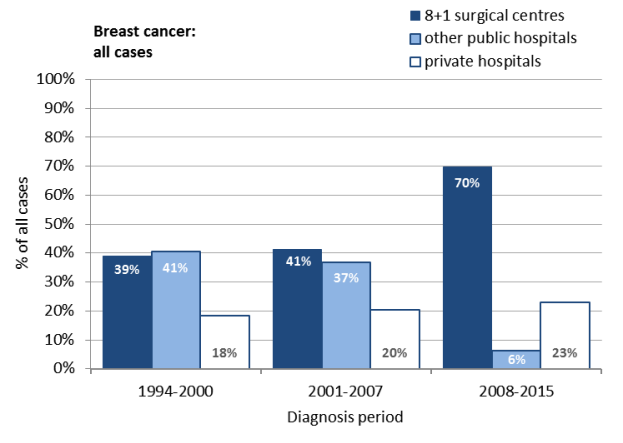


	Period	APC[2]	95% CI	Trend
8+1 surgical centres[1]	1994-2007	+0.8%	-0.1%,+1.7%	=
	2007-2010	**+21.1%**	+9.5%,+34%	↑
	2010-2015	-0.7%	-2.2%,+0.8%	=

	Period	APC[2]	95% CI	Trend
8+1 surgical centres[1]	1994-2007	**+1.0%**	+0.2%,+1.8%	↑
	2007-2010	**+23.0%**	+13%,+34%	↑
	2010-2015	0.0%	-0.1%,+0.2%	

[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for symptomatic breast disease and breast cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.35 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Breast cancer



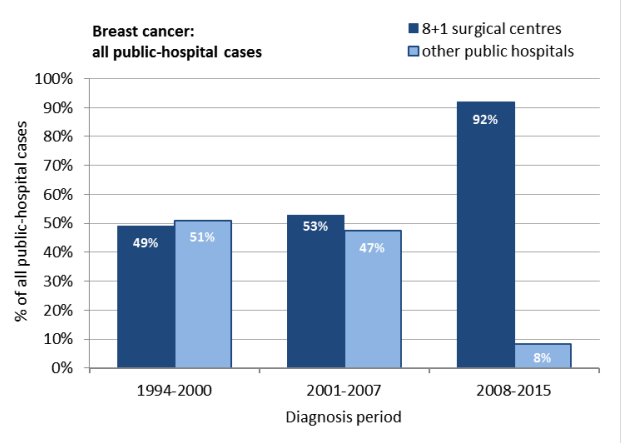
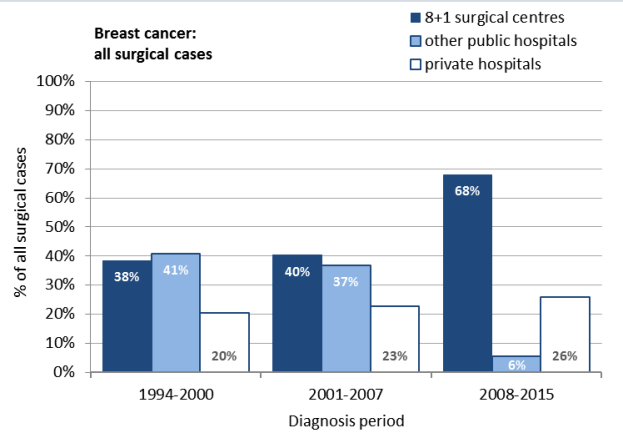
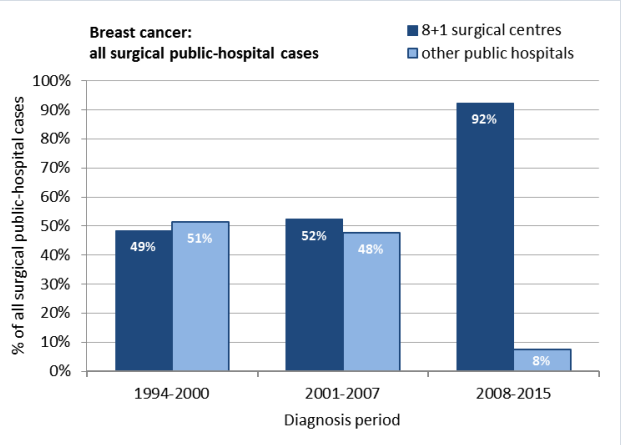


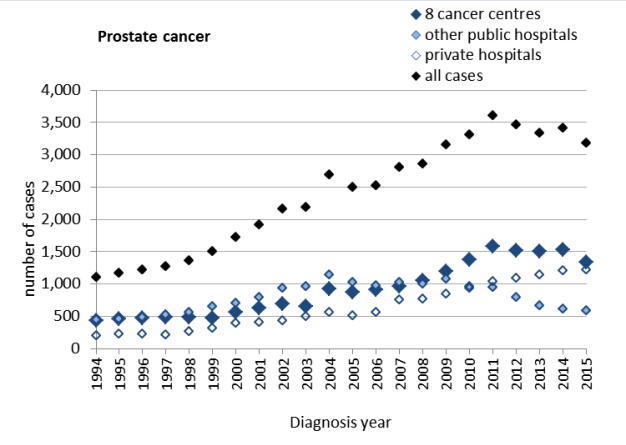
Figure a.1.36 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Breast cancer





Prostate cancer

Figure a.1.37 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Prostate cancer



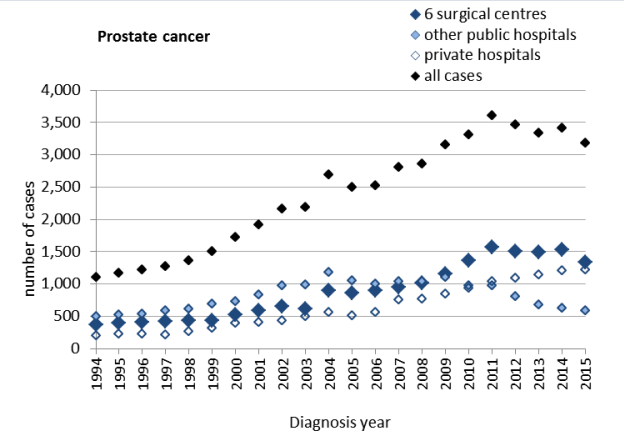


Figure a.1.38 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Prostate cancer

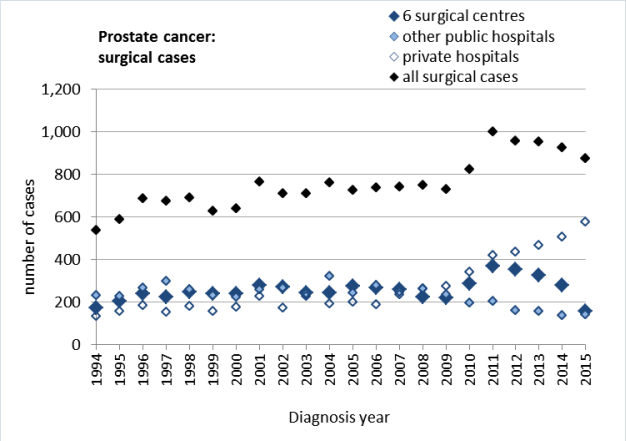
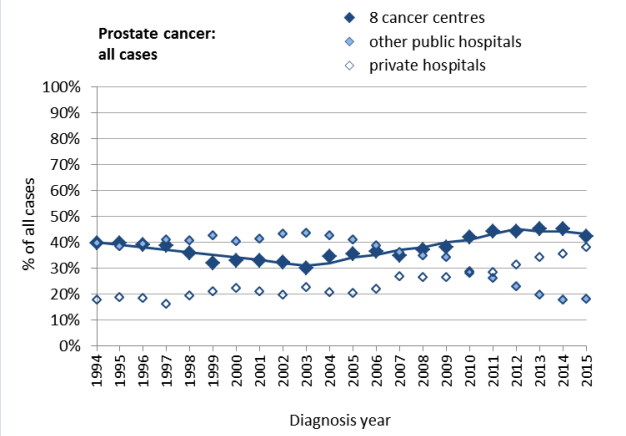
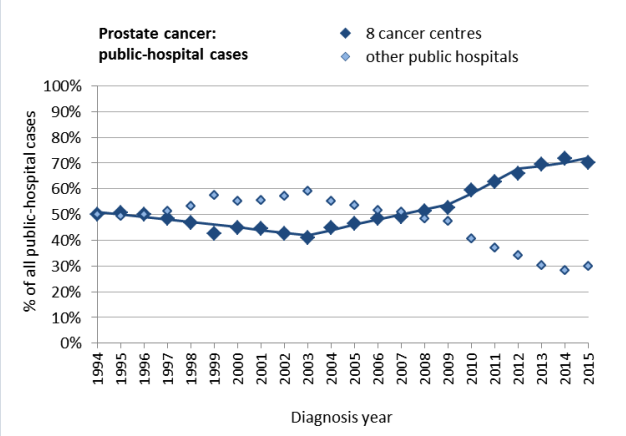


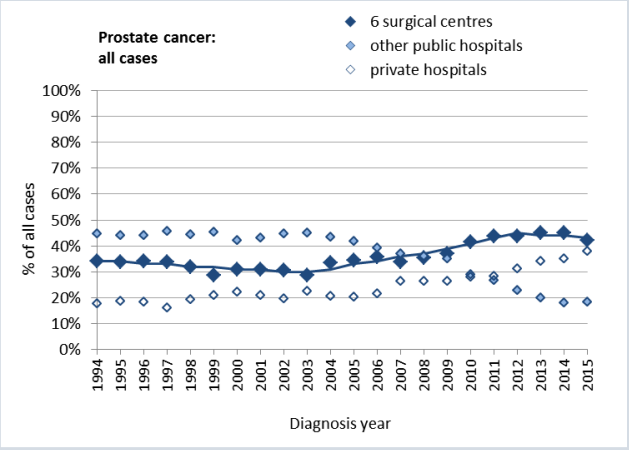
Figure a.1.39 Trends in proportion of cases *first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Prostate cancer

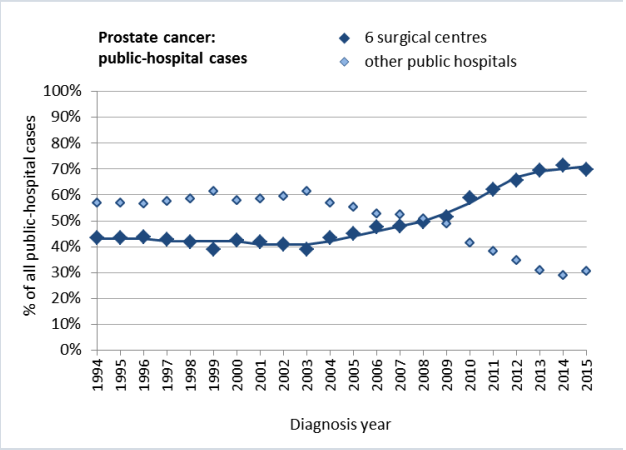




	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2003	**-2.8%**	-4.2%,-1.4%	↓
	2003-2012	**+4.1%**	+2.9%,+5.3%	↑
	2012-2015	-1.0%	-5.5%,+3.6%	=

	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2003	**-2.1%**	-2.9%,-1.3%	↓
	2003-2009	**+4.2%**	+2.7%,+5.7%	↑
	2009-2012	**+7.8%**	+3.1%,+13%	↑
	2012-2015	+2.0%	-0.1%,+4.0%	=



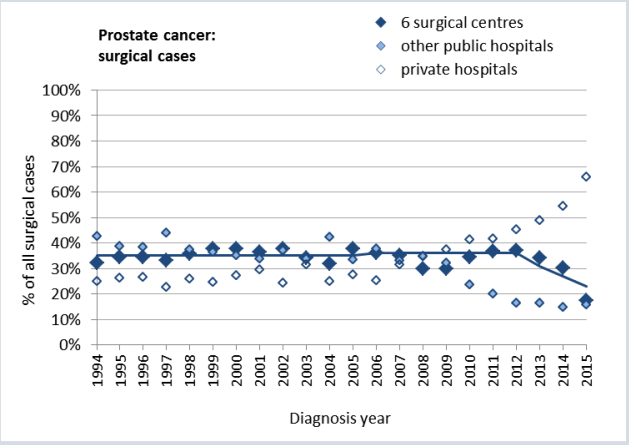


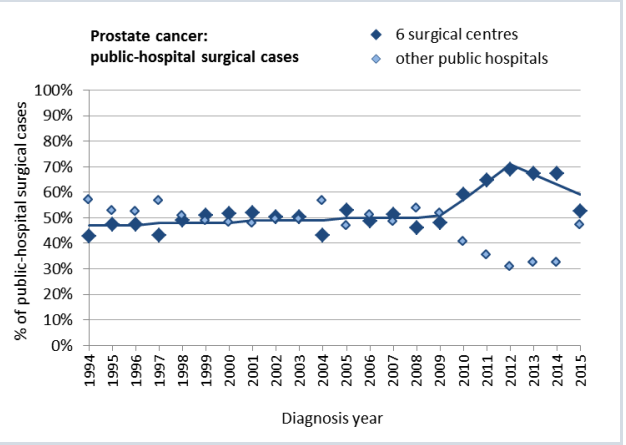
	Period	APC[3]	95% CI	Trend
6 surgical centres[2]	1994-2003	-1.4%	-3.0%,+0.1%	=
	2003-2012	**+4.5%**	+3.3%,+5.8%	↑
	2012-2015	-1.0%	-5.5%,+3.8%	=

	Period	APC[3]	95% CI	Trend
6 surgical centres[2]	1994-2003	-0.7%	-1.6%,+0.1%	=
	2003-2009	**+4.4%**	+2.9%,+5.9%	↑
	2009-2012	**+8.5%**	+3.7%,+13%	↑
	2012-2015	+1.9%	-0.1%,+4.0%	=

[1] 8 centres designated for prostate cancer rapid access clinics and for a range of cancers.
[2] 6 centres designated for prostate cancer surgery.
[3] APC = estimated annual % change (relative) across the period specified

Figure a.1.40 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Prostate cancer



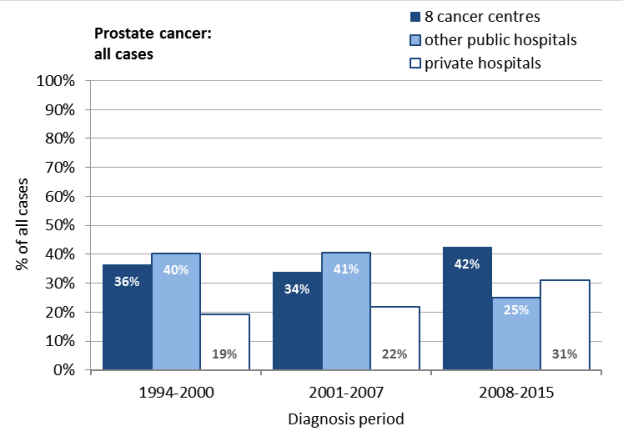


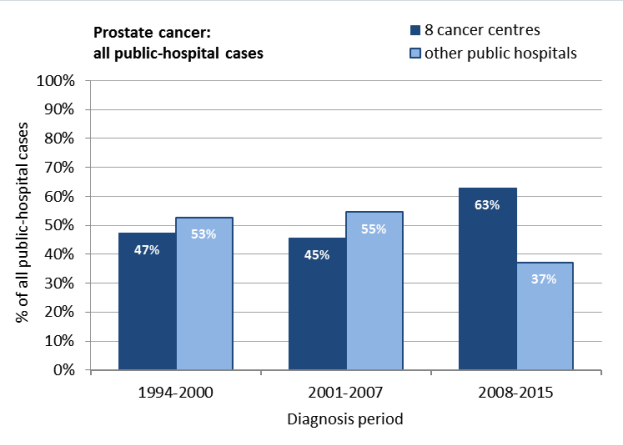
	Period	APC[2]	95% CI	Trend
6 surgical centres[1]	1994-2012	+0.2%	-0.6%,+1.0%	=
	2012-2015	**-13.9%**	-25%,-1.2%	↓

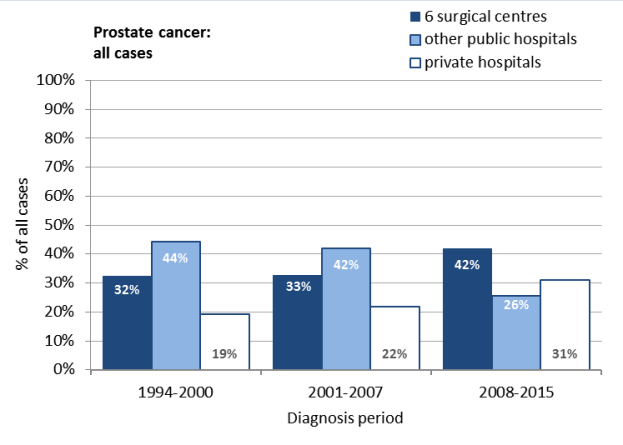
	Period	APC[2]	95% CI	Trend
6 surgical centres[1]	1994-2009	+0.5%	-0.5%,+1.5%	=
	2009-2012	+12.1%	-5.0%,+32%	=
	2012-2015	-6.1%	-15%,+3.9%	=

[1] 6 centres designated for prostate cancer surgery.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.41 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Prostate cancer







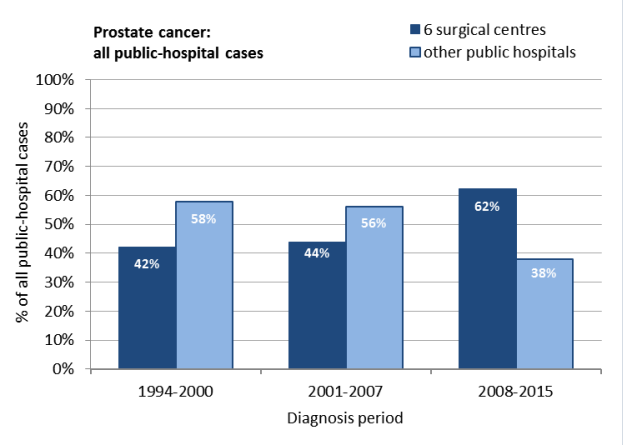
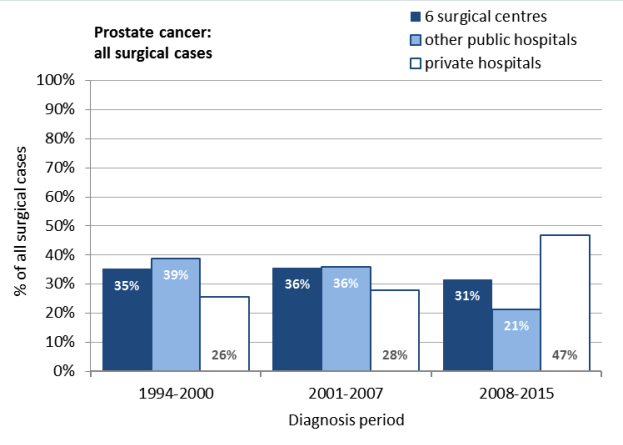
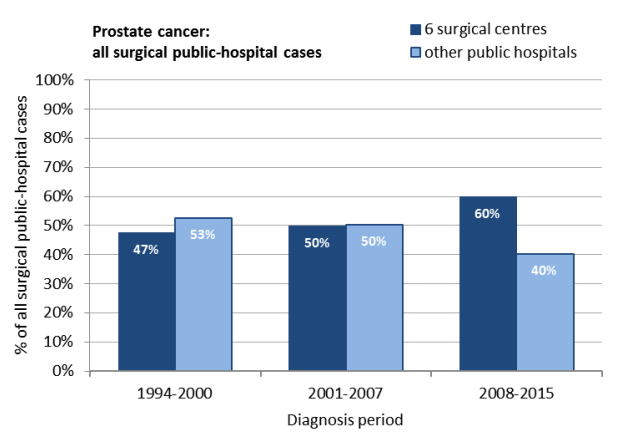


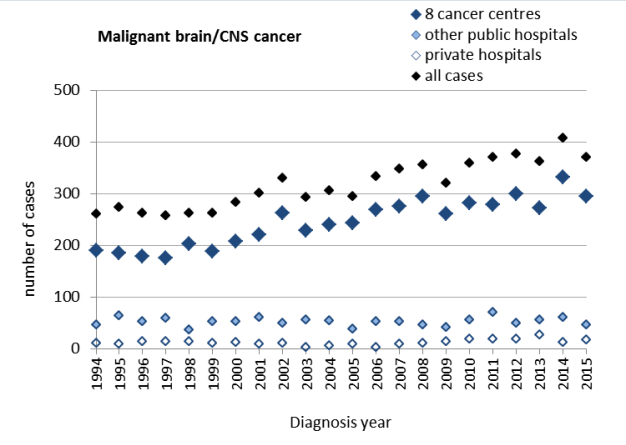
Figure a.1.42 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Prostate cancer





Malignant brain/CNS cancer

Figure a.1.43 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Malignant brain/CNS cancer



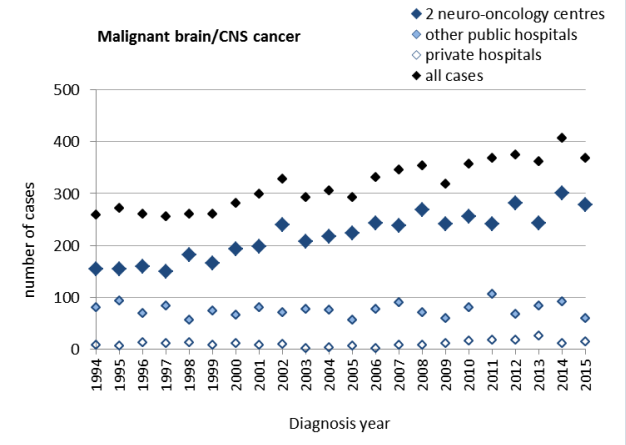


Figure a.1.44 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Malignant brain/CNS cancer

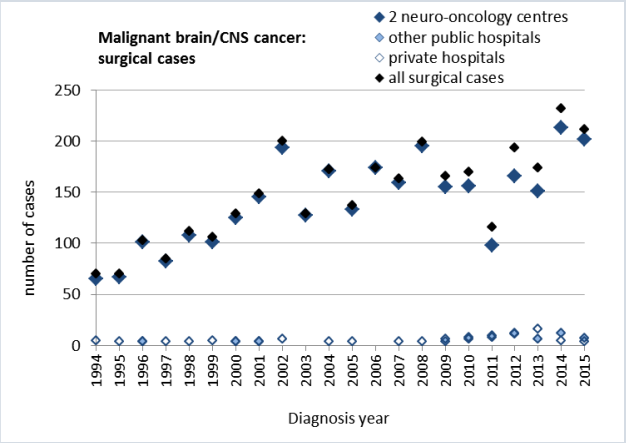
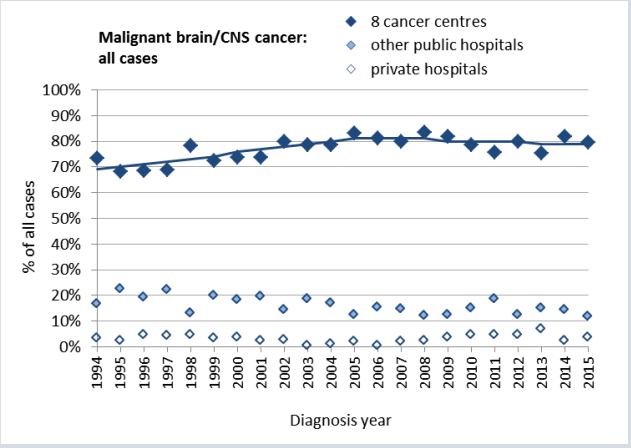
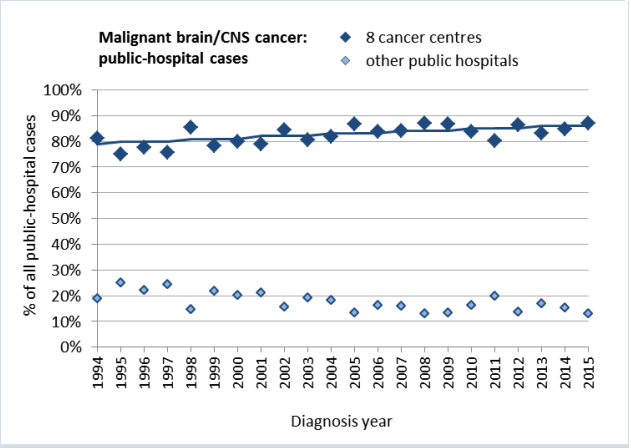


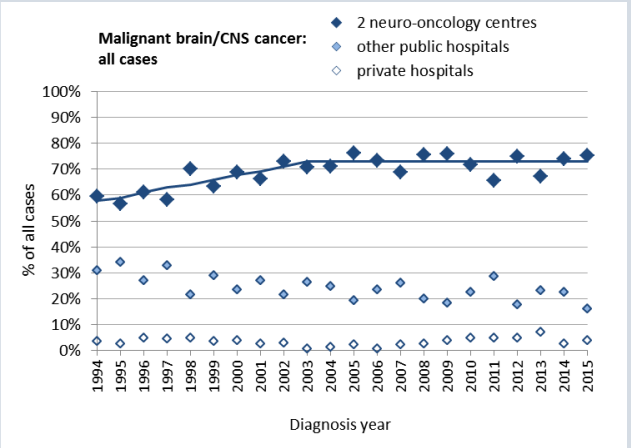
Figure a.1.45 Trends in proportion of cases *first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Malignant brain/CNS cancer



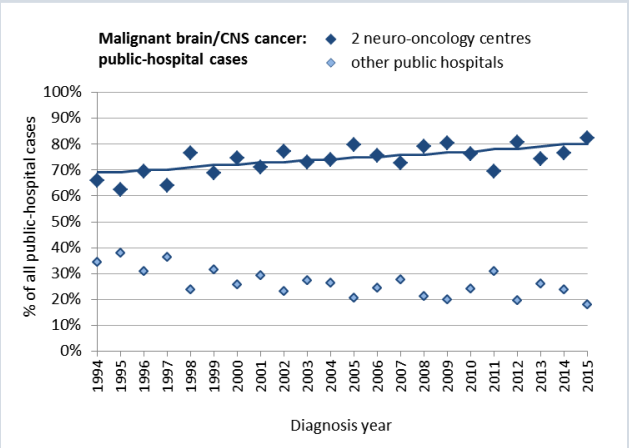
8 centres[1]	Period	APC[3]	95% CI	Trend
	1994-2005	**+1.5%**	+0.7%,+2.3%	↑
	2005-2015	-0.3%	-1.0%,+0.4%	=



8 centres[1]	Period	APC[3]	95% CI	Trend
	1994-2015	**+0.4%**	+0.2%,+0.6%	↑



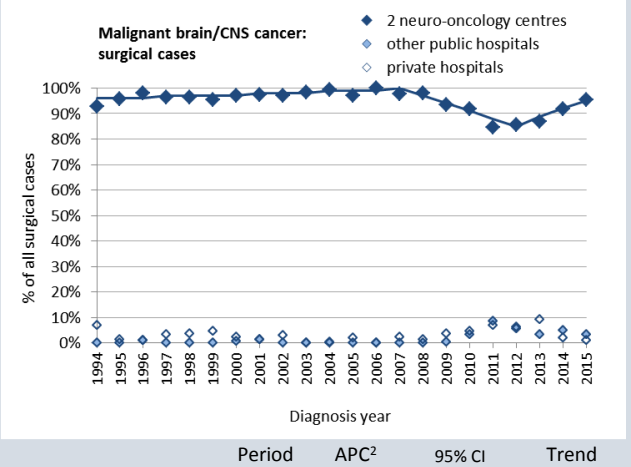
2 centres[2]	Period	APC[3]	95% CI	Trend
	1994-2003	**+2.6%**	+0.9%,+4.3%	↑
	2003-2015	0.0%	-0.8%,+0.8%	=



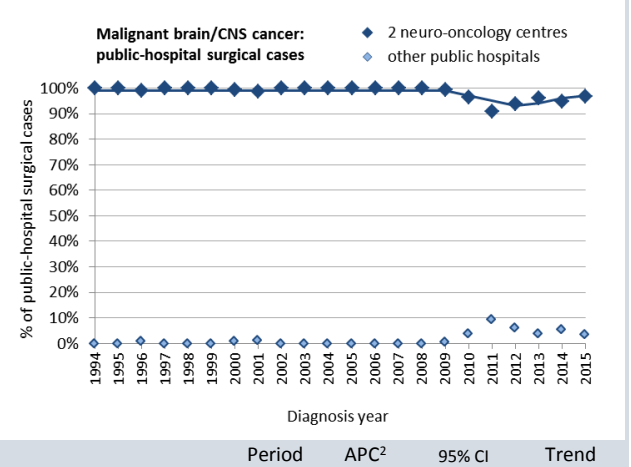
2 centres[2]	Period	APC[3]	95% CI	Trend
	1994-2015	**+0.7%**	+0.3%,+1.1%	↑

[1] 8 centres designated for a range of cancers but not specifically brain/CNS tumours.
[2] 2 centres designated for neuro-oncology.
[3] APC = estimated annual % change (relative) across the period specified

Figure a.1.46 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Malignant brain/CNS cancer



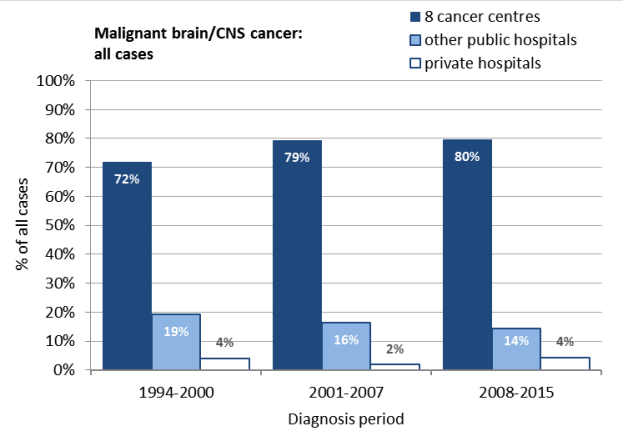
2 centres[1]	Period	APC[2]	95% CI	Trend
	1994-2007	**+0.3%**	+0.1%,+0.5%	↑
	2007-2012	**-3.0%**	-4.6%,-1.4%	↓
	2012-2015	**+3.6%**	+0.9%,+6.4%	↑

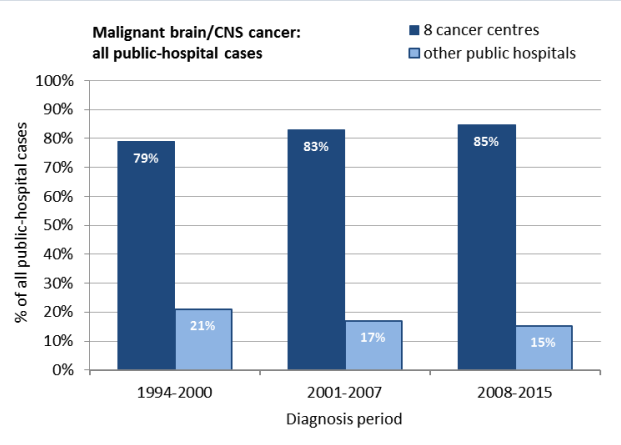


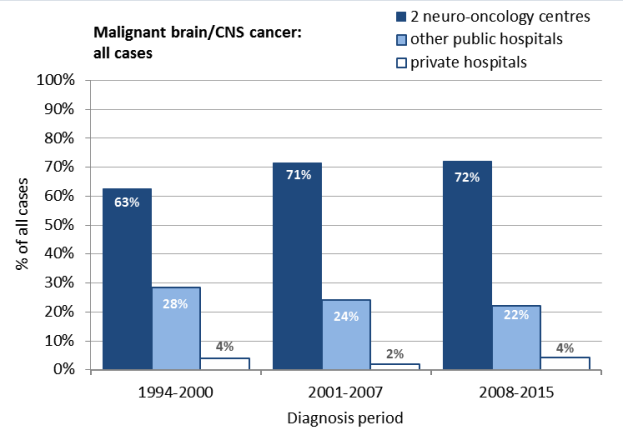
2 centres[1]	Period	APC[2]	95% CI	Trend
	1994-2009	0.0%	0.0%,+0.1%	=
	2009-2012	-2.1%	-4.6%,+0.5%	=
	2012-2015	**+1.2%**	+0.4%,+2.0%	↑

[1] 2 centres designated for neuro-oncology.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.47 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Malignant brain/CNS cancer







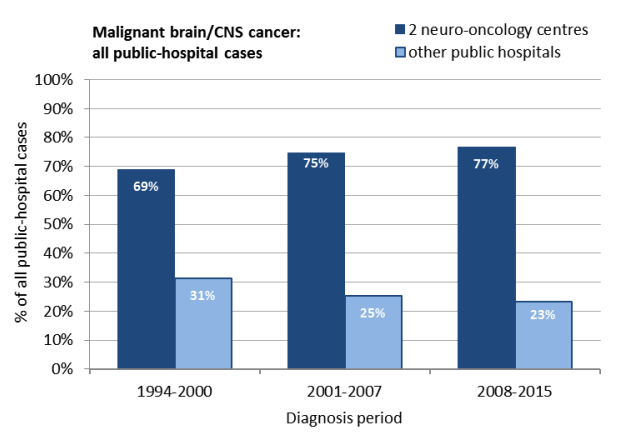
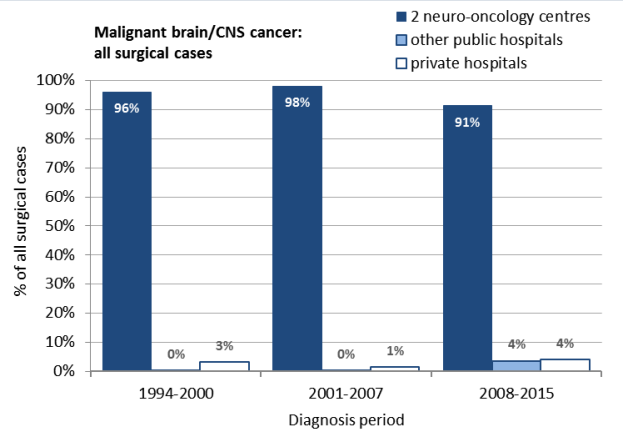
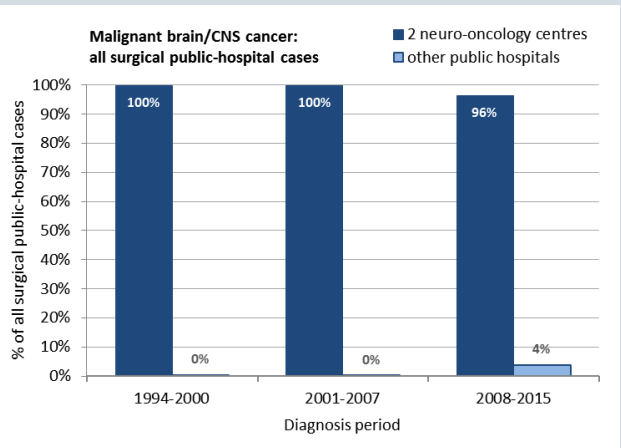


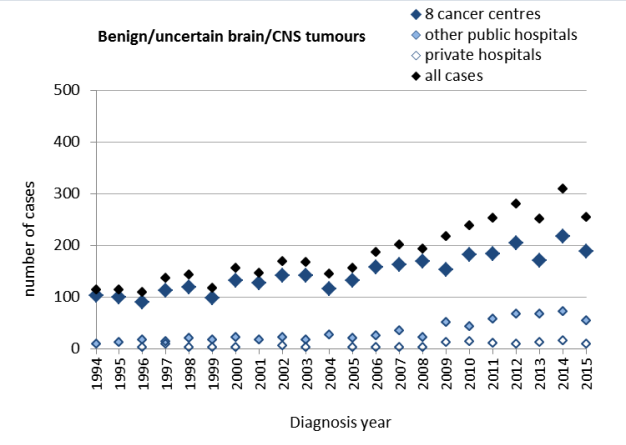
Figure a.1.48 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Malignant brain/CNS cancer





Benign/uncertain brain/CNS tumours

Figure a.1.49 Trends in numbers of *all cases first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Benign/uncertain brain/CNS tumours



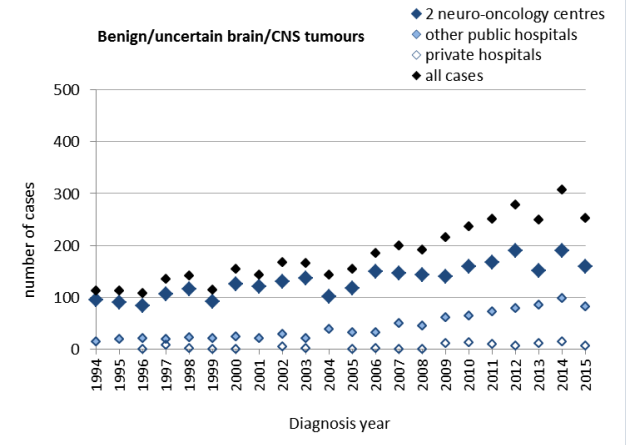


Figure a.1.50 Trends in numbers of *surgically-treated cases* who had their first excisional surgery in HSE cancer centres, other public hospitals or private hospitals: Benign/uncertain brain/CNS tumours

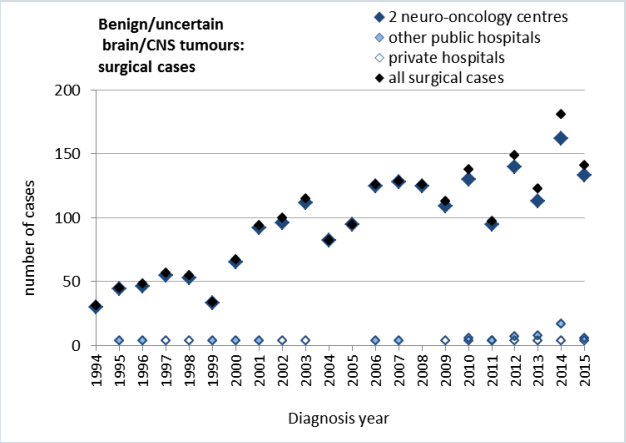
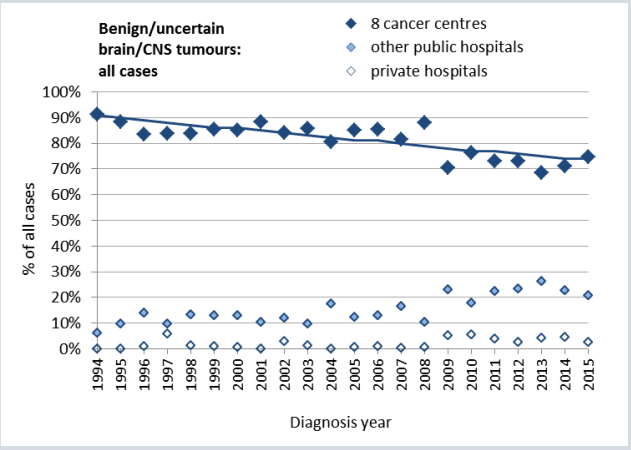
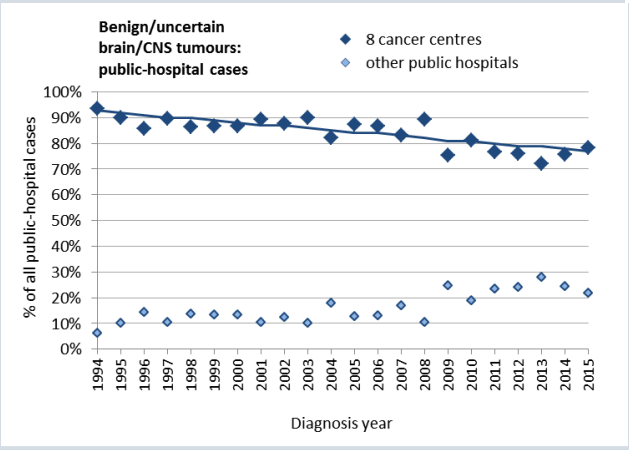


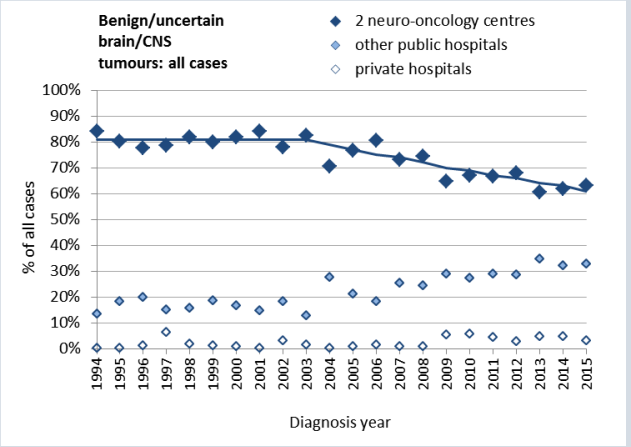
Figure a.1.51 Trends in proportion of cases *first treated or diagnosed* in HSE cancer centres, other public hospitals or private hospitals: Benign/uncertain brain/CNS tumours



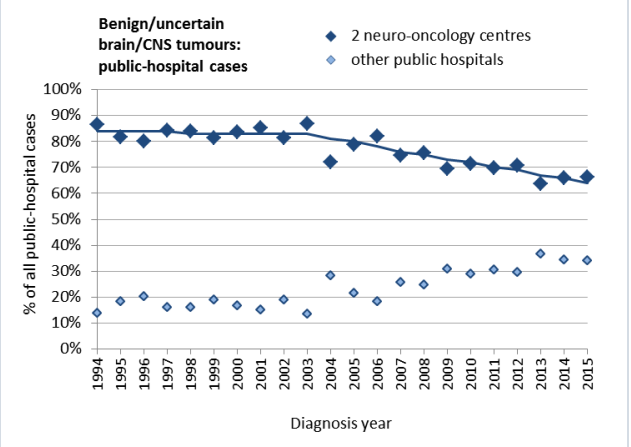
	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**-1.0%**	-1.4%,-0.6%	↓



	Period	APC[3]	95% CI	Trend
8 centres[1]	1994-2015	**-0.9%**	-1.2%,-1.6%	↓



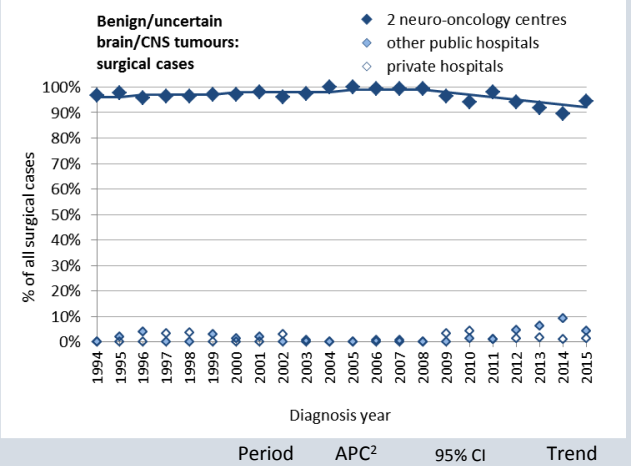
	Period	APC[3]	95% CI	Trend
2 centres[2]	1994-2003	0.0%	-1.2,+1.1%	=
	2003-2015	**-2.3%**	-3.1%,-1.5%	↓



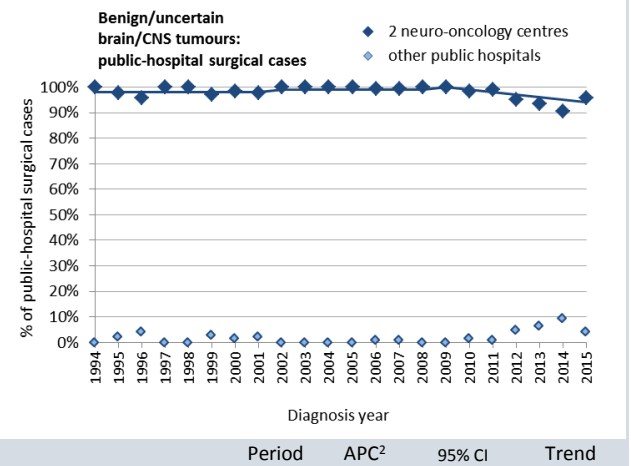
	Period	APC[3]	95% CI	Trend
2 centres[2]	1994-2003	-0.1%	-1.0%,+0.9%	=
	2003-2015	**-2.1%**	-2.8%,-1.5%	↓

[1] 8 centres designated for a range of cancers but not specifically brain/CNS tumours.
[2] 2 centres designated for neuro-oncology.
[3] APC = estimated annual % change (relative) across the period specified

Figure a.1.52 Trends in proportion of *surgical cases* whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Benign/uncertain brain/CNS tumours



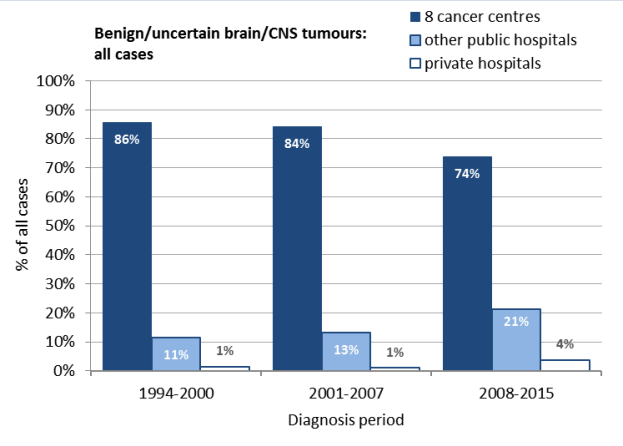
	Period	APC[2]	95% CI	Trend
2 centres[1]	1994-2008	**+0.2%**	0.0%,+0.4%	↑
	2008-2015	**-1.1%**	-1.8%,-0.5%	↓

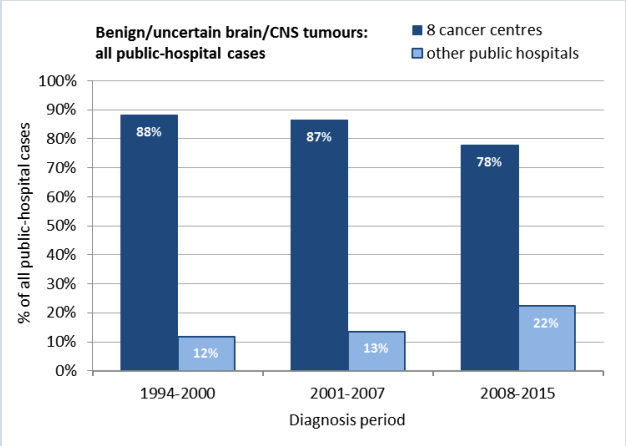


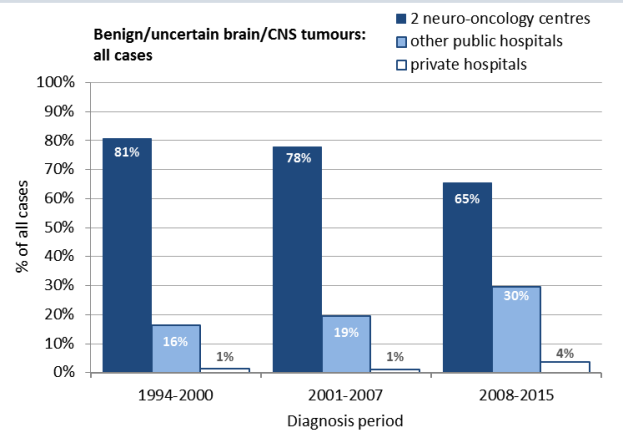
	Period	APC[2]	95% CI	Trend
2 centres[1]	1994-2009	+0.1%	-0.0%,+0.3%	=
	2009-2015	**-1.0%**	-1.6%,-0.4%	↓

[1] 2 centres designated for neuro-oncology.
[2] APC = estimated annual % change (relative) across the period specified.

Figure a.1.53 Proportion of cases (by period of diagnosis) *first treated or diagnosed* in a HSE cancer centre, another public hospital or a private hospital: Benign/uncertain brain/CNS tumours







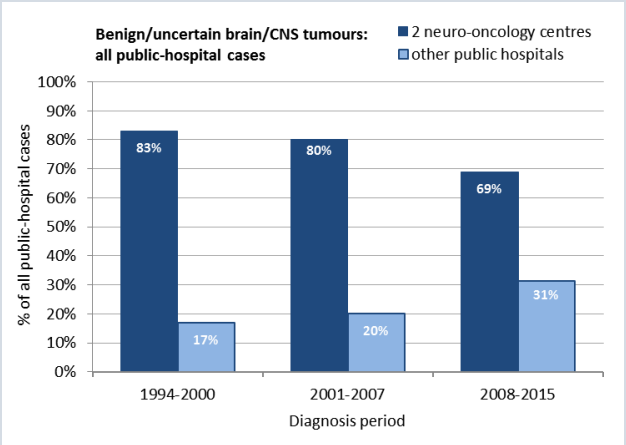
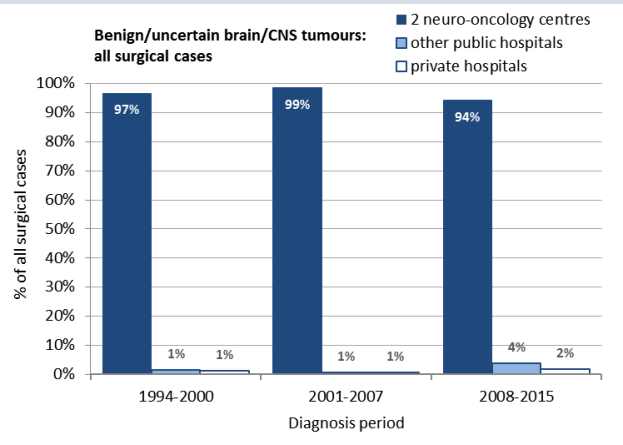
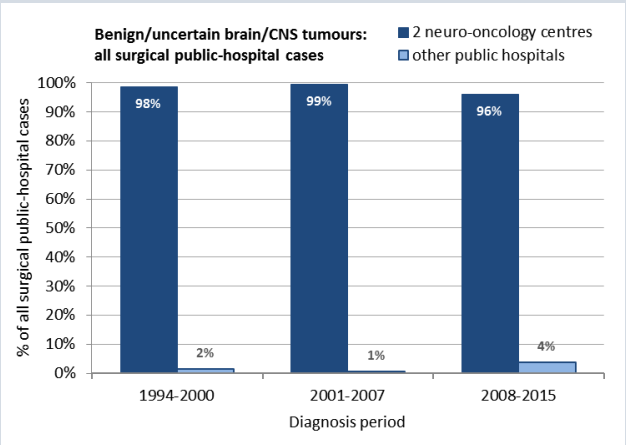


Figure a.1.54 Proportion of *surgical cases* (by period of diagnosis) whose first excisional surgery was in a HSE cancer centre, another public hospital or a private hospital: Benign/uncertain brain/CNS tumours

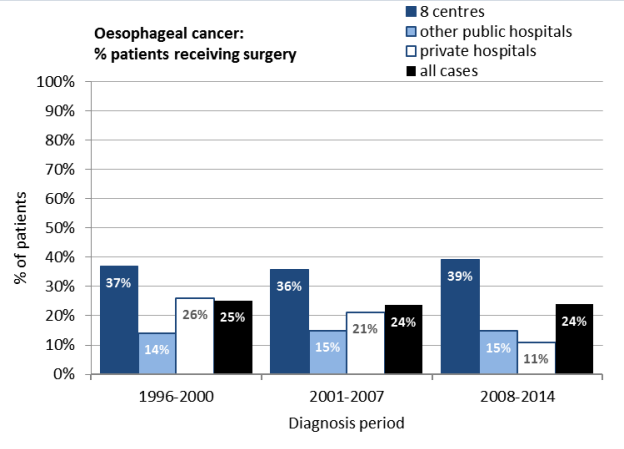


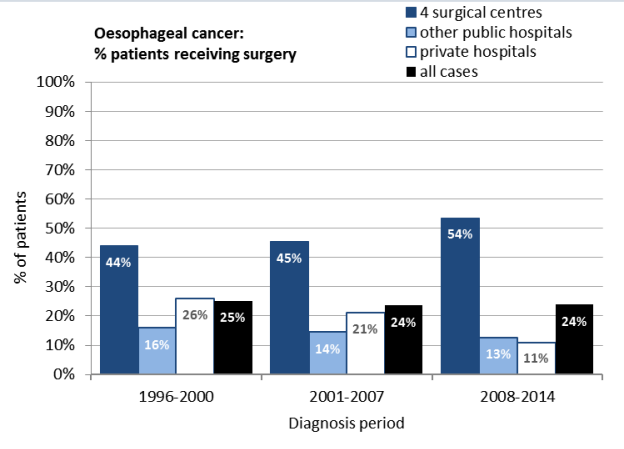


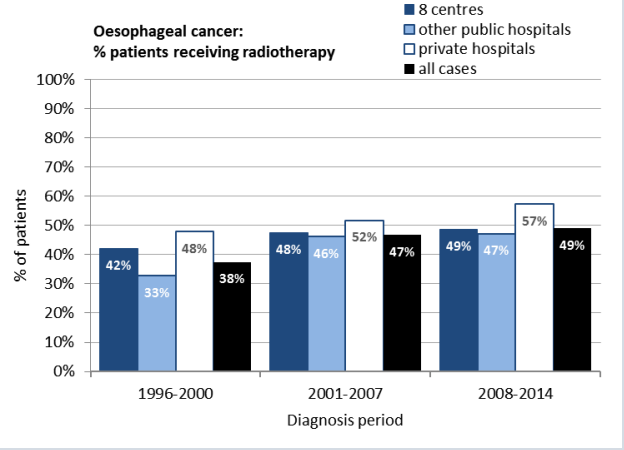
Appendix 2
Variation of treatment by hospital category: further summary figures

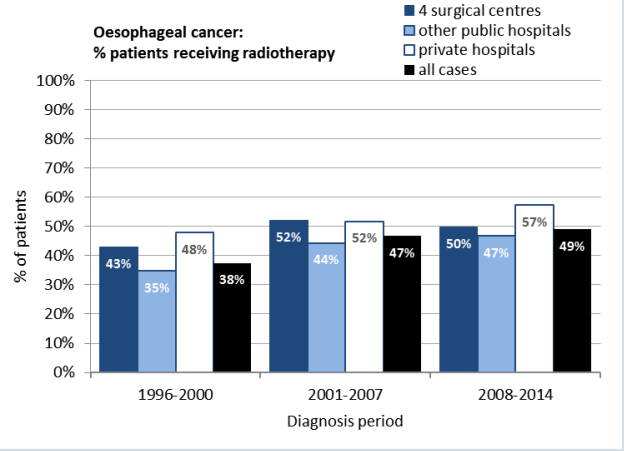
Oesophageal cancer

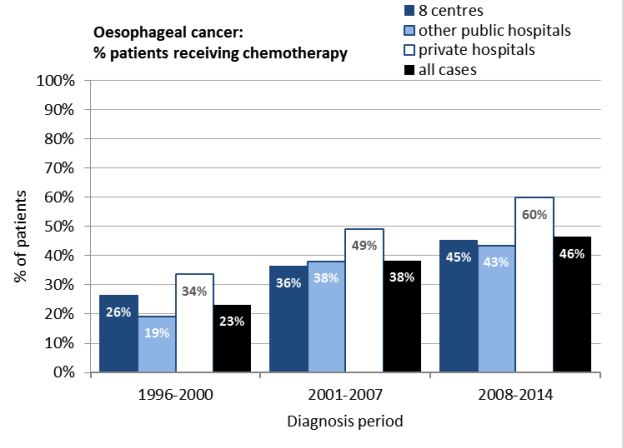
Figure a.2.1 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy or any tumour-directed treatment: Oesophageal cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

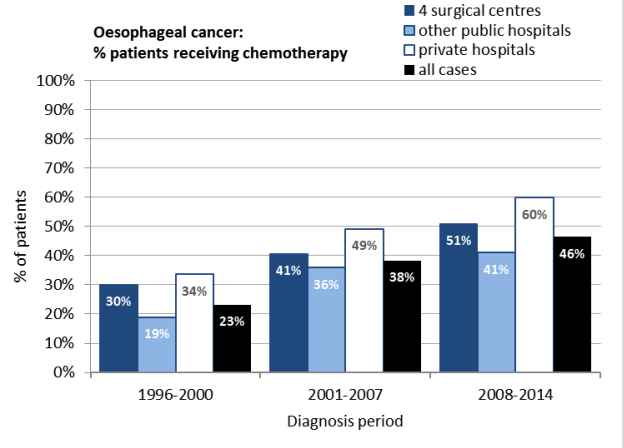


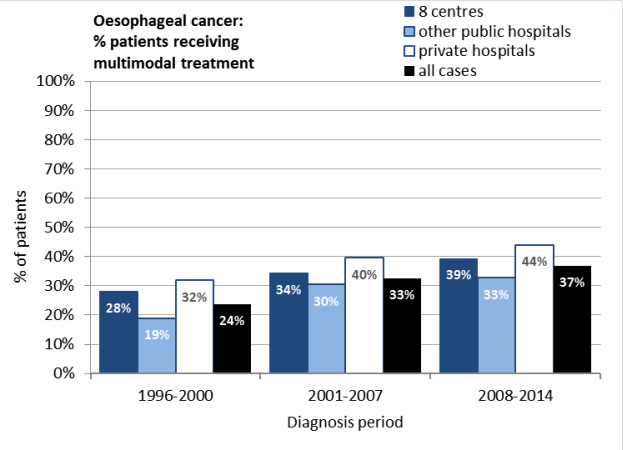


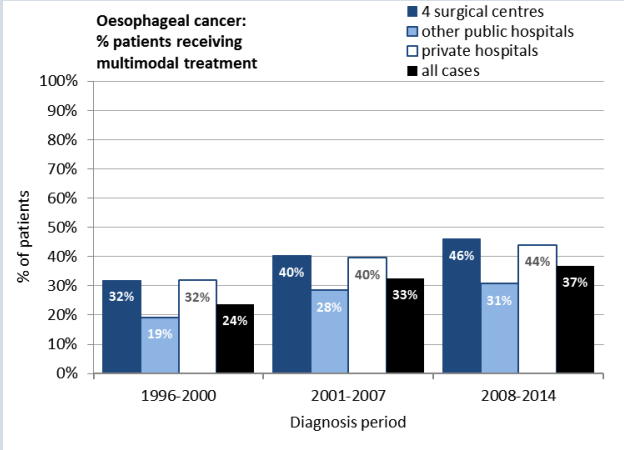


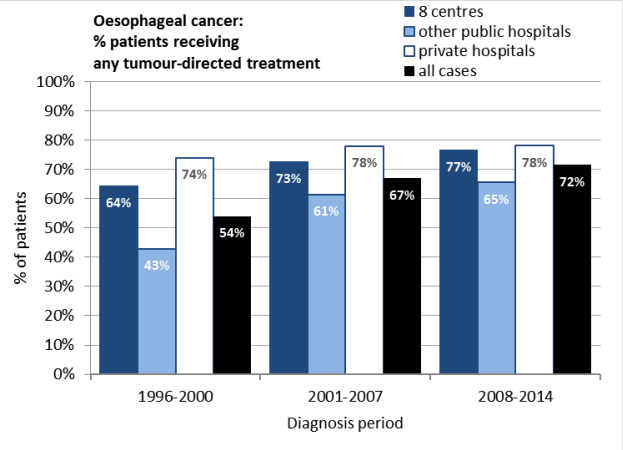


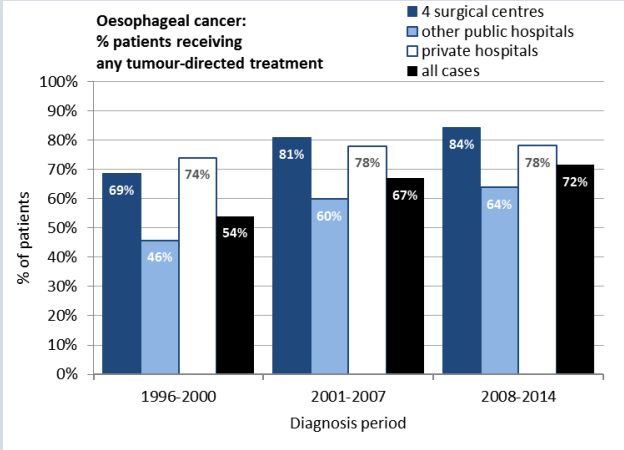








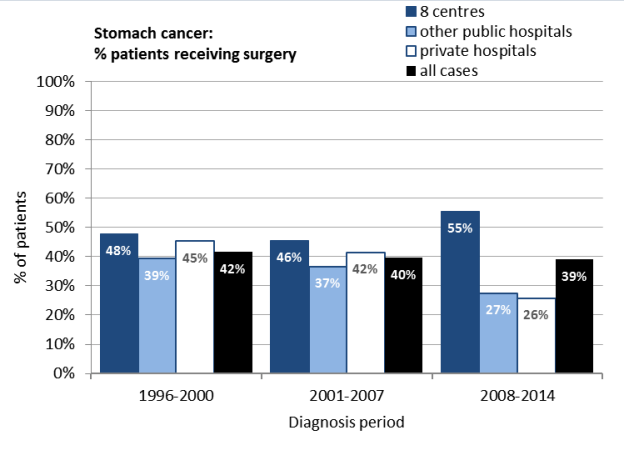


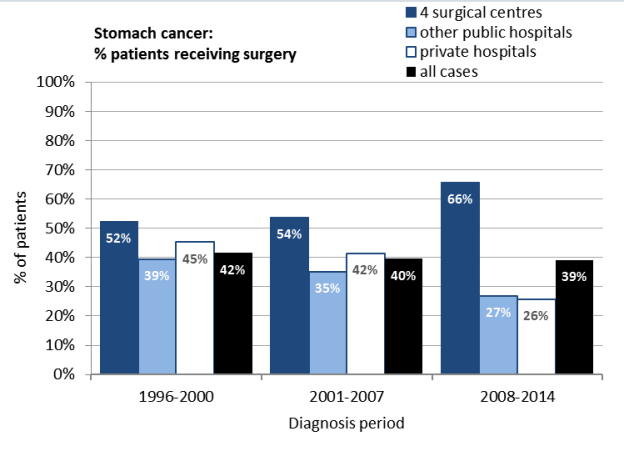


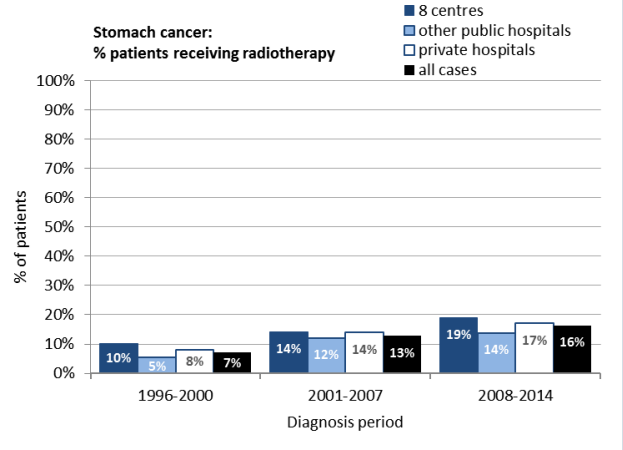
[1] 8 centres designated for a range of cancers but not specifically oesophageal cancer; 4 centres designated for upper gastrointestinal cancer surgery.

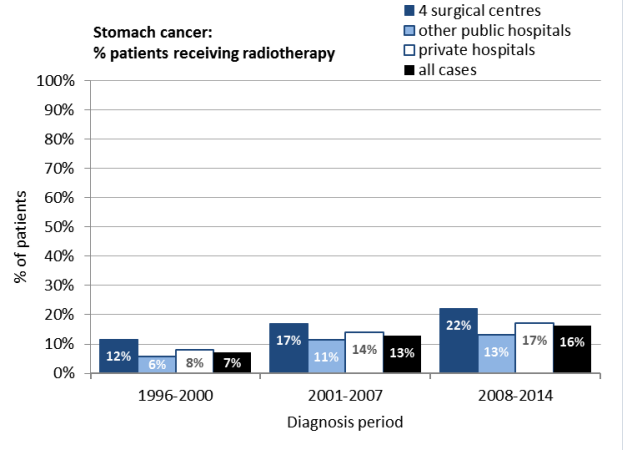
Stomach cancer

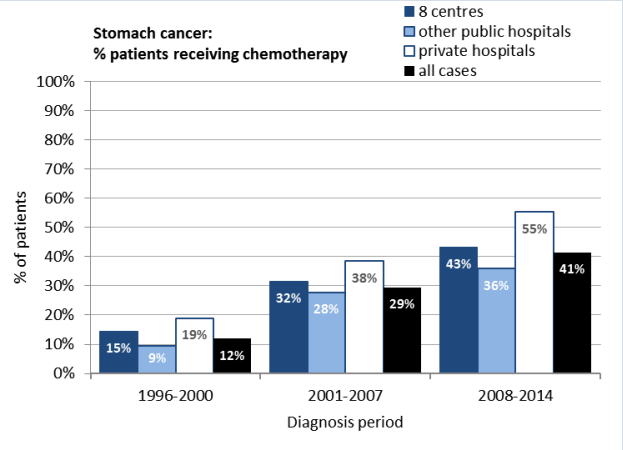
Figure a.2.2 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy or any tumour-directed treatment: Stomach cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

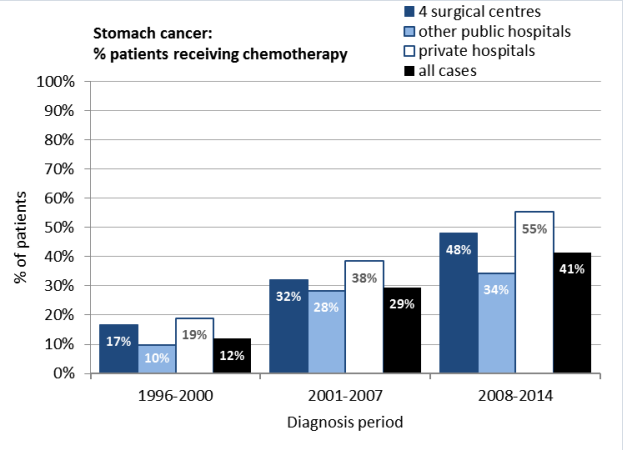


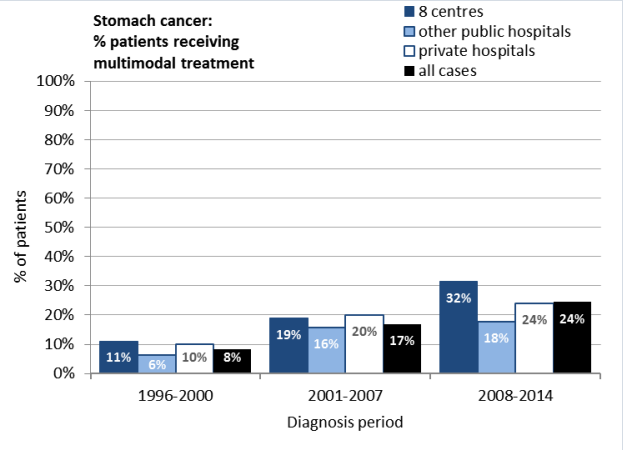


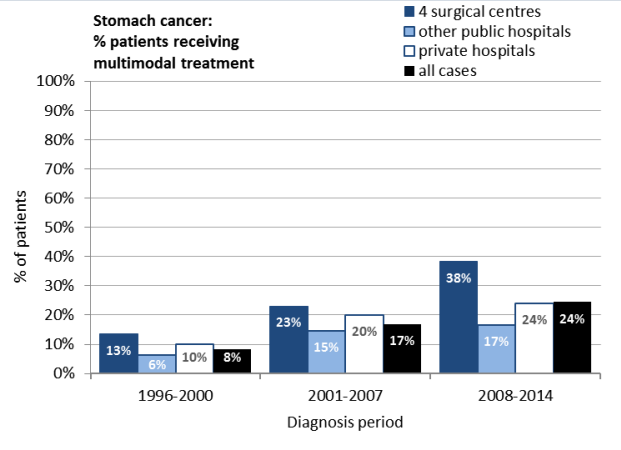


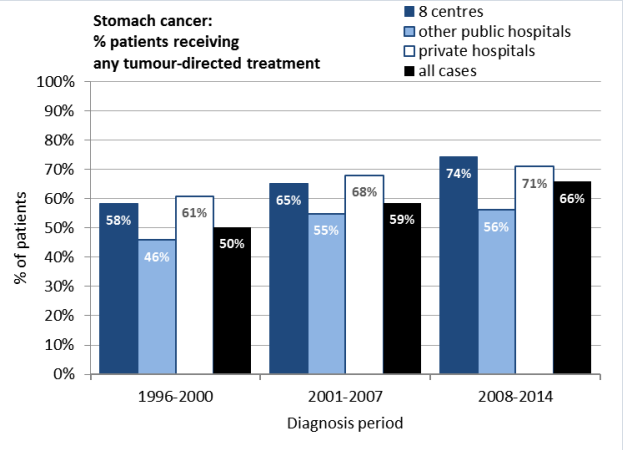


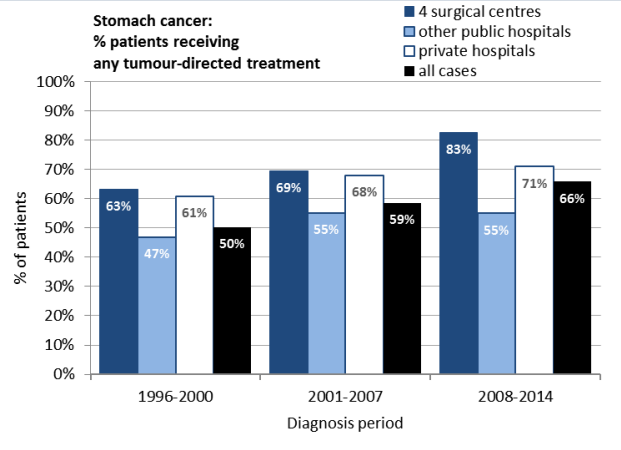








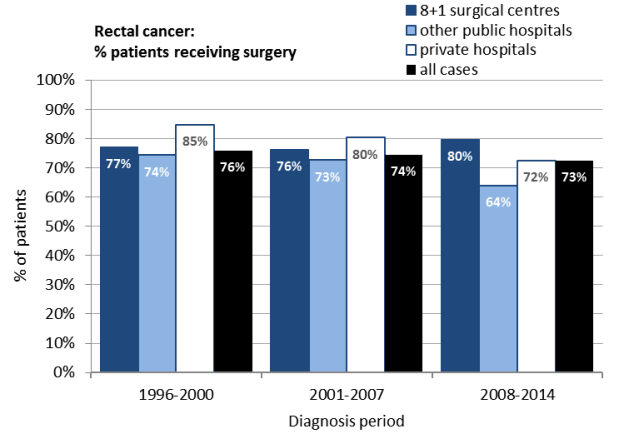


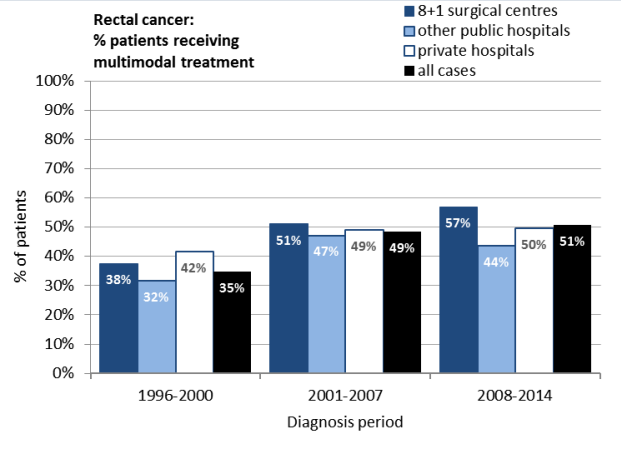


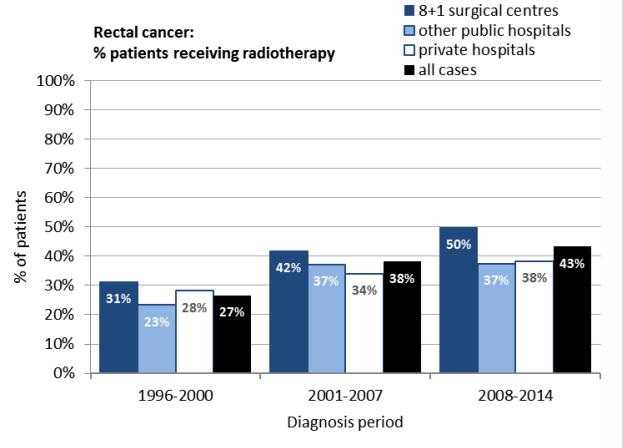
[1] 8 centres designated for a range of cancers but not specifically stomach cancer; 4 centres designated for upper gastrointestinal cancer surgery.

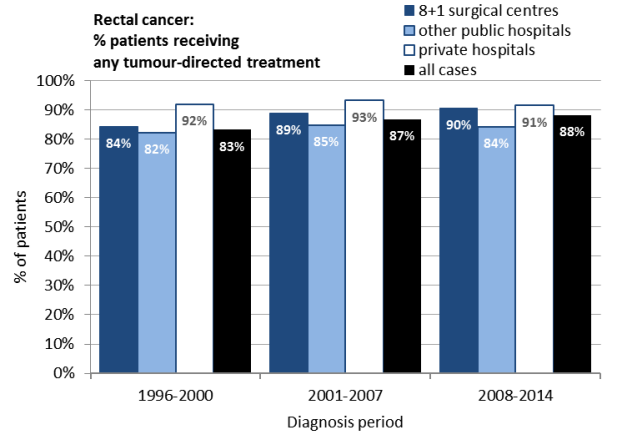
Rectal cancer

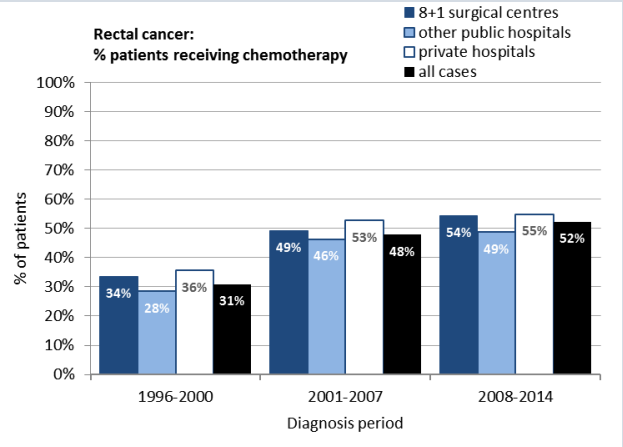
Figure a.2.3 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy or any tumour-directed treatment: Rectal cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.







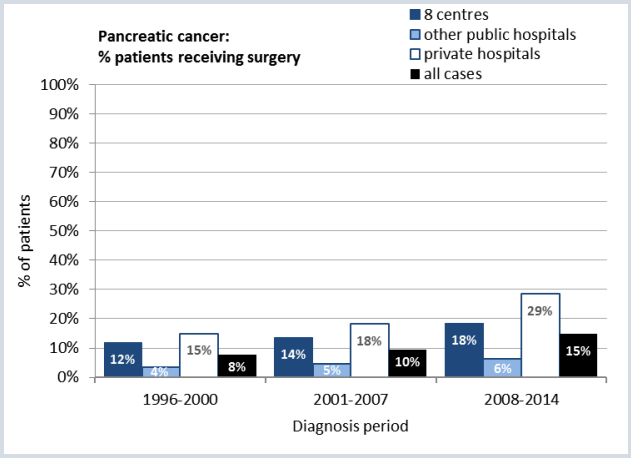


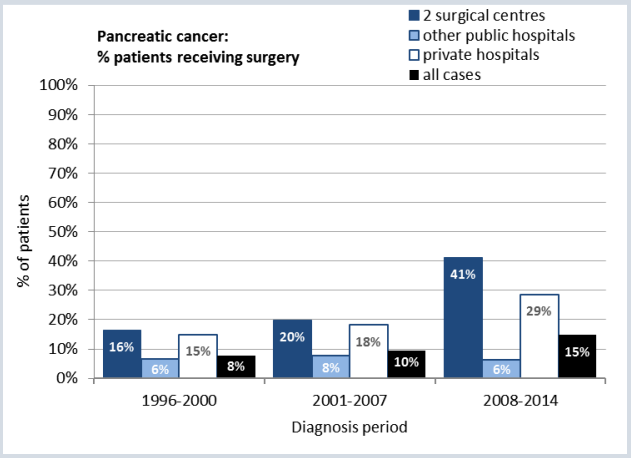


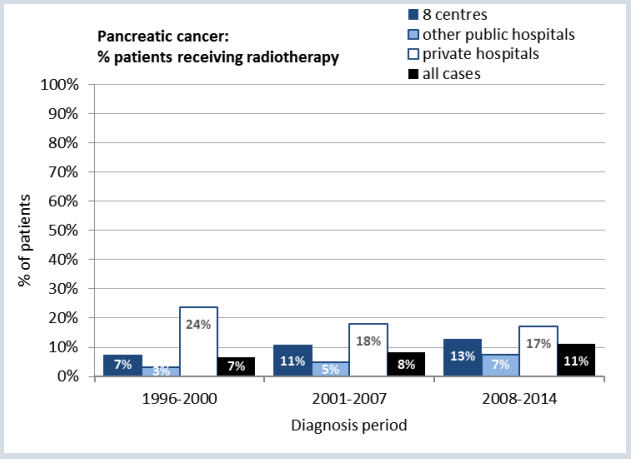
[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for rectal cancer surgery.

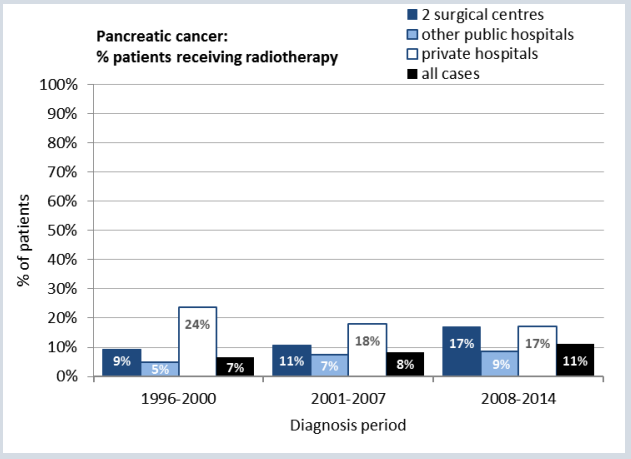
Pancreatic cancer

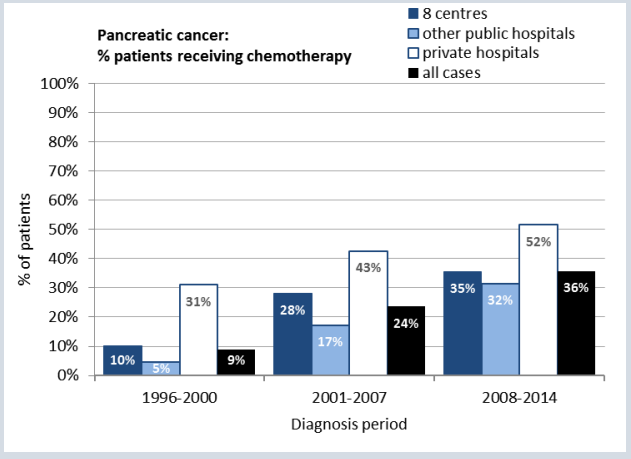
Figure a.2.4 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy or any tumour-directed treatment: Pancreatic cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

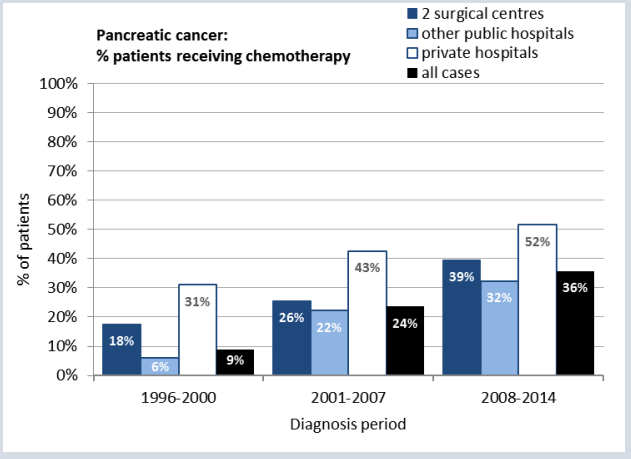


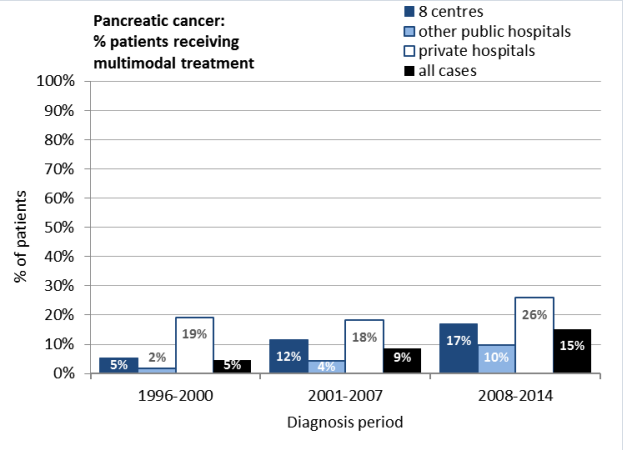


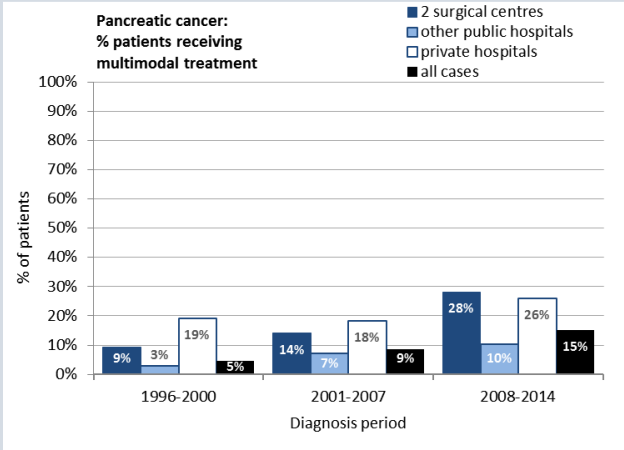


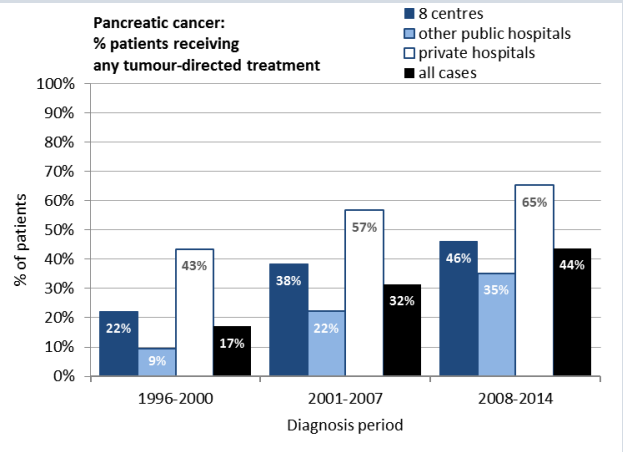


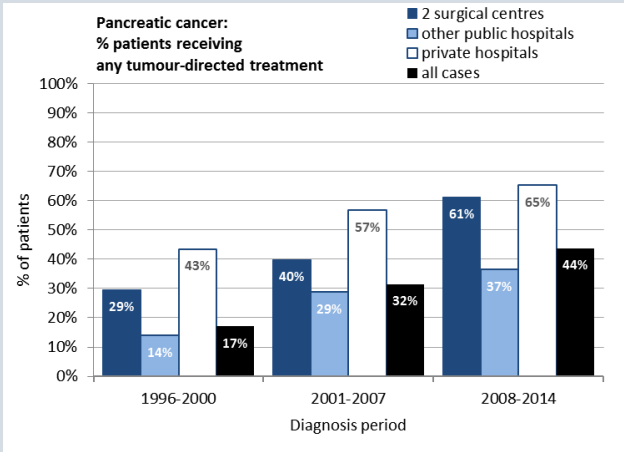








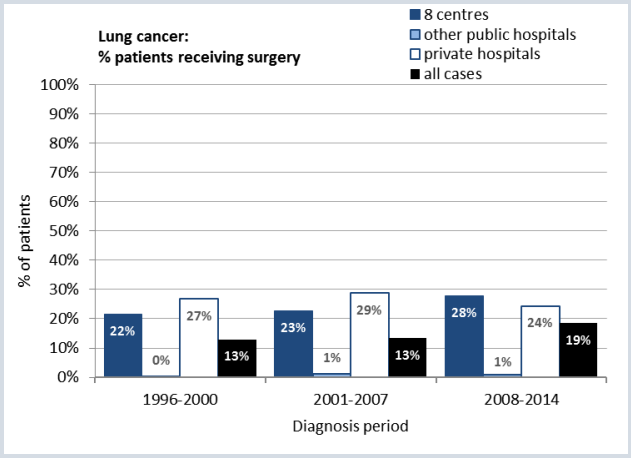


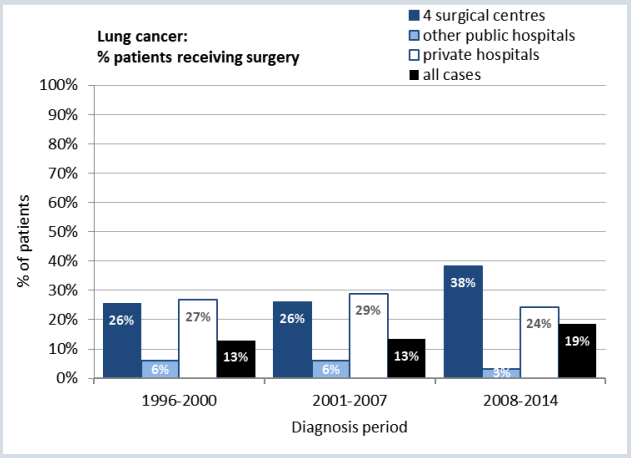


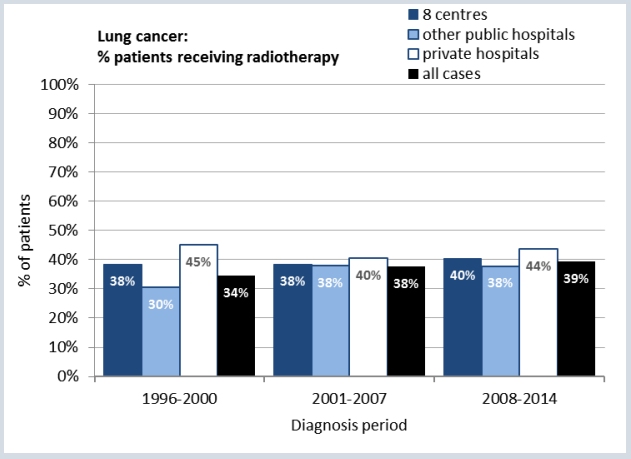
[1] 8 centres designated for a range of cancers but not specifically pancreatic cancer; 2 centres designated for pancreatic cancer surgery.

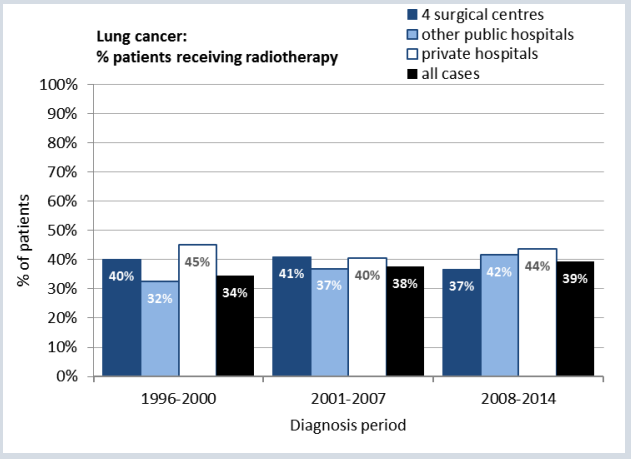
Lung cancer

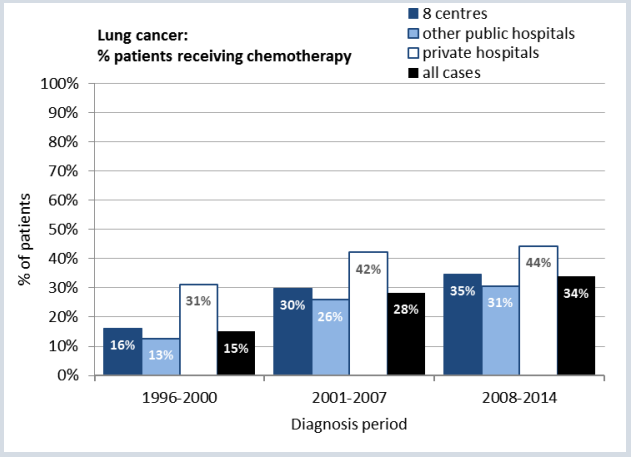
Figure a.2.5 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy or any tumour-directed treatment: Lung cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

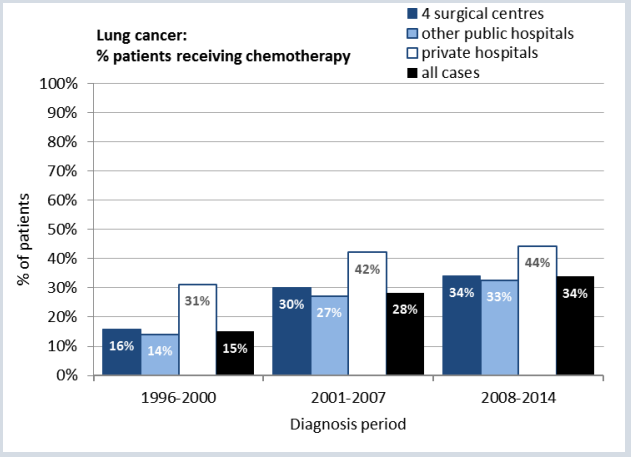


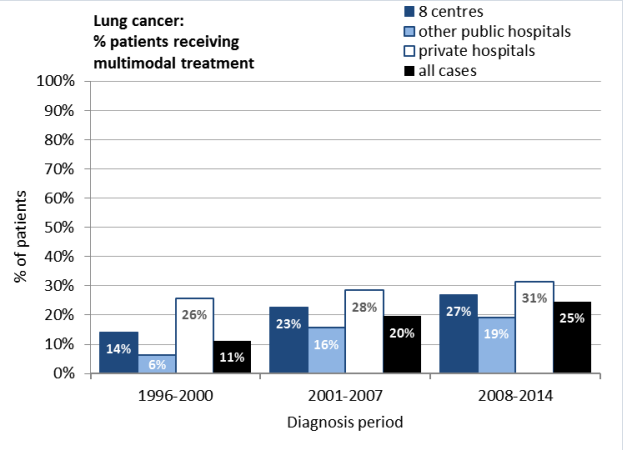


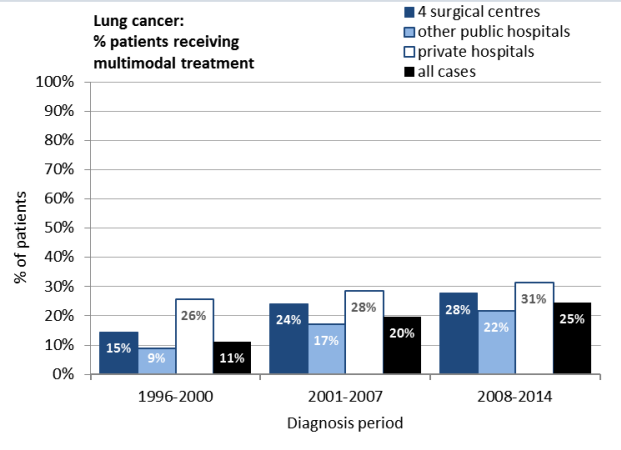


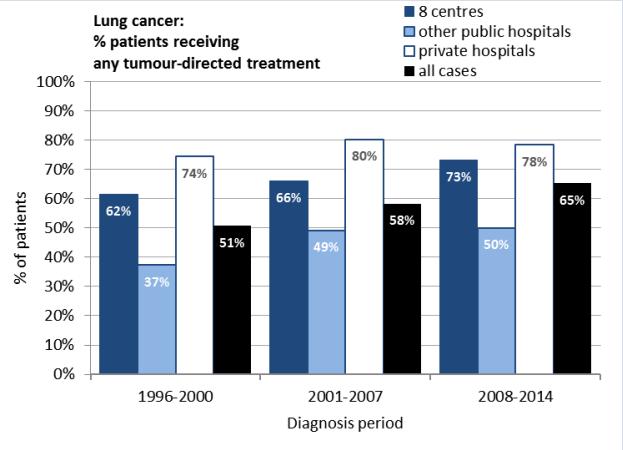


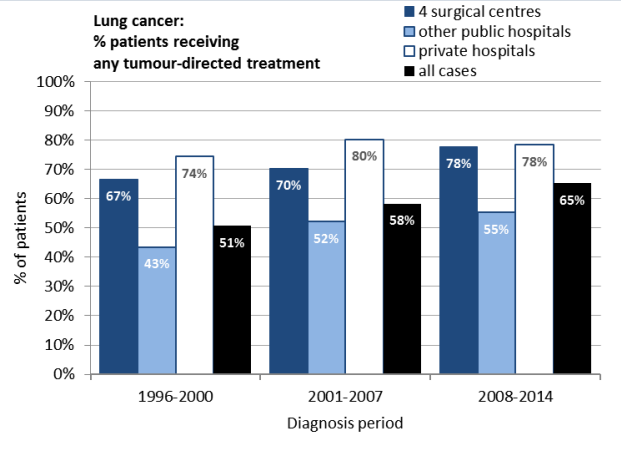








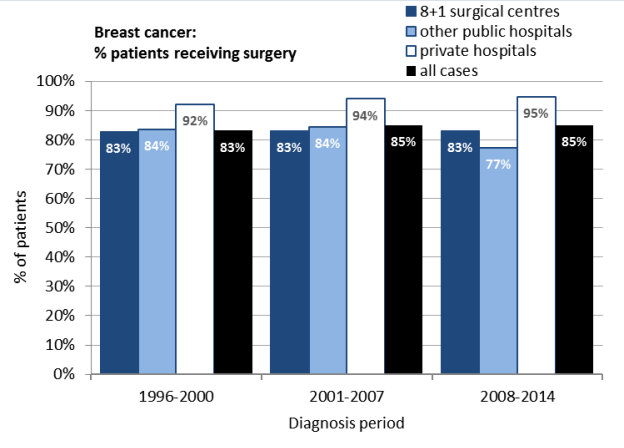


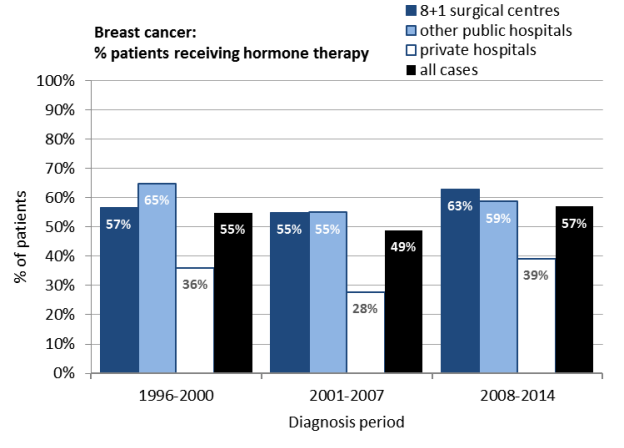


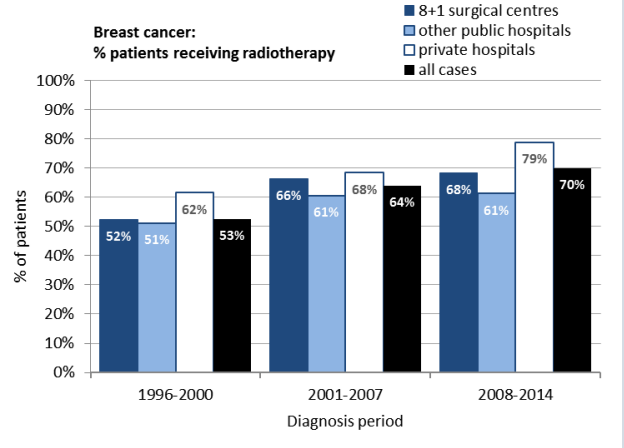
[1] 8 centres designated for lung cancer rapid access clinics and for a range of other cancers; 4 centres designated for lung cancer surgery.

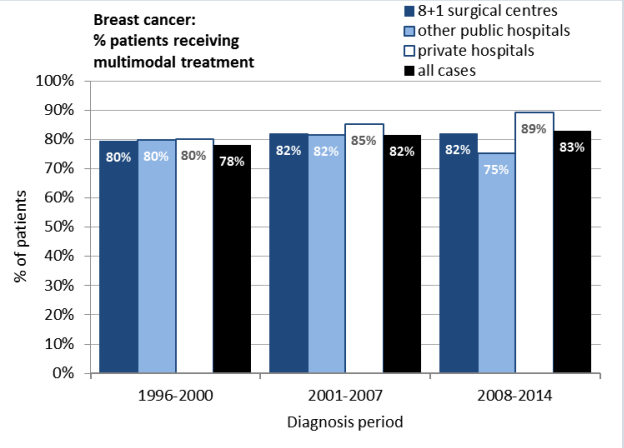
Breast cancer

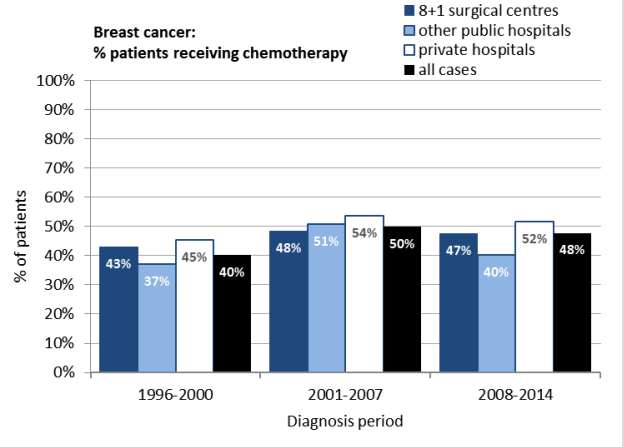
Figure a.2.6 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy, hormone therapy or any tumour-directed treatment: Breast cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

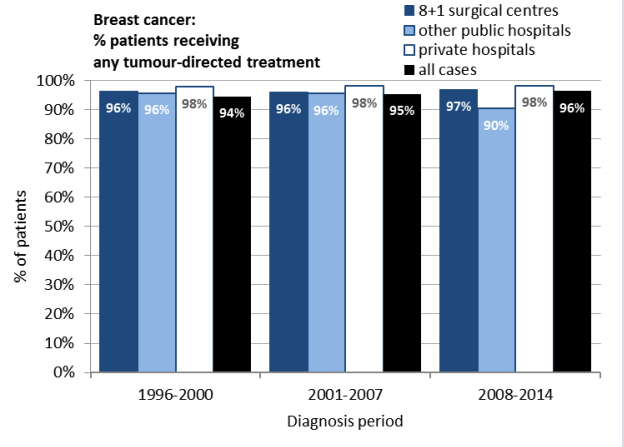








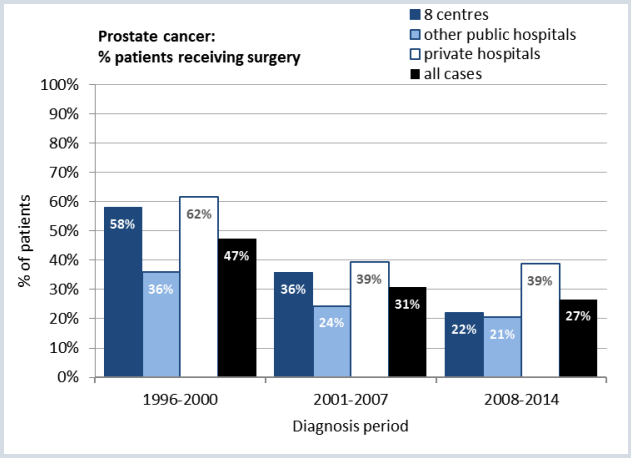


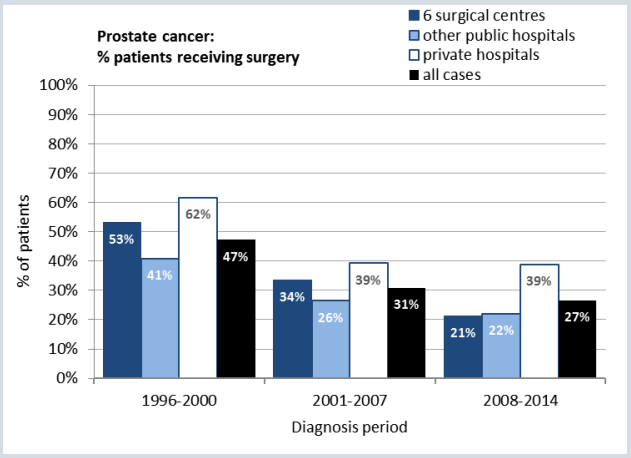


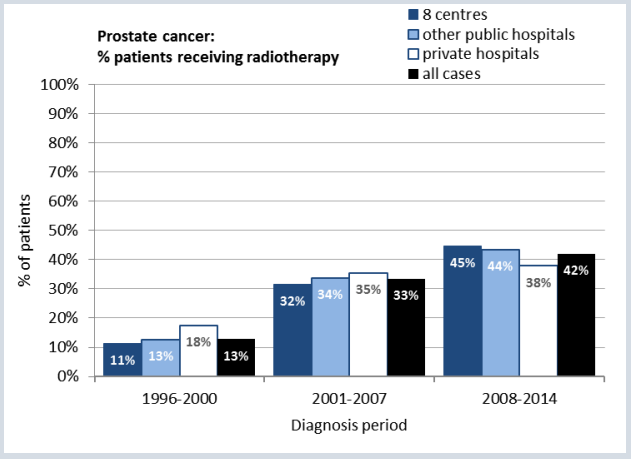
[1] 8 centres (+ Letterkenny General Hospital satellite to Galway University Hospital) designated for symptomatic breast disease and breast cancer surgery.

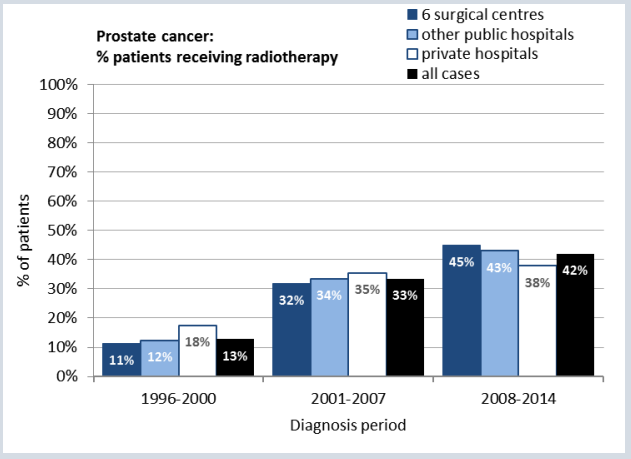
Prostate cancer

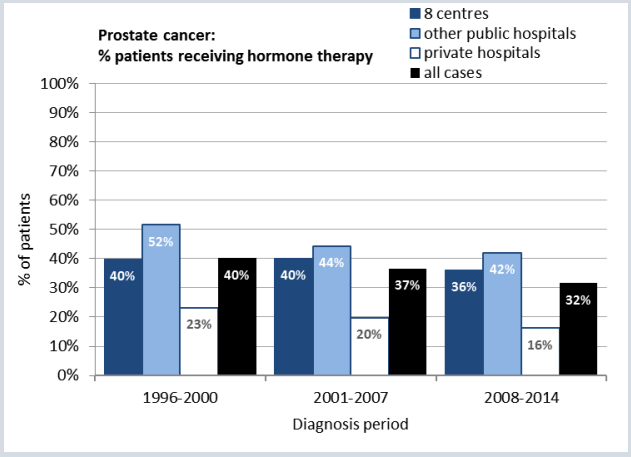
Figure a.2.7 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, hormone therapy or any tumour-directed treatment: Prostate cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

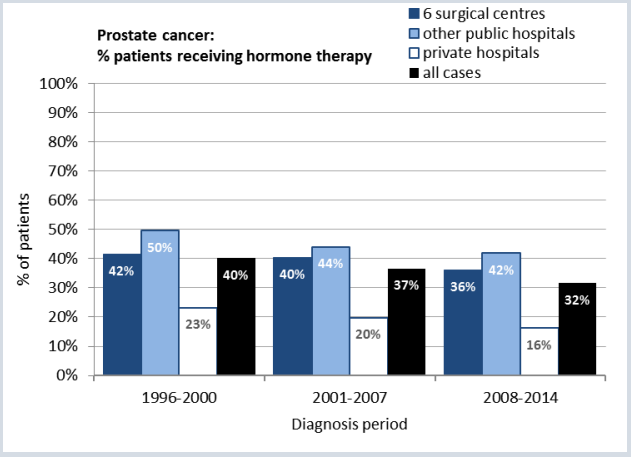


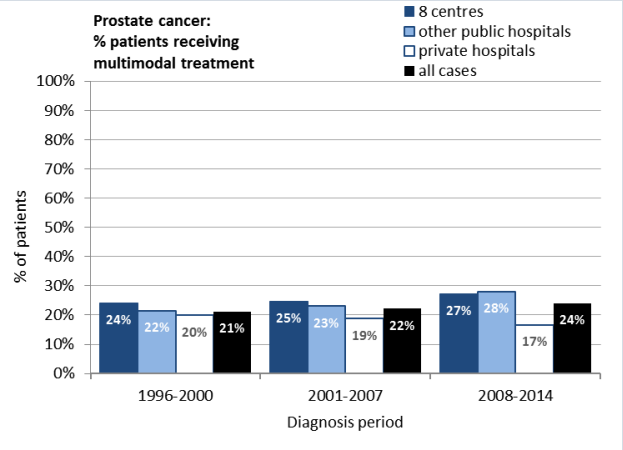


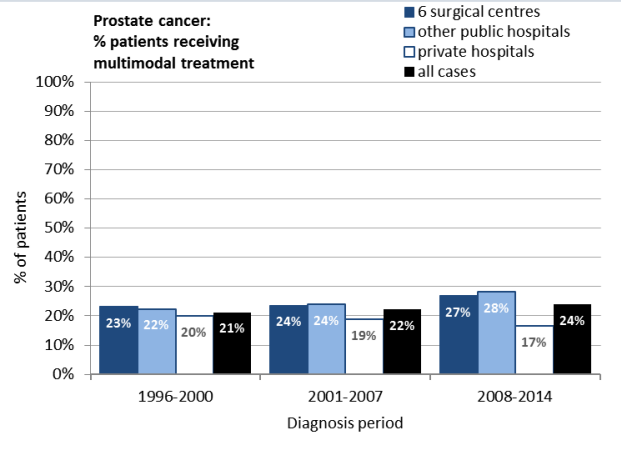


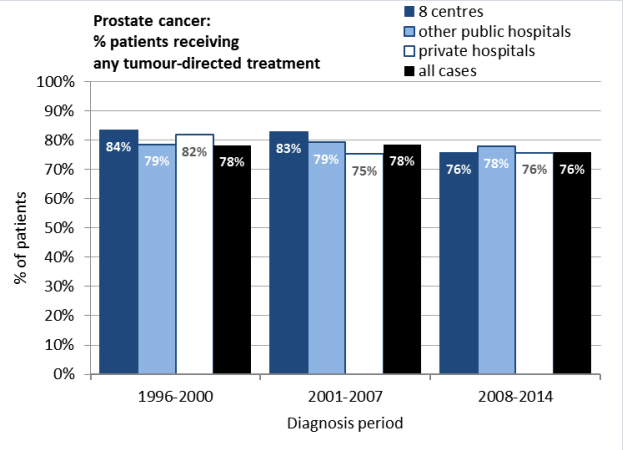


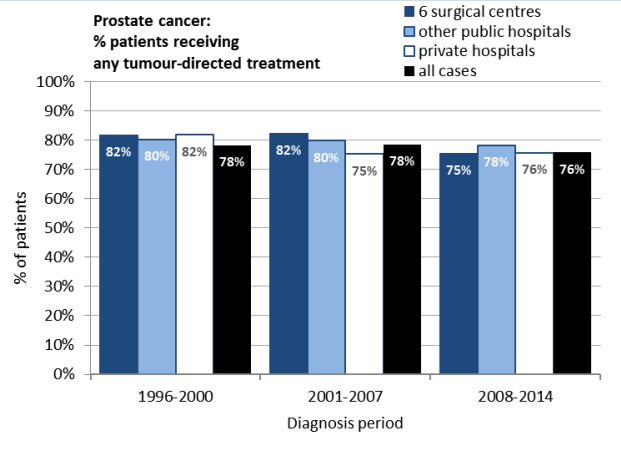








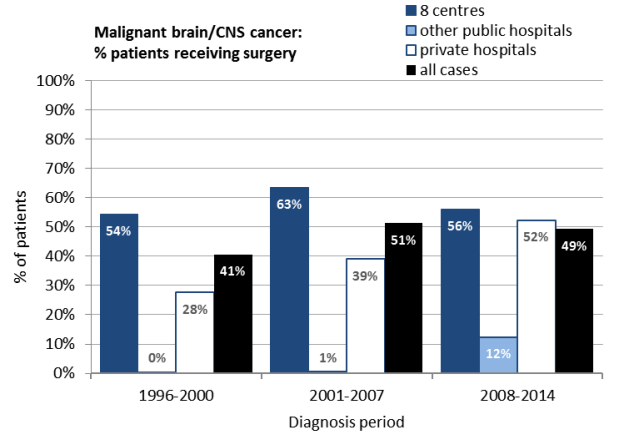


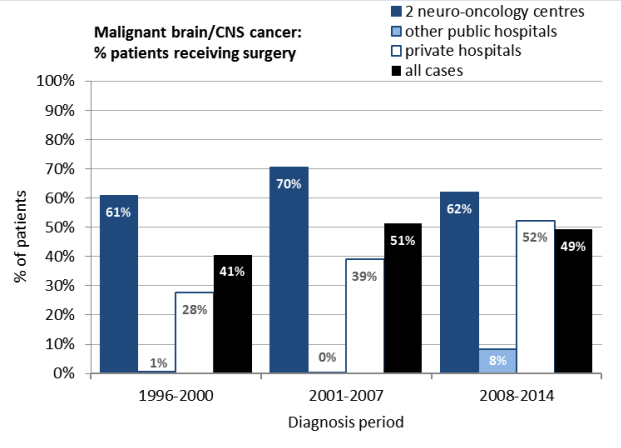


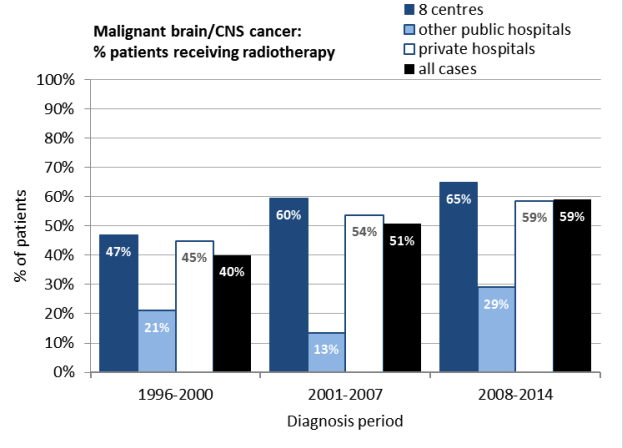
[1] 8 centres designated for prostate cancer rapid access clinics and for a range of cancer; 6centres designated for prostate cancer surgery.

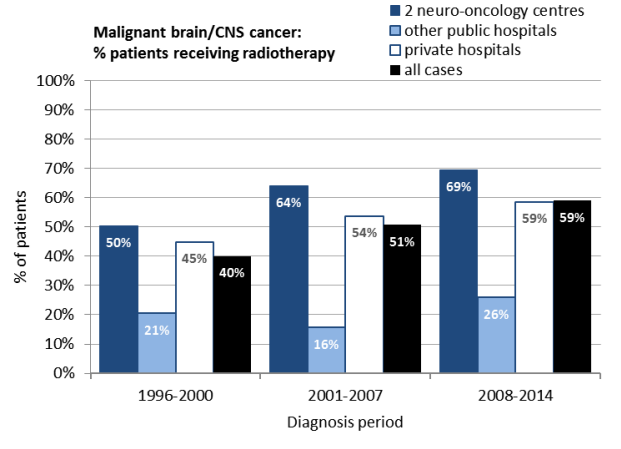
Malignant brain/CNS cancer

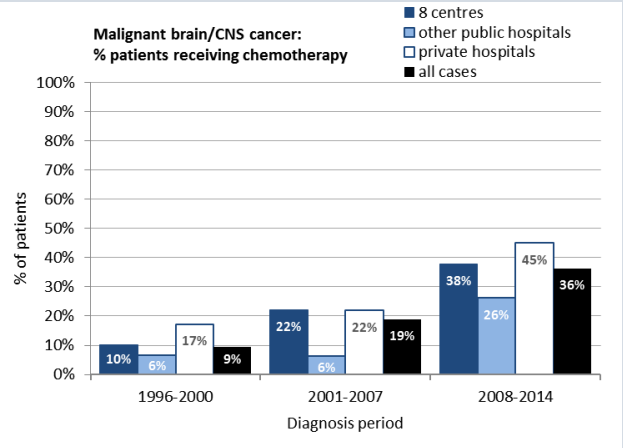
Figure a.2.8 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy, chemotherapy or any tumour-directed treatment: Malignant brain/CNS cancer. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

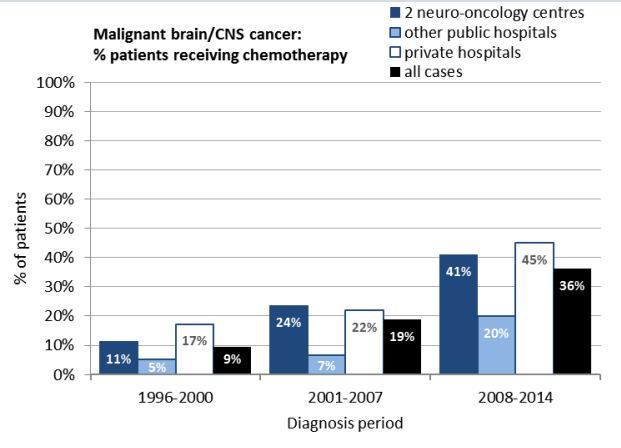


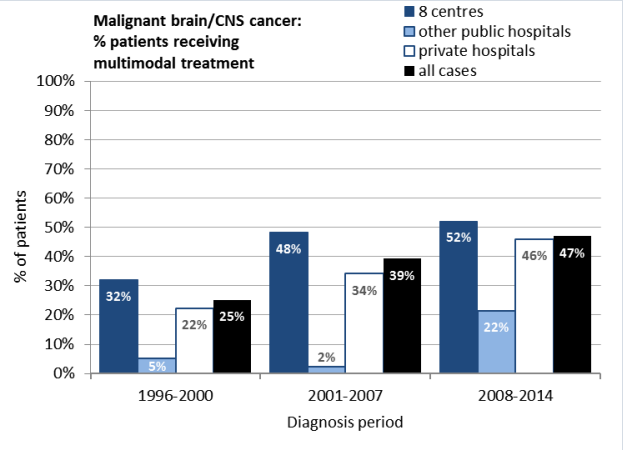


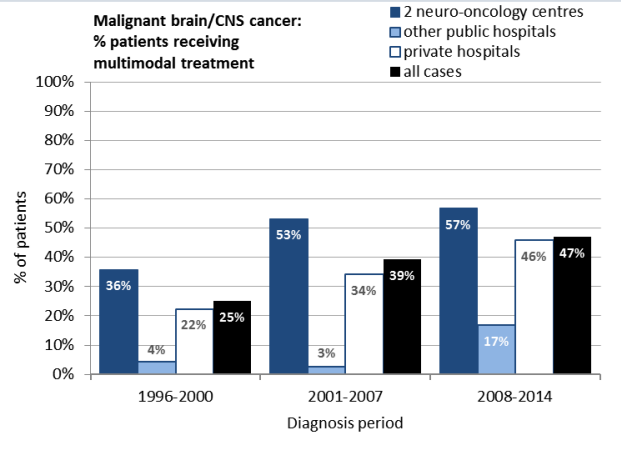


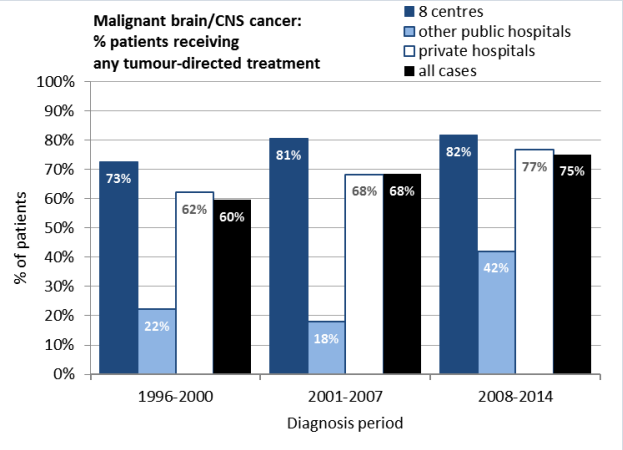


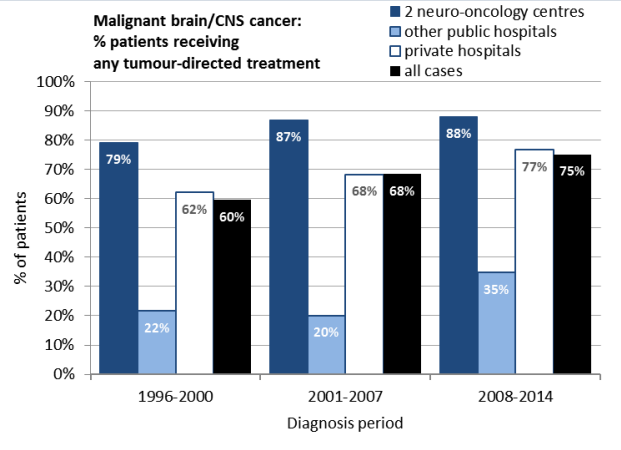








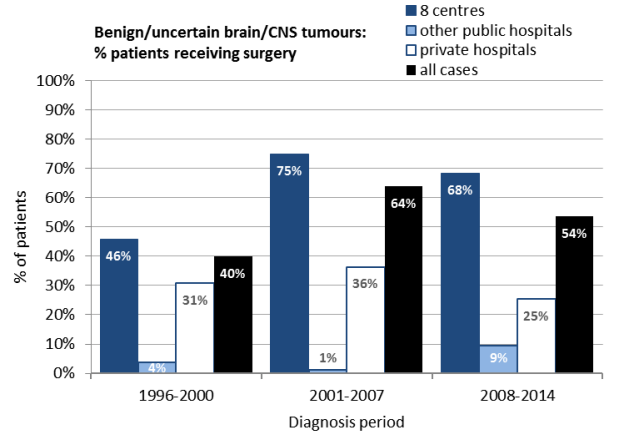


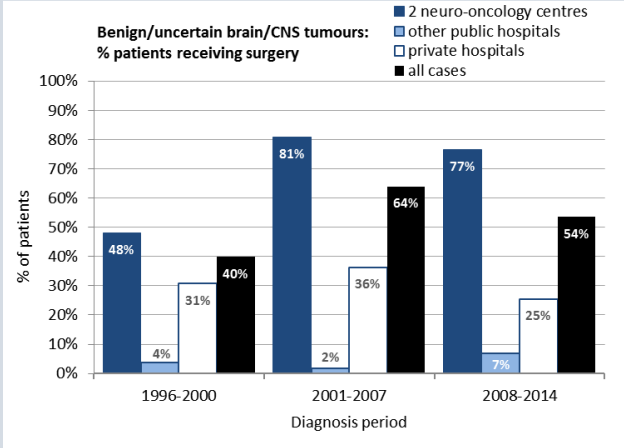


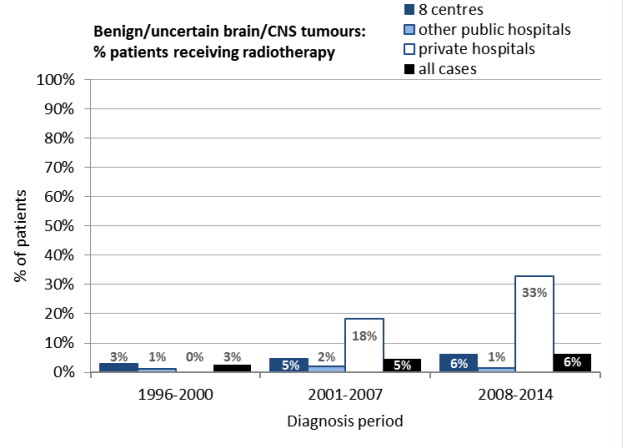
[1] 8 centres designated for a range of cancers but not specifically brain/CNS tumours; 2 centres designated for neuro-oncology.

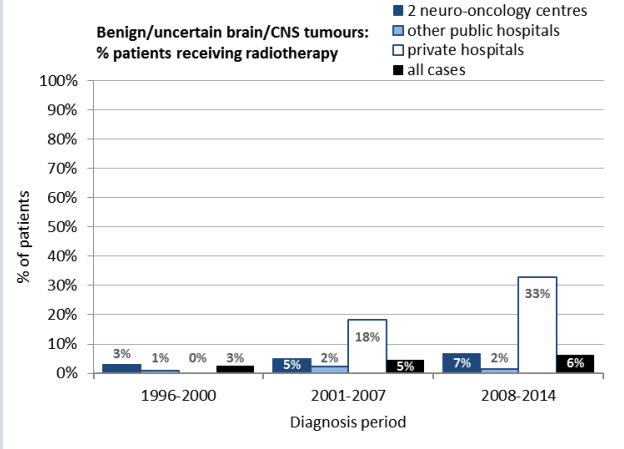
Benign/uncertain brain/CNS tumours

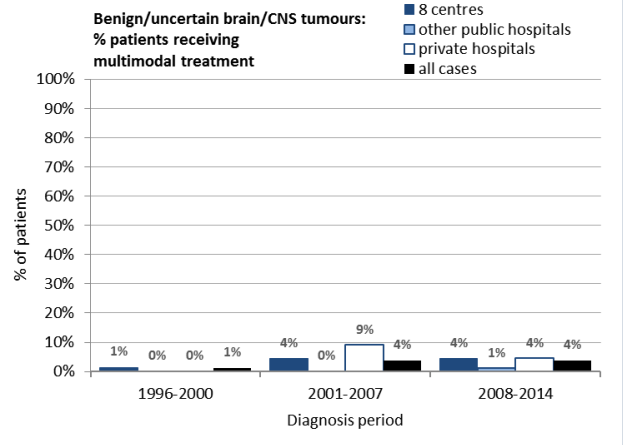
Figure a.2.9 Proportion of cases (by hospital category[1] and period of diagnosis) receiving surgery, radiotherapy or any tumour-directed treatment: Benign/uncertain brain/CNS tumours. Treatments relate to first year after diagnosis and data for 1994-1995 and 2015 are excluded as they are likely to be less complete than for other years.

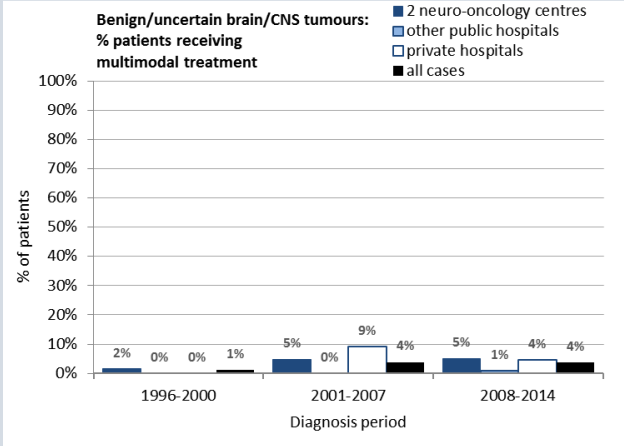


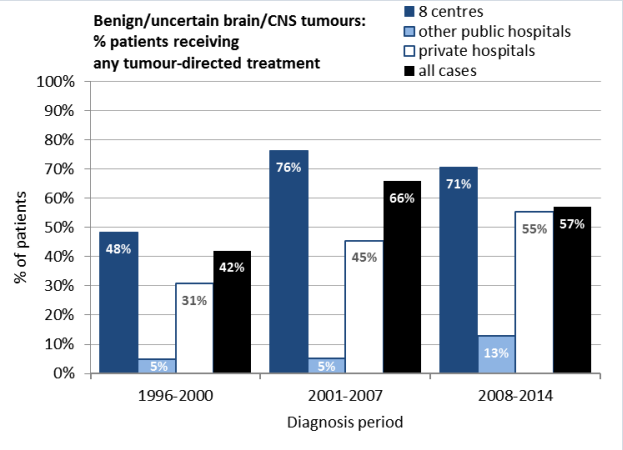


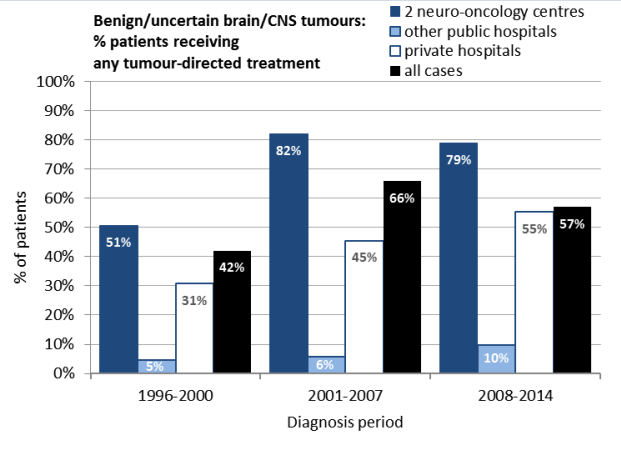












[1] 8 centres designated for a range of cancers but not specifically brain/CNS tumours; 2 centres designated for neuro-oncology.