



Variation in surgical resection for lung cancer in relation to survival: England 2004-2006

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VARIATIONS IN HEALTH CARE

The good, the bad and the inexplicable

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Figure 3 Distribution of crude rates and age-gender standardised rates for primary hip replacement (English PCTs, 2009/10)

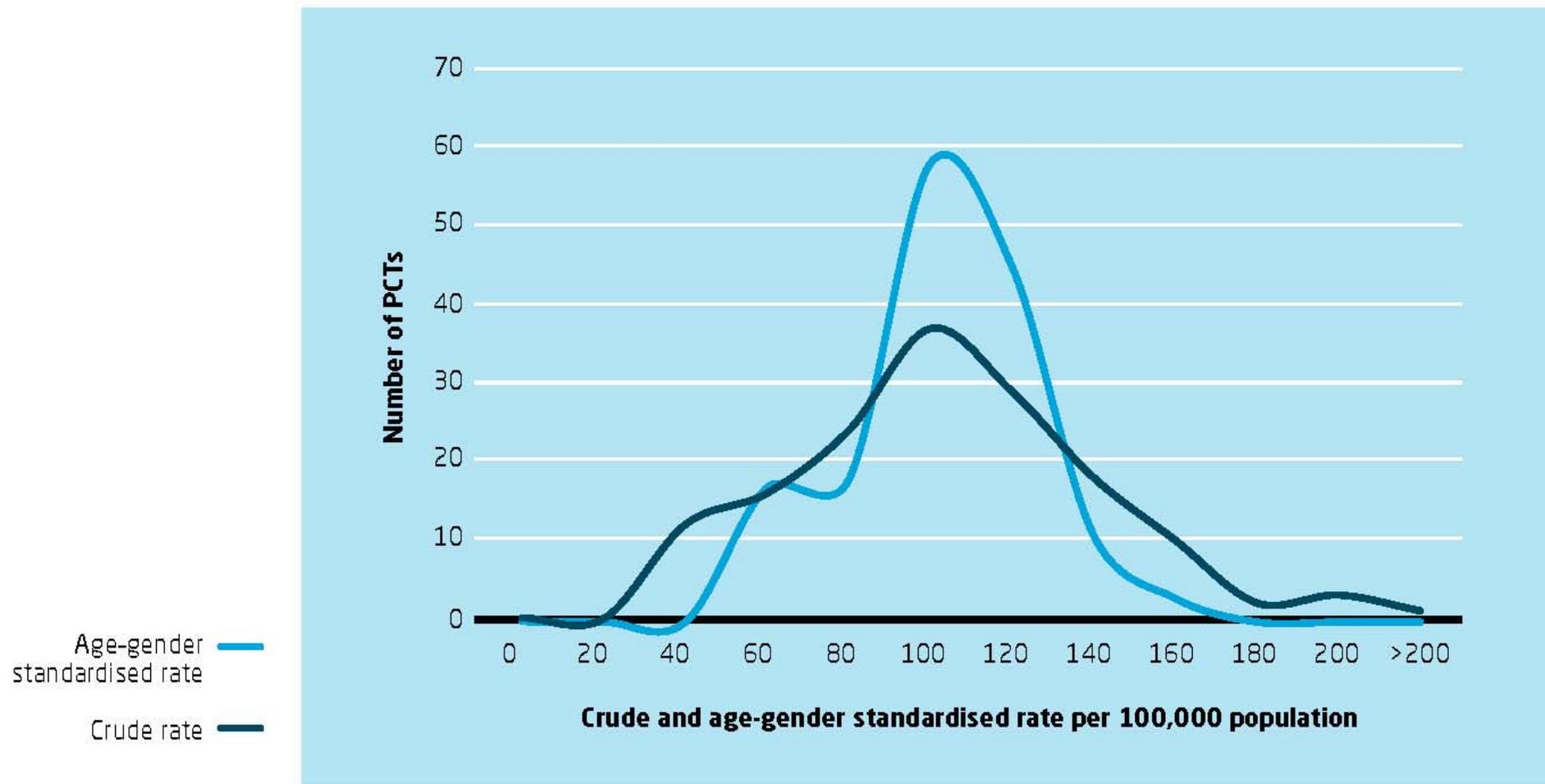
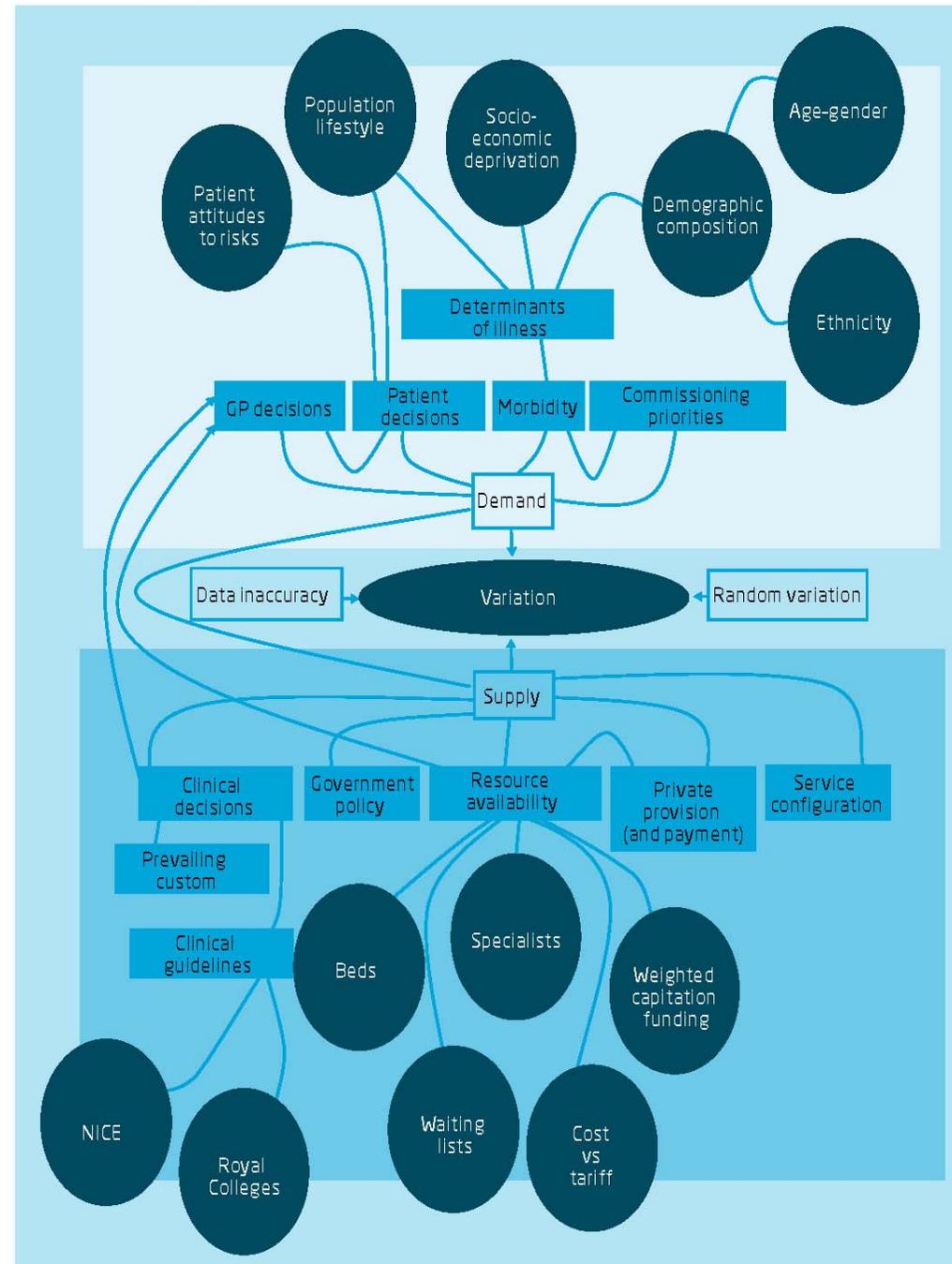


Figure 1 Mapping causes of variation

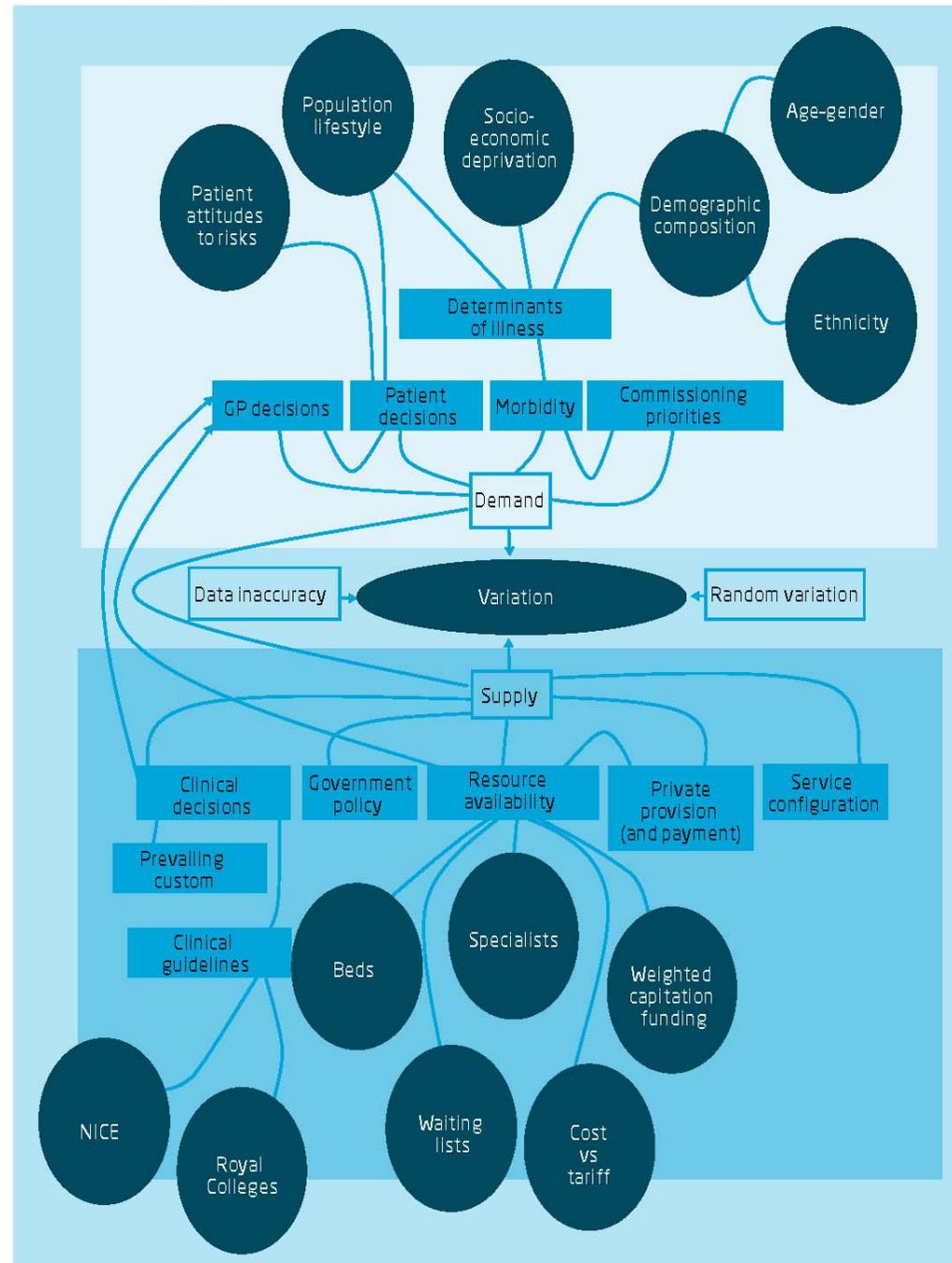


Demand

Variation

Supply

Figure 1 Mapping causes of variation



→ Outcomes?

Lung cancer in the UK

- Incidence: 39,000 cases per year
- Mortality: 36,000 lung cancer deaths per year
- Surgical resection around 9% (ex SCLC)
- 5-year relative survival is 8.5%

- 1-year survival: ~80% among resected patients
~30% among non-resected



National Lung Cancer Audit

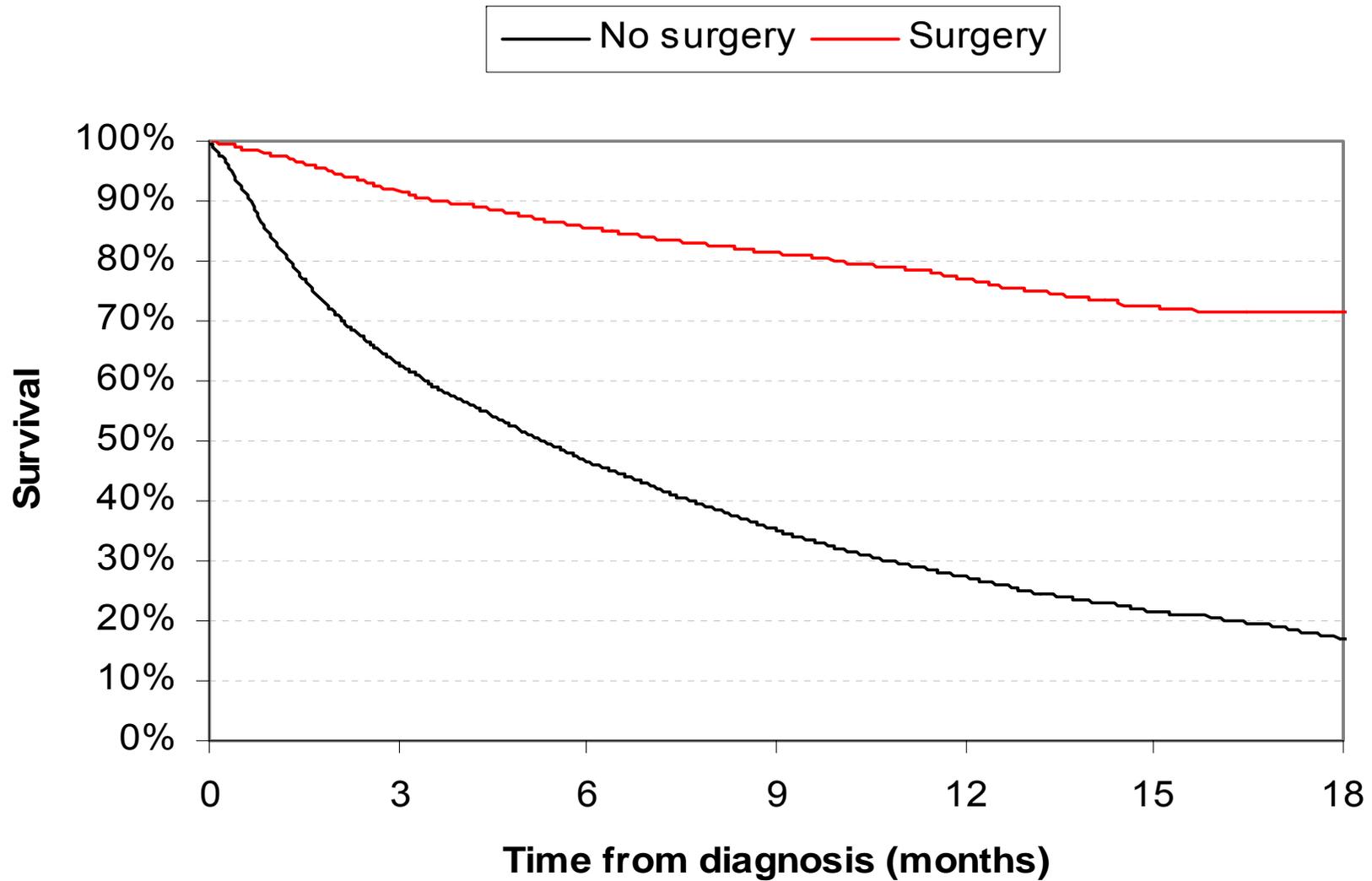
Key findings about the quality of care for
people with Lung Cancer in England
incorporating headline and completeness
data from Wales

Report for the audit period 2005



Prepared in association with:
Healthcare Commission • Royal College of Physicians

Surgical resection and survival



Questions

- How does the use of surgical resection vary in England?
- What is the association between surgical resection and survival?
- *Could we increase lung cancer survival by increasing the use of surgical resection?*



Materials and methods

- Lung cancer in England, 2004-2006, excl. SCLC (n=77,349)

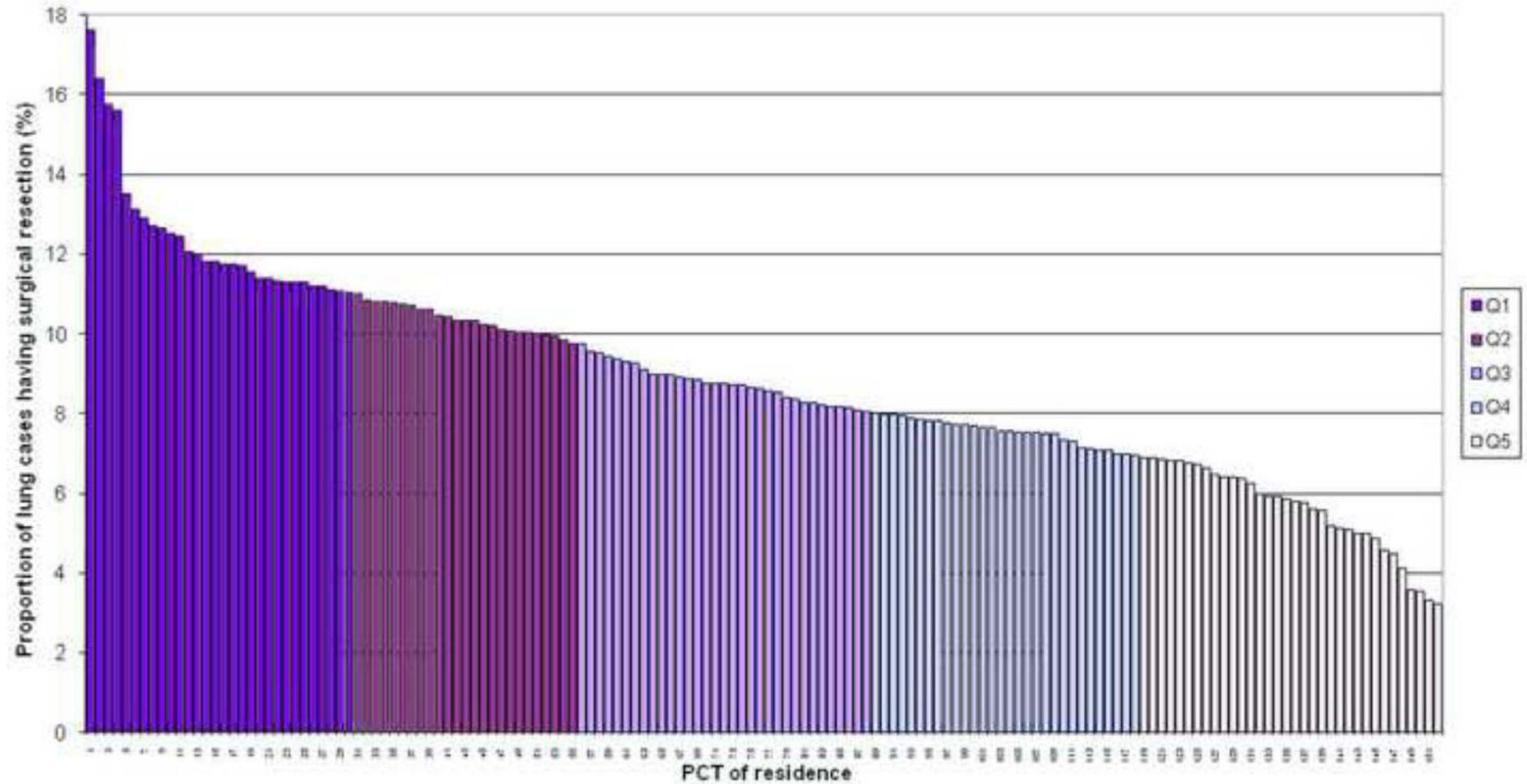
Source: cancer registries in England

- Surgical resection (%) by PCT area

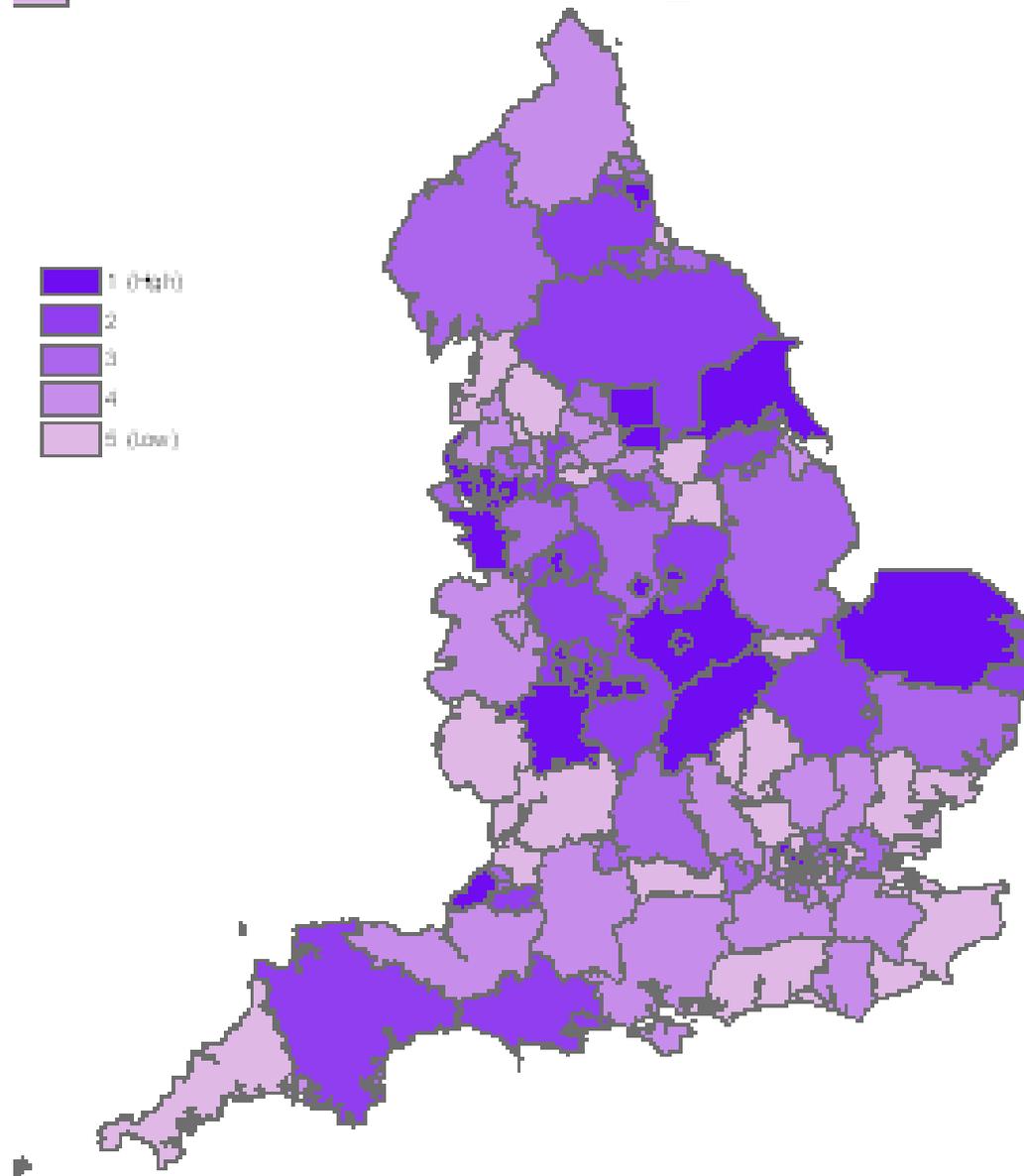
Source: hospital episode statistics data



PCT variation in surgical resection



PCT_variation in surgical resection



Factors associated with surgical resection

Proportion of resected patients, and adjusted odds ratios (OR) for resection.					
		Total	Resected	%	Adjusted OR 95%CI
Age group	0-54	5,379	776	14	1.34 (1.22-1.47)
	55-59	5,805	809	14	1.26 (1.15-1.38)
	60-64	8,385	1,147	14	1.25 (1.15-1.35)
	65-69	10,855	1,336	12	1.11 (1.03-1.21)
	70-74	13,164	1,427	11	1.00
	75-79	14,852	1,065	7	0.65 (0.60-0.71)
	80-84	11,692	303	3	0.23 (0.20-0.26)
	85+	7,217	37	1	0.05 (0.03-0.06)
	χ^2				1512.93
	<i>p-value for trend</i>				<0.001
Sex	Male	45,789	4,020	9	1.00
	Female	31,560	2,880	9	1.04 (0.99-1.10)
	χ^2				2.72
	<i>p-value</i>				0.10
Socio-economic deprivation (IMD 2004 income quintile)	1 (most affluent)	10,696	1,027	10	1.00
	2	13,582	1,189	9	0.88 (0.80-0.96)
	3	15,646	1,418	9	0.91 (0.83-0.99)
	4	17,648	1,527	9	0.82 (0.76-0.89)
	5 (most deprived)	19,777	1,739	9	0.76 (0.70-0.83)
	χ^2				42.08
	<i>p-value for trend</i>				<0.001

Hypotheses about resection and survival

- Survival of all patients in relation to surgery quintile

Surgical resection $\uparrow \rightarrow$ Survival \uparrow ?

- Survival of resected patients in relation to surgery quintile

Surgical resection $\uparrow \rightarrow$ Survival \downarrow ??



Survival analysis: all NSCLC patients

Hazard ratios (HR) according to frequency of surgical resection among all 77,349 lung cancer patients

Resection quintile	Number of patients	Proportion resected (%)	HR	95%CI
1 (high)	15,500	12	0.88	(0.86-0.91)
2	15,195	10	0.92	(0.90-0.94)
3	15,694	9	0.93	(0.91-0.95)
4	15,687	8	0.95	(0.92-0.97)
5 (low)	15,273	6	1.00	
χ^2			86.80	
<i>p-value for trend</i>			<0.001	

* Adjusted for age, sex and socio-economic deprivation

Survival analysis: resected NSCLC patients

Hazard ratios (HR) according to frequency of surgical resection among 6,900 resected lung cancer patients

Resection quintile	Number of patients	HR	95%CI
1 (high)	1,910	1.15	(0.98-1.36)
2	1,573	1.01	(0.85-1.20)
3	1,382	0.81	(0.67-0.97)
4	1,179	0.92	(0.76-1.10)
5 (low)	856	1.00	
χ^2		9.36	
<i>p-value for trend</i>		0.002	

* Adjusted for age, sex and socio-economic deprivation

Absolute numbers of deaths

Observed, expected and excess mortality in 77,349 lung cancer patients

Resection quintile	Observed (O)	Expected(E)	Excess deaths (O-E)
1 (high)	11,265	13,226	-1,961
2	11,123	12,442	-1,319
3	11,518	12,735	-1,217
4	11,595	12,519	-924
5 (low)*	11,555	11,555	0
Total	57,056	62,476	-5,420

Observed, expected and excess mortality in 6,900 resected lung cancer patients

Resection quintile	Observed (O)	Expected(E)	Excess deaths (O-E)
1 (high)	523	441	82
2	369	361	8
3	268	332	-64
4	256	276	-20
5 (low)*	197	197	0
Total	1613	1607	6



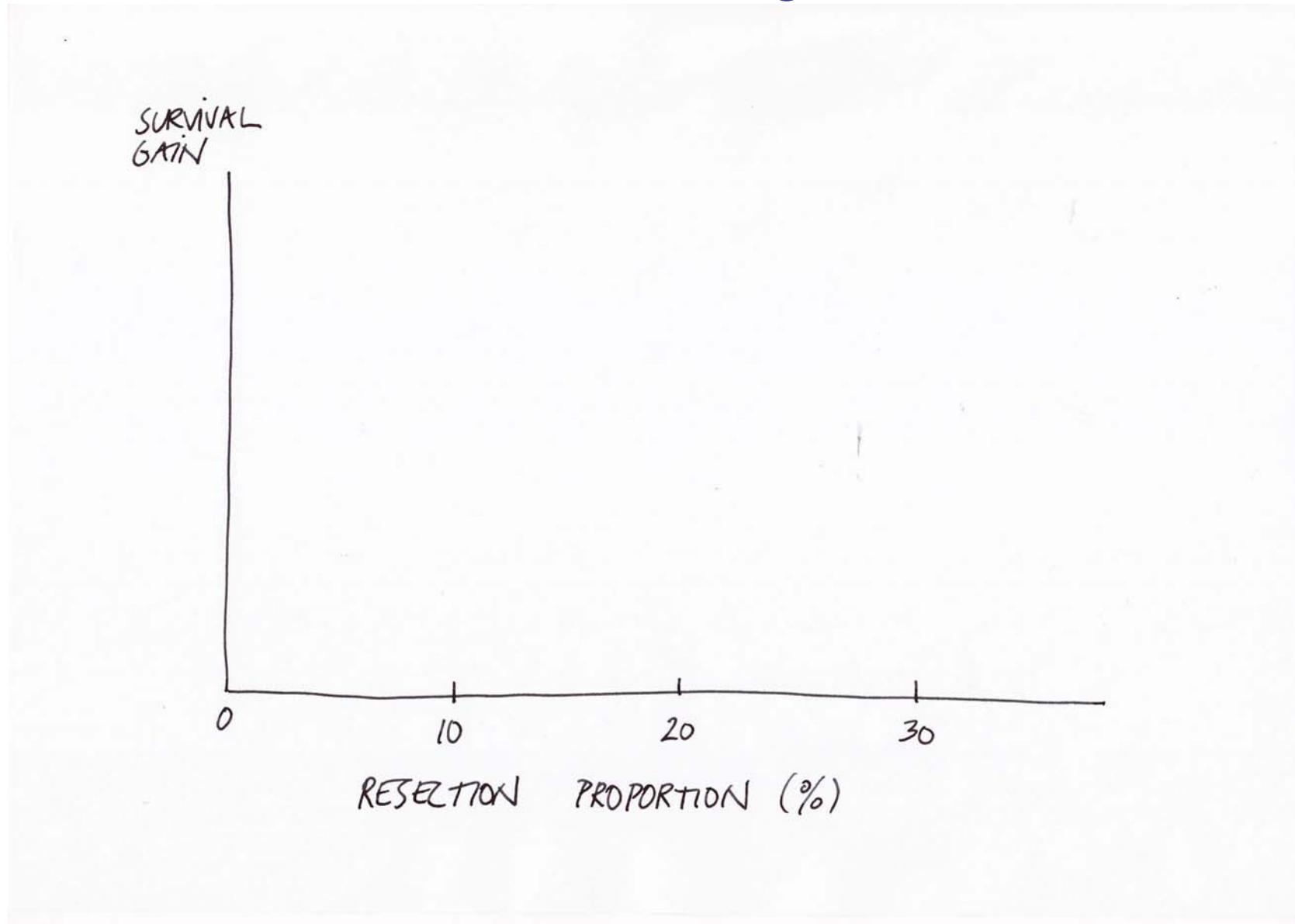
Bottom line

High resection proportion is strongly associated with survival overall and only moderately inversely associated with survival within the resected group.

These associations were not influenced by age or SES



Diminishing returns?



Diminishing returns?



Strengths and limitations

- Large, nationwide study
- High completeness of registration and ascertainment of resections and deaths
- No data on stage, comorbidity, imaging, resection volume, clinical specialisation



Inference, generalisation and action

Sources of variation:

- Tumour and patient factors
- Surgeon factors
- MDT and institutional factors



Intervention?

- Design clinician-led intervention to increase the proportion of lung cancer patients that are resected
- Collect relevant data on decision making process and relevant clinical covariates
- Collect survival and other relevant outcomes data



Acknowledgment

This is a contribution from the National Cancer Intelligence Network (www.ncin.org.uk) and is based on information collected and quality assured by the regional cancer registries in England (www.ukacr.org).



