

# EXPLORING DIFFERENCES IN SURVIVAL FROM LUNG CANCER IN SCOTLAND COMPARED TO BRITISH COLUMBIA: A POPULATION-BASED STUDY

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# Background

- Scotland historically one of the highest incidences of lung cancer
- Reported survival is lower than that observed in other countries
- Speculative reasons
  - Therapeutic nihilism
  - Late diagnosis
  - Lack of available healthcare resources

# Background

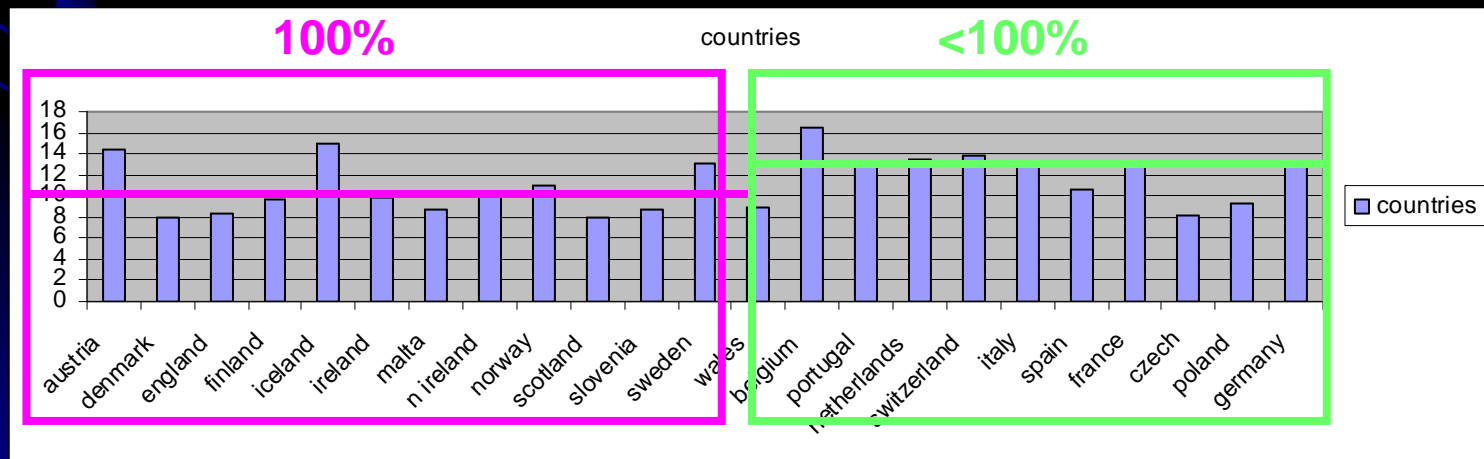
- MD Thesis University of London (Supervisor H. Møller)  
'Lung Cancer in Scotland: Past, Present and Future'
- Past
  - Review of history of lung cancer
  - Systematic review of population-based outcomes data for lung cancer
  - Comparison of outcomes in Scotland and BC from 1995
- Present
  - Outcomes in SE Scotland in 2002 v 1995
- Future
  - Models of service requirements for optimal lung cancer care
  - How can we improve outcomes?

# Background

- Registry-based data such as EURO CARE very useful to give 'the big picture'
- Weaknesses
  - Only very basic data collected
  - Differences in registrations e.g. no death certificate only registrations in France and Sweden
  - Age profile – weight 29% >75<sup>1</sup> – in Scotland 50% lung cancer patients >75yrs

# Background

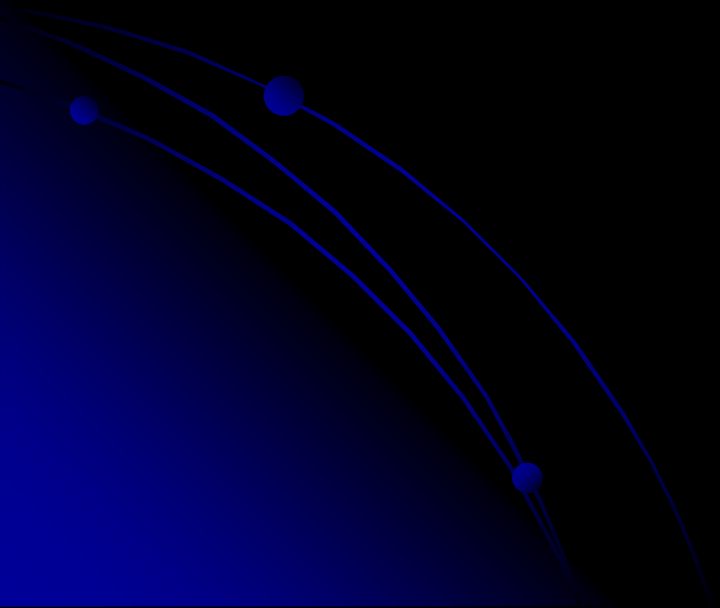
- Registry coverage – 11/23 have 100% coverage (all UK) others e.g. France 11%, Germany 1.3% of population
- Trend for 'improved' survival with reduced coverage



# Scotland 1995

- Scottish Lung Cancer Group conducted notes-based audit of 91% registrations <sup>1</sup>
- Demonstrated
  - Median survival 3.6mo
  - 10% 2-yr survival
  - Surgery 11%, RT 36%, Chemo 16%
  - Use RT – age, stage, specialist, Healthboard<sup>2</sup>

# Comparison Scotland v BC



# British Columbia

- Population 4 million
- Universal Healthcare via a Provincial Insurance Scheme
- 5 (6) cancer centres part of British Columbia Cancer Agency
- Unified treatment protocols
- Data linkage with Cancer Registry
- In 1992 lung cancer 5yr RS 12-15% v 6% Scotland





# Methods

- BC Cancer Registry identified 2073 pts  
(to match Scottish series excluded DCO and survival <1day)
- RT and chemo (<6/12) identified by BCCA
- Surgery by linkage with insurance claims
- Age, sex, stage, path type, deprivation (income), travel times.
- Compared with Scottish series to investigate
  - Factors affecting treatment
  - Factors affecting survival

# Results

-older

-more  
deprived

-less path

-fewer CTs

Comparison of patient and tumour-related factors in BC and Scotland.

	BC (n= 2073)	Scotland (n= 3833)	Chi-squared
Male	1215 (58,6%)	2327 (60,7%)	$p= 0,119$
Female	858 (41,4%)	1506 (39,3%)	
Age < 60	424 (20,5%)	576 (15,0%)	$p< 0,001$
60– 69	626 (30,2%)	1259 (32,8%)	
70– 79	735 (35,5%)	1437 (37,5%)	
80+	288 (13,9%)	561 (14,6%)	
Travel OK	1477 (71,3%)	3502 (91,4%)	$p< 0,001$
Not OK	594 (28,7%)	256 (6,7%)	
Not known	2 (0,0%)	75 (1,9%)	
Least deprived	906 (43,7%)	1261 (32,9%)	$p< 0,001$
Most deprived	1165 (56,2%)	2572 (67,1%)	
Not known	2 (0,0%)	–	
NSCLC	1540 (74,3%)	2168 (56,6%)	$p< 0,001$
SCLC	306 (14,8%)	674 (17,6%)	
No pathology	227 (11,0%)	991 (26,9%)	
Squamous	481 (31,2%)	1103 (50,9%)	$p< 0,001$
Adenocarcinoma	630 (40,9%)	553 (25,5%)	
Large cell	223 (14,5%)	180 (8,3%)	
NSCLC-NOS	206 (13,4%)	332 (15,3%)	
CT scan	1526 (76,3%)	1847 (48,2%)	$p< 0,001$
No	547 (26,4%)	1986 (51,8%)	
Localised	498 (24,0%)	964 (25,2%)	$p< 0,001$
Regional	538 (26,0%)	1254 (32,7%)	
Metastatic	756 (36,5%)	1202 (31,4%)	
Unknown	281 (13,6%)	413 (10,8%)	

Effect of fewer  
CT scans

# Results

-66 v 57% treated

-26 v 14% PCT

-21 v 11% surgery

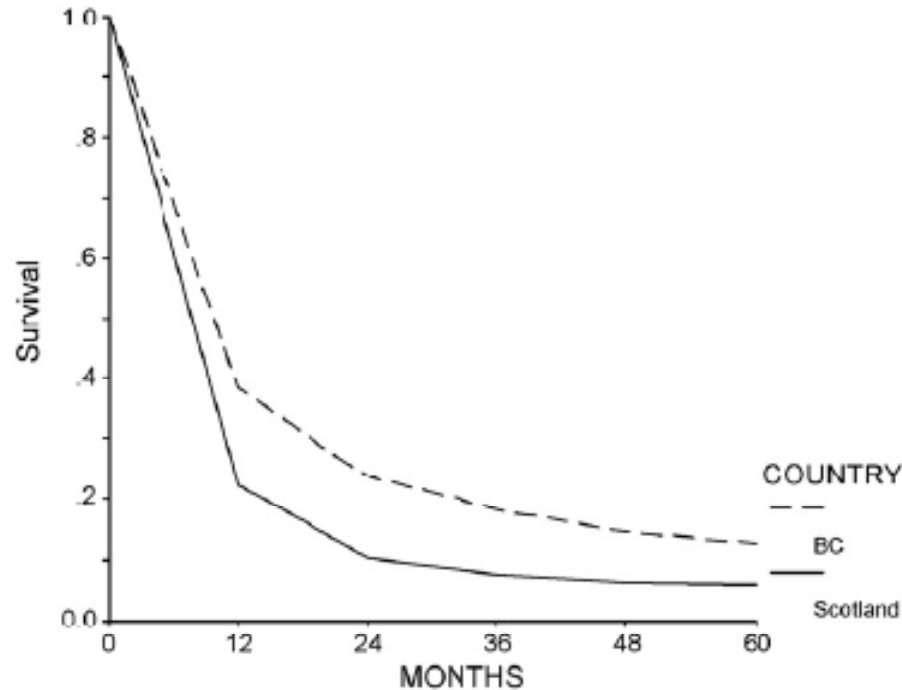
- 40 v 37% RT

Treatment	BC (n= 2073)	Scotland (n= 3383)
NSCLC		
Surgery	364(23.6%)	315(14.5%)
Surgery + PORT	30(1.9%)	35(1.6%)
Surgery + PORT + chemo	5(0.3%)	1(0.0%)
Surgery pall RT	17(1.1%)	3(0.1%)
Surgery + chemo	8(0.5%)	40(1.8%)
Surgery + pall RT + chemo	1(0.1%)	1(0.0%)
Radical RT	38(2.5%)	77(3.6%)
Radical RT + chemo	3(0.2%)	2(0.1%)
Pall RT chest	499(32.4%)	808(37.3%)
Pall RT + chemo	56(3.7%)	39(1.8%)
Chemo	60(3.9%)	95(4.4%)
None	459(29.8%)	752(34.7%)
SCLC		
Surgery	3(1.0%)	5(0.7%)
Surgery + adjuvantRT + chemo	2(0.7%)	2(0.3%)
Surgery + chemo	2(0.7%)	4(0.6%)
Surgery + pall RT + chemo	1(0.3%)	0(0%)
Chemo + adjuvantRT	64(20.9%)	48(7.1%)
Chemo + pall RT	71(23.2%)	59(8.8%)
Chemo	91(29.7%)	312(46.3%)
Pall RT	22(7.2%)	71(10.6%)
None	50(16.3%)	173(25.7%)
No pathology		
Surgery	5(2.2%)	0(0%)
Radical RT	3(1.3%)	15(1.5%)
Pall RT	24(10.8%)	23(2.3%)
Pall RT + chemo	0(0%)	3(0.3%)
Chemo	3(1.3%)	15(1.5%)
None	192(84.6%)	722(72.9%)

# MVA – any treatment and PCT

	BC		Scotland	
	Adjusted OR any treatment	Adjusted OR PCT	Adjusted OR any treatment	Adjusted OR PCT
Male	1	1	1	1
Female	1.0 (0.8-1.3)	1.0 (0.8-1.3)	0.9 (0.8-1.07)	1.1 (0.8-1.3)
Age <60	1	1	1	1
60-69	0.6 (0.4-0.9)	0.75 (0.53-1.08)	0.52 (0.4-0.7)	0.7 (0.4-0.8)
70-79	0.4 (0.3-0.6)	0.62 (0.44-0.87)	0.31 (0.2-0.4)	0.25 (0.2-0.35)
80+	0.2 (0.1-0.3)	0.16 (0.09-0.27)	0.1 (0.08-0.15)	0.03 (0.01-0.07)
Travel OK	1	1	1	1
Not OK	0.8 (0.7-1.1)	1.1 (0.8-1.4)	2.1 (1.5-2.9)	1.4 (0.9-2.1)
Most deprived	1	1	1	1
Least deprived	1.3 (1.1-1.7)	1.4 (1.1-1.8)	1.3 (1.1-1.5)	1.1 (0.9-1.4)
NSCLC	1	1	1	1
SCLC	2.8 (1.9-3.9)	2.1 (1.4-3.0)	1.8 (1.4-2.2)	0.6 (0.4-0.8)
No pathology	0.1 (0.1-0.2)	0.1 (0.04-0.2)	0.3 (0.3-0.4)	0.1 (0.07-0.2)
Localised	1	1	1	1
Regional	0.7 (0.5-1.0)	0.27 (0.2-0.36)	1.0 (0.8-1.2)	0.4 (0.3-0.5)
Metastatic	0.4 (0.3-0.5)	0.01 (0-0.012)	0.5 (0.5-0.6)	0.02 (0.01-0.03)
Unknown	0.07 (0.05-0.11)	0.11 (0.07-0.16)	0.26 (0.17-0.31)	0.01 (0.01-0.07)

# Relative Survival



$p < 0.001$

Number	Start	1 year	2 year	3 year	4 year	5 year
BC	2070	752	442	316	239	192
Scotland	3833	810	364	263	214	190

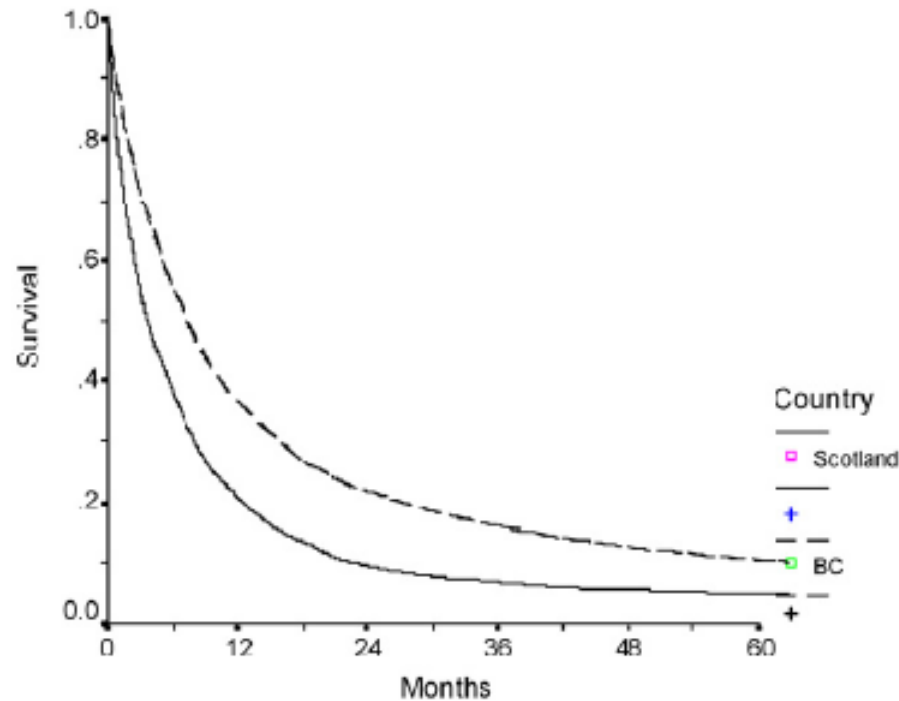
**1yr 38 v 22%**  
**2yr 23 v 10%**  
**5yr 12 v 6%**

# Cox's proportional hazard for Overall Survival

- In BC – men , age >70, more advanced disease, no pathology
- In Scotland – same plus living <1hr cancer centre and deprivation
- HR death 1.6 Scotland v BC
- However if add in 'treatment' v 'no treatment' HR death 1.5 Scotland v BC

.....so under-treatment not the whole story

# Overall Survival following surgery



p=0.0175

Number	Start	1 year	2 year	3 year	4 year	5 year
BC	437	348	275	224	178	152
Scotland	406	283	215	177	155	146

HR death 1.3

Scotland v BC

# So....even when treated aggressively Scottish patients fare less well – why?

## ● Hypotheses

- Co-morbidity e.g. cardiac disease
- Life-style –
  - Smoking 32% Scots v 27% BC in 1995
  - Diet – fruit and vegetables
  - ‘Stress’ – epigenetic changes
- Ethnicity – 25% BC residents ‘South-East Asian
- Differences in tumour biology



# Conclusions

- Survival in Scotland inferior to BC but can only partly be explained by less treatment
- Outcomes following treatment are inferior
- Possible other factors such as lifestyle, co-morbidity, population genetics, cancer biology
- Data is now 14yrs old but unfortunately still applicable as little change in survival

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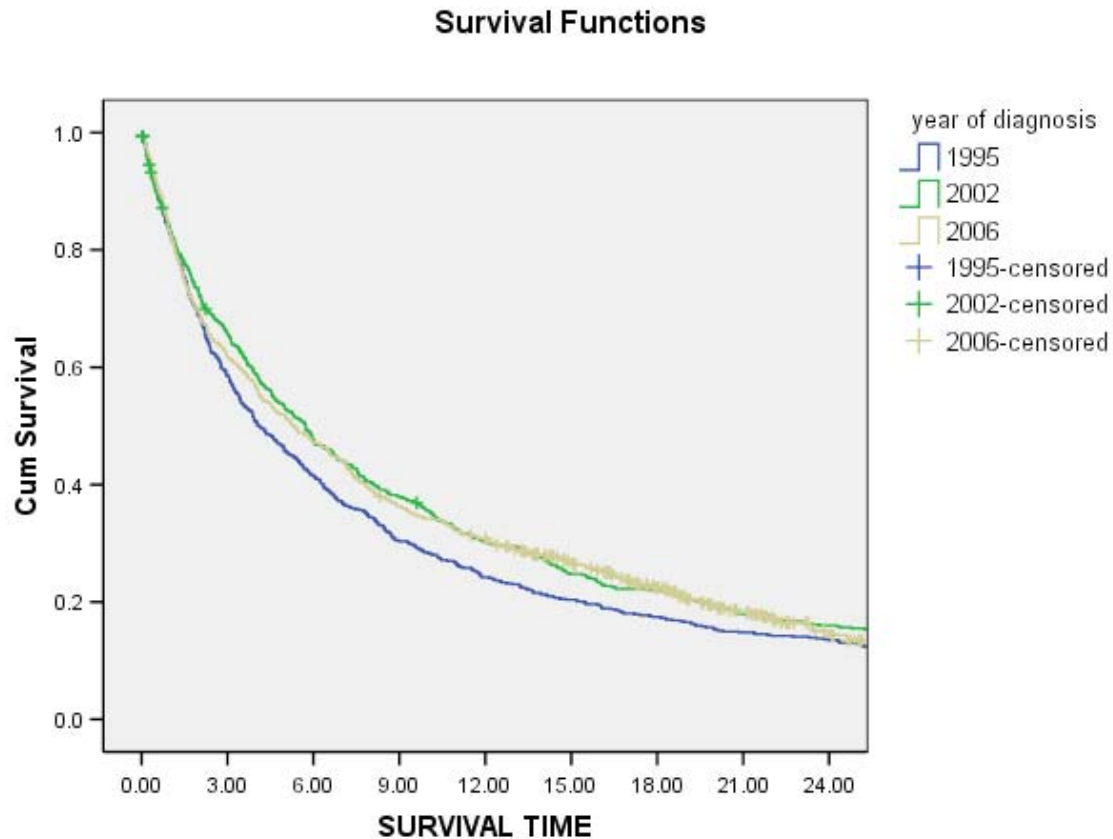
### **Thesis publications (so far)**

Scotland v BC: Lung Cancer. 2009;64(3):358-66.

Scotland 1995 v 2002: J Thorac Oncol. 2008; 491-8.

Systematic review: Nat Clin Pract Oncol. 2007;4(10):570-7.

# Current situation (Lothian n ~ 650PA)



	1995	2006
PCT	16%	26%
Pall	48%	31%
None	36%	43%

2006

Surgical rate = 9%

Rad RT = 17%