Patterns of care and survival from cancer in Ireland 1994 to 1998

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1 Contents

2 Introduction

Preliminary studies by the National Cancer Registry suggested to us that there were regional variations in patterns of treatment for cancer beyond those which could be reasonably expected by differences in case mix or random variation. In 2000 we sought and were awarded a grant by the Health Research Board to investigate this further. The work was completed with the aid of a further grant from the Department of Health and Children.

The purpose of this work was to identify if

a. there are significant differences in the expectation of survival of cancer patients in Ireland, based on place of residence

b. if any part of these differences can be related to

- patient factors such as age and morbidity
- tumour factors such as stage at presentation and cancer type
- differences between areas in cancer treatment

3 Methods

The cases analysed were all cases of cancer newly diagnosed by the National Cancer Registry between January 1st, 1994 and December 31st, 1998, regardless of whether they were histologically confirmed.

3.1 Exclusions

The data consisted of all patients with a date of diagnosis in 1994 to 1998 inclusive. If patients had more than one primary cancer (excluding non-melanoma skin cancer) only the earliest was included in the study.

Patients aged under 15 or over 99 at the time of diagnosis were excluded. Patients with unknown address were also excluded.

Cases for which the sole evidence of cancer was a death certificate, or where the cancer was not diagnosed until after death, were excluded. Other cases with survival=0 were retained. Only primary invasive carcinomas of the breast, colorectum, lung and prostate were included. In situ and benign cancers, and those of uncertain behaviour, were excluded.

All inclusions and exclusions are shown in Table 3.1.

Table 3.1 Data Preparation Summary

Tumour site	Exclusions	Observations
Colorectal	**All registrations for 1994 to 1998**	**8464**
	age <15 or age>99	-2
	address unknown	-0
	method of presentation was autopsy"	-30
	method of diagnosis was "post-mortem""	-14
	not carcinoma	-13
	in situ	-5
	Final dataset	**8400**
Prostate	All registrations for 1994 to 1998	5617
	age <15 or age>99	-9
	address unknown	-2
	method of presentation was autopsy"	-26
	method of diagnosis was "post-mortem""	-2
	not carcinoma	-1
	in situ	-1
	Final data set	**5576**
Lung	All registrations for 1994 to 1998	7286
	age <15 or age>99	-0
	address unknown	7218
	method of presentation was autopsy"	-36
	method of diagnosis was "post-mortem""	-29
	not carcinoma	-3
	in situ	-11
	Final data set	**7207**
Breast	All registrations 1994 to 1998	7923
	age <15 or age>99	-2
	sex=male	-62
	address unknown	0
	method of presentation was "autopsy"	-3
	not carcinoma	-7
	in situ	-15
	Final data set	**7834**

3.2 Variable definitions

3.2.1 Patient variables

a Age

This was the age at diagnosis, as calculated by the difference between date of birth and date of diagnosis. This was available for all patients.

b Smoking and marital status

This was recorded as given in the medical record.

c Date of death

The last day of follow-up was taken to be January 1st. 2000. The date of death was taken to be that on the death certificate. Where a patient was registered as dead, but ho date of death was recorded, the patient was taken as being alive on the date of censoring.

d Cause of death

The cause of death was that on the death certificate. The cancer registered was accepted as the cause of death if this fell into a pre-defined number of categories (see Appendix 1).

e Health board

The health board of residence was derived from the address given at the time of cancer diagnosis. This was assigned from DED coding of addresses for all patients in 1994 to 1997, and for those in Tipperary in 1998. For other patients, the county given in the address was taken as the county of residence. This is occasionally incorrect, where postal addresses refer to a neighbouring county. Most patients in a specific health board area are treated in a relatively limited number of hospitals and areas. Table 3.2 shows the health board area of treatment of residents of each health board area with cancer. For the ERHA, SHB and WHB, more than 90% of residents were treated in their area of residence, while for the other areas between 30% and 80% of cancers were treated in the area where the patient lived. The proportion treated locally was highest for colorectal cancer and lowest for lung cancer.

Table 3.2. Number (percentage) of cancer patients resident in each health board area by place of treatment

	Area of treatment	Area of residence							
		ERHA	MHB	MWHB	NEHBHB	NWHB	SHB	SEHB	WHB
breast	ERHA	**2895 (99%)**	124 (26%)	66 (10%)	169 (30%)	51 (11%)	16 (1%)	156 (20%)	44 (6%)
	MHB	9 (<1%)	**291 (62%)**	10 (2%)	6 (1%)	0 (0%)	0 (0%)	3 (<1%)	0 (0%)
	MWHB	0 (0%)	2 (<1%)	**446 (70%)**	0 (0%)	0 (0%)	2 (<1%)	12 (2%)	0 (0%)
	NEHB	5 (<1%)	4 (1%)	0 (0%)	**390 (69%)**	6 (1%)	0 (0%)	0 (0%)	1 (<1%)
	NWHB	0 (0%)	0 (0%)	0 (0%)	2 (<1%)	**388 (81%)**	0 (0%)	0 (0%)	5 (1%)
	SHB	1 (<1%)	1 (<1%)	41 (6%)	0 (0%)	1 (<1%)	**1212 (98%)**	40 (5%)	0 (0%)
	SEHB	3 (<1%)	7 (1%)	17 (3%)	0 (0%)	0 (0%)	0 (0%)	**556 (72%)**	1 (<1%)
	WHB	0 (0%)	44 (9%)	53 (8%)	0 (0%)	22 (5%)	0 (0%)	0 (0%)	**674 (92%)**
	none	7 (<1%)	0 (0%)	5 (1%)	2 (<1%)	9 (2%)	13 (1%)	4 (1%)	5 (1%)
lung	ERHA	**2844 (99%)**	193 (56%)	118 (23%)	263 (50%)	165 (38%)	14 (1%)	255 (37%)	82 (15%)
	MHB	9 (<1%)	**118 (34%)**	0 (0%)	1 (<1%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
	MWHB	0 (0%)	2 (1%)	**302 (60%)**	0 (0%)	0 (0%)	2 (<1%)	7 (1%)	0 (0%)
	NEHB	14 (<1%)	1 (<1%)	0 (0%)	**250 (48%)**	3 (1%)	0 (0%)	0 (0%)	0 (0%)
	NWHB	0 (0%)	0 (0%)	0 (0%)	4 (1%)	**207 (48%)**	0 (0%)	0 (0%)	5 (1%)
	SHB	0 (0%)	0 (0%)	51 (10%)	0 (0%)	0 (0%)	**929 (96%)**	83 (12%)	0 (0%)
	SEHB	4 (<1%)	1 (<1%)	4 (1%)	0 (0%)	0 (0%)	0 (0%)	**329 (48%)**	0 (0%)
	WHB	0 (0%)	25 (7%)	23 (5%)	1 (<1%)	31 (7%)	0 (0%)	0 (0%)	**443 (82%)**
	none	12 (<1%)	4 (1%)	7 (1%)	2 (<1%)	28 (6%)	20 (2%)	10 (1%)	8 (1%)
prostate	ERHA	**1668 (99%)**	168 (48%)	38 (9%)	278 (62%)	71 (18%)	25 (3%)	289 (42%)	58 (9%)
	MHB	3 (<1%)	**150 (43%)**	0 (0%)	2 (<1%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
	MWHB	0 (0%)	3 (1%)	**326 (74%)**	0 (0%)	0 (0%)	0 (0%)	9 (1%)	1 (<1%)
	NEHB	5 (<1%)	3 (1%)	0 (0%)	**161 (36%)**	1 (<1%)	0 (0%)	0 (0%)	1 (<1%)
	NWHB	0 (0%)	0 (0%)	0 (0%)	2 (<1%)	**307 (79%)**	0 (0%)	0 (0%)	10 (2%)
	SHB	1 (<1%)	0 (0%)	32 (7%)	0 (0%)	0 (0%)	**856 (96%)**	50 (7%)	0 (0%)
	SEHB	2 (<1%)	1 (<1%)	11 (2%)	1 (<1%)	0 (0%)	1 (<1%)	**340 (49%)**	0 (0%)
	WHB	0 (0%)	22 (6%)	31 (7%)	0 (0%)	5 (1%)	1 (<1%)	0 (0%)	**545 (87%)**
	none	0 (0%)	1 (<1%)	4 (1%)	1 (<1%)	6 (2%)	11 (1%)	3 (<1%)	7 (1%)
colorectal	ERHA	**2699 (98%)**	78 (16%)	26 (4%)	177 (26%)	72 (12%)	16 (1%)	91 (10%)	42 (5%)
	MHB	13 (<1%)	**351 (73%)**	2 (<1%)	3 (<1%)	3 (1%)	0 (0%)	1 (<1%)	2 (<1%)
	MWHB	0 (0%)	2 (<1%)	**507 (82%)**	0 (0%)	0 (0%)	2 (<1%)	9 (1%)	1 (<1%)
	NEHB	13 (<1%)	4 (1%)	0 (0%)	**498 (73%)**	11 (2%)	1 (<1%)	0 (0%)	0 (0%)
	NWHB	0 (0%)	1 (<1%)	0 (0%)	3 (<1%)	**496 (83%)**	1 (<1%)	0 (0%)	11 (1%)
	SHB	1 (<1%)	0 (0%)	40 (6%)	0 (0%)	0 (0%)	**1351 (97%)**	97 (11%)	1 (<1%)
	SEHB	7 (<1%)	2 (<1%)	18 (3%)	0 (0%)	0 (0%)	2 (<1%)	**670 (76%)**	0 (0%)
	WHB	0 (0%)	41 (9%)	21 (3%)	0 (0%)	4 (1%)	2 (<1%)	0 (0%)	**831 (93%)**
	none	18 (1%)	2 (<1%)	3 (<1%)	3 (<1%)	11 (2%)	25 (2%)	11 (1%)	6 (1%)

f Deprivation

A deprivation index was derived from data in the 1996 census at district electoral division (DED) level, and applied to individual patients by address linkage. This index was kindly provided by Dr. Alan Kelly, SAHRU, Trinity College Dublin.

g Co-morbidity

The Registry does not collect co-morbidity data, and this was added by linkage from the HIPE database. All records of patients in this study were linked with the anonymised HIPE database 1994-1998 by hospital, medical record number and date of birth. The records could be linked for 64% of breast and colorectal cancers, 70% of lung cancers but only 58% of prostate cancers. Co-morbidity was scored by attributing a Charlson index[3] score to each episode of care. If a patient had more than one episode, the episode with the highest score was used. The index was re-coded to low (Charlson score 0 or 1); high (Charlson score 2 or over), and missing. Diagnoses of malignant disease on the HIPE record were not included in the Charlson score.

3.2.2 Tumour variables

a TNM

TNM stage of tumours was derived from information in the medical record. Where a pathological T, N or M stage was given, this was used; otherwise the clinical stage was used.

b Summary stage

This was derived, by algorithm, from the TNM stage.

c Grade

This was provided by the pathologist. Where a Gleason score was provided, this was converted to a grade.

d Basis of diagnosis

This was classified as “histological” if the tumour was characterised by histology of the primary, or a metastasis, by cytology or by bone marrow aspirate. Other methods of diagnosis were described as “clinical”.

[3] Charlson index

3.2.3 Treatment variables

a Surgery

Any operation directed at reducing or removing the primary tumour was described as surgery. Diagnostic biopsy, bypass or reconstructive surgery was not included.

b Chemotherapy

In 1994 and 1995, no distinction was made by the Registry between chemotherapy and hormone therapy, so these cannot be distinguished for all 1994 incident cancers and a proportion of 1995 cancers.

c No treatment

Patients were considered to have had “no treatment” if the only treatment given was palliative, supportive or symptomatic, that is, not directed at reducing tumour bulk.

3.2.4 Hospital variables

Many patients attended a number of hospitals during the initial phase of their cancer. A hospital was recorded for each attendance. However, for each cancer a “main hospital” was defined. If surgery was carried out, this was the hospital of surgery; if not, the hospital of chemotherapy was used, and if there was neither chemotherapy nor surgery, the hospital of diagnosis.

3.3 Statistical models

3.3.1 Descriptive tables

Differences in the distribution of variables between health boards were assessed by simple chi-squared testing. Differences in one- and five-year survival were determined by log-rank testing using the STATA ***sts test*** routine.

3.3.2 Cox proportional hazards models.

The main method used in this report for determining if differences existed in survival between health boards was Cox proportional hazards modelling. This method tests the hypothesis that a significant difference exists between a specific health board and a reference area (in this case the ERHA). This difference is expressed a s "hazard ratio", the overall chance of dying of the specified cancer in the health board, relative to the reference, over the study period. A hazard ratio, for instance, of 1.04 for breast cancer in the MHB means that breast cancer patients in the MHB had, over the six years of follow-up, 4% greater chance of dying of the cancer than those in the ERHA. In most cases these differences are small and due to chance, so they are also tested for statistical significance, and give a probability.

For all cancers, and subgroups of cancers (e.g. those having surgery), two models were tested. The simple (univariate) model tested only the effect of health board on hazard/survival. The more complex (multivariate) model attempted to incorporate all other factors which might contributed to hazard (e.g. patient age, stage, co-morbidity), and to give a hazard ratio for each health board adjusted for all of these variables. In essence this describes the hazard ratio for a patient of a particular age, cancer stage etc in the target health board compared to an identical patient in the ERHA.

Models were fitted using the STATA ***stcox*** command. Models were tested for proportionality of hazards using the ***stphtes***t routine. Where hazards were non-proportional, variables were either excluded, or used for stratification only. The usual reason for non-proportionality appeared to be the inclusion of highest and lowest risk patients in a single group, with the intermediate risk patients in the other. This commonly occurred when treatment related variables were used. Goodness of fit was tested by testing the likelihood ratio against the base model. Variables which improved model fit significantly were included, even if coefficients for individual levels of these variables were not statistically significant.[4]

3.3.3 Logistic regression

Binary logistic regression was used to test for dependence of treatment on a variety of patient and tumour variables, using STATA routine ***logistic***. The principles underlying modelling and the use of univariate and multivariate moels in this process are almost identical to those for Cox modelling. Goodness of fit was tested by testing the likelihood ratio against the base model. Variables which improved model fit significantly were included, even if coefficients for individual levels of these variables were not statistically significant.

[4] For a description of the procedure followed see, for instance, Collett D. Modelling survival data in medical research. Pp149-197. London 1994. Chapman and Hall.

Results

4 Breast cancer

4.1 Cases analysed and their characteristics

4.1.1 Patients

The cases analysed are shown in Table 4.1. There were 7834 cases of female breast cancer in total during five years. The number rose slightly each year. The age distribution of cases was similar in all health board areas, with the exception of the NWHB, where more patients (11% as compared to the national average of 8%) were aged over 80, and the MHB, where fewer than average (5%) were aged over 80.

There was a lower percentage than expected of non-smokers in the ERHA and NEHB and a higher percentage in the SHB and WHB. The proportion of married and unmarried patients was the same in all areas. The number of patients living in areas described as “deprived “ was particularly high in the NWHB, but was also above average in the NEHB and ERHA.

Table 4.1. Breast cancer cases: patient characteristics

	Number (%) of Registrations									
	Health board of residence									
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**7834**	**2926**	**476**	**638**	**570**	**477**	**1244**	**772**	**731**
Year of incidence	1994	1496 (19%)	569 (19%)	93 (20%)	116 (18%)	97 (17%)	102 (21%)	250 (20%)	120 (16%)	149 (20%)
	1995	1511 (19%)	526 (18%)	96 (20%)	138 (22%)	98 (17%)	83 (17%)	247 (20%)	167 (22%)	156 (21%)
	1996	1571 (20%)	593 (20%)	88 (18%)	133 (21%)	117 (21%)	94 (20%)	249 (20%)	159 (21%)	138 (19%)
	1997	1595 (20%)	615 (21%)	85 (18%)	125 (20%)	136 (24%)	95 (20%)	232 (19%)	155 (20%)	152 (21%)
	1998	1661 (21%)	623 (21%)	114 (24%)	126 (20%)	122 (21%)	103 (22%)	266 (21%)	171 (22%)	136 (19%)
Age	<=40	622 (8%)	238 (8%)	42 (9%)	58 (9%)	44 (8%)	39 (8%)	89 (7%)	64 (8%)	48 (7%)
	41-50	1695 (22%)	652 (22%)	119 (25%)	129 (20%)	121 (21%)	79 (17%)	278 (22%)	161 (21%)	156 (21%)
	51-60	1900 (24%)	766 (26%)	107 (22%)	154 (24%)	135 (24%)	103 (22%)	279 (22%)	176 (23%)	180 (25%)
	61-70	1596 (20%)	582 (20%)	111 (23%)	143 (22%)	111 (19%)	92 (19%)	240 (19%)	160 (21%)	157 (21%)
	71-80	1377 (18%)	460 (16%)	73 (15%)	104 (16%)	102 (18%)	110 (23%)	243 (20%)	149 (19%)	136 (19%)
	80+	644 (8%)	228 (8%)	24 (5%)	50 (8%)	57 (10%)	54 (11%)	115 (9%)	62 (8%)	54 (7%)
Smoking status	Non-smoker	3793 (48%)	1143 (39%)	246 (52%)	329 (52%)	259 (45%)	236 (49%)	772 (62%)	366 (47%)	442 (60%)
	Ex-smoker	603 (8%)	243 (8%)	37 (8%)	28 (4%)	54 (9%)	46 (10%)	74 (6%)	51 (7%)	70 (10%)
	Smoker	1620 (21%)	621 (21%)	87 (18%)	148 (23%)	120 (21%)	98 (21%)	227 (18%)	168 (22%)	151 (21%)
	Unknown	1818 (23%)	919 (31%)	106 (22%)	133 (21%)	137 (24%)	97 (20%)	171 (14%)	187 (24%)	68 (9%)
Marital status	Married	4669 (60%)	1726 (59%)	291 (61%)	401 (63%)	330 (58%)	266 (56%)	760 (61%)	447 (58%)	448 (61%)
	Not married	2881 (37%)	1046 (36%)	171 (36%)	211 (33%)	216 (38%)	206 (43%)	463 (37%)	299 (39%)	269 (37%)
	Unknown	284 (4%)	154 (5%)	14 (3%)	26 (4%)	24 (4%)	5 (1%)	21 (2%)	26 (3%)	14 (2%)
Deprivation	Affluent	2055 (26%)	1231 (42%)	69 (14%)	201 (32%)	57 (10%)	28 (6%)	255 (20%)	62 (8%)	152 (21%)
	Intermediate	3288 (42%)	639 (22%)	284 (60%)	344 (54%)	296 (52%)	251 (53%)	717 (58%)	379 (49%)	378 (52%)
	Deprived	1653 (21%)	700 (24%)	83 (17%)	77 (12%)	157 (28%)	184 (39%)	174 (14%)	177 (23%)	101 (14%)
	Unknown	838 (11%)	356 (12%)	40 (8%)	16 (3%)	60 (11%)	14 (3%)	98 (8%)	154 (20%)	100 (14%)

4.1.2 Cancers

Characteristics of the cancer studied are shown in Table 4.2. Only a very small number of cancers was discovered incidentally or through screening and this did not vary much between health boards. The number for which this information was unknown was relatively high for the ERHA, possibly reflecting secondary referral of some cancers to ERHA hospitals. The percentage of histological confirmation was uniformly high, running from 94% in the NWHB and MWHB to 99% in the MHB.

Half of the cases had full TNM staging information recorded. The fraction was highest in the SEHB (57%) and lowest in the NEHB (33%). Information on grade was similarly about 50% complete, with the highest levels of reporting in the NWHB (69%) and lowest in the MWHB (43%). Because of the high percentage of unknown values, it is not possible to draw any firm conclusions about difference in stage distribution between health boards. However, for those cases in which a stage was reported, there was a higher than expected percentage of later stage cases (III and IV) in NEHB residents ($\chi 2=15.7;p=.027$). A higher percentage of high-grade tumours was reported from the MWHB (68%) and SEHB (66%) compared to the average of 51% ($p<.001$).

Table 4.2. Breast cancer cases: tumour characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**7834**	**2926**	**476**	**638**	**570**	**477**	**1244**	**772**	**731**
Presentation	Screening	142 (2%)	51 (2%)	1 (0%)	11 (2%)	9 (2%)	8 (2%)	36 (3%)	17 (2%)	9 (1%)
	Incidental	168 (2%)	39 (1%)	4 (1%)	19 (3%)	15 (3%)	9 (2%)	63 (5%)	5 (1%)	14 (2%)
	Symptoms	7221 (92%)	2638 (90%)	454 (95%)	583 (91%)	530 (93%)	456 (96%)	1133 (91%)	729 (94%)	698 (95%)
	Unknown	303 (4%)	198 (7%)	17 (4%)	25 (4%)	16 (3%)	4 (1%)	12 (1%)	21 (3%)	10 (1%)
Histological confirmation	Yes	7519 (96%)	2848 (97%)	469 (99%)	599 (94%)	540 (95%)	449 (94%)	1179 (95%)	733 (95%)	702 (96%)
	No	315 (4%)	78 (3%)	7 (1%)	39 (6%)	30 (5%)	28 (6%)	65 (5%)	39 (5%)	29 (4%)
Morphology	Malignant	349(4%)	90(3%)	10(2%)	46(7%)	31(5%)	29(6%)	66(5%)	42(5%)	35(5%)
	Squamous	567(7%)	253(9%)	16(3%)	114(18%)	38(7%)	18(4%)	36(3%)	47(6%)	45(6%)
	Adeno	590(8%)	183(6%)	60(13%)	71(11%)	35(6%)	28(6%)	75(6%)	74(10%)	64(9%)
	Specific	6328(81%)	2400(82%)	390(82%)	407(64%)	466(82%)	402(84%)	1067(86%)	609(79%)	587(80%)
Summary stage	1	833 (11%)	296 (10%)	45 (9%)	75 (12%)	30 (5%)	72 (15%)	157 (13%)	86 (11%)	72 (10%)
	2A	1162 (15%)	463 (16%)	72 (15%)	96 (15%)	55 (10%)	75 (16%)	184 (15%)	144 (19%)	73 (10%)
	2B	874 (11%)	356 (12%)	54 (11%)	57 (9%)	42 (7%)	48 (10%)	144 (12%)	91 (12%)	82 (11%)
	3A	278 (4%)	135 (5%)	16 (3%)	17 (3%)	15 (3%)	15 (3%)	29 (2%)	34 (4%)	17 (2%)
	3B	205 (3%)	100 (3%)	12 (3%)	10 (2%)	12 (2%)	11 (2%)	18 (1%)	28 (4%)	14 (2%)
	4	589 (8%)	228 (8%)	27 (6%)	49 (8%)	35 (6%)	46 (10%)	93 (7%)	54 (7%)	57 (8%)
	Unknown	3893 (50%)	1348 (46%)	250 (53%)	334 (52%)	381 (67%)	210 (44%)	619 (50%)	335 (43%)	416 (57%)
Grade	I	558 (7%)	279 (10%)	45 (9%)	31 (5%)	35 (6%)	28 (6%)	63 (5%)	27 (3%)	50 (7%)
	II	1659 (21%)	718 (25%)	99 (21%)	57 (9%)	124 (22%)	153 (32%)	310 (25%)	97 (13%)	101 (14%)
	III	2170 (28%)	815 (28%)	107 (22%)	106 (17%)	204 (36%)	142 (30%)	375 (30%)	229 (30%)	192 (26%)
	IV	122 (2%)	19 (1%)	1 (0%)	79 (12%)	0 (0%)	6 (1%)	3 (0%)	7 (1%)	7 (1%)
	Unknown	3325 (42%)	1095 (37%)	224 (47%)	365 (57%)	207 (36%)	148 (31%)	493 (40%)	412 (53%)	381 (52%)

4.2 Survival

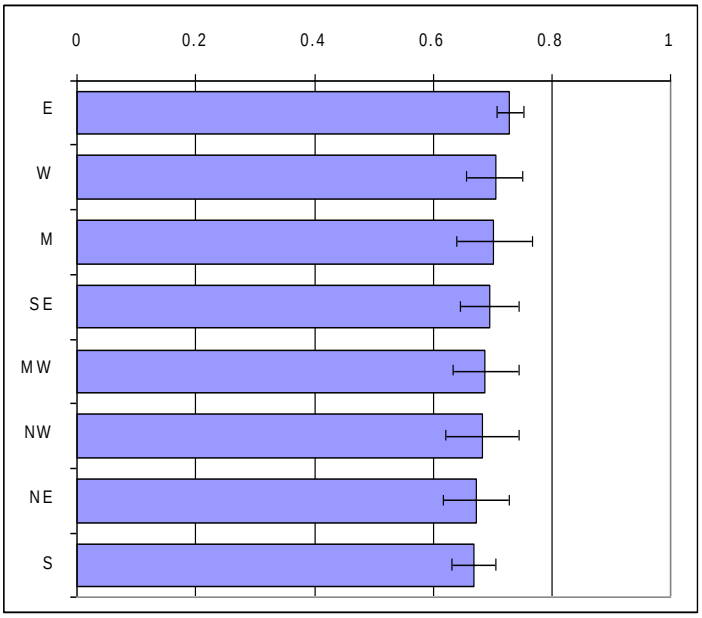
Overall survival for patients with breast cancer was 61.5% at five years (Table 4.3). However deaths specifically from breast cancer were fewer, with a five year survival of 70.2%.

Table 4.3. Breast cancer survival

	Probability of survival	
Years from diagnosis	**All causes**	**Cause-specific**
1	90.7% (90.0%; 91.3%)	92.7% (92.1%; 93.3%)
2	82.2% (81.3%; 83.0%)	86.1% (85.3%; 86.9%)
3	74.5% (73.5%; 75.6%)	80.0% (79.0%; 81.0%)
4	67.3% (66.1%; 68.6%)	74.3% (73.1%; 75.4%)
5	61.5% (60.0%; 63.0%)	70.2% (68.8%; 71.6%)
6	53.7% (50.6%; 56.6%)	64.7% (61.5%; 67.7%)

Table 4.4. Breast cancer: one- and five-year survival by health board

	Cause specific survival	
Area of residence	**One year**	**Five years**
ERHA	93.6% (92.6%; 94.4%)	73.0% (70.6%; 75.2%)
MHB	92.4% (89.6%; 94.4%)	70.3% (63.9%; 75.8%)
MWHB	91.3% (88.8%; 93.3%)	68.9% (63.4%; 73.8%)
NEHB	92.2% (89.6%; 94.1%)	67.3% (61.7%; 72.3%)
NWHB	91.3% (88.4%; 93.5%)	68.2% (62.1%; 73.6%)
SHB	92.0% (90.3%; 93.4%)	66.9% (63.2%; 70.2%)
SEHB	92.5% (90.4%; 94.2%)	69.5% (64.7%; 73.9%)
WHB	93.8% (91.8%; 95.3%)	70.4% (65.7%; 74.6%)



The highest survival was seen in the ERHA (73%) and the lowest in the SHB (67%) (Table 4.4;). Relative to the ERHA, survival at five years was significantly poorer in the NEHB, NWHB and SHB areas. Over the full follow-up period, the poorest survival was seen in the NWHB.

Figure 4.1. Zero to six year Kaplan-Meier survival curves: by health board

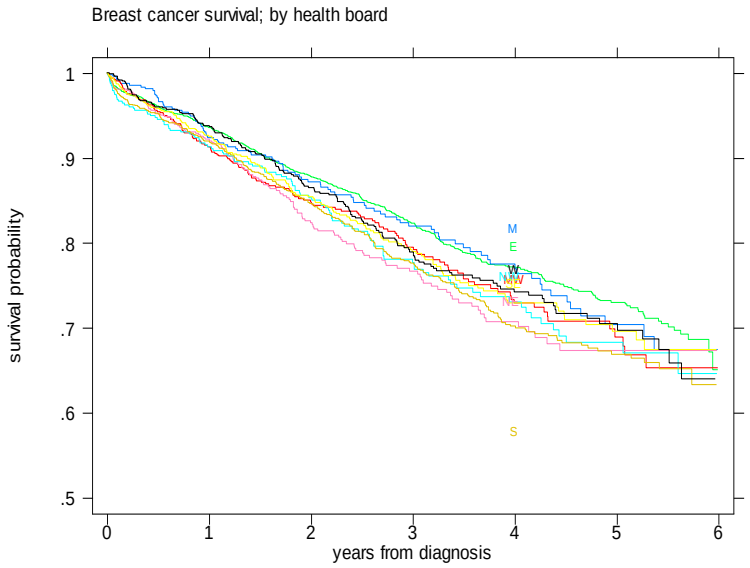
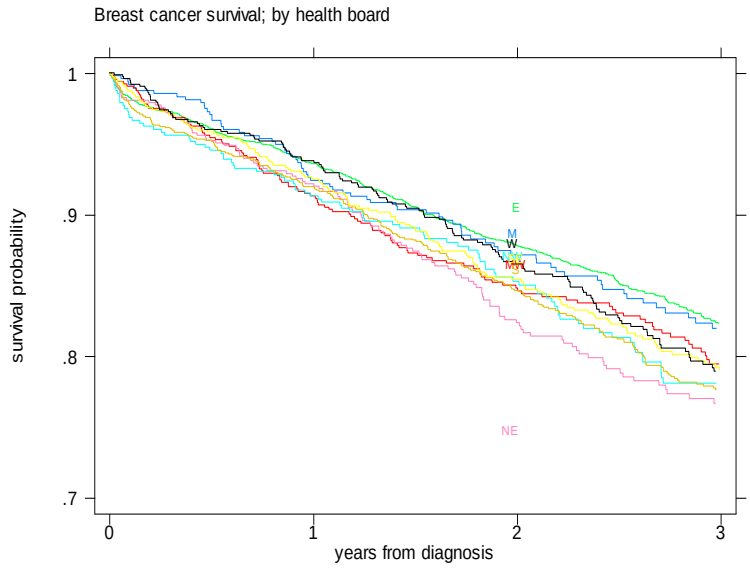


Figure 4.2. Zero to three year Kaplan-Meier survival curves: by health board



Plots of cause-specific survival by health board (Figure 4.1, Figure 4.2) show generally better survival in the ERHA and MHB at most times, and poorer survival in the NEHB and SHB. However, after four years' follow-up, the lines begin to converge, probably due to the relatively small number of patients followed up for this long. As a consequence, modelling of the overall survival patterns through proportional hazards models is a more accurate measure of differences between health boards than are comparisons of five-year survival, which is based on a relatively few number of cases and survivors.

4.3 Factors affecting survival

A number of patient, tumour and treatment factors were tested for their relationship to survival. The data are summarised in Table 4.5, Table 4.6. Detailed tables of one, three and five year survival are provided in Appendix 1.

Table 4.5. Patient characteristics and five-year survival

		Five year survival
Age	<=40	0.721
	41-50	0.746
	51-60	0.737
	61-70	0.704
	71-80	0.657
	>80	0.530
Smoking	Non-smoker	0.711
	Ex-smoker	0.705
	Smoker	0.706
	Unknown	0.676
Marital status	Married	0.726
	Not married	0.664
	Unknown	0.685
Deprivation index	Affluent	0.740
	Intermediate	0.700
	Deprived	0.664
	Unknown	0.552

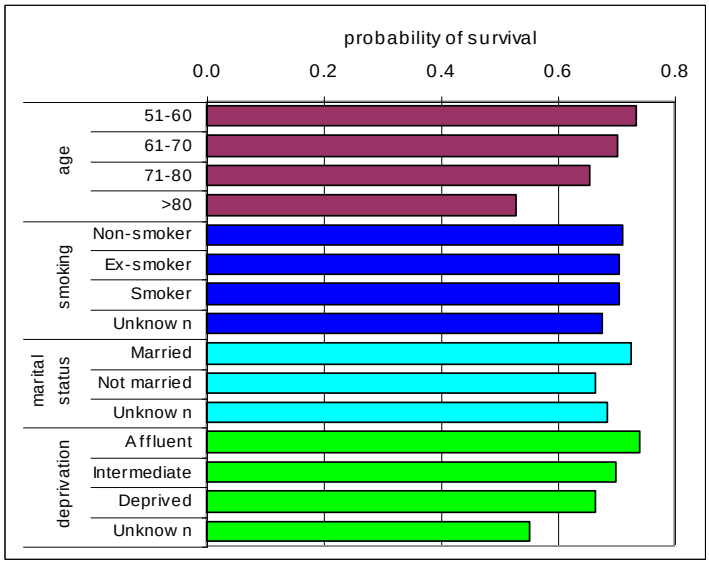
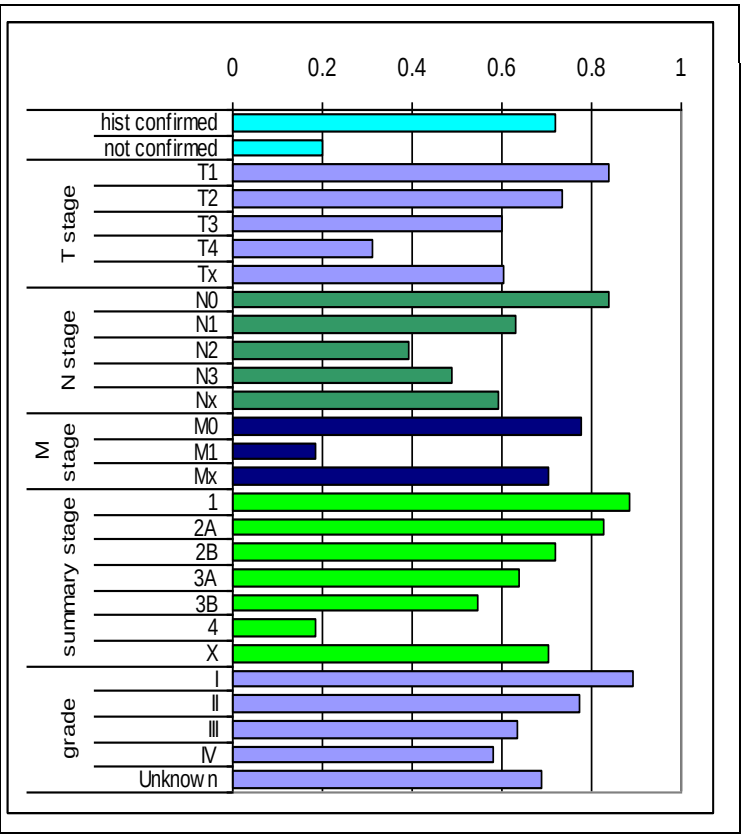


Table 4.6. Tumour characteristics and five-year survival

		Five year survival
Histological confirmation	Confirmed	0.721
	Not confirmed	0.199
T stage	T1	0.837
	T2	0.734
	T3	0.602
	T4	0.310
	TX	0.605
N stage	N0	0.838
	N1	0.630
	N2	0.391
	N3	0.487
	NX	0.591
M stage	M0	0.778
	M1	0.186
	MX	0.705
Summary stage	I	0.884
	2A	0.828
	2B	0.719
	3A	0.638
	3B	0.545
	4	0.186
	Unknown	0.705
Grade	I	0.894
	II	0.774
	III	0.635
	IV	0.580
	Unknown	0.687



Survival decreased with increasing age (χ^2=197.2; p<0.001), with non-married status (χ^2 54.8;p<0.001, with deprivation (χ^2=26.5;p, 0.001), but was only weakly related to smoking (χ^2=7.6;p=0.56).

Of tumour factors, the most strongly correlated with survival were histological confirmation of diagnosis (χ^2=754.7;p<0.001), T stage (χ^2=1011.4;p<0.001), N stage (χ^2 =627.1; p<. 001), M stage (χ^2 1695.8; p<. 001), summary stage (χ^2=1594; p<.001) and grade (χ^2=142.4; p<.001).

Surgery was strongly related to survival, as was any tumour-related treatment (**Error! Reference source not found.**). Even in the absence of surgery, any other tumour related treatment was strongly related to survival (χ^2=14.5, p=.001); hazard ratio 0.70.

Table 4.7. Treatment and five-year survival

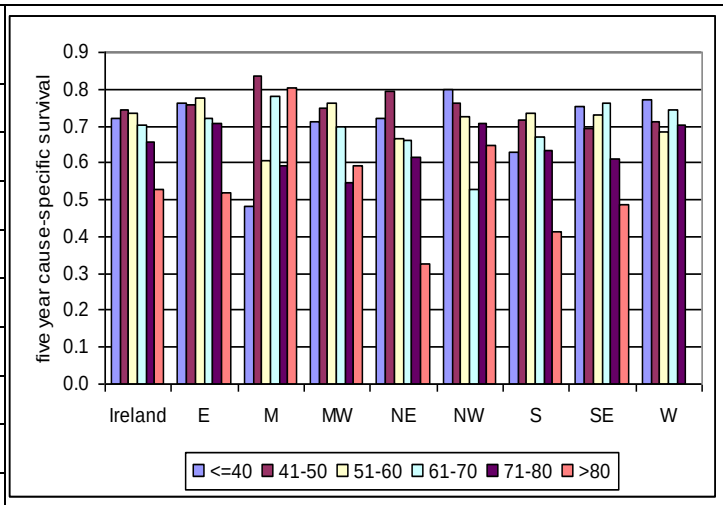
Surgery:		Five year survival
	no surgery	0.388
	surgery	0.761
Any tumour-related treatment:		
	not treated	0.402
	treated	0.715

4.3.1 Age

In general, the decrease in survival as seen for all areas, and was similar to that for Ireland as a whole. As can be seen below (Table 4.8), and in the subsequent data, the figures for Ireland tend to be similar to, and dominated by, those for the ERHA. The trend of survival with age seemed most pronounced in the NEHB and least in the WHB. However, in the latter there were no patients over 80.

Table 4.8; Figure 4.3. Five year breast cancer survival by health board and patient age

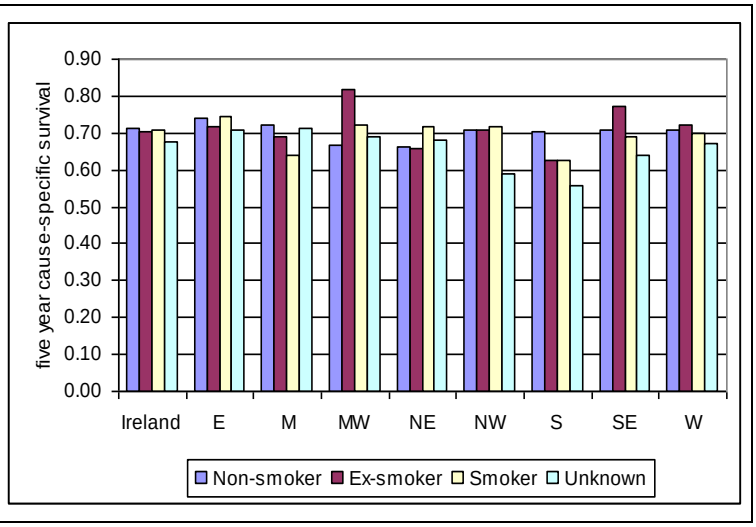
Area of residence	<=40	41-50	51-60	61-70	71-80	>80
Ireland	0.72	0.75	0.74	0.70	0.66	0.53
ERHA	0.76	0.76	0.78	0.72	0.71	0.52
MHB	0.48	0.84	0.61	0.78	0.59	0.80
MWHB	0.71	0.75	0.76	0.70	0.55	0.59
NEHB	0.72	0.79	0.66	0.66	0.62	0.33
NWHB	0.80	0.76	0.72	0.53	0.71	0.65
SHB	0.63	0.72	0.74	0.67	0.64	0.42
SEHB	0.75	0.69	0.73	0.76	0.61	0.49
WHB	0.77	0.71	0.68	0.74	0.70	—



4.3.2 Smoking

Table 4.9; Figure 4.4. Five year breast cancer survival by health board and smoking status

Area of residence	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.71	0.71	0.71	0.68
ERHA	0.74	0.72	0.74	0.71
MHB	0.72	0.69	0.64	0.71
MWHB	0.67	0.82	0.72	0.69
NEHB	0.66	0.66	0.72	0.68
NWHB	0.71	0.71	0.72	0.59
SHB	0.70	0.63	0.63	0.56
SEHB	0.71	0.77	0.69	0.64
WHB	0.71	0.72	0.70	0.67



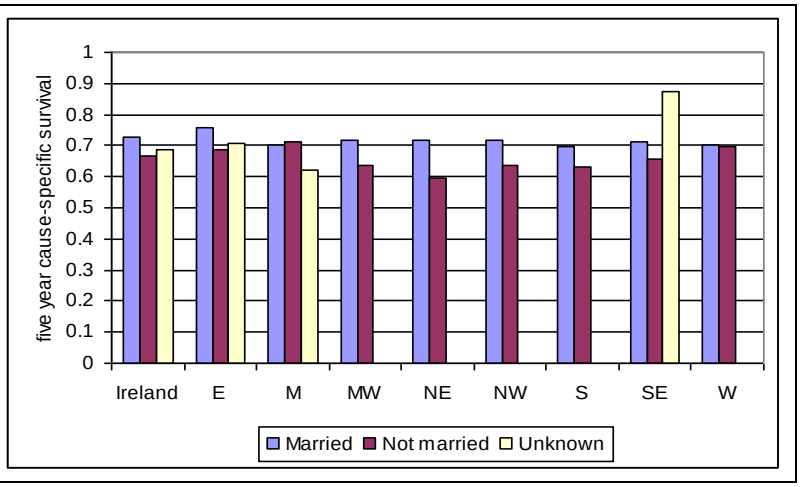
For most areas, patients whose smoking status was “unknown” had a slightly poorer prognosis (Table 4.9).

4.3.3 Marital status

In all areas but the MHB and WHB, married patients had a slight survival advantage of those who were never married (Table 4.10).

Table 4.10; Figure 4.5. Five year breast cancer survival by health board and smoking

Area of residence	Married	Not married	Unknown
Ireland	0.73	0.66	0.69
ERHA	0.76	0.69	0.71
MHB	0.70	0.71	0.62
MWHB	0.72	0.64	—
NEHB	0.72	0.60	—
NWHB	0.72	0.64	—
SHB	0.70	0.63	—
SEHB	0.71	0.66	0.87
WHB	0.70	0.70	—

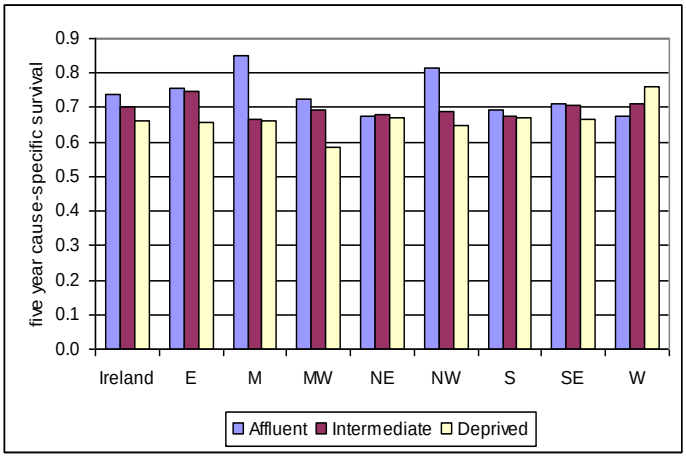


4.3.4 Deprivation

Although there was an overall trend in survival with deprivation, this was not consistent across health boards, with decrease in survival with deprivation in the ERHA, MWHB and NWHB, no definite trend in the MHB, NEHB, SHB and SEHB, and an increase in survival with deprivation in the WHB (Table 4.11).

Table 4.11; Figure 4.6. Five year breast cancer survival by health board and deprivation status

Area of residence	Affluent	Intermediate	Deprived	Unknown
Ireland	0.74	0.70	0.66	0.55
ERHA	0.76	0.75	0.66	—
MHB	0.85	0.67	0.66	—
MWHB	0.73	0.69	0.58	0.61
NEHB	0.67	0.68	0.67	—
NWHB	0.82	0.69	0.65	—
SHB	0.69	0.68	0.67	0.46
SEHB	0.71	0.71	0.66	0.46
WHB	0.68	0.71	0.76	—

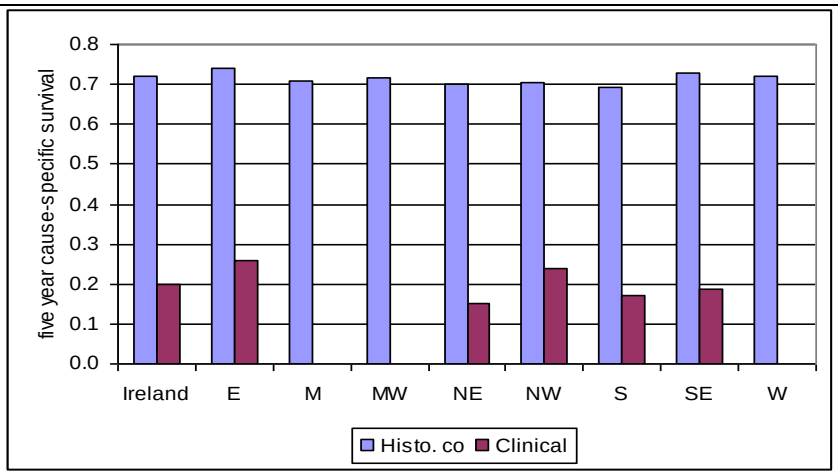


4.3.5 Histological confirmation

The relationship between histological confirmation and survival was consistent across health boards areas, in those areas where some patients were diagnosed without such confirmation (Table 4.12).

Table 4.12; Figure 4.7. Five year breast cancer survival by health board and patient age

Area of residence	Histological confirmation	Clinical
Ireland	0.72	0.20
ERHA	0.74	0.26
MHB	0.71	—
MWHB	0.72	—
NEHB	0.70	0.15
NWHB	0.71	0.24
SHB	0.69	0.17
SEHB	0.73	0.19
WHB	0.72	—



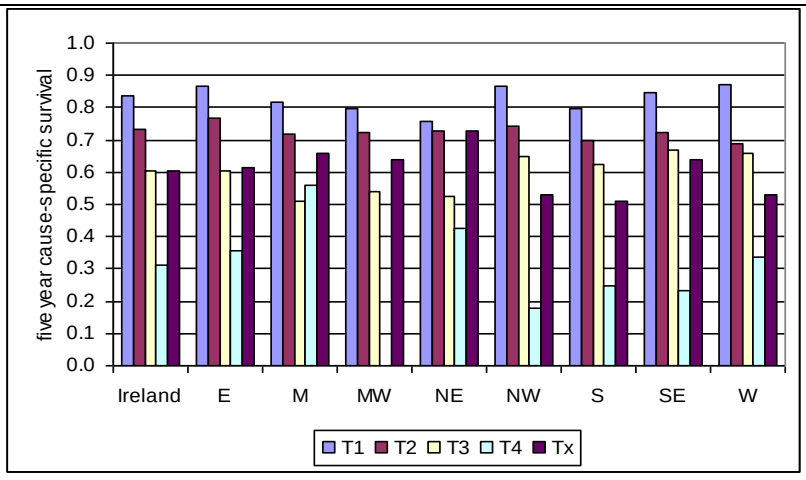
4.3.6 Stage

a T stage

Prognosis for T1 and T2 cancers was similar in all areas (Table 4.13). There was a much wider range of variation inn outcome for T3 and T4 cancers. Survival for TX cancers varied from 73% in the NEHB to 51% in the SHB, suggesting that the reasons for absence of T stage may differ between health boards.

Table 4.13; Figure 4.8. Five year breast cancer survival by health board and T stage

Area of residence	T1	T2	T3	T4	TX
Ireland	0.84	0.73	0.60	0.31	0.60
ERHA	0.87	0.77	0.60	0.35	0.61
MHB	0.82	0.72	0.51	0.56	0.66
MWHB	0.80	0.72	0.54	—	0.64
NEHB	0.76	0.73	0.52	0.43	0.73
NWHB	0.87	0.74	0.65	0.18	0.53
SHB	0.80	0.70	0.62	0.25	0.51
SEHB	0.85	0.72	0.67	0.23	0.64
WHB	0.87	0.69	0.66	0.33	0.53

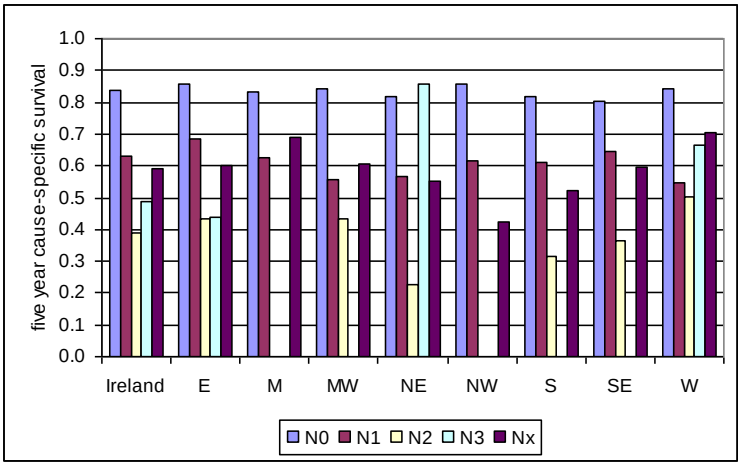


b N stage

Survival for N0 cases was quite similar between health boards (Table 4.14). That for N1 cancers ranged from 68% in the ERHA to 55% in the WHB. The very small number of N3 cases made the results inconsistent. As with TX cases, the range of variation in survival was high reflecting the heterogeneity of this group.

Table 4.14; Figure 4.9. Five year breast cancer survival by health board and N stage

Area of residence	N0	N1	N2	N3	NX
Ireland	0.84	0.63	0.39	0.49	0.59
ERHA	0.86	0.68	0.43	0.44	0.60
MHB	0.83	0.63	—	—	0.69
MWHB	0.84	0.56	0.43	—	0.60
NEHB	0.82	0.56	0.23	0.86	0.55
NWHB	0.86	0.61	—	—	0.42
SHB	0.82	0.61	0.31	—	0.52
SEHB	0.80	0.65	0.36	—	0.60
WHB	0.84	0.55	0.50	0.67	0.70

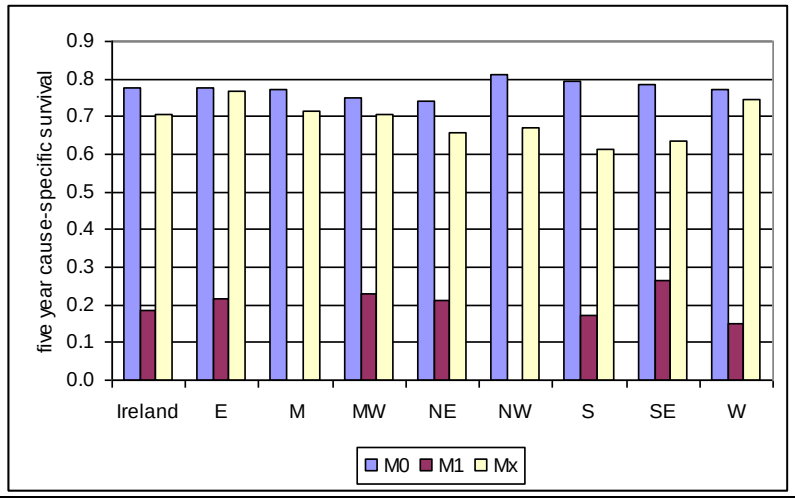


c M stage

The relationship between M stage and survival was strong and consistent across health board areas (Table 4.14). For most areas, the prognosis for MX and cases was only slightly less than that for M0 cases.

Table 4.15; Figure 4.10. Five year breast cancer survival by health board and M stage

Area of residence	M0	M1	MX
Ireland	0.78	0.19	0.70
ERHA	0.77	0.22	0.77
MHB	0.77	—	0.71
MWHB	0.75	0.23	0.71
NEHB	0.74	0.21	0.66
NWHB	0.81	—	0.67
SHB	0.79	0.17	0.61
SEHB	0.78	0.27	0.63
WHB	0.77	0.15	0.74

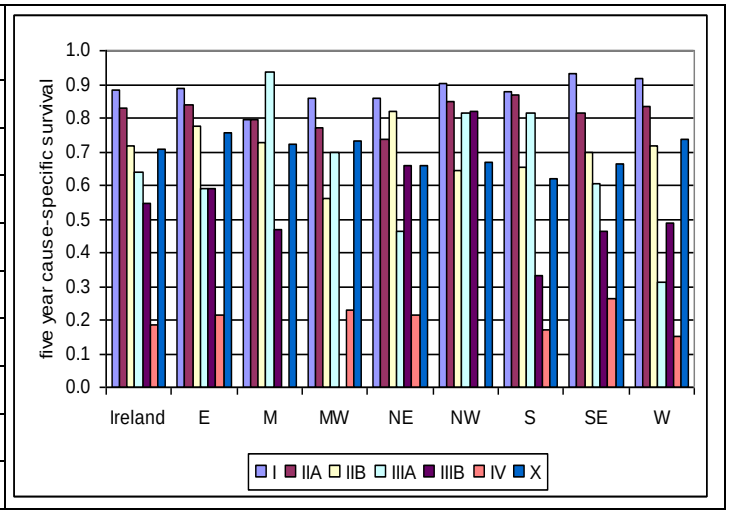


d Summary stage

Survival for stage I cases was best in the SEHB (93%) and poorest in the MHB (80%) (Table 4.16). This difference was not statistically significant. There was a similar range of variation for stage IIA and IIb cases. For IIB cases, survival was significantly poorer in the MWHB and NWHB areas.

Table 4.16; Figure 4.11. Five year breast cancer survival by health board and summary stage

Area of residence	I	IIA	IIB	IIIA	IIIB	IV	X
Ireland	0.88	0.83	0.72	0.64	0.55	0.15	0.71
ERHA	0.89	0.84	0.77	0.59	0.59	0.22	0.75
MHB	0.80	0.80	0.73	0.94	0.47	—	0.72
MWHB	0.86	0.77	0.56	0.70	—	0.23	0.73
NEHB	0.86	0.73	0.82	0.46	0.66	0.21	0.66
NWHB	0.90	0.85	0.64	0.81	0.82	—	0.67
SHB	0.88	0.87	0.65	0.82	0.33	0.17	0.62
SEHB	0.93	0.81	0.70	0.61	0.46	0.27	0.66
WHB	0.92	0.83	0.72	0.31	0.49	0.15	0.74

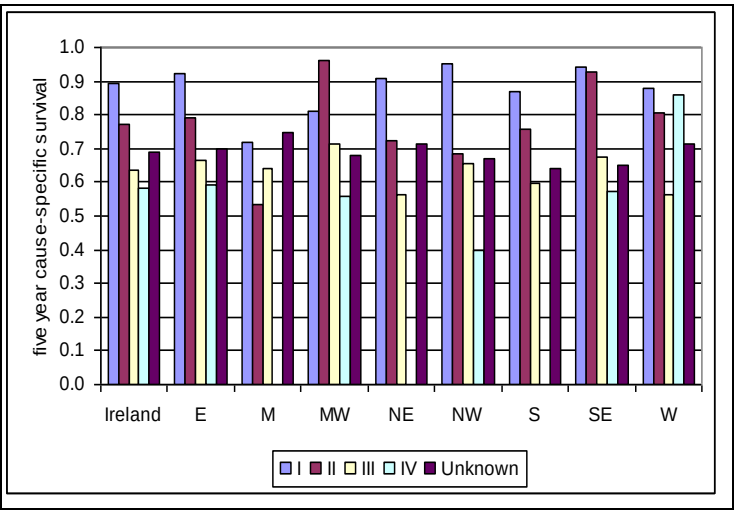


4.3.7 Grade

With a few minor exceptions, higher-grade cancers were associated with a poorer prognosis in all health board areas (Table 4.17). As with stage, cancers with unknown grade seemed to be quite heterogeneous.

Table 4.17; Figure 4.12. Five year breast cancer survival by health board and grade

Area of residence	I	II	III	IV	Unknown
Ireland	0.89	0.77	0.64	0.58	0.69
ERHA	0.92	0.79	0.66	0.59	0.70
MHB	0.72	0.54	0.64	—	0.75
MWHB	0.81	0.96	0.72	0.56	0.68
NEHB	0.91	0.72	0.56	—	0.71
NWHB	0.95	0.69	0.65	0.40	0.67
SHB	0.87	0.76	0.60	—	0.64
SEHB	0.94	0.93	0.67	0.57	0.65
WHB	0.88	0.81	0.57	0.86	0.72



4.4 Survival modelling

A range of Cox proportional hazards models was fitted to the data, in an attempt to adjust for confounders among the patient and tumour characteristics.

When tested in a Cox proportional hazards model, hazard ratios for all areas were higher than in the ERHA (Table 4.18). Survival in the NEHB and SHB were highly significantly lower than that in the ERHA, and for the MWHB and SEHB, although the differences were not significant at the 5% levels, there was strong evidence of poorer survival than in the ERHA.

Table 4.18. Hazard ratios for breast cancer, uncorrected by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.000	
MHB	1.041 (0.838; 1.294)	0.716
MWHB	1.191 (0.990; 1.432)	0.063
NEHB	**1.323 (1.095; 1.598)**	**0.004**
NWHB	**1.236 (1.005; 1.520)**	**0.045**
SHB	**1.277 (1.109; 1.470)**	**0.001**
SEHB	1.167 (.0981; 1.388)	0.082
WHB	1.133 (0.950; 1.351)	0.165

Adding the following patient and tumour factors significantly improved the fit of the model[5]:

- Age
- Deprivation index
- Smoker status
- Co-morbidity
- Tumour morphology
- Tumour grade
- Tumour stage T, N, M

Table 4.19. Hazard ratios for breast cancer, multivariate by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.000	
MHB	1.076 (0.836 ;1.384)	0.571
MWHB	1.122 (0.885 ;1.421)	0.342
NEHB	1.144 (0.915 ;1.431)	0.237
NWHB	0.960 (0.751 ;1.226)	0.743
SHB	1.332 (1.123 ;1.581)	0.001
SEHB	0.955 (0.774 ;1.179)	0.667
WHB	1.127 (0.915 ;1.387)	0.261

[5] The full multivariate models are given in Appendix 3 Table1.1.

Prognosis, and factors affecting prognosis, were quite different for the small number of breast cancer patients who did not have surgery (Table 4.20), so these groups were separated for further analysis.

Table 4.20. Hazard ratios by health board; surgical and non-surgical treatment

	Hazard ratio (95% confidence limits)	
Area of residence	**No surgery**	**Surgery**
ERHA	1.000	0.229 (0.193 ;0.272)
MHB	1.054 (0.727 ;1.530)	0.248 (0.163 ;0.108)
MWHB	1.230 (0.901 ;1.679)	0.281 (0.044 ;0.140)
NEHB	1.176 (0.835 ;1.656)	0.337 (0.023 ;0.159)
NWHB	**1.659 (1.218 ;2.260)**	0.239 (0.000 ;0.115)
SHB	**1.259 (1.005 ;1.577)**	0.282 (0.009 ;0.169)
SEHB	1.221 (0.919 ;1.622)	0.265 (0.029 ;0.139)
WHB	1.088 (0.797 ;1.486)	0.281 (0.074 ;0.141)

4.4.1 Hazard ratios: Patients having surgery

a Univariate model

Uncorrected (univariate) hazard ratios for patients having surgery were similar to those for all patients, again showing a significant reduction in survival for patients in the NEHB and SHB, with the reductions in the MWHB and WHB not significant at the 5% level (Table 4.21).

Table 4.21. Hazard ratios for breast cancer, in patients having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.00	
MHB	1.082 (0.828 ;1.415)	0.564
MWHB	1.229 (0.978 ;1.545)	0.077
NEHB	**1.490 (1.187 ;1.871)**	**0.001**
NWHB	1.043 (0.788 ;1.380)	0.769
SHB	**1.228 (1.025 ;1.471)**	**0.026**
SEHB	1.160 (0.931 ;1.446)	0.185
WHB	1.225 (0.988 ;1.517)	0.064

b Multivariate model

The univariate model was expanded by the addition of the variables already listed. For patients having surgery, the following factors significantly improved model fit:[6]

- Patient age
- T stage
- N stage
- M stage
- Tumour grade
- Co-morbidity

Following correction for these factors, survival for breast cancer patients remained significantly poorer in the NEHB and SHB than in the ERHA (Table 4.22).

Table 4.22. Multivariate hazard ratios for breast cancer, patients having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.000	
MHB	1.188 (0.880 ;1.603)	0.261
MWHB	1.260 (0.942 ;1.685)	0.119
NEHB	**1.331 (1.015 ;1.745)**	**0.039**
NWHB	0.937 (0.668 ;1.315)	0.707
SHB	**1.289 (1.048 ;1.586)**	**0.016**
SEHB	1.101 (0.852 ;1.423)	0.461
WHB	1.122 (0.871 ;1.445)	0.374

[6] The full multivariate models are given in Appendix 3 Table 1.1.

4.4.2 Hazard ratios: Patients not having surgery

a Univariate model

For patients not having surgery, survival was also best in the ERHA, and significantly poorer in the NWHB (Table 4.23).

Table 4.23. Hazard ratios for breast cancer, patients not having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.00	
MHB	1.029 (0.709 ;1.493)	0.880
MWHB	1.197 (0.877 ;1.635)	0.257
NEHB	1.126 (0.800 ;1.586)	0.496
NWHB	**1.547 (1.135 ;2.107)**	**0.006**
SHB	1.227 (0.980 ;1.537)	0.074
SEHB	1.168 (0.879 ;1.551)	0.284
WHB	1.073 (0.786 ;1.465)	0.658

b Multivariate model

A slightly different range of variables had to be fitted to the model of patients not having surgery. These were:

- deprivation score
- smoking
- T stage
- N stage
- M stage
- Tumour morphology[7]

After the inclusion of these variables, hazard ratios associated with health board of residence, in general, decreased and none was significantly higher than that for the ERHA (Table 4.24).

Table 4.24. Multivariate hazard ratios for breast cancer, patients not having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.000	
MHB	1.147 (0.773 ;1.704)	0.496
MWHB	0.990 (0.708 ;1.383)	0.951
NEHB	1.150 (0.801 ;1.650)	0.449
NWHB	1.195 (0.856 ;1.668)	0.296
SHB	1.216 (0.945 ;1.563)	0.128
SEHB	1.081 (0.797 ;1.466)	0.616
WHB	1.113 (0.799 ;1.552)	0.526

[7] The full multivariate models are given in Appendix 3 Table 1.1.

4.5 Treatment differences by health board

4.5.1 Descriptive analysis

As noted earlier, "hormone treatment" did not exist as a separate category of treatment in 1994 or 1995, so all 1994 and many 1995 cases which were registered as having chemotherapy were in fact treated by hormone therapy. For this reason, two tables are presented below, a simple one covering 1994 to 1998, and a more complete tabulation covering the period 1996 to 1998.

There were few difference between health boards in the percentages of patients having any treatment (χ^2=7.5, p=.375) or having surgery (χ^2 12.2; p=.095) (Table 4.25). There were some significant difference for radiotherapy (χ^2 =137.3, p<.001), ranging from 24% in the WHB to 48% in the SEHB. Similar differences existed for patients having surgery as a single modality—15% in the MWHB compared to 7% in the WHB (χ^2=48.9; p<.001).

Table 4.25. Treatments given for breast cancer, by health board of residence (1994-1998)

	Number (%) of Registrations								
	Health board of residence								
	Ireland	**ERHA**	**MHB**	**MWHB**	**NEHB**	**NWHB**	**SHB**	**SEHB**	**WHB**
All cases	**7834**	**2926**	**476**	**638**	**570**	**477**	**1244**	**772**	**731**
Has treatment	7483(96%)	2774(95%)	454(95%)	612(96%)	544(95%)	458(96%)	1192(96%)	747(97%)	702(96%)
Has surgery	6520(83%)	2438(83%)	405(85%)	537(84%)	484(85%)	388(81%)	1005(81%)	638(83%)	625(85%)
Has radiotherapy	3068(39%)	1223(42%)	195(41%)	206(32%)	222(39%)	151(32%)	528(42%)	370(48%)	173(24%)
Mutually exclusive therapies:									
Surgery only	880(11%)	394(13%)	52(11%)	94(15%)	61(11%)	42(9%)	124(10%)	63(8%)	50(7%)
Radiotherapy only	81(1%)	44(2%)	5(1%)	6(1%)	5(1%)	2(0%)	11(1%)	6(1%)	2(0%)
Surgery + R	566(7%)	311(11%)	31(7%)	46(7%)	34(6%)	13(3%)	64(5%)	40(5%)	27(4%)
Surgery + (R or H or C)	5640(72%)	2044(70%)	353(74%)	443(69%)	423(74%)	346(73%)	881(71%)	575(74%)	575(79%)

Data for 1996 to 1998 showed the same uniformity of surgical treatment rates, although because of the smaller number of cases the differences — from 80% in the SHB to 88% in the WHB—were only just significant (^{X2}=14.2; p=.048) (Table 4.26).

The range of variation for chemotherapy rates was wider, from 27% in the MWHB to 40% in the MHB (χ^2 16.7; p=.019), as it was for radiotherapy (χ^2 106.8; p<.001) and hormone therapy (χ^2=339.1;p<.001), where the range of variation, from 40% in the ERHA to 79% in the SHB, was almost two-fold. As was shown in a previous section, variations in casemix between areas were not large enough to credibly explain this variation.

Table 4.26. Treatments given for breast cancer, by health board of residence (1996-1998)

	Number (%) of Registrations								
	Health board of residence								
	Ireland	E	M	MW	NE	NW	S	SE	W
All cases	**4827**	**1831**	**287**	**384**	**375**	**292**	**747**	**485**	**426**
Has treatment	4610(96%)	1732(95%)	274(95%)	368(96%)	358(95%)	281(96%)	714(96%)	473(98%)	410(96%)
Has surgery	4036(84%)	1523(83%)	247(86%)	325(85%)	323(86%)	241(83%)	601(80%)	403(83%)	373(88%)
Has chemotherapy	1687(35%)	643(35%)	116(40%)	105(27%)	128(34%)	92(32%)	270(36%)	177(36%)	156(37%)
Has radiotherapy	1987(41%)	795(43%)	131(46%)	124(32%)	154(41%)	84(29%)	356(48%)	236(49%)	107(25%)
Has hormone therapy	2631(55%)	728(40%)	138(48%)	207(54%)	190(51%)	183(63%)	589(79%)	326(67%)	270(63%)
Mutually exclusive therapies:									
Surgery only	512(11%)	250(14%)	23(8%)	67(17%)	43(11%)	18(6%)	47(6%)	37(8%)	27(6%)
Chemotherapy only	60(1%)	26(1%)	8(3%)	5(1%)	1(<1%)	2(1%)	6(1%)	5(1%)	7(2%)
Radiotherapy only	56(1%)	37(2%)	2(1%)	3(1%)	3(1%)	1(<1%)	5(1%)	3(1%)	2(<1%)
Hormone only	294(6%)	87(5%)	13(5%)	23(6%)	17(5%)	32(11%)	65(9%)	35(7%)	22(5%)
Surgery + Chemotherapy	469(10%)	226(12%)	27(9%)	31(8%)	35(9%)	45(15%)	18(2%)	34(7%)	53(12%)
Surgery + Radiotherapy	335(7%)	193(11%)	21(7%)	30(8%)	19(5%)	12(4%)	27(4%)	19(4%)	14(3%)
Surgery + Hormone.	1009(21%)	280(15%)	65(23%)	93(24%)	97(26%)	86(29%)	139(19%)	100(21%)	149(35%)
*S + C+R	507(11%)	254(14%)	54(19%)	21(5%)	61(16%)	20(7%)	20(3%)	43(9%)	34(8%)
*S + C+H	244(5%)	56(3%)	7(2%)	23(6%)	10(3%)	12(4%)	71(10%)	21(4%)	44(10%)
*S + R + H	646(13%)	215(12%)	32(11%)	42(11%)	44(12%)	37(13%)	148(20%)	90(19%)	38(9%)
*S + R + H + C	314(7%)	49(3%)	18(6%)	18(5%)	14(4%)	11(4%)	131(18%)	59(12%)	14(3%)
*S + (R or H or C)	3524(73%)	1273(70%)	224(78%)	258(67%)	280(75%)	223(76%)	554(74%)	366(75%)	346(81%)
*C + Ro	39(1%)	18(1%)	1(<1%)	4(1%)	6(2%)	0(0%)	2(<1%)	5(1%)	3(1%)
*C + H	34(1%)	12(1%)	0(0%)	2(1%)	1(0%)	2(1%)	12(2%)	4(1%)	1(<1%)
*R + H	70(1%)	27(1%)	2(1%)	5(1%)	7(2%)	3(1%)	13(2%)	11(2%)	2(<1%)
*C + R +H	20(<1%)	2(<1%)	1(<1%)	1(<1%)	0(0%)	0(0%)	10(1%)	6(1%)	0(0%)

*S: surgery C: chemotherapy R radiotherapy H hormone therapy

4.5.2 Logistic regression analysis

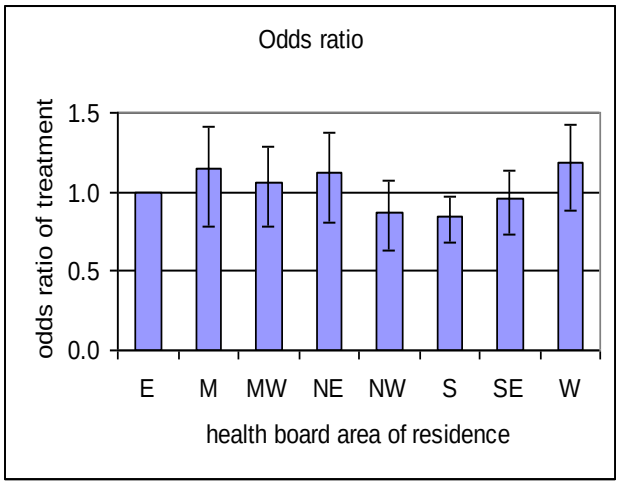
To incorporate the possible effects of the many patient and tumour variables which might have influenced treatments, a series of logistic regression models was fitted to the data, using the different treatment modalities as outcomes. As previously mentioned, hormone therapy and chemotherapy could be modeled only from 1996 to 1998.

a Surgery

The simplest model for surgery, incorporating only the health board effects, showed little significant difference between health boards, as would be expected from the descriptive analysis in 5.1, with only the SHB showing a slightly lower than expected odds of surgery relative to the ERHA (Table 4.27)

Table 4.27. Odds of surgical treatment by health board; univariate model

Health board of residence	Odds ratio (95% confidence intervals)	p
E	1.000	
M	1.14 (0.87 ;1.50)	0.336
MW	1.06 (0.84 ;1.34)	0.602
NE	1.13 (0.88 ;1.45)	0.349
NW	0.87 (0.68 ;1.12)	0.285
S	0.84 (0.71 ;1.00)	0.049
SE	0.95 (0.77 ;1.18)	0.653
W	1.18 (0.94 ;1.48)	0.154



A number of patient and tumour factors were significantly related to the probability of having surgery. The chances of having surgery decreased with age, with increasing deprivation, for the unmarried, for cancers of undefined on non-specific cell type, and for patients with clinically advanced cancers.

The following factors significantly improved model fit:

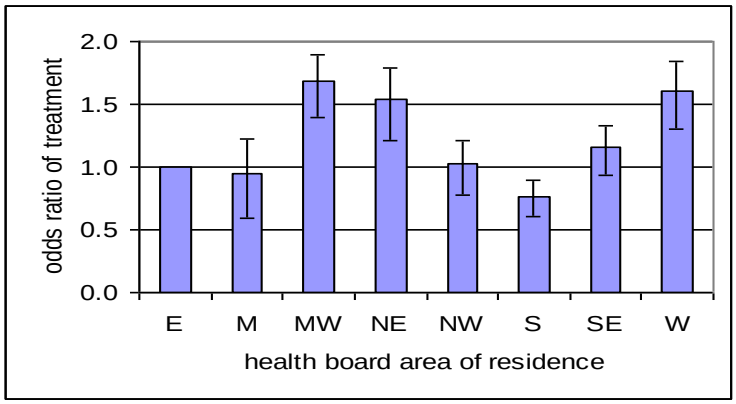
- Patient age
- Deprivation
- Marital status
- Smoker status
- Histological confirmation
- Tumour morphology
- Tumour grade
- T stage
- N stage
- M stage

If these factors are added to the model, the relative odds of having surgery change. It can bee seen that, for cases where these patient and tumour factors are added, the odds of having surgery were highest in the MWHB and WHB, and lowest in the SHB had fallen to 0.76, all three areas having odds which were significantly different from those in the ERHA (Table 4.28)[8].

[8] Full model is given in Appendix 4, Table 1.9

Table 4.28.Odds of surgical treatment by health board; multivariate model

health board of residence	odds ratio (95% confidence intervals)	p
E	1.000	
M	0.95 (0.67; 1.35)	0.765
MW	1.68 (1.17; 2.40)	0.004
NE	1.53 (1.07; 2.20)	0.020
NW	1.02 (0.70; 1.49)	0.915
S	0.76 (0.59; 0.99)	0.043
SE	1.15 (0.85; 1.57)	0.359
W	1.61 (1.15; 2.25)	0.005

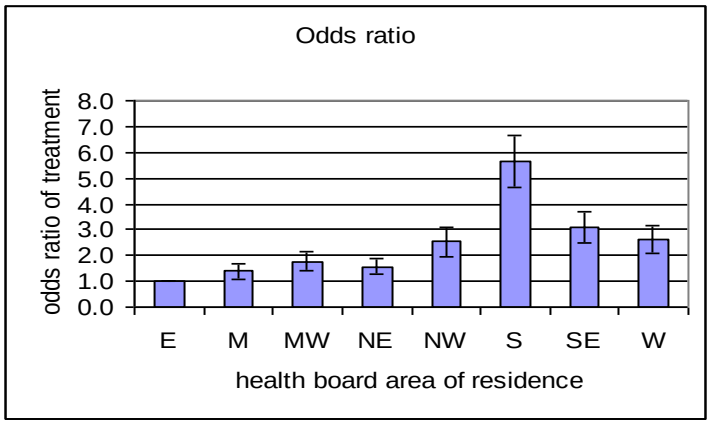


b Hormone therapy (1996 to 1998 only)

The simplest model for hormone therapy, incorporating only the health board effects, showed higher rate of hormone therapy in all areas compared to that in the ERHA, with the highest level in the SHB, where 79% of patients had hormone therapy, compared to 40% in the ERHA (Table 4.29).

Table 4.29.Odds of hormone treatment by health board; univariate model

Health board of residence	odds ratio (95% confidence intervals)	P
E	1.000	
M	1.40 (1.09; 1.80)	0.008
MW	1.77 (1.42; 2.21)	0.000
NE	1.56 (1.24; 1.94)	0.000
NW	2.54 (1.97; 3.28)	0.000
S	5.65 (4.63; 6.89)	0.000
SE	3.11 (2.51; 3.84)	0.000
W	2.62 (2.11; 3.26)	0.000



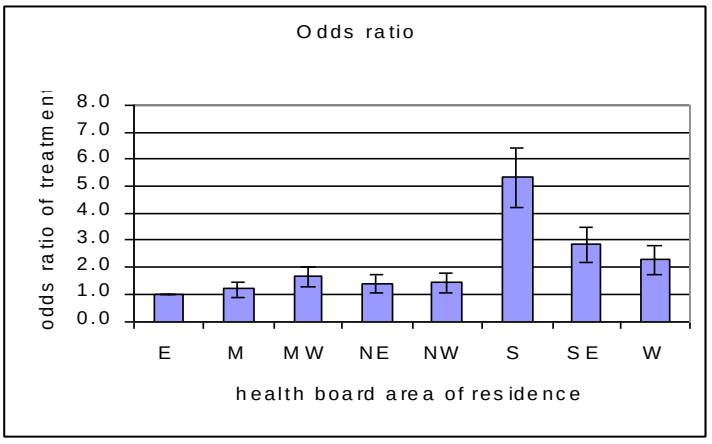
As with surgery, a range of patient and tumour factors seemed to be influential in determining hormone treatment. The following factors significantly improved model fit:

- Patient age
- Deprivation
- Marital status
- Smoker status
- Co-morbidity
- Tumour morphology and grade
- N and M stage

When these factors have been corrected for the odds ratios are slightly reduced for all health board relative to the ERHA, but only to a slight degree, except for the MHB (Table 4.30)[9].

Table 4.30. Odds of hormone treatment by health board; multivariate model

Health board of residence	**odds ratio (95% confidence intervals)**	**P**
E	1.000	
M	1.18 (0.88 ;1.58)	0.266
MW	**1.64 (1.26 ;2.14)**	**0.000**
NE	**1.40 (1.08 ;1.83)**	**0.012**
NW	**1.44 (1.07 ;1.93)**	**0.016**
S	**5.32 (4.23 ;6.69)**	**0.000**
SE	**2.85 (2.22 ;3.66)**	**0.000**
W	**2.27 (1.77 ;2.92)**	**0.000**



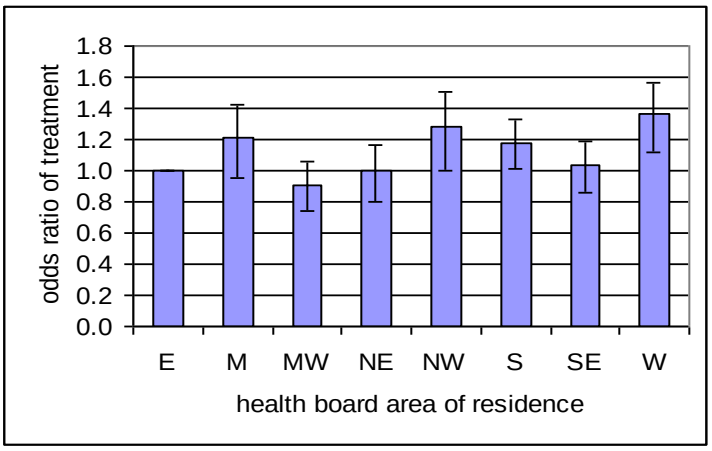
[9] Full model is given in Appendix 4, Table 1.9

c Chemotherapy (1996 to 1998)

In the simple model, the odds of having chemotherapy were highest in the WHB and lowest in the MWHB, but the latter was not statistically significant (Table 4.31). The odds of having chemotherapy were significantly higher than the ERHA in the NWHB and SHB.

Table 4.31.Odds of chemotherapy by health board; univariate model

Health board of residence	**odds ratio (95% confidence intervals**	**P**
E	1.000	
M	1.21 (0.99; 1.47)	0.056
MW	0.91 (0.76; 1.08)	0.293
NE	1.00 (0.83; 1.20)	0.997
NW	1.28 (1.05; 1.55)	0.014
S	1.18 (1.03; 1.35)	0.016
SE	1.04 (0.88; 1.22)	0.669
W	1.36 (1.16; 1.60)	0.000



The odds of having chemotherapy were related to the expected patent and tumour factors. Older patients were much less likely to have chemotherapy, while those with more advanced tumour and nodal stages were more likely. The odds of having of chemotherapy increased significantly between 1996 and 1998, by about 19% per year.

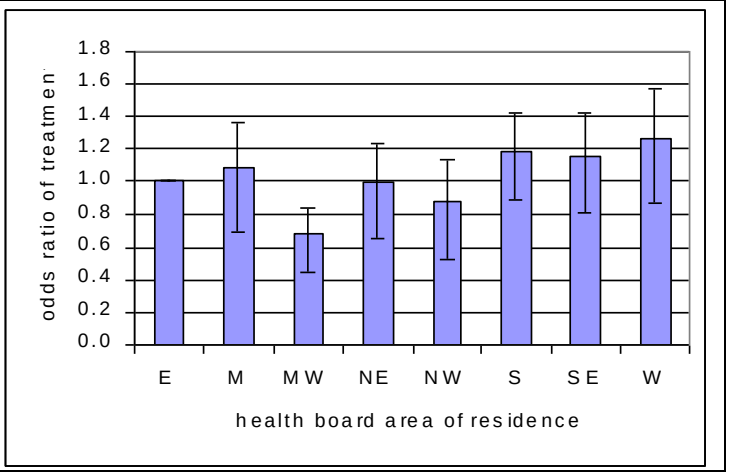
After correction for the above factors, only the odds of chemotherapy in the MWHB were statistically significant from those in the ERHA, with an odds of 0.67 (Table 4.32).[10]

The following factors significantly improved model fit:

- Patient age
- Marital status
- Co-morbidity
- Tumour morphology and grade
- N and M stage

Table 4.32. Odds of chemotherapy by health board; multivariate model

Health board of residence	**odds ratio (95% confidence intervals)**	**P**
E	1.000	
M	1.08 (0.79; 1.48)	0.621
MW	**0.67 (0.50 ; 0.90)**	**0.009**
NE	0.99 (0.74; 1.33)	0.935
NW	0.88 (0.63; 1.24)	0.469
S	1.19 (0.95; 1.48)	0.137
SE	1.16 (0.89; 1.51)	0.281
W	1.27 (0.96; 1.66)	0.091



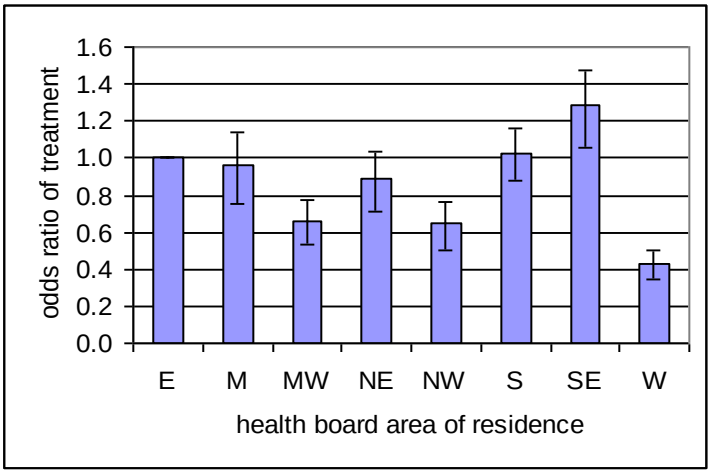
[10] Full model is given in Appendix 4, Table 1.9

d Radiotherapy

For most health board areas, the odds of having radiotherapy were significantly lower than in the ERHA (Table 4.33). The main exception was the SEHB, where the odds of radiotherapy treatment were statistically significant higher than in the ERHA.

Table 4.33. Odds of radiotherapy by health board; univariate model

Health board of residence	odds ratio (95% confidence intervals	P
E	1.000	
M	0.97 (0.79 ;1.18)	0.733
MW	0.66 (0.55 ;0.80)	0.000
NE	0.89 (0.74 ;1.07)	0.206
NW	0.64 (0.52 ;0.79)	0.000
S	1.03 (0.90 ;1.17)	0.699
SE	1.28 (1.09 ;1.50)	0.002
W	0.43 (0.36 ;0.52)	0.000



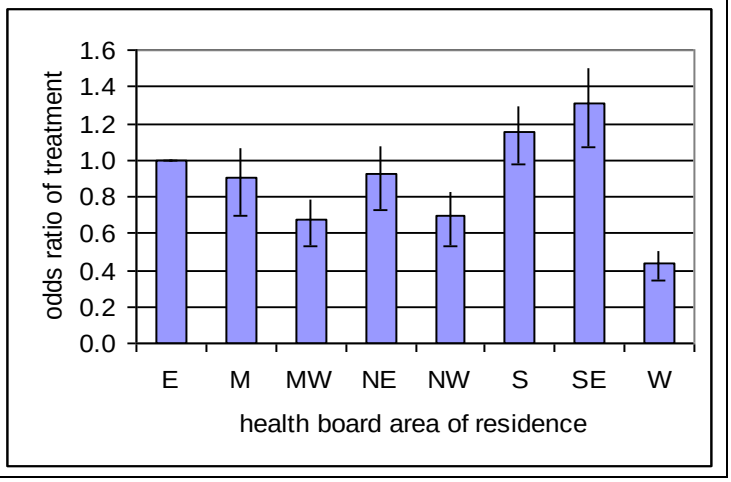
The following factors significantly improved model fit:

- Patient age
- Marital status
- Smoker status
- Co-morbidity
- Tumour morphology
- T stage
- M stage

The odds of having radiotherapy decreased with age, and increased if the tumour morphology was well characterized . After correction for the above factors, the odds of radiotherapy treatment were significantly lower than in the ERHA for patients living in the MWHB, NWHB and WHB and higher in the SEHB (Table 4.34).[11]

Table 4.34 Odds of radiotherapy by health board; multivariate model

Health board of residence	odds ratio (95% confidence intervals	P
E	1.000	
M	0.90 (0.73 ;1.10)	0.307
MW	**0.68 (0.56 ;0.82)**	**0.000**
NE	0.92 (0.76 ;1.12)	0.417
NW	**0.69 (0.56 ;0.86)**	**0.001**
S	1.15 (1.00 ;1.32)	0.058
SE	**1.30 (1.10 ;1.54)**	**0.002**
W	**0.44 (0.36 ;0.53)**	**0.000**



[11] Full model is given in Appendix 4, Table 1.9

5 Colorectal cancer

5.1 Cases analysed and their characteristics

The cases analysed are shown in (Table 5.1). A total of 8400 cases was registered from 1994 to 1998, and the number of cases remained fairly constant over that period.

Male patients outnumbered female in all areas. The highest proportion of male patients (63%) was in the MWHB and the lower (54%) in the MHB and the SHB. The age distribution of patients was similar in all areas, except for the NWHB which had a higher proportion of older patients.

There was a lower percentage than expected of non-smokers in the ERHA and NEHB and a higher percentage in the SHB and WHB. The proportion of married and unmarried patients was the same in all areas. The number of patients living in areas described as "deprived " was particularly high in the NWHB, but was also above average in the NEHB and ERHA.

Table 5.1. Colorectal cancers: patient characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**8400**	**2772**	**490**	**628**	**688**	**609**	**1412**	**894**	**907**
Year of incidence	1994	1722 (21%)	572 (21%)	109 (22%)	137 (22%)	139 (20%)	114 (19%)	284 (20%)	173 (19%)	194 (21%)
	1995	1613 (19%)	534 (19%)	93 (19%)	111 (18%)	118 (17%)	128 (21%)	273 (19%)	187 (21%)	169 (19%)
	1996	1618 (19%)	513 (19%)	112 (23%)	102 (16%)	130 (19%)	133 (22%)	268 (19%)	181 (20%)	179 (20%)
	1997	1721 (20%)	586 (21%)	95 (19%)	138 (22%)	147 (21%)	114 (19%)	292 (21%)	183 (20%)	166 (18%)
	1998	1726 (21%)	567 (20%)	81 (17%)	140 (22%)	154 (22%)	120 (20%)	295 (21%)	170 (19%)	199 (22%)
Sex	Female	3637 (43%)	1245 (45%)	223 (46%)	233 (37%)	289 (42%)	273 (45%)	645 (46%)	383 (43%)	346 (38%)
	Male	4763 (57%)	1527 (55%)	267 (54%)	395 (63%)	399 (58%)	336 (55%)	767 (54%)	511 (57%)	561 (62%)
Age	<=60	2004 (24%)	696 (25%)	126 (26%)	142 (23%)	158 (23%)	114 (19%)	333 (24%)	229 (26%)	206 (23%)
	61-70	2371 (28%)	838 (30%)	128 (26%)	177 (28%)	195 (28%)	152 (25%)	386 (27%)	251 (28%)	244 (27%)
	71-80	2753 (33%)	852 (31%)	164 (33%)	218 (35%)	238 (35%)	218 (36%)	463 (33%)	288 (32%)	312 (34%)
	80+	1272 (15%)	386 (14%)	72 (15%)	91 (14%)	97 (14%)	125 (21%)	230 (16%)	126 (14%)	145 (16%)
Smoking status	Non-smoker	3758 (45%)	1001 (36%)	229 (47%)	295 (47%)	309 (45%)	266 (44%)	788 (56%)	435 (49%)	435 (48%)
	Ex-smoker	1318 (16%)	485 (17%)	66 (13%)	92 (15%)	128 (19%)	119 (20%)	151 (11%)	122 (14%)	155 (17%)
	Smoker	1731 (21%)	545 (20%)	106 (22%)	125 (20%)	137 (20%)	131 (22%)	279 (20%)	187 (21%)	221 (24%)
	Unknown	1593 (19%)	741 (27%)	89 (18%)	116 (18%)	114 (17%)	93 (15%)	194 (14%)	150 (17%)	96 (11%)
Marital status	Married	4713 (56%)	1574 (57%)	277 (57%)	349 (56%)	390 (57%)	299 (49%)	794 (56%)	513 (57%)	517 (57%)
	Not married	3437 (41%)	1072 (39%)	203 (41%)	248 (39%)	278 (40%)	305 (50%)	591 (42%)	366 (41%)	374 (41%)
	Unknown	250 (3%)	126 (5%)	10 (2%)	31 (5%)	20 (3%)	5 (1%)	27 (2%)	15 (2%)	16 (2%)
Deprivation	Affluent	1906 (23%)	1083 (39%)	57 (12%)	182 (29%)	70 (10%)	24 (4%)	270 (19%)	58 (6%)	162 (18%)
	Intermediate	3834 (46%)	685 (25%)	327 (67%)	332 (53%)	394 (57%)	325 (53%)	848 (60%)	443 (50%)	480 (53%)
	Deprived	1878 (22%)	731 (26%)	80 (16%)	94 (15%)	149 (22%)	236 (39%)	193 (14%)	251 (28%)	144 (16%)
	Unknown	782 (9%)	273 (10%)	26 (5%)	20 (3%)	75 (11%)	24 (4%)	101 (7%)	142 (16%)	121 (13%)

Presentation was symptomatic in almost all cases (Table 5.2). The Registry does not record if presentation was an emergency.

Histological confirmation was high in all areas. The highest percentage was in the ERHA (95%) and the lowest in the NWHB, SHB and SEHB (88%).

The site of the cancers was similar in all areas. In the MHB, 69% of cancers were in the colon while in the MWHB and WHB only 60% were colonic. ($\chi 2$ 23.1;p=.002). Most cancers had a T stage recorded. The percentage with unrecorded stage was highest in the WHB (20%) and lowest in the NEHB (12%).($\chi 2$=23.9;p=.001). Nodes were reported positive in 78% of cases in the NEHB compared to 63% in the WHB.($\chi 2$; p<.001). Metastases staging were not reported in 54% of cases in the WHB, twice as often as in the SEHB (27%). Metastases were reported fairly consistently in 18% to 24% of cases across the health boards, but the high percentage of unknown values makes any difference difficult to interpret. Data for summary stage were again dominated by the high level of unknown metastases. However, it is

noticeable that the percentage of late stage cancers was much higher in the NWHB (61%) than in the MWHB (47%) (p<.001).

Many cancers had unknown grade, and the differences between health boards were large, from 31% high grade tumours in the NWHB to 12% in the MWHB. This is more likely to be due to reporting differences than real differences in tumour grade.

Table 5.2. Colorectal cancers: tumour characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**8400**	**2772**	**490**	**628**	**688**	**609**	**1412**	**894**	**907**
Presentation	Screening	17 (<1%)	7 (<1%)	0 (0%)	2 (<1%)	0 (<1%)	2 (<1%)	2 (<1%)	3 (<1%)	1 (<1%)
	Incidental	91 (1%)	31 (1%)	5 (1%)	2 (<1%)	9 (1%)	2 (<1%)	28 (2%)	7 (1%)	7 (1%)
	Symptoms	8100 (96%)	2619 (94%)	476 (97%)	600 (96%)	672 (98%)	596 (98%)	1379 (98%)	866 (97%)	892 (98%)
	Unknown	192 (2%)	115 (4%)	9 (2%)	24 (4%)	7 (1%)	9 (1%)	3 (<1%)	18 (2%)	7 (1%)
Histological confirmation	Yes	7698 (92%)	2635 (95%)	456 (93%)	583 (93%)	640 (93%)	537 (88%)	1237 (88%)	788 (88%)	822 (91%)
	No	702 (8%)	137 (5%)	34 (7%)	45 (7%)	48 (7%)	72 (12%)	175 (12%)	106 (12%)	85 (9%)
Site	Colon	5268 (63%)	1692 (61%)	336 (69%)	376 (60%)	438 (64%)	410 (67%)	912 (65%)	558 (62%)	546 (60%)
	Junction	673 (8%)	246 (9%)	29 (6%)	67 (11%)	46 (7%)	56 (9%)	68 (5%)	66 (7%)	95 (10%)
	Rectal/anal	2459 (29%)	834 (30%)	125 (26%)	185 (29%)	204 (30%)	143 (23%)	432 (31%)	270 (30%)	266 (29%)
T stage	T1	438 (5%)	120 (4%)	28 (6%)	28 (4%)	48 (7%)	33 (5%)	112 (8%)	36 (4%)	33 (4%)
	T2	1309 (16%)	427 (15%)	81 (17%)	128 (20%)	92 (13%)	100 (16%)	236 (17%)	133 (15%)	112 (12%)
	T3	4216 (50%)	1497 (54%)	256 (52%)	300 (48%)	394 (57%)	284 (47%)	594 (42%)	428 (48%)	463 (51%)
	T4	1066 (13%)	303 (11%)	44 (9%)	61 (10%)	69 (10%)	94 (15%)	220 (16%)	160 (18%)	115 (13%)
	TX	1371 (16%)	425 (15%)	81 (17%)	111 (18%)	85 (12%)	98 (16%)	250 (18%)	137 (15%)	184 (20%)
N stage	N0	3566(42%)	1210 (44%)	214(44%)	257(41%)	328(48%)	239(39%)	629 (45%)	396 (44%)	293 (32%)
	N1	1770(21%)	602 (22%)	88(18%)	118(19%)	139(20%)	181(30%)	275 (19%)	195 (22%)	172 (19%)
	N2	652(8%)	256 (9%)	46(9%)	29(5%)	58(8%)	15(2%)	85 (6%)	79 (9%)	84 (9%)
	N3	90(1%)	13 (<1%)	13(3%)	3(<1%)	9(1%)	2 (<1%)	18 (1%)	14 (2%)	18 (2%)
	NX	2321(28%)	691(25%)	129(26%)	221(35%)	154(22%)	172(28%)	405 (29%)	210 (23%)	339 (37%)
M stage	M0	3534 (42%)	1251 (45%)	234 (48%)	328 (52%)	219 (32%)	254 (42%)	572 (41%)	443 (50%)	233 (26%)
	M1	1762 (21%)	583 (21%)	89 (18%)	126 (20%)	146 (21%)	125 (21%)	297 (21%)	214 (24%)	182 (20%)
	Unknown	3104 (37%)	938 (34%)	167 (34%)	174 (28%)	323 (47%)	230 (38%)	543 (38%)	237 (27%)	492 (54%)
Summary stage	1	742 (9%)	233 (8%)	53 (11%)	70 (11%)	40 (6%)	75 (12%)	147 (10%)	88 (10%)	36 (4%)
	2	1388 (17%)	487 (18%)	109 (22%)	111 (18%)	95 (14%)	85 (14%)	222 (16%)	188 (21%)	91 (10%)
	3	1044 (12%)	385 (14%)	56 (11%)	81 (13%)	68 (10%)	70 (11%)	163 (12%)	138 (15%)	83 (9%)
	4	1755 (21%)	581 (21%)	88 (18%)	124 (20%)	146 (21%)	125 (21%)	297 (21%)	214 (24%)	180 (20%)
	Unknown	3471 (41%)	1086 (39%)	184 (38%)	242 (39%)	339 (49%)	254 (42%)	583 (41%)	266 (30%)	517 (57%)
Grade	I	936 (11%)	109 (4%)	212 (43%)	261 (42%)	63 (9%)	37 (6%)	80 (6%)	66 (7%)	108 (12%)
	II	4424 (53%)	1876 (68%)	130 (27%)	148 (24%)	352 (51%)	290 (48%)	812 (58%)	473 (53%)	343 (38%)
	III	1086 (13%)	326 (12%)	55 (11%)	42 (7%)	87 (13%)	139 (23%)	188 (13%)	85 (10%)	164 (18%)
	IV	50 (1%)	7 (<1%)	0 (<1%)	13 (2%)	4 (1%)	7 (1%)	6 (<1%)	1 (<1%)	12 (1%)
	Unknown	1904 (23%)	454 (16%)	93 (19%)	164 (26%)	182 (26%)	136 (22%)	326 (23%)	269 (30%)	280 (31%)

5.2 Survival

Overall survival from colorectal cancer at five years was 35.6%, while cause specific survival was 45.6% (Table 5.3)

Table 5.3.Colorectal cancer survival

	Five year survival	
Years from diagnosis	**All causes**	**Cause-specific**
1	67.5% (66.5%; 68.5%)	72.4% (71.4%; 73.3%)
2	54.1% (52.9%; 55.1%)	60.4% (59.3%; 61.5%)
3	45.5% (44.3%; 46.6%)	53.2% (52.0%; 54.4%)
4	39.7% (38.5%; 40.9%)	48.7% (47.5%; 50.0%)
5	35.6% (34.3%; 36.9%)	45.6% (44.2%; 47.0%)

Cause-specific survival for colorectal cancer was 45.6% at five years, 48.2% for women and 43.2% for men (Table 5.4). Survival was also better for women at three years after diagnosis, but not at one year.

Table 5.4. One, three and five year survival from colorectal cancer, by sex.

	Time from diagnosis	Number at start of period	Proportion surviving (95% confidence limits)
Both sexes	1 year	5629	0.7238 (0.714 :0.733)
	3 years	2287	0.5316 (0.520 :0.544)
	5 years	639	0.4556 (0.442 :0.470)
Females	1 year	2461	0.7261 (0.711 :0.741)
	3 years	1044	0.5485 (0.530 :0.566)
	5 years	303	0.4842 (0.464 :0.505)
Males	1 year	3169	0.7219 (0.709 :0.735)
	3 years	1246	0.5184 (0.502 :0.534)
	5 years	337	0.4324 (0.413 :0.452)

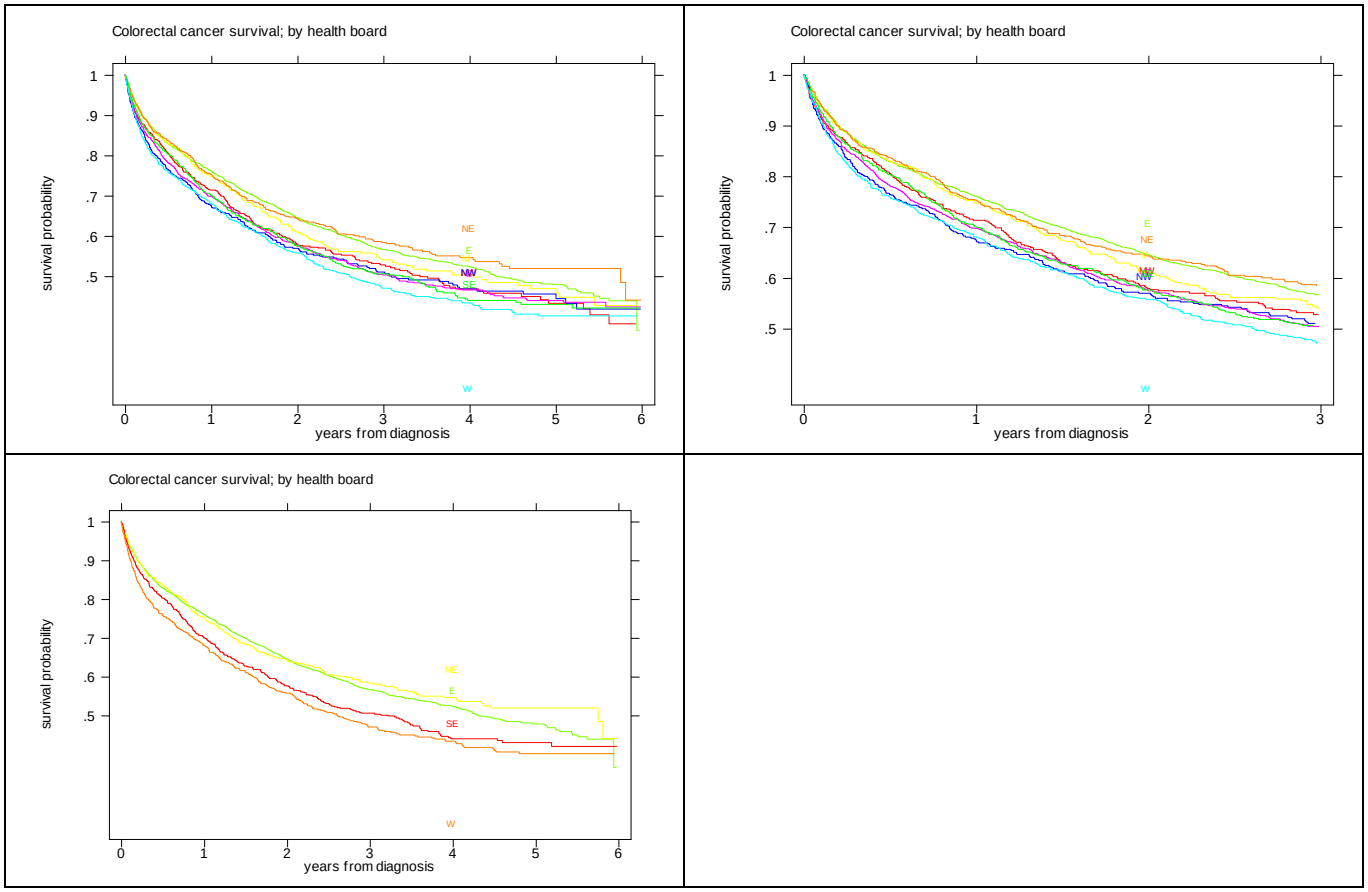
The highest five –year survival was recorded in the NEHB (52%), and the lowest for in the WHB (40%). Survival at one year followed a broadly similar pattern, but with the best survival in the ERHA and the poorest in the NWHB.

Table 5.5. Colorectal cancer survival by health board

Area of residence	1year	5years
	Hazard (95% confidence intervals)	Hazard (95% confidence intervals)
ERHA	76.1% (74.4%; 77.6%)	47.8% (45.3%; 50.3%)
MHB	74.7% (70.6%; 78.4%)	46.9% (41.2%; 52.3%)
MWHB	71.3% (67.6%; 74.7%)	43.2% (37.7%; 48.5%)
NEHB	75.3% (71.8%; 78.4%)	51.9% (47.0%; 56.5%)
NWHB	67.4% (63.4%; 71.1%)	45.5% (40.5%; 50.4%)
SHB	69.7% (67.2%; 72.1%)	43.9% (40.6%; 47.2%)
SEHB	70.0% (66.8%; 73.0%)	43.0% (38.8%; 47.1%)
WHB	68.1% (64.8%; 71.0%)	40.1% (36.0%; 44.2%)

Plots of cause-specific survival by health board show generally better survival in the ERHA and NEHB and poorer survival in the WHB and SEHB (Figure 5.1). The picture is clearer in the first three years, where there are larger numbers of cases.

Figure 5.1. Kaplan-Meier survival curves for colorectal cancer, by health board

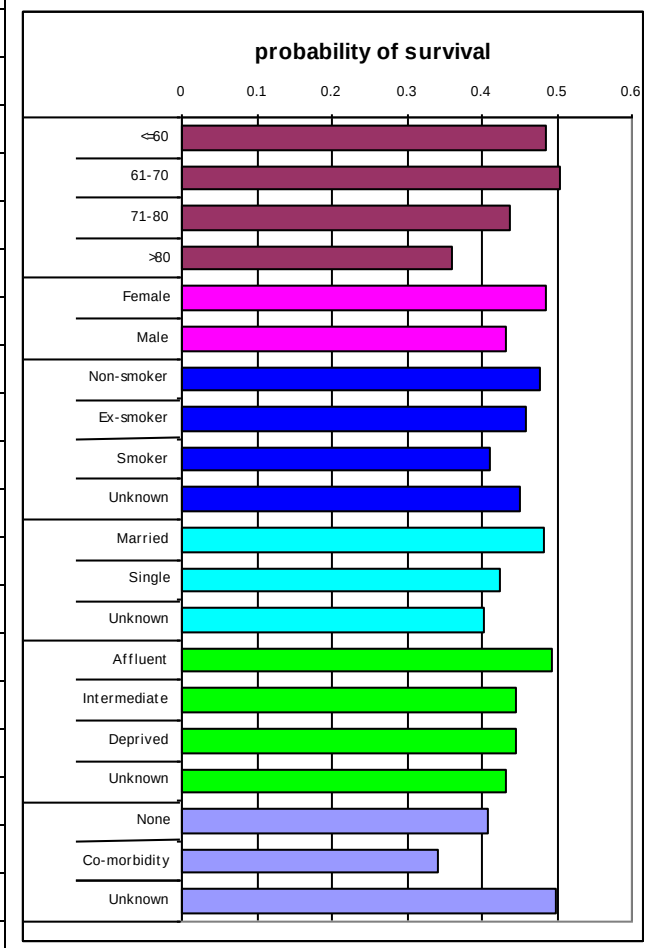


5.3 Factors affecting survival

A number of patient, tumour and treatment factors were tested for their relationship to survival. The data are summarised in Figure 5.2. and Figure 5.3[12]

Figure 5.2. Patient factors related to colorectal cancer survival at five years

		Five year survival
Age	<=60	0.484 (0.454; 0.513)
	61-70	0.505 (0.479; 0.529)
	71-80	0.437 (0.412; 0.461)
	>80	0.360 (0.326; 0.395)
Sex	Female	0.484 (0.464; 0.505)
	Male	0.432 (0.413; 0.452)
Smoking	Non-smoker	0.477 (0.457; 0.498)
	Ex-smoker	0.458 (0.422; 0.494)
	Smoker	0.411 (0.379; 0.442)
	Unknown	0.451 (0.419; 0.482)
Marital status	Married	0.482 (0.463; 0.501)
	Single	0.423 (0.403; 0.444)
	Unknown	0.402 (0.328; 0.474)
Deprivation	Affluent	0.494 (0.465; 0.521)
	Intermediate	0.446 (0.426; 0.467)
	Deprived	0.445 (0.416; 0.473)
	Unknown	0.433 (0.348; 0.514)
Co-morbidity	None	0.409 (0.383; 0.435)
	Co-morbidity	0.340 (0.274; 0.408)
	Unknown	0.498 (0.478; 0.519)



Survival decreased with male gender ($\chi 2=5.4$; p=.020) increasing age ($\chi 2$ 253.1;p<0.001), with non-married status ($\chi 2$ 42.5;p<0.001, with deprivation ($\chi 2$ 16.9;p, 0.001), and with smoking ($\chi 2=15.4$;p=0.0015).

[12] Detailed tables of cancer risk factors and one, three and five years survival by health board are in Appendix 1

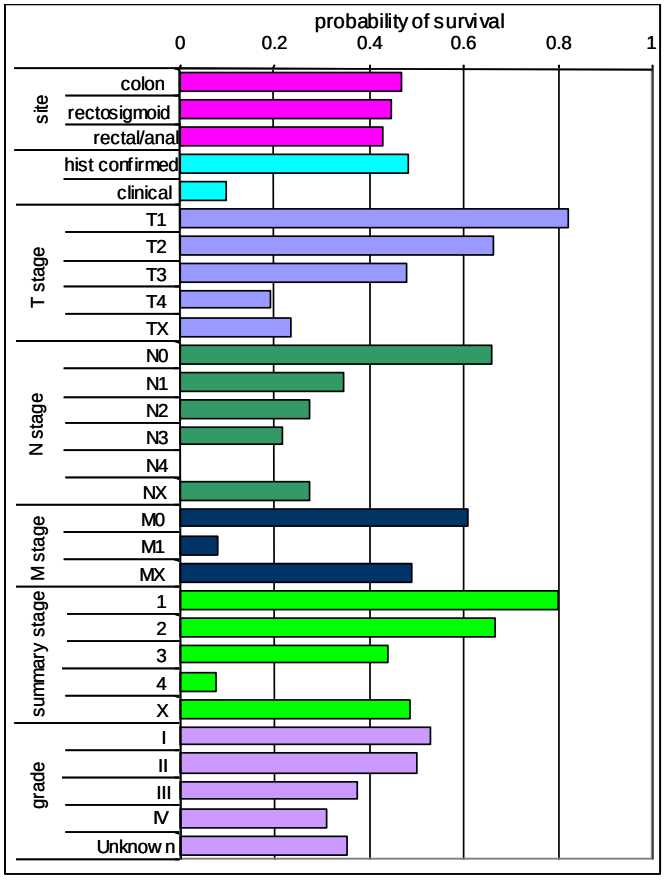
Of tumour factors, the most strongly correlated with survival were histological confirmation of diagnosis ($\chi2$=1608.4;p<.001), T stage ($\chi2$=1784.9; p<.001), N stage ($\chi2$ 1472.0; p<. 001), M stage ($\chi2$ 2636.4,p<. 001), summary stage ($\chi2$=2816.9; $\chi2$<.001) and grade ($\chi2$=490.1; p<.001).

Site within the colon was not a determinant of survival ($\chi2$=0.1; p=.976)

Surgery was strongly related to survival ($\chi2$=2403.8; p<.001), as was any tumour-related treatment ($\chi2$=2146.6; p<.001). Even in the absence of surgery, any other tumour related treatment was strongly related to survival ($\chi2$-34.8, p<.001); hazard ratio 0.67.

Figure 5.3. Tumour factors related to colorectal cancer survival at five years

		Five year survival
Site	colon	0.468 (0.451; 0.485)
	rectosigmoid	0.446 (0.398; 0.494)
	rectal/anal	0.429 (0.402; 0.456)
Histology	hist confirmed	0.484 (0.469; 0.498)
	clinical	0.098 (0.069; 0.133)
T-stage	T1	0.825 (0.780; 0.861)
	T2	0.666 (0.627; 0.701)
	T3	0.481 (0.461; 0.501)
	T4	0.194 (0.158; 0.226)
	TX	0.235 (0.207; 0.264)
N-stage	N0	0.661 (0.640; 0.681)
	N1	0.346 (0.316; 0.375)
	N2	0.274 (0.229; 0.320)
	N3	0.218 (0.126; 0.327)
	NX	0.275 (0.250; 0.300)
M-stage	M0	0.608 (0.587; 0.630)
	M1	0.079 (0.063; 0.097)
	MX	0.493 (0.468; 0.517)
Summary stage	1	0.802 (0.757; 0.840)
	2	0.669 (0.636; 0.700)
	3	0.440 (0.399; 0.480)
	4	0.075 (0.059; 0.093)
	X	0.488 (0.465; 0.511)
Grade	I	0.532 (0.489; 0.573)
	II	0.503 (0.483; 0.523)
	III	0.376 (0.341; 0.412)
	IV	0.310 (0.169; 0.463)
	Unknown	0.356 (0.329; 0.382)

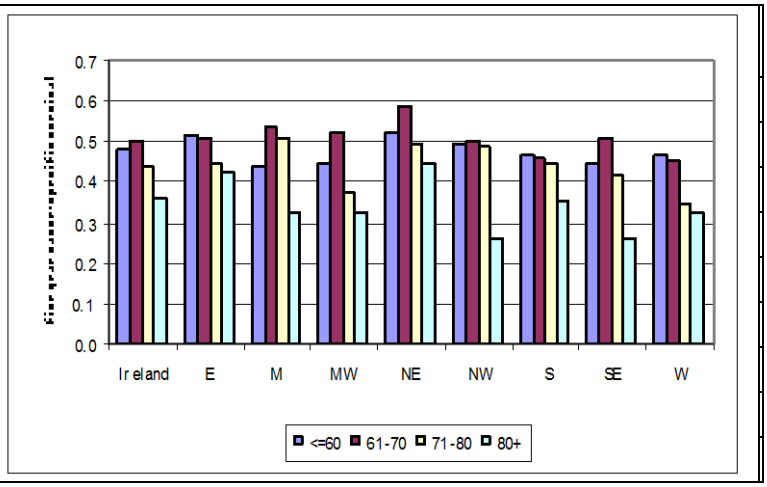


5.3.1 Age

In general, the decrease in survival with age was seen for all areas (Table 5.6). Overall, survival for patients over 80 was 33% poorer than for those under 60. As with breast cancer, the figures for Ireland tend to be similar to, and dominated by, those for the ERHA. The decrease in survival with age was most pronounced in the SEHB and WHB areas, and least in the MHB and NEHB. For Ireland as a whole and in a number of health board areas, survival for patients under 60 was poorer than for those aged 61 to 70.

Table 5.6; Figure 5.4. Five year colorectal cancer survival by health board and age

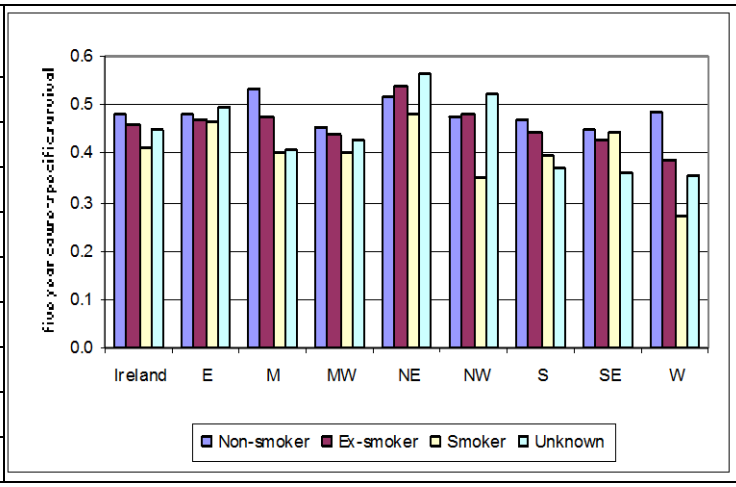
Area of residence	<=60	61-70	71-80	80+
Ireland	0.48	0.50	0.44	0.36
ERHA	0.52	0.51	0.44	0.42
MHB	0.44	0.54	0.51	0.32
MWHB	0.45	0.52	0.37	0.33
NEHB	0.52	0.58	0.49	0.44
NWHB	0.49	0.50	0.49	0.26
SHB	0.46	0.46	0.45	0.36
SEHB	0.44	0.51	0.42	0.26
WHB	0.47	0.45	0.35	0.32



5.3.2 Smoking

Table 5.7; Figure 5.5. Five year colorectal cancer survival by health board and smoking

Area of residence	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.48	0.46	0.41	0.45
ERHA	0.48	0.47	0.47	0.49
MHB	0.53	0.47	0.40	0.41
MWHB	0.45	0.44	0.40	0.43
NEHB	0.52	0.54	0.48	0.56
NWHB	0.48	0.48	0.35	0.52
SHB	0.47	0.44	0.40	0.37
SEHB	0.45	0.43	0.44	0.36
WHB	0.48	0.39	0.27	0.36



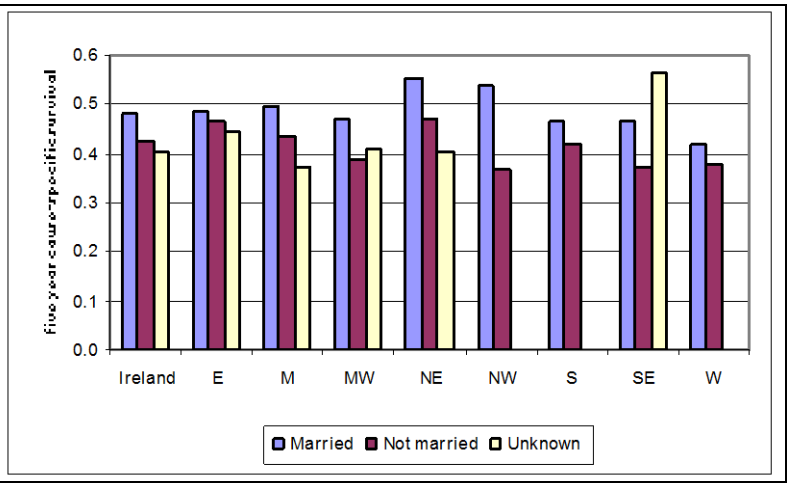
In all areas current smokers had a poorer prognosis, although the difference was slight in the ERHA and SEHB. In the MHB, SHB and WHB ex-smokers were also reported to have a poorer prognosis than non-smokers (Table 5.7).

5.3.3 Marital status

There was a strong and consistent relationship between marital status (ever married) and survival across health board areas (Table 5.8).

Table 5.8; Figure 5.6. Five year colorectal cancer survival by health board and marital status

Area of residence	Married	Not married	Unknown
Ireland	0.48	0.42	0.40
ERHA	0.49	0.47	0.45
MHB	0.50	0.43	0.38
MWHB	0.47	0.39	0.41
NEHB	0.55	0.47	0.41
NWHB	0.54	0.37	—
SHB	0.47	0.42	—
SEHB	0.46	0.37	0.56
WHB	0.42	0.38	—

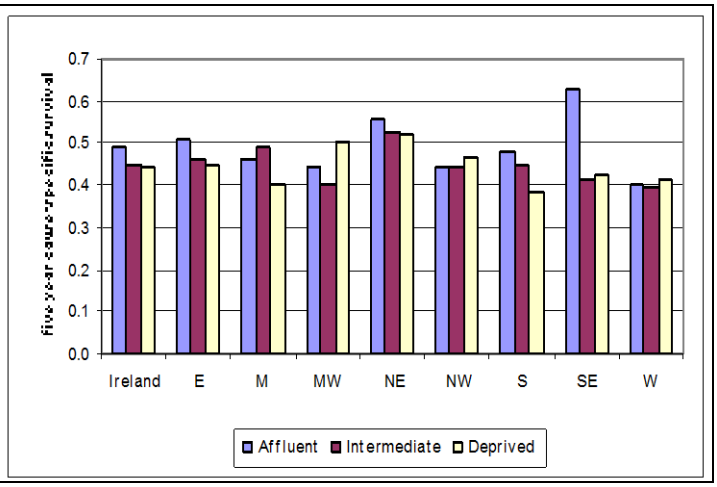


5.3.4 Deprivation

Survival was better for patients in affluent areas in most health boards (Table 5.9). Although there was an overall trend in survival with deprivation, patients in the most deprived areas had better survival than those in the affluent areas in the MWHB, NWHB and WHB. This may be due to differences in the implication of census-derived deprivation indices in predominantly rural areas.

Table 5.9; Figure 5.7. Five year colorectal cancer survival by health board and deprivation

Area of residence	Affluent	Intermediate	Deprived	Unknown
Ireland	0.49	0.45	0.44	0.43
ERHA	0.51	0.46	0.45	—
MHB	0.46	0.49	0.40	—
MWHB	0.44	0.40	0.50	0.48
NEHB	0.56	0.53	0.52	—
NWHB	0.44	0.44	0.47	0.59
SHB	0.48	0.45	0.38	0.39
SEHB	0.63	0.42	0.42	0.40
WHB	0.40	0.40	0.42	0.45

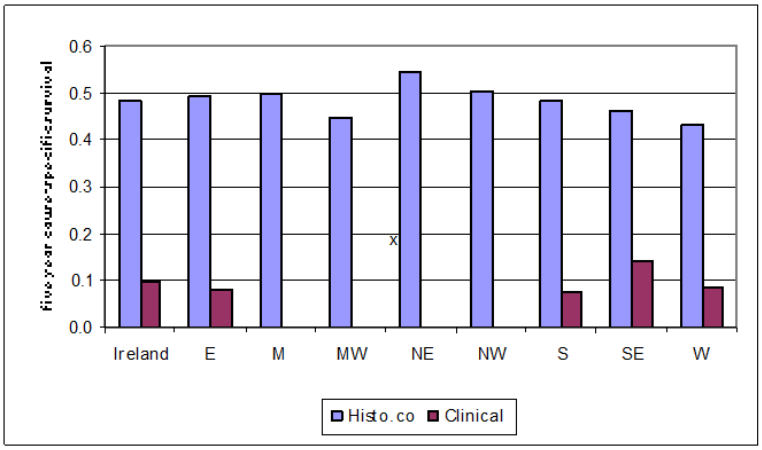


5.3.5 Histological confirmation

The relationship between histological confirmation and survival was consistent across health board areas, in those areas where some patients were diagnosed without such confirmation (Table 5.10). Survival was significantly higher in the SEHB area for clinically diagnosed cases.

Table 5.10; Figure 5.8. Five year colorectal cancer survival by health board and histological confirmation

Area of residence	Histological confirmation	Clinical
Ireland	0.48	0.10
ERHA	0.49	0.08
MHB	0.50	—
MWHB	0.45	.—
NEHB	0.54	—
NWHB	0.50	—
SHB	0.48	0.08
SEHB	0.46	0.14
WHB	0.43	0.08

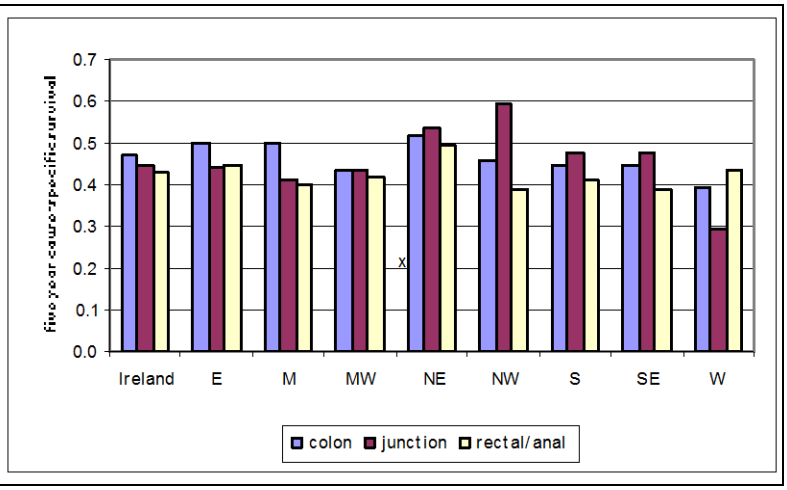


5.3.6 Site

There was no significant difference in survival by health board between the three main colorectal sites (Table 5.11). Most variation was seen in rectosigmoid survival because of the small numbers. Survival for rectal cancers was higher than for colon cancer in the WHB only (hazard ratio 0.71;p=.003).

Table 5.11; Figure 5.9. Five year colorectal cancer survival by health board and site

Area of residence	colon	junction	rectal/anal
Ireland	0.47	0.45	0.43
ERHA	0.50	0.44	0.45
MHB	0.50	0.41	0.40
MWHB	0.44	0.43	0.42
NEHB	0.52	0.54	0.50
NWHB	0.46	0.59	0.39
SHB	0.45	0.47	0.41
SEHB	0.44	0.48	0.39
WHB	0.40	0.30	0.43



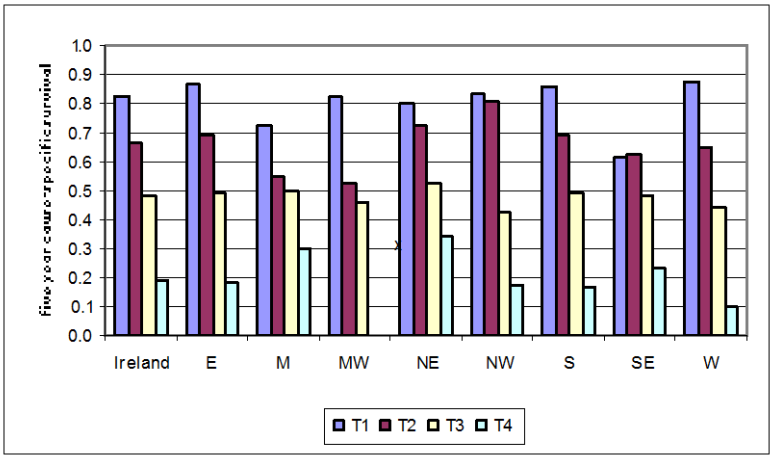
5.3.7 Stage

a T stage

Prognosis for T1 cancers varied from 62% in the SEHB to 88% in the WHB (Table 5.12). Survival in the SEHB for T1 cancers was significantly lower than for other areas (p<.001). Survival for T2 and T3 cancers was similar in all areas, while that for T4 varied from 10% in the WHB to 34% in the NEHB.

Table 5.12; Figure 5.10. Five year colorectal cancer survival by health board and T stage

Area of residence	T1	T2	T3	T4	TX
Ireland	0.82	0.67	0.48	0.19	0.24
ERHA	0.87	0.69	0.49	0.19	0.30
MHB	0.73	0.55	0.50	0.30	0.30
MWHB	0.83	0.52	0.46	--	0.32
NEHB	0.80	0.72	0.53	0.34	0.21
NWHB	0.84	0.81	0.43	0.17	0.20
SHB	0.86	0.69	0.49	0.17	0.09
SEHB	0.62	0.62	0.49	0.23	0.22
WHB	0.88	0.65	0.44	0.10	0.22

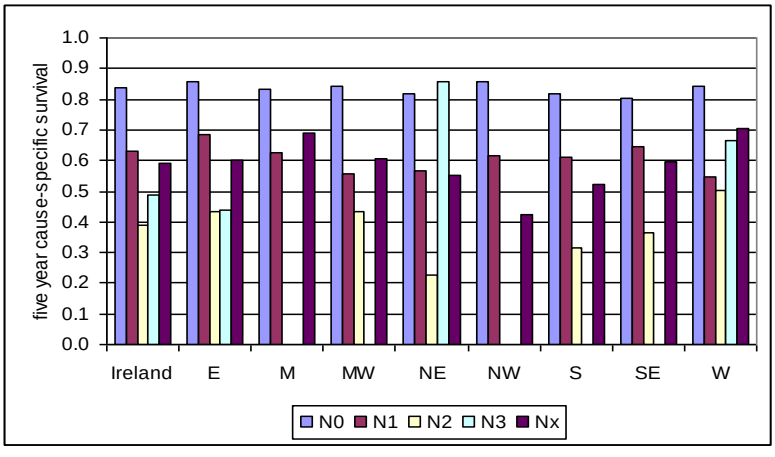


b N stage

Survival for N0 cases was quite similar between health boards, but was significantly poorer in the MWHB and SEHB (Table 5.13) That for N1 cancers ranged from 21% in the NWHB to 44% in the MHB. Survival for N2/N3 cases was best in the ERHA and NWHB and was significantly poorer than in the ERHA for all other areas..

Table 5.13; Figure 5.11. Five year colorectal cancer survival by health board and N stage

Area of residence	N0	N1	N2	N3	NX
Ireland	0.66	0.35	0.27	0.22	0.27
ERHA	0.67	0.37	0.32	0.35	0.31
MHB	0.66	0.44	0.19	--	0.29
MWHB	0.59	0.36	--	--	0.30
NEHB	0.68	0.42	0.29	0.30	0.35
NWHB	0.77	0.21	--	--	0.27
SHB	0.66	0.33	0.26	0.27	0.19
SEHB	0.65	0.27	0.30	--	0.21
WHB	0.61	0.38	0.18	--	0.29

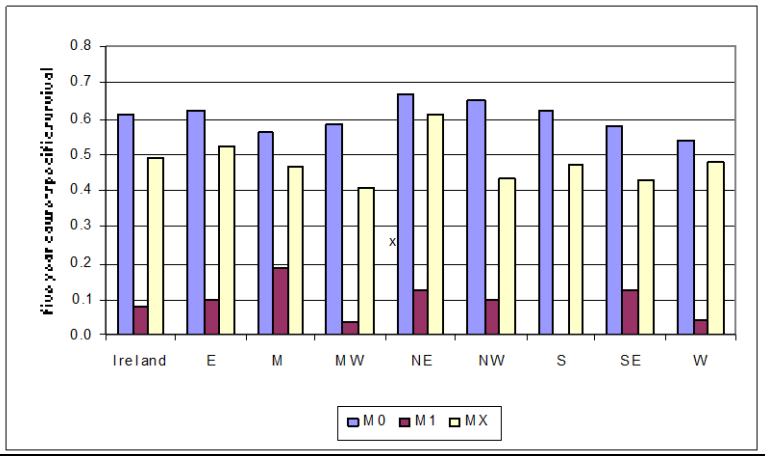


c M stage

The relationship between M stage and survival was strong and consistent across health board areas (Table 5.14). Prognosis for M0 and MX cases is difficult to interpret because of the large number of MX cases. Prognosis for MI cases varied widely but was not significantly different in any area from the overall figure.

Table 5.14; Figure 5.12. Five year colorectal cancer survival by health board and M stage

Area of residence	M0	M1	MX
Ireland	0.61	0.08	0.49
ERHA	0.62	0.10	0.53
MHB	0.57	0.19	0.47
MWHB	0.59	0.04	0.40
NEHB	0.67	0.12	0.61
NWHB	0.65	0.10	0.43
SHB	0.63	--	0.47
SEHB	0.58	0.12	0.43
WHB	0.54	0.04	0.48

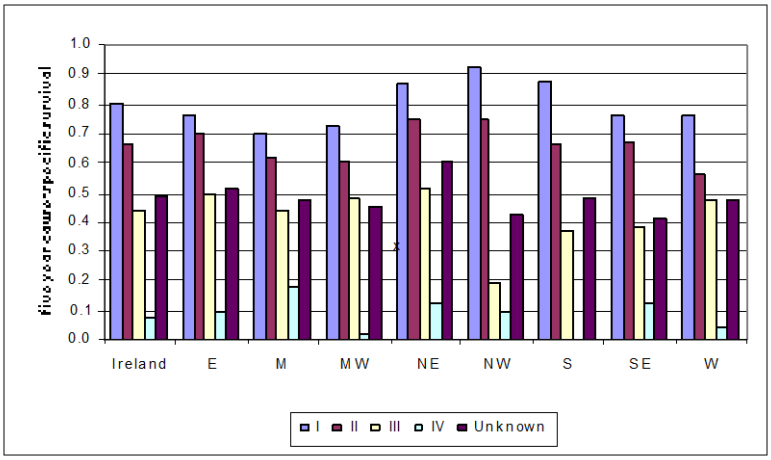


d Summary stage

Survival for stage I cases was best in the NWHB (93%) and poorest in the MHB (70%) (Table 5.15). This difference was not statistically significant. There was a wide range of variation for stage II and III cases. For stage III cases, survival was significantly poorer in the NWHB area. Stage IV cases were not reported from some areas, and there were no statistically significant difference in survival.

Table 5.15; Figure 5.13. Five year colorectal cancer survival by health board and summary stage

Area of residence	I	II	III	IV	Unknown
Ireland	0.80	0.67	0.44	0.08	0.49
ERHA	0.76	0.70	0.50	0.10	0.52
MHB	0.70	0.62	0.44	0.18	0.47
MWHB	0.73	0.60	0.48	0.02	0.46
NEHB	0.87	0.74	0.51	0.12	0.60
NWHB	0.93	0.75	0.19	0.10	0.42
SHB	0.88	0.67	0.37	—	0.48
SEHB	0.76	0.67	0.38	0.12	0.41
WHB	0.77	0.56	0.47	0.04	0.47

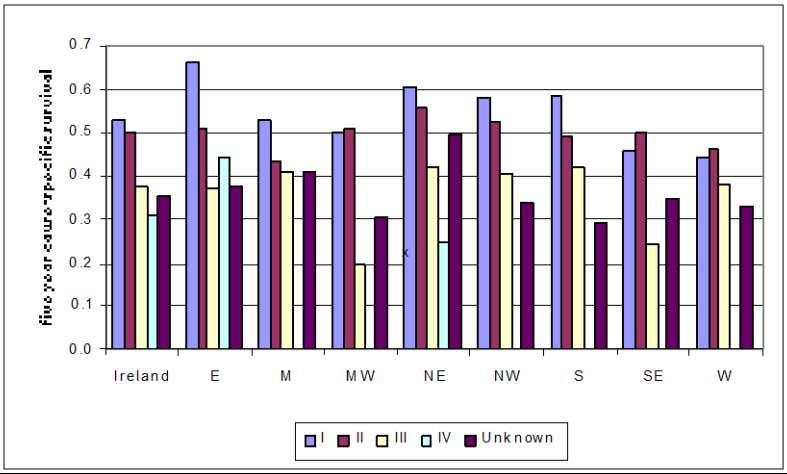


e Grade

With a few minor exceptions, higher-grade cancers were associated with a poorer prognosis in all health board areas (Table 5.16). As with stage, cancers with unknown grade seemed to be quite heterogeneous.

Table 5.16; Figure 5.14. Five year colorectal cancer survival by health board and grade

Area of residence	I	II	III	IV	Unknown
Ireland	0.53	0.50	0.38	0.31	0.36
ERHA	0.66	0.51	0.38	0.44	0.38
MHB	0.53	0.44	0.41	—	0.41
MWHB	0.50	0.51	0.20	—	0.30
NEHB	0.60	0.56	0.42	0.25	0.50
NWHB	0.58	0.52	0.41	—	0.34
SHB	0.59	0.49	0.42	—	0.29
SEHB	0.46	0.50	0.24	—	0.35
WHB	0.44	0.46	0.38	—	0.33



5.4 Survival modelling

A range of Cox proportional hazards models was fitted to the data, in an attempt to adjust for confounders among the patient and tumour characteristics. In each cases, the baseline hazard is that for the ERHA, and the probabilities are of a difference from the ERHA hazard.

Hazard ratios for all areas other than the NEHB were higher than in the ERHA for both sexes combined (Table 5.17). Survival in the MWHB, NWHB, SHB, SEHB and WHB was highly significantly lower than that in the ERHA. For both males and females survival was significantly poorer in the NWHB, SHB, and WHB, for females only in the MWHB and for males only in the MHB and SEHB.

Table 5.17. Hazard ratios for colorectal cancer by health board

	Both sexes		Female		Male	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000		1.000	
MHB	1.073 (1.241 ;1.330)	0.342	0.831 (0.659 ;1.048)	0.118	**1.330 (1.103 ;1.603)**	**0.003**
MWHB	**1.179 (1.341 ;1.108)**	**0.012**	**1.288 (1.051 ;1.579)**	**0.015**	1.108 (0.937 ;1.310)	0.229
NEHB	0.961 (1.097 ;0.926)	0.555	1.008 (0.824 ;1.233)	0.935	0.926 (0.776 ;1.105)	0.396
NWHB	**1.231 (1.404 ;1.226)**	**0.002**	**1.244 (1.022 ;1.514)**	**0.030**	**1.226 (1.028 ;1.462)**	**0.024**
SHB	**1.209 (1.332 ;1.229)**	**0.000**	**1.180 (1.019 ;1.367)**	**0.027**	**1.229 (1.081 ;1.397)**	**0.002**
SEHB	**1.211 (1.356 ;1.280)**	**0.001**	1.124 (0.943 ;1.340)	0.192	**1.280 (1.104 ;1.483)**	**0.001**
WHB	**1.319 (1.472 ;1.318)**	**0.000**	**1.315 (1.104 ;1.567)**	**0.002**	**1.318 (1.145 ;1.518)**	**0.000**

Following adjustment for patient and tumour factors, hazard ratios for females were no longer significantly different from those in the 2002, with the exception of the MWHB (Table 5.18).[13] However, for males, rates in most areas remained significantly above those in the ERHA.

Table 5.18. Hazard ratios for colorectal cancer by health board. Multivariate model, all patients

	Female		Male	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000	
MHB	0.884 (0.678 ;1.153)	0.364	**1.357 (1.086;1.693)**	**0.007**
MWHB	**1.306 (1.023;1.667)**	**0.032**	**1.238 (1.024 ;1.497)**	**0.027**
NEHB	0.918 (0.732 ;1.149)	0.455	0.952 (0.786 ;1.153)	0.616
NWHB	1.065 (0.850 ;1.333)	0.584	1.144 (0.945 ;1.386)	0.167
SHB	1.028 (0.872 ;1.213)	0.740	**1.305 (1.133 ;1.504)**	**0.000**
SEHB	1.004 (0.825 ;1.221)	0.969	**1.214 (1.035 ;1.425)**	**0.017**
WHB	1.133 (0.931;1.379)	0.211	1.073 (0.916 ;1.257)	0.382

Prognosis, and factors affecting prognosis, were quite different for the 22% of colorectal cancer patients who did not have surgery (Table 5.19; Table 5.20), so these groups were separated for further analysis.

[13] The full multivariate models are given in Appendix 3, Table 1.2.

Table 5.19. Percentage of colorectal cancer patients having surgery

Treatments	Female	Male
No surgery	794 (21.8%)	1035 (21.7%)
Surgery	2843 (78.2%)	3728 (78.3%)

Table 5.20. Hazard ratios by health board; surgical and non-surgical treatment

	Hazard ratio (95% confidence limits)	
Area of residence	**No surgery**	**Surgery**
ERHA	1.000	0.218 (0.218 ;0.281)
MHB	1.021 (0.896 ;1.147)	0.234 (0.109 ;0.333)
MWHB	**1.158 (1.036 ;1.280)**	0.279 (0.157 ;0.365)
NEHB	**1.200 (1.073 ;1.327)**	0.223 (0.097 ;0.311)
NWHB	**1.279 (1.178 ;1.381)**	0.230 (0.129 ;0.327)
SHB	**1.617 (1.537 ;1.696)**	0.235 (0.156 ;0.308)
SEHB	1.001 (0.907 ;1.095)	0.262 (0.167 ;0.342)
WHB	**1.288 (1.191 ;1.384)**	0.296 (0.199 ;0.373)

5.4.1 Hazard ratios: Patients having surgery

a Univariate model

Uncorrected (univariate) hazard ratios for patients having surgery were similar to those for all patients, but the number of areas which were significantly different from the ERHA was smaller (Table 5.21). For females, survival was poorer in the MWHB and WHB, while for men it was poorer in the WHB only. Survival for SEHB patients, although poorer for both sexes, was not quite significantly different at the 5% level.

Table 5.21. Hazard ratios for colorectal cancer, patients having surgery, by sex and health board

	Female		Male	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000	
MHB	0.961 (0.731 ;1.264)	0.776	1.202 (0.946 ;1.528)	0.133
MWHB	**1.574 (1.241 ;1.996)**	**0.000**	1.120 (0.916 ;1.371)	0.270
NEHB	1.126 (0.887 ;1.430)	0.328	0.954 (0.773 ;1.177)	0.658
NWHB	1.026 (0.780 ;1.349)	0.857	1.089 (0.866 ;1.370)	0.464
SHB	1.055 (0.871 ;1.279)	0.584	1.099 (0.935 ;1.292)	0.252
SEHB	1.223 (0.981 ;1.525)	0.074	1.189 (0.986 ;1.433)	0.070
WHB	**1.470 (1.190 ;1.816)**	**0.000**	**1.292 (1.085 ;1.539)**	**0.004**

b Multivariate model

The univariate model was expanded by the addition of the variables already listed. For patients having surgery, the following factors significantly improved model fit:[14]

- Patient age
- T stage
- N stage
- Tumour grade
- Histological verification of diagnosis
- M stage

Table 5.22. Hazard ratios for colorectal cancer, patients having surgery, by sex and health board

	Female		Male	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000	
MHB	1.222 (0.890 ;1.679)	0.215	**1.458 (1.086 ;1.957)**	**0.012**
MWHB	**1.713 (1.265 ;2.321)**	**0.001**	**1.366 (1.077;1.733)**	**0.010**
NEHB	0.929 (0.715 ;1.207)	0.581	0.991 (0.789;1.250)	0.941
NWHB	1.086 (0.802 ;1.472)	0.592	**1.417 (1.099 ;1.824)**	**0.007**
SHB	1.139 (0.920 ;1.411)	0.233	**1.339 (1.117 ;1.603)**	**0.002**
SEHB	1.226 (0.960 ;1.565)	0.102	**1.321 (1.077 ;1.620)**	**0.007**
WHB	1.295 (1.013 ;1.656)	0.039	1.173 (0.957 ;1.438)	0.125

Following correction for these patient and tumour factors, it can be seen that, allowing for case-mix, prognosis for colorectal cancer patients was significantly poorer for females living in the MWHB and males living in the MHB, MWHB, NWHB, SHB and SEHB than for their counterparts living in the ERHA (Table 5.22).

[14] The full multivariate models are given in Appendix 3, Table1.3.

5.4.2 Hazard ratios: Patients not having surgery

a Univariate

For patients not having surgery, survival was significantly poorer for both sexes in the SHB and for males in the SEHB and MHB, while it was better than figures for the ERHA for females in the MHB area (Table 5.23). Overall, most health boards had poorer survival than the ERHA.

Table 5.23. Hazard ratios for colorectal cancer, patients not having surgery, by sex and health board

	Female		Male	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000	
MHB	**0.617 (0.397 ;0.961)**	**0.033**	**1.458 (1.080 ;1.967)**	**0.014**
MWHB	1.017 (0.679 ;1.523)	0.935	1.257 (0.932 ;1.695)	0.134
NEHB	1.128 (0.771 ;1.651)	0.534	1.200 (0.865 ;1.666)	0.276
NWHB	1.180 (0.886 ;1.570)	0.258	1.264 (0.957 ;1.670)	0.099
SHB	**1.373 (1.090 ;1.729)**	**0.007**	**1.548 (1.253 ;1.913)**	**0.000**
SEHB	0.750 (0.561 ;1.002)	0.052	**1.330 (1.044 ;1.693)**	**0.021**
WHB	1.312 (0.955 ;1.803)	0.094	1.265 (0.996 ;1.607)	0.054

b Multivariate

A different set of variables had to be fitted to the model of patients not having surgery. These were:

- Age
- Marital status
- T, N and M stage
- grade

After the inclusion of these variables, hazard ratios associated with health board of residence were mostly lower for females outside the ERHA, and significantly so in the case of the MHB and SEHB (Table 5.24[15]). For males, hazard ratios were mostly higher than those in the ERHA, but only that in the NEHB was statistically significant.

Table 5.24. Hazard ratios for colorectal cancer, patients not having surgery, by sex and health board

	Female		Male	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000	
MHB	**0.537 (0.326 ;0.884)**	**0.015**	1.166 (0.837 ;1.622	0.363
MWHB	0.826 (0.521 ;1.308)	0.414	1.160 (0.842 ;1.599)	0.364
NEHB	0.943 (0.627 ;1.417)	0.776	**1.455 (1.024 ; 2.068)**	**0.036**
NWHB	0.730 (0.525 ;1.014)	0.060	0.877 (0.652 ;1.181)	0.389
SHB	0.983 (0.761 ;1.272)	0.899	1.250 (0.999 ;1.566)	0.051
SEHB	**0.689 (0.502 ;0.948)**	**0.022**	1.078 (0.832 ;1.397)	0.567
WHB	1.212 (0.852 ;1.726)	0.285	0.986 (0.767 ;1.266)	0.909

[15] The full multivariate models are given in Appendix 3, Table1.4

5.5 Treatment differences by health board

5.5.1 Descriptive analysis

Although the difference between health boards in proportions of patients having treatment or having surgery were not great, these were statistically significant (Table 5.25). The percentage having any treatment ranged from 78% in the SEHB to 87% in the NEHB (χ^2 41.2; p<.001) and for surgery from 73% in the NWHB to 85% in the NEHB (χ^2 51.4; p<.001).

The differences were larger for chemotherapy, from 21% in the WHB to 31% in the NWHB (χ^2 93.9; p<.001) and for radiotherapy—from 5% in the MWHB to 12% in the ERHA (χ^2 58.7; p<.001).

Table 5.25.Treatments given, by health board

	Number (%) of Registrations								
	Health board of residence								
	Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases	**8400**	**2772**	**490**	**628**	**688**	**609**	**1412**	**894**	**907**
Has treatment	6910(82%)	2329(84%)	397(81%)	532(85%)	597(87%)	486(80%)	1121(79%)	696(78%)	752(83%)
Has surgery	6571(78%)	2202(79%)	382(78%)	519(83%)	582(85%)	446(73%)	1069(76%)	658(74%)	713(79%)
Has chemotherapy	1972(23%)	711(26%)	119(24%)	132(21%)	158(23%)	191(31%)	218(15%)	250(28%)	193(21%)
Has radiotherapy	750(9%)	330(12%)	36(7%)	32(5%)	45(7%)	61(10%)	93(7%)	76(9%)	77(8%)
Mutually exclusive therapies:									
Surgery only	4643(55%)	1484(54%)	268(55%)	390(62%)	424(62%)	282(46%)	842(60%)	421(47%)	532(59%)
Chemotherapy only	165(2%)	47(2%)	9(2%)	5(1%)	8(1%)	27(4%)	23(2%)	23(3%)	23(3%)
Radiotherapy only	92(1%)	41(1%)	2(0%)	3(0%)	4(1%)	3(0%)	23(2%)	5(1%)	11(1%)
Surgery + C	1352(16%)	468(17%)	84(17%)	105(17%)	120(17%)	116(19%)	163(12%)	176(20%)	120(13%)
Surgery + R	203(2%)	93(3%)	8(2%)	7(1%)	11(2%)	10(2%)	38(3%)	20(2%)	16(2%)
Surgery + C +R	373(4%)	157(6%)	22(4%)	17(3%)	27(4%)	38(6%)	26(2%)	41(5%)	45(5%)
Surgery + R or C	1928(23%)	718(26%)	114(23%)	129(21%)	158(23%)	164(27%)	227(16%)	237(27%)	181(20%)
C + R	82(1%)	39(1%)	4(1%)	5(1%)	3(0%)	10(2%)	6(0%)	10(1%)	5(1%)

5.5.2 Logistic regression analysis

To incorporate the possible effects of the many patient and tumour variables which might have influenced treatments, a series of logistic regression models was fitted to the data, using the different treatment modalities as outcomes

a Surgery

The simplest model for surgery, incorporating only the health board effects, showed similar difference to those described above, with the odds of surgery significantly lower for patients in the NEHB, NWHB, SHB and SEHB (Table 5.26).

Table 5.26. Odds of surgical treatment by health board; univariate model

	Both sexes		Females		Males	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000		1.000	
MHB	0.916 (0.726 ;1.155)	0.457	1.213 (1.754 ;0.840)	0.303	0.742 (1.004 ;0.549)	0.053
MWHB	1.233 (0.983 ;1.545)	0.070	1.361 (1.977 ;0.937)	0.106	1.158 (1.540 ;0.870)	0.315
NEHB	**1.421 (1.133 ;1.783)**	**0.002**	**1.477 (2.093 ;1.042)**	**0.028**	**1.379 (1.858 ;1.023)**	**0.035**
NWHB	**0.708 (0.579 ;0.867)**	**0.001**	**0.607 (0.813 ;0.454)**	**0.001**	0.812 (1.075 ;0.613)	0.145
SHB	**0.807 (0.693 ;0.940)**	**0.006**	**0.778 (0.973 ;0.622)**	**0.028**	0.833 (1.027 ;0.676)	0.087
SEHB	**0.722 (0.606 ;0.860)**	**0.000**	**0.731 (0.952 ;0.561)**	**0.020**	**0.714 (0.901 ;0.565)**	**0.005**
WHB	0.951 (0.792 ;1.143)	0.594	1.215 (1.651 ;0.894)	0.213	0.825 (1.039 ;0.654)	0.102

These differences were statistically significant for females in the four areas, but for males in the NEHB and SEHB only.

A number of patient and tumour factors were significantly related to the probability of having surgery. The chances of having surgery decreased with age, with increasing deprivation, for the unmarried, for cancers of undefined on non-specific cell type, and for patients with clinically advanced cancers.

The following factors significantly improved model fit:

- Patient sex
- Patient age
- Year of incidence
- Marital status
- Deprivation
- Smoking status
- Histological confirmation
- Site
- Tumour grade
- T stage
- N stage
- M stage

and for males only, marital status and co-morbidity

If these factors are added to the model, the relative odds of having surgery change (Table 5.27[16]). Allowing for case-mix, patients were more likely to have surgery if they lived in the MWHB, NEHB and WHB. For females, those living in the WHB were also more likely to have surgery, while for males, only those living in the MWHB and SEHB had a statistically significantly odds of surgery.

[16] Full multivariate model described in Appendix 4, Table1.10

Table 5.27. Odds of surgical treatment by health board; multivariate model

	Both sexes		Females		males	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000		1.000	
MHB	0.875 (0.633 ;1.211)	0.421	0.868 (0.526 ;1.435)	0.582	0.896 (0.579 ;1.365)	0.615
MWHB	**1.557 (1.135 ;2.136)**	**0.006**	**1.926 (1.108 ;3.349)**	**0.020**	**1.434 (0.987 ;2.166)**	**0.070**
NEHB	**2.356 (1.734 ;3.200)**	**0.000**	**3.035 (1.813 ;5.079)**	**0.000**	**2.074 (1.391 ;3.010)**	**0.000**
NWHB	0.856 (0.631 ;1.162)	0.318	0.852 (0.531 ;1.367)	0.507	0.899 (0.581 ;1.307)	0.607
SHB	1.236 (0.991 ;1.542)	0.061	1.275 (0.910 ;1.784)	0.158	1.264 (0.922 ;1.666)	0.120
SEHB	0.984 (0.764 ;1.269)	0.904	0.935 (0.634 ;1.378)	0.734	1.031 (0.724 ;1.420)	0.860
WHB	**1.803 (1.400 ;2.322)**	**0.000**	**2.588 (1.698 ;3.943)**	**0.000**	**1.495(1.066 ;2.019)**	**0.013**

b Radiotherapy

Table 5.28.Odds of radiotherapy by health board; univariate model

	Both sexes		Females		Males	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000		1.000	
MHB	0.587 (0.410 ;0.840)	0.004	0.682 (0.391 ;1.191)	0.179	0.532 (0.333 ;0.851)	0.008
MWHB	**0.397 (0.273 ;0.577)**	**0.000**	**0.380 (0.190 ;0.760)**	**0.006**	**0.386 (0.247 ;0.602)**	**0.000**
NEHB	**0.518 (0.375 ;0.716)**	**0.000**	0.666 (0.403 ;1.100)	0.112	**0.435 (0.285 ;0.664)**	**0.000**
NWHB	0.824 (0.617 ;1.099)	0.188	0.748 (0.457 ;1.225)	0.248	0.867 (0.606 ;1.239)	0.433
SHB	**0.522 (0.411 ;0.663)**	**0.000**	**0.510 (0.343 ;0.760)**	**0.001**	**0.529 (0.392 ;0.715)**	**0.000**
SEHB	**0.688 (0.529 ;0.893)**	**0.005**	0.661 (0.422 ;1.034)	0.069	**0.691 (0.500 ;0.956)**	**0.026**
WHB	**0.687 (0.529 ;0.891)**	**0.005**	**0.611 (0.378 ;0.988)**	**0.045**	**0.692 (0.506 ;0.945)**	**0.021**

In the simple model, the odds of having radiotherapy were highest in the ERHA and lowest in the MWHB (Table 5.28). All areas other than the NWHB had a statistically significantly lower level of radiotherapy. The pattern was similar for men and women. The odds of having radiotherapy were related to fewer factors than was surgery. The factors affecting odds of having radiotherapy were as follows:

Female
- Age
- Histological confirmation
- Site
- T stage
- M stage
- Co-morbidity

Male
- Age
- Year of incidence
- Site
- T stage
- M stage
- Co-morbidity

After correction for the above factors, the odds of radiotherapy were still lower in all areas compared to the ERHA, and significantly so in the MWHB, NEHB, SHB and WHB for both sexes.

Table 5.29.Odds of radiotherapy by health board; multivariate model[17]

	Both sexes		Females		Males	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000		1.000	
MHB	0.742 (0.495 ;1.114)	0.150	0.707 (0.382 ;1.307)	0.268	0.636 (0.383 ;1.057)	0.081
MWHB	**0.437 (0.288 ;0.662)**	**0.000**	**0.396 (0.190 ;0.825)**	**0.013**	**0.417 (0.259 ;0.673)**	**0.000**
NEHB	**0.464 (0.327 ;0.659)**	**0.000**	0.694 (0.399 ;1.204)	0.194	**0.380 (0.241 ;0.597)**	**0.000**
NWHB	0.807 (0.577 ;1.130)	0.213	1.031 (0.588 ;1.808)	0.914	0.746 (0.493 ;1.131)	0.168
SHB	**0.556 (0.427 ;0.724)**	**0.000**	**0.542 (0.349 ;0.842)**	**0.006**	**0.577 (0.415 ;0.802)**	**0.001**
SEHB	0.745 (0.554 ;1.001)	0.051	0.604 (0.362 ;1.008)	0.054	0.777 (0.541 ;1.116)	0.172
WHB	**0.625 (0.466 ;0.837)**	**0.002**	0.669 (0.393 ;1.139)	0.138	**0.619 (0.438 ;0.874)**	**0.007**

[17] Full multivariate model is described in Appendix 4, Table 1.11.

c Chemotherapy

For the MWHB, SHB and WHB areas, the odds of having chemotherapy were significantly lower than in the ERHA. In the NWHB, especially for men, the rate of chemotherapy was higher than in the ERHA (Table 5.30).

Table 5.30 .Odds of chemotherapy by health board; univariate model

	Both sexes		Females		Males	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**
ERHA	1.000		1.000		1.000	
MHB	0.930 (0.744 ;1.163)	0.523	0.985 (0.706 ;1.373)	0.928	0.888 (0.657 ;1.201)	0.442
MWHB	**0.771 (0.625 ;0.952)**	**0.015**	0.821 (0.584 ;1.154)	0.256	**0.735 (0.562 ;0.960)**	**0.024**
NEHB	0.864 (0.710 ;1.052)	0.146	0.825 (0.604 ;1.125)	0.224	0.887 (0.687 ;1.145)	0.357
NWHB	**1.325 (1.094 ;1.604)**	**0.004**	1.167 (0.869 ;1.569)	0.305	**1.456 (1.132 ;1.873)**	**0.003**
SHB	**0.529 (0.448 ;0.626)**	**0.000**	**0.565 (0.441 ;0.726)**	**0.000**	**0.502 (0.400 ;0.630)**	**0.000**
SEHB	1.125 (0.950 ;1.333)	0.171	1.017 (0.780 ;1.326)	0.903	1.202 (0.965 ;1.498)	0.101
WHB	**0.784 (0.654 ;0.938)**	**0.008**	**0.713 (0.529 ;0.961)**	**0.027**	0.816 (0.650 ;1.025)	0.080

The following factors affected the odds of having chemotherapy:

Both sexes	**Female**	**Male**
▪ Year of incidence	▪	▪ Year of incidence
▪ Patient age	▪ Patient age	▪ Patient age
▪ Marital status	▪	▪ Marital status
▪ Smoker status	▪	▪ Smoker status
▪ Histological confirmation	▪ Histological confirmation	▪ Histological confirmation
▪ Site	▪ Site	▪
▪ Tumour grade	▪ Tumour grade	▪ Tumour grade
▪ **T stage**	▪ **T stage**	▪ **T stage**
▪ N stage	▪	▪ N stage
▪ M stage	▪ M stage	▪ M stage
▪ **Co-morbidity**	▪ **Co-morbidity**	▪ **Co-morbidity**

After correction for the above factors, the odds of chemotherapy treatment were significantly lower than in the ERHA for patients living in the SHB and SEHB, and higher in the NWHB (Table 5.). For females the only significant difference was the lower rate of chemotherapy in the SEHB, while for males all the differences described were statistically significant.

Table 5.32.Odds of chemotherapy by health board; multivariate model[18]

	Both sexes		Females		Males	
Area of residence	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**p**	**Hazard ratio (95% confidence limits)**	**P**
ERHA	1.000		1.000		1.000	
MHB	1.083 (0.831 ;1.413)	0.554	1.016 (0.683 ;1.512)	0.937	1.142 (0.799 ;1.633)	0.465
MWHB	0.932 (0.726 ;1.196)	0.579	0.899 (0.596 ;1.356)	0.611	0.947 (0.691 ;1.297)	0.733
NEHB	0.980 (0.784 ;1.225)	0.860	0.868 (0.606 ;1.242)	0.438	1.081 (0.812 ;1.439)	0.593
NWHB	**1.493 (1.170 ;1.905)**	**0.001**	1.359 (0.937 ;1.973)	0.106	**1.697 (1.234 ;2.335)**	**0.001**
SHB	**0.521 (0.431 ;0.629)**	**0.000**	**0.594 (0.448 ;0.787)**	**0.000**	**0.505 (0.392 ;0.651)**	**0.000**
SEHB	**1.288 (1.053 ;1.575)**	**0.014**	1.106 (0.807 ;1.517)	0.531	**1.475 (1.138 ;1.912)**	**0.003**
WHB	0.887 (0.720 ;1.093)	0.261	0.833 (0.586 ;1.184)	0.308	0.948 (0.730 ;1.231)	0.687

[18] Full multivariate model is described in Appendix 4, Table 1.12.

6 Lung cancer—all cell types

6.1 Cases analysed and their characteristics

6.1.1 Patients

The cases analysed are shown in Table 6.1. There were 7207 cases of lung cancer in total during the five years 1994 to 1998. There was a higher proportion of older patients in the NWHB and WHB areas (38% and 37% aged over 75 respectively, compared to 31% nationally). 9% of patients were recorded as “non-smokers”, varying from 6% in the NEHB to 15% in the SHB. The proportion of married and patients was highest in the ERHA and SHB areas. The number of patients living in areas described as “deprived “ was particularly high in the ERHA and NWHB, and was very low in the MHB and WHB.

Only a very small number of cancers was discovered incidentally and this did not vary much between health boards.. The percentage of histological confirmation was variable, ranging from 66% in the SEHB to 82% in the ERHA.

Table 6.1. All lung cancer cases: patient characteristics and presentation

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		7207	2968	365	536	533	475	997	736	597
Patient factor:										
Sex	Female	2484(34%)	1116(38%)	110(30%)	176(33%)	186(35%)	136(29%)	333(33%)	231(31%)	196(33%)
	Male	4723(66%)	1852(62%)	255(70%)	360(67%)	347(65%)	339(71%)	664(67%)	505(69%)	401(67%)
Age	<50	289(4%)	144(5%)	16(4%)	19(4%)	21(4%)	18(4%)	29(3%)	22(3%)	20(3%)
	50-54	404(6%)	183(6%)	9(2%)	32(6%)	34(6%)	19(4%)	65(7%)	38(5%)	24(4%)
	55-59	543(8%)	237(8%)	23(6%)	47(9%)	41(8%)	29(6%)	66(7%)	55(7%)	45(8%)
	60-64	865(12%)	357(12%)	34(9%)	75(14%)	68(13%)	46(10%)	139(14%)	82(11%)	64(11%)
	65-69	1362(19%)	570(19%)	84(23%)	96(18%)	85(16%)	81(17%)	182(18%)	155(21%)	109(18%)
	70-74	1481(21%)	603(20%)	84(23%)	108(20%)	126(24%)	101(21%)	190(19%)	156(21%)	113(19%)
	75-79	1253(17%)	485(16%)	74(20%)	86(16%)	79(15%)	98(21%)	173(17%)	131(18%)	127(21%)
	>=80	1010(14%)	389(13%)	41(11%)	73(14%)	79(15%)	83(17%)	153(15%)	97(13%)	95(16%)
Smoking status	Non-smoker	634(9%)	203(7%)	40(11%)	51(10%)	34(6%)	39(8%)	153(15%)	64(9%)	50(8%)
	Ex-smoker	1643(23%)	729(25%)	66(18%)	108(20%)	143(27%)	103(22%)	203(20%)	169(23%)	122(20%)
	Smoker	4071(56%)	1597(54%)	227(62%)	312(58%)	312(59%)	302(64%)	517(52%)	436(59%)	368(62%)
	Unknown	859(12%)	439(15%)	32(9%)	65(12%)	44(8%)	31(7%)	124(12%)	67(9%)	57(10%)
Year of incidence	1994	1507(21%)	596(20%)	76(21%)	111(21%)	108(20%)	94(20%)	219(22%)	168(23%)	135(23%)
	1995	1382(19%)	609(21%)	60(16%)	99(18%)	103(19%)	85(18%)	189(19%)	130(18%)	107(18%)
	1996	1410(20%)	578(19%)	73(20%)	81(15%)	109(20%)	106(22%)	189(19%)	148(20%)	126(21%)
	1997	1405(19%)	594(20%)	66(18%)	107(20%)	95(18%)	84(18%)	212(21%)	142(19%)	105(18%)
	1998	1503(21%)	591(20%)	90(25%)	138(26%)	118(22%)	106(22%)	188(19%)	148(20%)	124(21%)
Marital status	Married	3996(55%)	1728(58%)	192(53%)	291(54%)	280(53%)	250(53%)	576(58%)	375(51%)	304(51%)
	Not married	2965(41%)	1122(38%)	163(45%)	215(40%)	239(45%)	217(46%)	395(40%)	340(46%)	274(46%)
	Unknown	246(3%)	118(4%)	10(3%)	30(6%)	14(3%)	8(2%)	26(3%)	21(3%)	19(3%)
Deprivation	Affluent	1399(19%)	823(28%)	44(12%)	120(22%)	45(8%)	24(5%)	187(19%)	50(7%)	106(18%)
	Intermediate	2838(39%)	660(22%)	223(61%)	272(51%)	259(49%)	245(52%)	529(53%)	353(48%)	297(50%)
	Deprived	2223(31%)	1161(39%)	59(16%)	126(24%)	169(32%)	180(38%)	209(21%)	234(32%)	85(14%)
	Unknown	747(10%)	324(11%)	39(11%)	18(3%)	60(11%)	26(5%)	72(7%)	99(13%)	109(18%)
Presentation/diagnosis:										
Presentation	Screening	14(0%)	4(0%)	0(0%)	0(0%)	0(0%)	1(0%)	7(1%)	1(0%)	1(0%)
	Incidental	210(3%)	88(3%)	10(3%)	13(2%)	21(4%)	17(4%)	22(2%)	22(3%)	17(3%)
	Symptoms	6769(94%)	2759(93%)	340(93%)	504(94%)	501(94%)	450(95%)	958(96%)	691(94%)	566(95%)
	Unknown	214(3%)	117(4%)	15(4%)	19(4%)	11(2%)	7(1%)	10(1%)	22(3%)	13(2%)
Histological confirmation	Yes	5442(76%)	2442(82%)	284(78%)	324(60%)	394(74%)	325(68%)	765(77%)	489(66%)	419(70%)
	No	1765(24%)	526(18%)	81(22%)	212(40%)	139(26%)	150(32%)	232(23%)	247(34%)	178(30%)

6.1.2 Cancers

The majority of cases were described as non small cell cancer (NSCLC), from 50% in the MWHB to 67% in the ERHA. Tumour size was recorded in 55% of cases, from 43% in the NEHB to 69% in the SEHB. Summary stage (full TNM) was available in only 36% of cases, from 28% in the NWHB to 42% in the ERHA. Because of the high percentage of unknown values, it is not possible to draw any firm conclusions about difference in stage distribution between health boards. However, for those cases in which a stage was reported, there was a higher than expected percentage of stage III and IV cases in ERHA and MHB residents ($\chi 2=97.1.;p=.001$).

Information on grade was about 40% complete, with the highest levels of reporting in the ERHA.

Table 6.2. All lung cancer cases: tumour characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**7207**	**2968**	**365**	**536**	**533**	**475**	**997**	**736**	**597**
Cell type	NSCLC	4440(62%)	1999(67%)	238(65%)	267(50%)	311(58%)	263(55%)	608(61%)	395(54%)	359(60%)
	SCLC	1002(14%)	443(15%)	46(13%)	57(11%)	83(16%)	62(13%)	157(16%)	94(13%)	60(10%)
	Unconfirmed	1765(24%)	526(18%)	81(22%)	212(40%)	139(26%)	150(32%)	232(23%)	247(34%)	178(30%)
T stage	T1	545(8%)	276(9%)	34(9%)	30(6%)	59(11%)	16(3%)	66(7%)	34(5%)	30(5%)
	T2	1707(24%)	743(25%)	101(28%)	110(21%)	108(20%)	107(23%)	223(22%)	210(29%)	105(18%)
	T3	623(9%)	229(8%)	40(11%)	31(6%)	30(6%)	56(12%)	116(12%)	85(12%)	36(6%)
	T4	1086(15%)	386(13%)	46(13%)	76(14%)	34(6%)	78(16%)	185(19%)	179(24%)	102(17%)
	TX	3246(45%)	1334(45%)	144(39%)	289(54%)	302(57%)	218(46%)	407(41%)	228(31%)	324(54%)
N stage	N0	1010(14%)	490(17%)	45(12%)	74(14%)	64(12%)	61(13%)	122(12%)	105(14%)	49(8%)
	N1	856(12%)	384(13%)	32(9%)	55(10%)	72(14%)	58(12%)	98(10%)	97(13%)	60(10%)
	N2	702(10%)	306(10%)	38(10%)	40(7%)	26(5%)	23(5%)	90(9%)	116(16%)	63(11%)
	N3	263(4%)	111(4%)	13(4%)	13(2%)	23(4%)	10(2%)	41(4%)	28(4%)	24(4%)
	NX	4376(61%)	1677(57%)	237(65%)	354(66%)	348(65%)	323(68%)	646(65%)	390(53%)	401(67%)
M stage	M0	1234(17%)	658(22%)	55(15%)	101(19%)	87(16%)	75(16%)	81(8%)	108(15%)	69(12%)
	M1	1830(25%)	805(27%)	95(26%)	121(23%)	123(23%)	86(18%)	276(28%)	178(24%)	146(24%)
	MX	4143(57%)	1505(51%)	215(59%)	314(59%)	323(61%)	314(66%)	640(64%)	450(61%)	382(64%)
Summary stage	1	309(4%)	179(6%)	14(4%)	19(4%)	20(4%)	17(4%)	24(2%)	21(3%)	15(3%)
	2	125(2%)	67(2%)	1(0%)	8(1%)	9(2%)	7(1%)	8(1%)	12(2%)	13(2%)
	3a	189(3%)	89(3%)	15(4%)	11(2%)	10(2%)	14(3%)	12(1%)	26(4%)	12(2%)
	3b	208(3%)	112(4%)	7(2%)	15(3%)	13(2%)	9(2%)	12(1%)	27(4%)	13(2%)
	4	1828(25%)	805(27%)	95(26%)	121(23%)	122(23%)	86(18%)	276(28%)	177(24%)	146(24%)
	Unknown	4548(63%)	1716(58%)	233(64%)	362(68%)	359(67%)	342(72%)	665(67%)	473(64%)	398(67%)
Grade	I	190(3%)	65(2%)	9(2%)	33(6%)	6(1%)	8(2%)	45(5%)	19(3%)	5(1%)
	II	903(13%)	406(14%)	34(9%)	48(9%)	60(11%)	63(13%)	138(14%)	101(14%)	53(9%)
	III	1363(19%)	626(21%)	82(22%)	68(13%)	90(17%)	76(16%)	170(17%)	104(14%)	147(25%)
	IV	666(9%)	338(11%)	31(8%)	47(9%)	52(10%)	39(8%)	33(3%)	74(10%)	52(9%)
	Unknown	4085(57%)	1533(52%)	209(57%)	340(63%)	325(61%)	289(61%)	611(61%)	438(60%)	340(57%)

6.2 Non-small cell lung cancer

6.2.1 Patients

The cases analysed are shown in Table 6.3. There were 4440 cases of NCSLC cancer in total during the five years 1994 to 1998.

Table 6.3.Non small cell lung cancer. Patient characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**4440**	**1999**	**238**	**267**	**311**	**263**	**608**	**395**	**359**
Year of incidence	1994	955(22%)	397(20%)	54(23%)	69(26%)	62(20%)	56(21%)	137(23%)	101(26%)	79(22%)
	1995	829(19%)	406(20%)	34(14%)	50(19%)	50(16%)	40(15%)	107(18%)	73(18%)	69(19%)
	1996	893(20%)	402(20%)	49(21%)	50(19%)	63(20%)	57(22%)	120(20%)	66(17%)	86(24%)
	1997	861(19%)	396(20%)	44(18%)	47(18%)	60(19%)	54(21%)	133(22%)	73(18%)	54(15%)
	1998	902(20%)	398(20%)	57(24%)	51(19%)	76(24%)	56(21%)	111(18%)	82(21%)	71(20%)
Sex	Female	1409(32%)	688(34%)	69(29%)	72(27%)	98(32%)	62(24%)	189(31%)	122(31%)	109(30%)
	Male	3031(68%)	1311(66%)	169(71%)	195(73%)	213(68%)	201(76%)	419(69%)	273(69%)	250(70%)
Age	<50	208(5%)	107(5%)	10(4%)	12(4%)	16(5%)	12(5%)	20(3%)	15(4%)	16(4%)
	50-54	289(7%)	137(7%)	5(2%)	20(7%)	24(8%)	12(5%)	44(7%)	29(7%)	18(5%)
	55-59	396(9%)	178(9%)	19(8%)	29(11%)	25(8%)	20(8%)	56(9%)	36(9%)	33(9%)
	60-64	595(13%)	252(13%)	28(12%)	44(16%)	43(14%)	32(12%)	96(16%)	56(14%)	44(12%)
	65-69	909(20%)	391(20%)	58(24%)	51(19%)	63(20%)	53(20%)	122(20%)	94(24%)	77(21%)
	70-74	928(21%)	415(21%)	56(24%)	54(20%)	65(21%)	67(25%)	120(20%)	84(21%)	67(19%)
	75-79	705(16%)	318(16%)	46(19%)	34(13%)	49(16%)	41(16%)	97(16%)	55(14%)	65(18%)
	>=80	410(9%)	201(10%)	16(7%)	23(9%)	26(8%)	26(10%)	53(9%)	26(7%)	39(11%)
Smoking status	Non-smoker	392(9%)	146(7%)	25(11%)	27(10%)	16(5%)	22(8%)	93(15%)	33(8%)	30(8%)
	Ex-smoker	1085(24%)	505(25%)	46(19%)	54(20%)	92(30%)	63(24%)	140(23%)	107(27%)	78(22%)
	Smoker	2524(57%)	1087(54%)	150(63%)	158(59%)	182(59%)	171(65%)	318(52%)	230(58%)	228(64%)
	Unknown	439(10%)	261(13%)	17(7%)	28(10%)	21(7%)	7(3%)	57(9%)	25(6%)	23(6%)
Marital status	Married	2604(59%)	1213(61%)	131(55%)	148(55%)	180(58%)	148(56%)	372(61%)	215(54%)	197(55%)
	Not married	1713(39%)	714(36%)	104(44%)	111(42%)	124(40%)	113(43%)	224(37%)	169(43%)	154(43%)
	Unknown	123(3%)	72(4%)	3(1%)	8(3%)	7(2%)	2(1%)	12(2%)	11(3%)	8(2%)
Deprivation	Affluent	928(21%)	555(28%)	30(13%)	67(25%)	29(9%)	17(6%)	126(21%)	34(9%)	70(19%)
	Intermediate	1688(38%)	443(22%)	143(60%)	128(48%)	153(49%)	144(55%)	315(52%)	181(46%)	181(50%)
	Deprived	1398(31%)	786(39%)	42(18%)	65(24%)	95(31%)	92(35%)	137(23%)	128(32%)	53(15%)
	Unknown	426(10%)	215(11%)	23(10%)	7(3%)	34(11%)	10(4%)	30(5%)	52(13%)	55(15%)

6.2.2 Cancers

There was a wide range in the proportion of early (I and II) cancers, from 4% in the SHB to 11 in the ERHA. Metastases were also variable in incidence, from 17% of cases in the NWHB to 25% in the ERHA. It is not possible to determine if the generally later stage of cancers in residents of the ERHA is a real phenomenon or is due to more complete investigation and/or reporting of stage.

Table 6.4. Non small cell lung cancer: Tumour characteristics

			Number (%) of Registrations							
			Health board of residence							
		Total	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**4440**	**1999**	**238**	**267**	**311**	**263**	**608**	**395**	**359**
Presentation	Screening	9(0%)	3(0%)	0(0%)	0(0%)	0(0%)	1(0%)	5(1%)	0(0%)	0(0%)
	Incidental	140(3%)	63(3%)	8(3%)	9(3%)	12(4%)	10(4%)	12(2%)	14(4%)	12(3%)
	Symptoms	4185(94%)	1870(94%)	219(92%)	254(95%)	291(94%)	250(95%)	588(97%)	372(94%)	341(95%)
	Unknown	106(2%)	63(3%)	11(5%)	4(1%)	8(3%)	2(1%)	3(0%)	9(2%)	6(2%)
T stage	T1	404(9%)	206(10%)	29(12%)	20(7%)	41(13%)	14(5%)	52(9%)	19(5%)	23(6%)
	T2	1195(27%)	565(28%)	72(30%)	68(25%)	70(23%)	66(25%)	151(25%)	126(32%)	77(21%)
	T3	443(10%)	177(9%)	25(11%)	23(9%)	19(6%)	40(15%)	83(14%)	50(13%)	26(7%)
	T4	713(16%)	285(14%)	36(15%)	38(14%)	26(8%)	54(21%)	114(19%)	93(24%)	67(19%)
	TX	1685(38%)	766(38%)	76(32%)	118(44%)	155(50%)	89(34%)	208(34%)	107(27%)	166(46%)
N stage	N0	804(18%)	414(21%)	38(16%)	48(18%)	48(15%)	54(21%)	96(16%)	75(19%)	31(9%)
	N1	634(14%)	306(15%)	26(11%)	36(13%)	48(15%)	32(12%)	71(12%)	67(17%)	48(13%)
	N2	479(11%)	222(11%)	26(11%)	27(10%)	20(6%)	19(7%)	60(10%)	62(16%)	43(12%)
	N3	187(4%)	81(4%)	9(4%)	10(4%)	15(5%)	7(3%)	30(5%)	15(4%)	20(6%)
	NX	2336(53%)	976(49%)	139(58%)	146(55%)	180(58%)	151(57%)	351(58%)	176(45%)	217(60%)
M stage	M0	945(21%)	534(27%)	41(17%)	59(22%)	67(22%)	54(21%)	58(10%)	82(21%)	50(14%)
	M1	1036(23%)	497(25%)	54(23%)	58(22%)	60(19%)	45(17%)	158(26%)	77(19%)	87(24%)
	MX	2459(55%)	968(48%)	143(60%)	150(56%)	184(59%)	164(62%)	392(64%)	236(60%)	222(62%)
Summary stage	I	259(6%)	158(8%)	11(5%)	13(5%)	18(6%)	16(6%)	18(3%)	15(4%)	10(3%)
	II	108(2%)	62(3%)	1(0%)	8(3%)	7(2%)	3(1%)	6(1%)	11(3%)	10(3%)
	IIIa	148(3%)	70(4%)	12(5%)	9(3%)	8(3%)	11(4%)	9(1%)	18(5%)	11(3%)
	IIIb	162(4%)	90(5%)	6(3%)	10(4%)	11(4%)	7(3%)	8(1%)	20(5%)	10(3%)
	IV	1034(23%)	497(25%)	54(23%)	58(22%)	59(19%)	45(17%)	158(26%)	76(19%)	87(24%)
	Unknown	2729(61%)	1122(56%)	154(65%)	169(63%)	208(67%)	181(69%)	409(67%)	255(65%)	231(64%)
Grade	I	187(4%)	63(3%)	9(4%)	32(12%)	6(2%)	8(3%)	45(7%)	19(5%)	5(1%)
	II	873(20%)	401(20%)	34(14%)	47(18%)	58(19%)	62(24%)	125(21%)	96(24%)	50(14%)
	III	1305(29%)	598(30%)	80(34%)	67(25%)	84(27%)	73(28%)	160(26%)	101(26%)	142(40%)
	IV	343(8%)	176(9%)	14(6%)	24(9%)	33(11%)	11(4%)	17(3%)	31(8%)	37(10%)
	Unknown	1732(39%)	761(38%)	101(42%)	97(36%)	130(42%)	109(41%)	261(43%)	148(37%)	125(35%)

6.3 Small-cell lung cancer

6.3.1 Patients

The cases analysed are shown in Table 6.5. There were 1002 cases of SCLC cancer in total during the five years 1994 to 1998, 58% in males.

Table 6.5. Small cell lung cancer: Patient characteristics

		Health board of residence								
		Total	E	M	MW	NE	NW	S	SE	W
All cases		**1002**	**443**	**46**	**57**	**83**	**62**	**157**	**94**	**60**
Year of incidence	1994	207(21%)	88(20%)	7(15%)	7(12%)	20(24%)	15(24%)	33(21%)	20(21%)	17(28%)
	1995	206(21%)	96(22%)	11(24%)	13(23%)	18(22%)	9(15%)	31(20%)	19(20%)	9(15%)
	1996	173(17%)	76(17%)	7(15%)	8(14%)	19(23%)	12(19%)	24(15%)	19(20%)	8(13%)
	1997	206(21%)	94(21%)	7(15%)	11(19%)	15(18%)	10(16%)	39(25%)	17(18%)	13(22%)
	1998	210(21%)	89(20%)	14(30%)	18(32%)	11(13%)	16(26%)	30(19%)	19(20%)	13(22%)
Sex	Female	423(42%)	208(47%)	14(30%)	27(47%)	34(41%)	20(32%)	63(40%)	35(37%)	22(37%)
	Male	579(58%)	235(53%)	32(70%)	30(53%)	49(59%)	42(68%)	94(60%)	59(63%)	38(63%)
Age	<50	63(6%)	33(7%)	4(9%)	4(7%)	2(2%)	4(6%)	7(4%)	6(6%)	3(5%)
	50-54	79(8%)	35(8%)	2(4%)	4(7%)	9(11%)	3(5%)	13(8%)	9(10%)	4(7%)
	55-59	95(9%)	44(10%)	3(7%)	8(14%)	9(11%)	7(11%)	7(4%)	12(13%)	5(8%)
	60-64	157(16%)	65(15%)	4(9%)	10(18%)	17(20%)	8(13%)	28(18%)	14(15%)	11(18%)
	65-69	223(22%)	103(23%)	14(30%)	6(11%)	12(14%)	12(19%)	38(24%)	24(26%)	14(23%)
	70-74	186(19%)	85(19%)	11(24%)	12(21%)	17(20%)	11(18%)	23(15%)	16(17%)	11(18%)
	75-79	133(13%)	53(12%)	6(13%)	7(12%)	9(11%)	14(23%)	28(18%)	9(10%)	7(12%)
	>=80	66(7%)	25(6%)	2(4%)	6(11%)	8(10%)	3(5%)	13(8%)	4(4%)	5(8%)
Smoking status	Non-smoker	69(7%)	18(4%)	6(13%)	6(11%)	4(5%)	3(5%)	23(15%)	7(7%)	2(3%)
	Ex-smoker	203(20%)	101(23%)	10(22%)	12(21%)	15(18%)	7(11%)	28(18%)	22(23%)	8(13%)
	Smoker	632(63%)	262(59%)	29(63%)	33(58%)	57(69%)	51(82%)	96(61%)	58(62%)	46(77%)
	Unknown	98(10%)	62(14%)	1(2%)	6(11%)	7(8%)	1(2%)	10(6%)	7(7%)	4(7%)
Marital status	Married	613(61%)	281(63%)	24(52%)	32(56%)	48(58%)	39(63%)	97(62%)	58(62%)	34(57%)
	Not married	372(37%)	150(34%)	22(48%)	21(37%)	35(42%)	23(37%)	60(38%)	36(38%)	25(42%)
	Unknown	17(2%)	12(3%)	0(0%)	4(7%)	0(0%)	0(0%)	0(0%)	0(0%)	1(2%)
Deprivation	Affluent	180(18%)	119(27%)	4(9%)	9(16%)	7(8%)	2(3%)	26(17%)	4(4%)	9(15%)
	Intermediate	412(41%)	102(23%)	33(72%)	33(58%)	42(51%)	34(55%)	76(48%)	58(62%)	34(57%)
	Deprived	323(32%)	175(40%)	5(11%)	14(25%)	28(34%)	25(40%)	45(29%)	25(27%)	6(10%)
	Unknown	87(9%)	47(11%)	4(9%)	1(2%)	6(7%)	1(2%)	10(6%)	7(7%)	11(18%)

6.3.2 Cancers

Fewer than half of the cancers were staged, and of those that were, almost all were late (stage IV))(Table 6.6). Because of the high percentage of unstaged cancers, variation in the percentage of late cancers between health boards is not meaningful

Table 6.6. Small cell lung cancer: Tumour characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases		**1002**	**443**	**46**	**57**	**83**	**62**	**157**	**94**	**60**
Presentation	Screening	1(0%)	1(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
	Incidental	26(3%)	10(2%)	0(0%)	1(2%)	4(5%)	1(2%)	4(3%)	3(3%)	3(5%)
	Symptoms	955(95%)	422(95%)	45(98%)	56(98%)	77(93%)	58(94%)	152(97%)	88(94%)	57(95%)
	Unknown	20(2%)	10(2%)	1(2%)	0(0%)	2(2%)	3(5%)	1(1%)	3(3%)	0(0%)
T stage	T1	49(5%)	32(7%)	0(0%)	1(2%)	4(5%)	0(0%)	5(3%)	6(6%)	1(2%)
	T2	188(19%)	73(16%)	8(17%)	9(16%)	18(22%)	14(23%)	41(26%)	19(20%)	6(10%)
	T3	73(7%)	26(6%)	6(13%)	2(4%)	3(4%)	5(8%)	17(11%)	12(13%)	2(3%)
	T4	163(16%)	63(14%)	6(13%)	11(19%)	6(7%)	8(13%)	32(20%)	27(29%)	10(17%)
	TX	529(53%)	249(56%)	26(57%)	34(60%)	52(63%)	35(56%)	62(39%)	30(32%)	41(68%)
N stage	N0	77(8%)	39(9%)	3(7%)	5(9%)	6(7%)	4(6%)	9(6%)	10(11%)	1(2%)
	N1	101(10%)	44(10%)	3(7%)	3(5%)	13(16%)	10(16%)	14(9%)	12(13%)	2(3%)
	N2	114(11%)	55(12%)	5(11%)	3(5%)	1(1%)	2(3%)	20(13%)	19(20%)	9(15%)
	N3	46(5%)	23(5%)	1(2%)	2(4%)	2(2%)	3(5%)	7(4%)	6(6%)	2(3%)
	NX	664(66%)	282(64%)	34(74%)	44(77%)	61(73%)	43(69%)	107(68%)	47(50%)	46(77%)
M stage	M0	154(15%)	88(20%)	6(13%)	8(14%)	14(17%)	8(13%)	15(10%)	11(12%)	4(7%)
	M1	348(35%)	152(34%)	20(43%)	15(26%)	24(29%)	15(24%)	58(37%)	39(41%)	25(42%)
	MX	500(50%)	203(46%)	20(43%)	34(60%)	45(54%)	39(63%)	84(54%)	44(47%)	31(52%)
Summary stage	1	20(2%)	11(2%)	1(2%)	3(5%)	1(1%)	0(0%)	3(2%)	1(1%)	0(0%)
	2	9(1%)	4(1%)	0(0%)	0(0%)	2(2%)	1(2%)	1(1%)	0(0%)	1(2%)
	3a	31(3%)	16(4%)	2(4%)	1(2%)	2(2%)	2(3%)	3(2%)	4(4%)	1(2%)
	3b	22(2%)	14(3%)	0(0%)	0(0%)	2(2%)	1(2%)	2(1%)	3(3%)	0(0%)
	4	348(35%)	152(34%)	20(43%)	15(26%)	24(29%)	15(24%)	58(37%)	39(41%)	25(42%)
	Unknown	572(57%)	246(56%)	23(50%)	38(67%)	52(63%)	43(69%)	90(57%)	47(50%)	33(55%)
Grade	I	3(0%)	2(0%)	0(0%)	1(2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
	II	30(3%)	5(1%)	0(0%)	1(2%)	2(2%)	1(2%)	13(8%)	5(5%)	3(5%)
	III	56(6%)	28(6%)	2(4%)	1(2%)	5(6%)	3(5%)	9(6%)	3(3%)	5(8%)
	IV	323(32%)	162(37%)	17(37%)	23(40%)	19(23%)	28(45%)	16(10%)	43(46%)	15(25%)
	Unknown	590(59%)	246(56%)	27(59%)	31(54%)	57(69%)	30(48%)	119(76%)	43(46%)	37(62%)

6.4 Survival

Overall survival for patients with lung cancer was 6.4% at five years (Table 6.7). However deaths specifically from lung cancer were fewer, with a five year survival of 9.3%. Survival for NSCLC (Table 6.8) was significantly better than that for SCLC (Table 6.9) at all times after diagnosis.

Table 6.7. Lung cancer survival-all types

	Probability of survival	
Years from diagnosis	**All causes**	**Cause-specific**
1	0.235 (0.225 ;0.245)	0.263 (0.252 ;0.274)
2	0.126 (0.118 ;0.134)	0.153 (0.144 ;0.162)
3	0.090 (0.083 ;0.097)	0.116 (0.107 ;0.124)
4	0.073 (0.066 ;0.080)	0.100 (0.092 ;0.109)
5	0.064 (0.058 ;0.071)	0.093 (0.084 ;0.102)

Table 6.8. Lung cancer survival-NSCLC

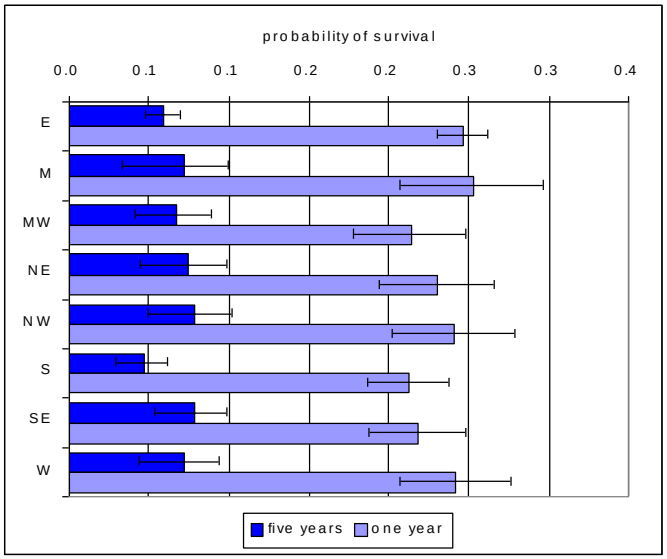
	Probability of survival	
Years from diagnosis	**All causes**	**Cause-specific**
1	0.280 (0.267 ;0.293)	0.307 (0.293 ;0.321)
2	0.159 (0.148 ;0.170)	0.188 (0.176 ;0.201)
3	0.115 (0.106 ;0.126)	0.145 (0.134 ;0.157)
4	0.093 (0.083 ;0.103)	0.125 (0.113 ;0.137)
5	0.081 (0.072 ;0.091)	0.115 (0.103 ;0.128)

Table 6.9. Lung cancer survival-SCLC

	Probability of survival	
Years from diagnosis	**All causes**	**Cause-specific**
1	0.209 (0.184 ;0.235)	0.233 (0.206 ;0.261)
2	0.074 (0.058 ;0.091)	0.089 (0.071 ;0.110)
3	0.049 (0.036 ;0.065)	0.060 (0.045 ;0.079)
4	0.042 (0.030 ;0.057)	0.054 (0.039 ;0.073)
5	0.042 (0.030 ;0.057)	0.054 (0.039 ;0.073)

Table 6.10.All lung cancer: one- and five-year survival by health board

	Cause specific survival	
Area of residence	**One year**	**Five years**
ERHA	0.246 (0.231 ;0.262)	0.059 (0.049 ;0.071)
MHB	0.253 (0.209 ;0.299)	0.071 (0.043 ;0.110)
MWHB	0.214 (0.180 ;0.250)	0.067 (0.046 ;0.094)
NEHB	0.231 (0.196 ;0.268)	0.074 (0.051 ;0.104)
NWHB	0.241 (0.203 ;0.281)	0.078 (0.055 ;0.107)
SHB	0.212 (0.187 ;0.238)	0.047 (0.033 ;0.065)
SEHB	0.218 (0.189 ;0.249)	0.078 (0.058 ;0.102)
WHB	0.242 (0.208 ;0.277)	0.072 (0.050 ;0.099)



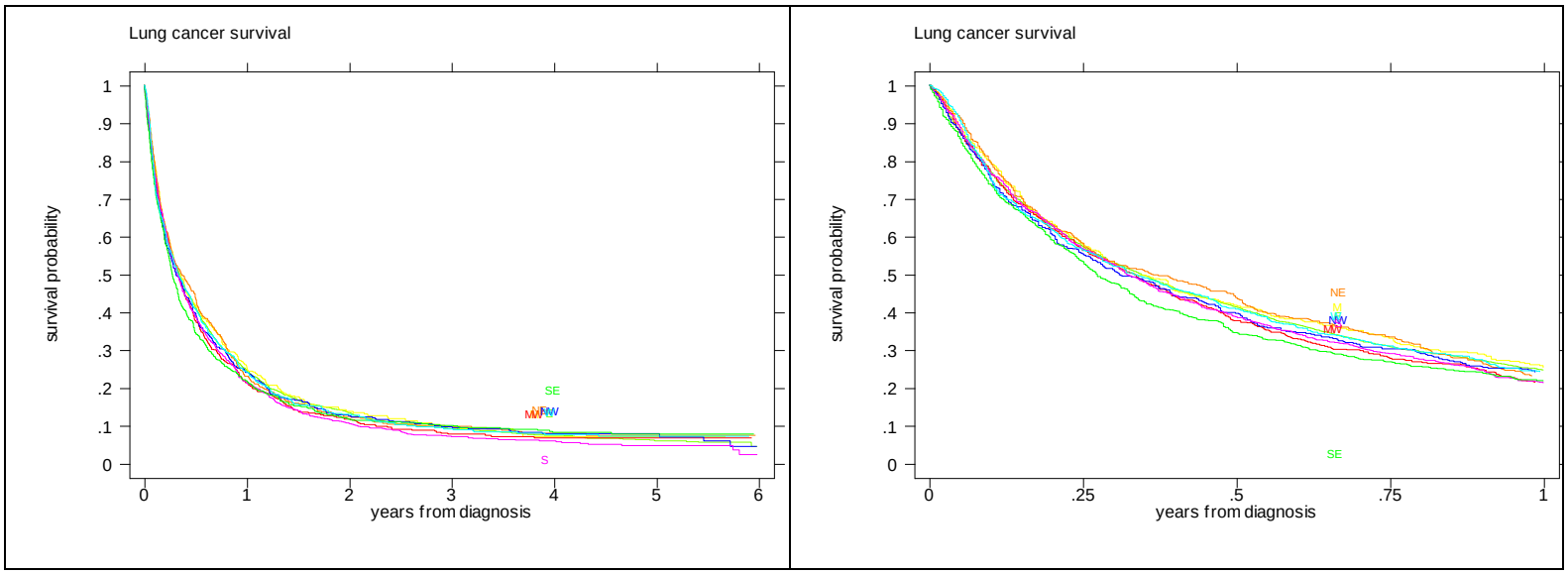
The highest survival at one year was seen in the WHB (24%) and the lowest in the SHB (21%). At five years, the best survival was in the NWHB and SEHB (7.8%) and the poorest in the SHB (4.7%). These differences were not statistically significant.

Table 6.11. All lung cancer: one- and five-year survival by health board

	One year		Five years	
Area of residence	**NSCLC**	**SCLC**	**NSCLC**	**SCLC**
ERHA	0.286 (0.266 ;0.306)	0.224 (0.186 ;0.264)	0.074 (0.060 ;0.090)	0.045 (0.027 ;0.070)
MHB	0.293 (0.236 ;0.353)	0.196 (0.097 ;0.320)	0.087 (0.049 ;0.139)	
MWHB	0.237 (0.188 ;0.289)	0.268 (0.160 ;0.387)	0.095 (0.062 ;0.136)	
NEHB	0.283 (0.233 ;0.334)	0.150 (0.082 ;0.237)	0.095 (0.060 ;0.139)	0.050 (0.016 ;0.113)
NWHB	0.310 (0.255 ;0.367)	0.194 (0.107 ;0.300)	0.108 (0.072 ;0.152)	0.032 (0.006 ;0.099)
SHB	0.250 (0.216 ;0.285)	0.217 (0.156 ;0.284)	0.056 (0.037 ;0.081)	0.045 (0.019 ;0.089)
SEHB	0.296 (0.252 ;0.342)	0.181 (0.111 ;0.265)	0.106 (0.074 ;0.145)	0.035 (0.008 ;0.096)
WHB	0.281 (0.235 ;0.329)	0.172 (0.089 ;0.279)	0.089 (0.059 ;0.126)	0.024 (0.002 ;0.106)

There were no significant differences between health boards in one or five year survival for either NSCLC or SCLC (Table 6.11).

Figure 6.1.Lung cancer: one and five-year survival by health board



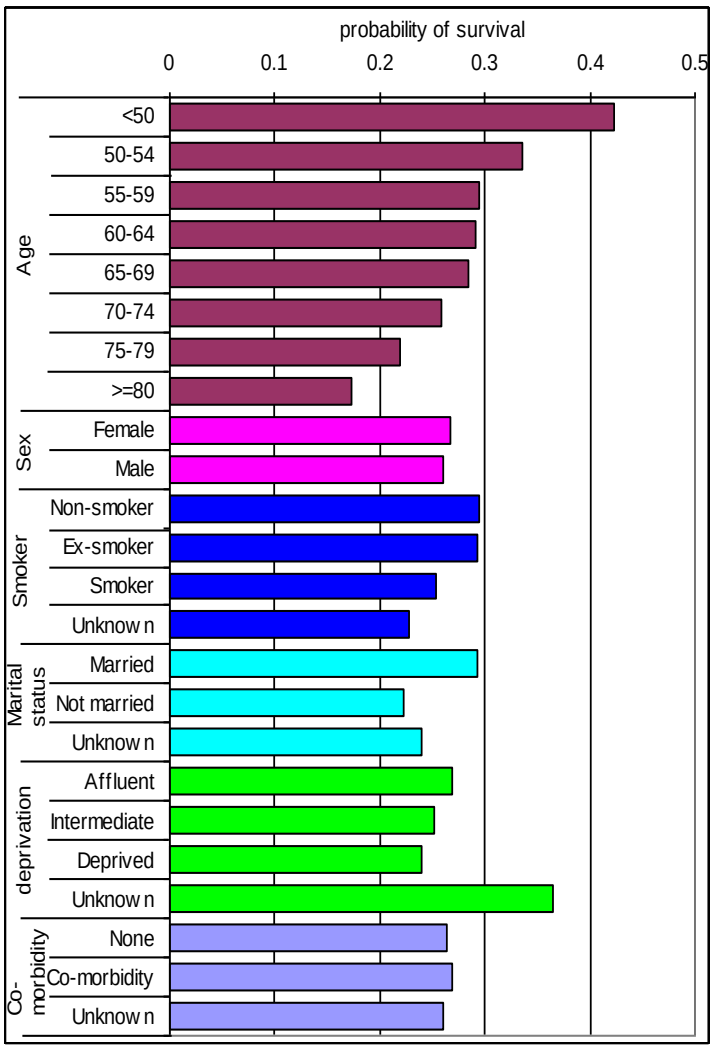
Plots of cause-specific survival by health board that there is essentially no difference in survival at five years (Figure 6.1). At one less than year, there are some small differences; in particular an apparently poorer survival in the SEHB, which is statistically significant (chi=10.8; p=.010). Modelling of the overall survival patterns through proportional hazards models is a more accurate measure of differences between health boards than are comparisons of five-year survival, which is based on a relatively few number of cases and survivors.

6.5 Factors affecting survival

A number of patient, tumour and treatment factors were tested for their relationship to survival. The data are summarised in Figures 6.2 and 6.3[19]

Figure 6.2. Patient factors related to survival at one year

		One year survival
Age	<50	0.42
	50-54	0.34
	55-59	0.3
	60-64	0.29
	65-69	0.28
	70-74	0.26
	75-79	0.22
	>=80	0.17
Sex	Female	0.27
	Male	0.26
Smoker status	Non-smoker	0.29
	Ex-smoker	0.29
	Smoker	0.25
	Unknown	0.23
Marital status	Married	0.29
	Not married	0.22
	Unknown	0.24
Deprivation	Affluent	0.27
	Intermediate	0.25
	Deprived	0.24
	Unknown	0.36
Co-morbidity	None	0.26
	Co-morbidity	0.27
	Unknown	0.26



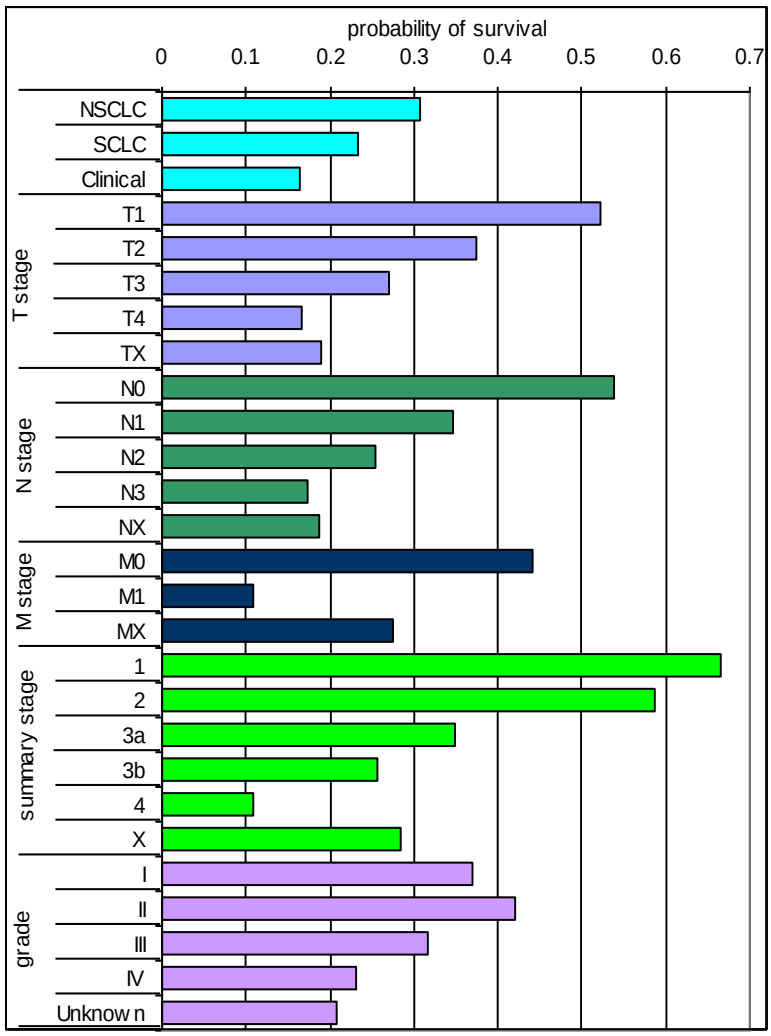
Survival decreased with increasing age (χ^2 263.8;p<0.001), with non-married status (χ^2 86.2;p<0.001), with deprivation (χ2 30.7;p, 0.001), and with smoking (χ^2=22.6;p<.001.

[19] Detailed tables of cancer risk factors and one, three and five years survival by health board are in Appendix 1

Of tumour factors, the most strongly correlated with survival were cell type (χ^2 =298.0; p<.001), histological confirmation of diagnosis (χ2=273.4;p<0.001), T stage (χ^2=452.1;p<0.001), N stage (χ^2 554.6; p<. 001), M stage (χ^2 490.6; p<.001), summary stage (χ^2=608.7; p<.001) and grade (χ^2=244.7; p<.001) (Figure 6.3).

Figure 6.3. Tumour factors related to survival at one year

		One year survival
Histological confirmation	Confirmed	0.29
	Not confirmed	0.16
Cell type	NSCLC	0.31
	SCLC	0.23
	Clinical	0.16
T stage	T1	0.52
	T2	0.37
	T3	0.27
	T4	0.17
	TX	0.19
N stage	N0	0.54
	N1	0.35
	N2	0.25
	N3	0.17
	NX	0.19
M stage	M0	0.44
	M1	0.11
	MX	0.27
Summary stage	1	0.66
	2	0.59
	3a	0.35
	3b	0.26
	4	0.11
	X	0.28
Grade	I	0.37
	II	0.42
	III	0.32
	IV	0.23
	Unknown	0.21



Surgery was strongly related to survival, as was any tumour-related treatment (Table 6.12). However, in the absence of surgery, any other tumour related treatment had no effect on five-year survival.

Table 6.12. . Treatment and one-year survival

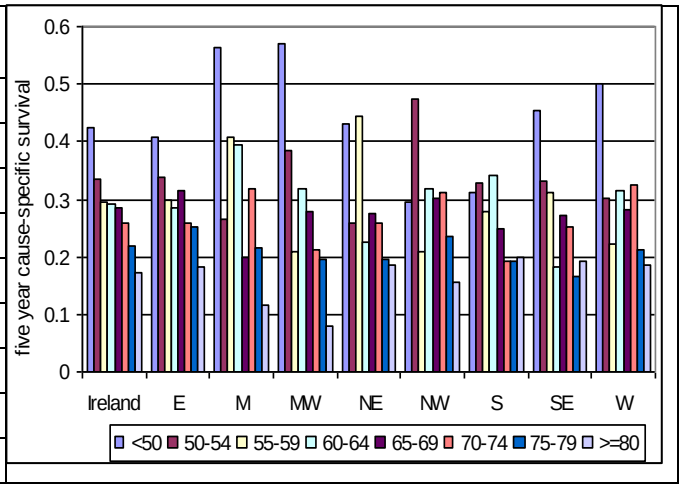
Surgery	One –year survival
No surgery	0.19 (0.18; 0.20)
Surgery	0.67 (0.64; 0.69)
Any tumour-related treatment	
Not treated	0.16 (0.15; 0.17)
Treated	0.36 (0.34; 0.37)
Any tumour-related treatment other than surgery	
Not treated	0.16 (0.15; 0.17)
Treated	0.23 (0.21; 0.25)

6.5.1 Age

In general, the decrease in survival with age was seen for all areas, and was similar to that for Ireland as a whole (Table 6.13). The trend of survival with age was least pronounced in the SEHB.

Table 6.13; Figure 6.4. One year lung cancer survival by health board and patient age

Area of residence	<50	50-54	55-59	60-64	65-69	70-74	74-79	>=80
Ireland	0.42	0.34	0.3	0.29	0.28	0.26	0.22	0.17
E	0.41	0.34	0.3	0.29	0.31	0.26	0.25	0.18
M	0.56	0.27	0.41	0.39	0.2	0.32	0.21	0.12
MW	0.57	0.39	0.21	0.32	0.28	0.21	0.2	0.08
NE	0.43	0.26	0.44	0.23	0.27	0.26	0.2	0.19
NW	0.29	0.47	0.21	0.32	0.3	0.31	0.24	0.16
S	0.31	0.33	0.28	0.34	0.25	0.19	0.19	0.2
SE	0.45	0.33	0.31	0.18	0.27	0.25	0.17	0.19
W	0.5	0.3	0.22	0.32	0.28	0.32	0.21	0.18

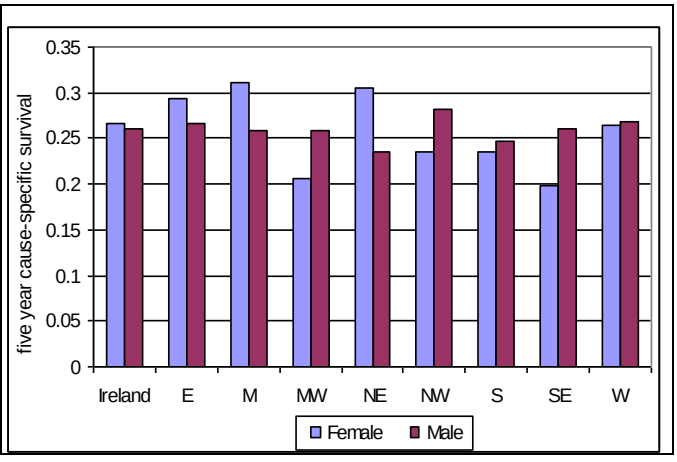


6.5.2 Sex

Females had better survival than males overall, but this was not consistent across health boards, being marked in the NWHB and WHB, but reversed in the MWHB, NEHB, SHB and SEHB (Table 6.).

Table 6.14; Figure 6.5. One year lung cancer survival by health board and patient age

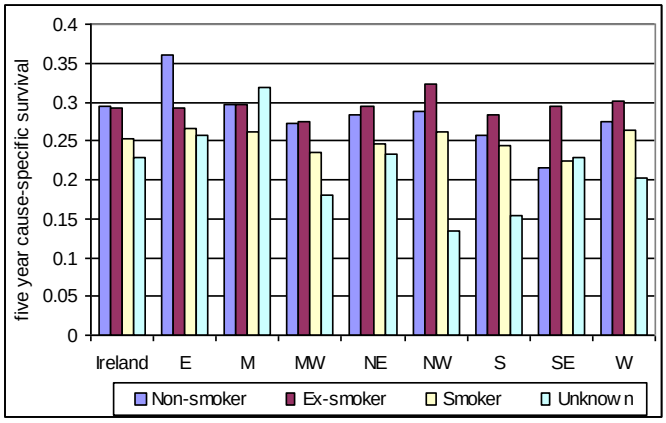
Area of residence	Female	Male
Ireland	0.27	0.26
E	0.29	0.27
M	0.31	0.26
MW	0.21	0.26
NE	0.3	0.24
NW	0.24	0.28
S	0.24	0.25
SE	0.2	0.26
W	0.27	0.27



6.5.3 Smoking

Table 6.15; Figure 6.6. Five year lung cancer survival by health board and smoking

Area of residence	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.29	0.29	0.25	0.23
ERHA	0.36	0.29	0.27	0.26
MHB	0.3	0.3	0.26	0.32
MWHB	0.27	0.27	0.23	0.18
NEHB	0.28	0.29	0.25	0.23
NWHB	0.29	0.32	0.26	0.13
SHB	0.26	0.28	0.24	0.15
SEHB	0.21	0.29	0.22	0.23
WHB	0.27	0.3	0.26	0.2



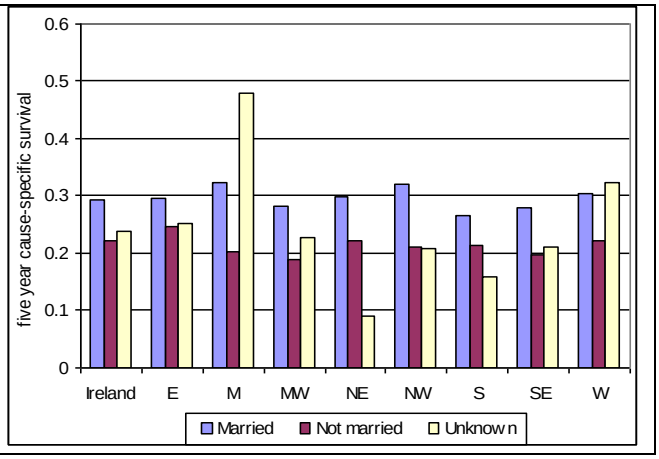
For all areas, smokers had a poorer prognosis than ex-smokers or non-smokers. In general ex-smokers had a poorer prognosis than non-smokers, except in the SHB, SEHB and WHB (Table 6.).

6.5.4 Marital status

In all areas but the MHB and NWHB, married patients had a slight survival advantage of those who were never married (Table 6.).

Table 6.16; Figure 6.7. Five year breast cancer survival by health board and marital status

Area of residence	Married	Single	Unknown
Ireland	0.29	0.22	0.24
ERHA	0.3	0.25	0.25
MHB	0.32	0.2	0.48
MWHB	0.28	0.19	0.23
NEHB	0.3	0.22	0.09
NWHB	0.32	0.21	0.21
SHB	0.27	0.22	0.16
SEHB	0.28	0.2	0.21
WHB	0.3	0.22	0.32

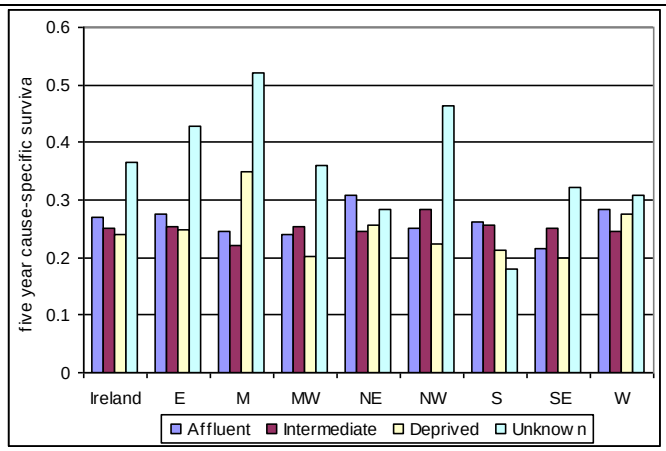


6.5.5 Deprivation

Although there was an overall trend in survival with deprivation, this was not obvious for individual health boards (Table 6.17)

Table 6.17; Figure 6.8. Five year lung cancer survival by health board and deprivation status

Area of residence	Affluent	Intermediate	Deprived	Unknown
Ireland	0.27	0.25	0.24	0.36
ERHA	0.28	0.25	0.25	0.43
MHB	0.24	0.22	0.35	0.52
MWHB	0.24	0.25	0.2	0.36
NEHB	0.31	0.25	0.26	0.28
NWHB	0.25	0.28	0.22	0.46
SHB	0.26	0.26	0.21	0.18
SEHB	0.21	0.25	0.2	0.32
WHB	0.28	0.25	0.28	0.31

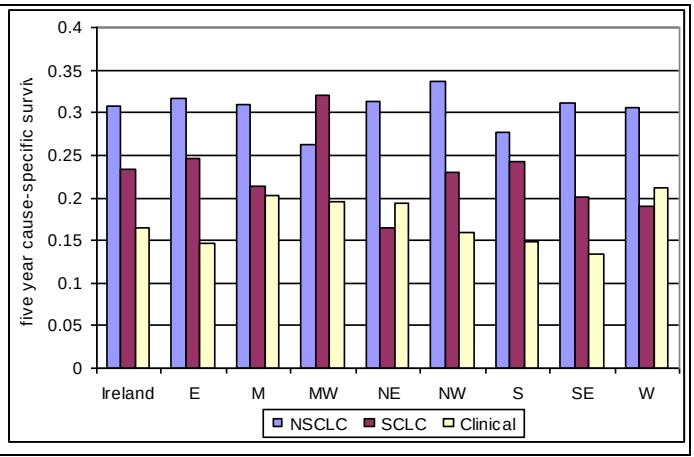


6.5.6 Cell type

Patients with non-small cell disease had a better prognosis in all areas. The largest differential was in the NWHB and the smallest in the SHB (Table 6.18).

Table 6.18; Figure 6.9. Five year lung cancer survival by health board and cell type

Area of residence	NSCLC	SCLC	Clinical/Unknown
Ireland	0.31	0.23	0.16
ERHA	0.32	0.25	0.15
MHB	0.31	0.21	0.2
MWHB	0.26	0.32	0.2
NEHB	0.31	0.17	0.19
NWHB	0.34	0.23	0.16
SHB	0.28	0.24	0.15
SEHB	0.31	0.20	0.13
WHB	0.31	0.19	0.21

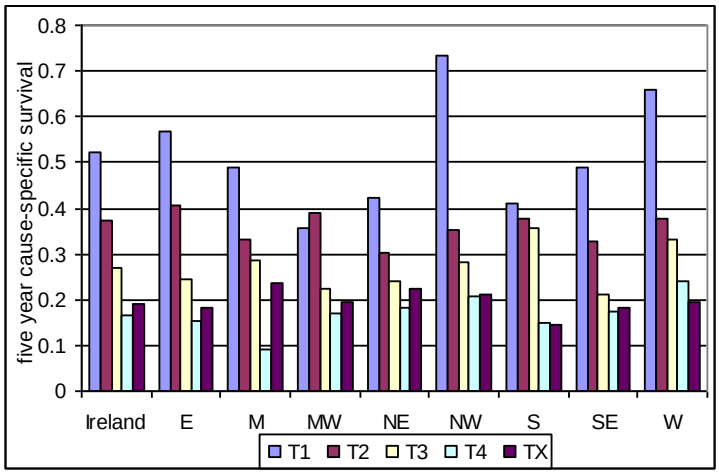


6.5.7 T stage

There was a strong and consistent relationship between stage and prognosis in all areas (Table 6.19).

Table 6.19; Figure 6.10. Five year lung cancer survival by health board and T stage

Area of residence	T1	T2	T3	T4	TX
Ireland	0.52	0.37	0.27	0.17	0.19
ERHA	0.57	0.4	0.24	0.15	0.18
MHB	0.49	0.33	0.29	0.09	0.24
MWHB	0.36	0.39	0.22	0.17	0.19
NEHB	0.42	0.3	0.24	0.18	0.22
NWHB	0.73	0.35	0.28	0.21	0.21
SHB	0.41	0.38	0.36	0.15	0.15
SEHB	0.49	0.33	0.21	0.17	0.18
WHB	0.66	0.38	0.33	0.24	0.19

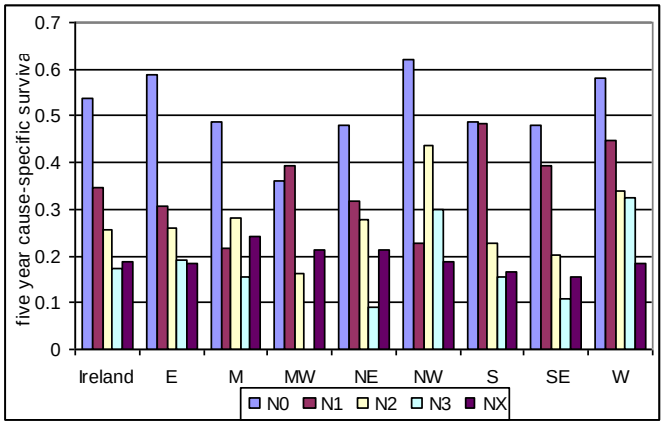


6.5.8 N stage

N0 cases had in general a much better prognosis, with the exception of the MWHB, NEHB and WHB where the prognosis for N1 cases was almost as good (Table 6.20).

Table 6.20; Figure 6.11. Five year lung cancer survival by health board and N stage

Area of residence	N0	N1	N2	N3	NX
Ireland	0.54	0.35	0.25	0.17	0.19
ERHA	0.59	0.31	0.26	0.19	0.18
MHB	0.49	0.22	0.28	0.15	0.24
MWHB	0.36	0.39	0.16	—	0.21
NEHB	0.48	0.32	0.28	0.09	0.21
NWHB	0.62	0.23	0.43	0.3	0.19
SHB	0.49	0.48	0.23	0.15	0.17
SEHB	0.48	0.39	0.2	0.11	0.15
WHB	0.58	0.45	0.34	0.33	0.18

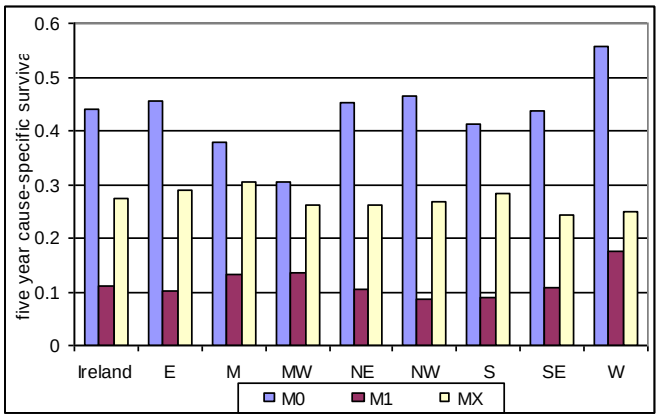


6.5.9 M stage

As would be expected, patients with M0 disease had a much better prognosis in all areas (Table 6.21).

Table 6.21; Figure 6.2. Five year lung cancer survival by health board and M stage

Area of residence	M0	M1	MX
Ireland	0.44	0.11	0.27
ERHA	0.46	0.1	0.29
MHB	0.38	0.13	0.3
MWHB	0.3	0.14	0.26
NEHB	0.45	0.1	0.26
NWHB	0.47	0.09	0.27
SHB	0.41	0.09	0.28
SEHB	0.44	0.11	0.24
WHB	0.56	0.18	0.25

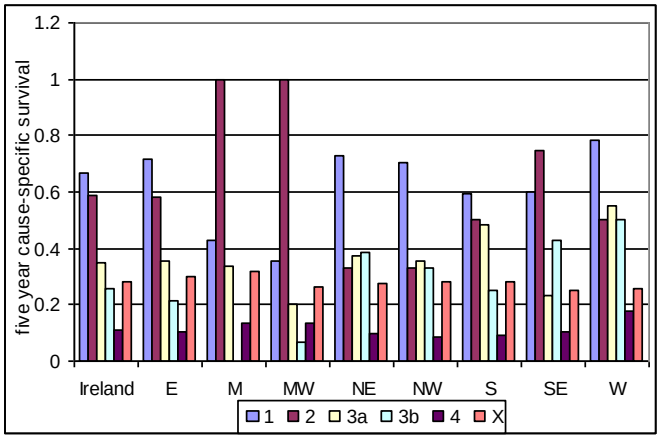


6.5.10 Summary stage

The relationship between summary stage and prognosis was strong, although obscured by small case numbers in some areas (Table 6.22).

Table 6.22; Figure 6.3. Five year lung cancer survival by health board and summary stage

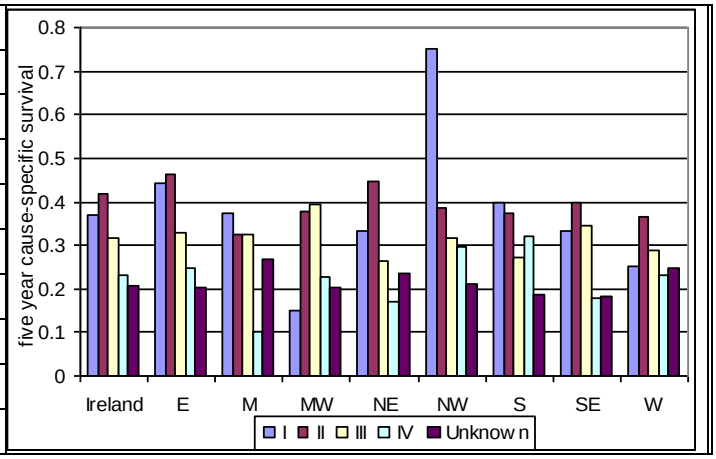
Area of residence	I	II	IIIA	IIIB	IV	Unknown
Ireland	0.66	0.59	0.35	0.26	0.11	0.28
ERHA	0.72	0.58	0.35	0.21	0.1	0.3
MHB	0.43	1.00	0.34	—	0.13	0.32
MWHB	0.36	1.00	0.20	0.07	0.14	0.26
NEHB	0.73	0.33	0.38	0.38	0.10	0.28
NWHB	0.71	0.33	0.36	0.33	0.09	0.28
SHB	0.59	0.5	0.49	0.25	0.09	0.28
SEHB	0.6	0.75	0.23	0.43	0.10	0.25
WHB	0.79	0.5	0.55	0.5	0.18	0.26



6.5.11 Grade

Table 6.23; Figure 6.4. Five year lung cancer survival by health board and grade.

Area of residence	I	II	III	IV	Unknown
Ireland	0.37	0.42	0.32	0.23	0.21
ERHA	0.44	0.46	0.33	0.25	0.2
MHB	0.38	0.32	0.33	0.1	0.27
MWHB	0.15	0.38	0.39	0.23	0.2
NEHB	0.33	0.45	0.27	0.17	0.23
NWHB	0.75	0.39	0.32	0.3	0.21
SHB	0.4	0.37	0.27	0.32	0.19
SEHB	0.33	0.4	0.35	0.18	0.18
WHB	0.25	0.37	0.29	0.23	0.25



6.6 Survival modelling

A range of Cox proportional hazards models was fitted to the data, in an attempt to adjust for confounders among the patient and tumour characteristics.

When tested in a Cox proportional hazards model, hazard ratios for health board areas were similar, with the highest hazard value in the SEHB (1.096) and the lowest in the NEHB (0.983). Only SEHB was significantly different from the ERHA (Table 6.).

Table 6.24. Hazard ratios for lung cancer, by health board

Area of residence	Hazard ratio (95% confidence intervals)	P
ERHA	1.000	
MHB	0.988 (0.875; 0.843)	0.843
MWHB	1.073 (0.970; 0.169)	0.169
NEHB	0.983 (0.886; 0.738)	0.738
NWHB	1.015 (0.912; 0.782)	0.782
SHB	1.059 (0.979; 0.153)	0.153
SEHB	1.096 (1.003; 0.043)	**0.043**
WHB	0.986 (0.892; 0.773)	0.773

Adjusting the model for all lung cancers with patient and tumour factors significantly improved the model fit. Only the WHB remained significantly different following adjustment.

The factors which significantly improved model fit included:

- Patient age
- Marital status
- Sex
- Deprivation
- Histological confirmation
- T, N, M stage

Table 6.25. Hazard ratios for lung cancer, by health board multivariate model[20]

Area of residence	Hazard ratio (95% confidence intervals	P
ERHA	1.000	
MHB	0.935 (0.818; 0.328)	0.328
MWHB	0.963 (0.859; 0.514)	0.514
NEHB	0.947 (0.845; 0.341)	0.341
NWHB	0.914 (0.811; 0.143)	0.143
SHB	0.954 (0.873; 0.302)	0.302
SEHB	1.082 (0.977; 0.129)	0.129
WHB	0.874 (0.783; 0.017)	**0.017**

Prognosis, and factors affecting prognosis, are quite different for the patients depending on cell type and those who do not have surgery, so these groups were separated for further analysis. As only a very small number of SCLC patients (34, 3%) had surgery, this group is not described further.

[20] Full multivariate model is described in Appendix 3, Table 1.5

6.6.1 Hazard ratios: All NSCLC patients

a Univariate model

The simple univariate model for NSCLC patients is shown in Table 6.26. There were no significant differences in hazard between health board.

Table 6.26. Univariate hazard ratios for NSCLC, all patients by health board

	NSCLC	
Area of residence	**Hazard ratio**	**P**
ERHA	1.000	
MHB	0.989 (0.850; 1.151)	0.887
MWHB	1.066 (0.925; 1.228)	0.378
NEHB	0.920 (0.803; 1.054)	0.229
NWHB	0.928 (0.802; 1.074)	0.317
SHB	1.038 (0.939; 1.149)	0.464
SEHB	0.973 (0.862; 1.097)	0.651
WHB	0.973 (0.857; 1.106)	0.677

b Multivariate model

The difference in hazard between the ERHA and other health boards for non-surgical patients suggested that, possibly, patients with worse prognosis were having surgery in the ERHA.[21] Although correction for grade, stage and co-morbidity should allow for this, other factors not measured by us might have had an impact. We also looked at prognosis for all patients, regardless of treatment, using the model above. This again showed that survival was better for most non-ERHA health boards, and significantly so in the NEHB and WHB.

Table 6.27. Multivariate hazard ratios for NSCLC, all patients by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.000	
MHB	0.848 (0.730 ;0.986)	0.032
MWHB	1.009 (0.878 ;1.160)	0.898
NEHB	0.849 (0.743 ;0.969)	0.015
NWHB	0.872 (0.757 ;1.005)	0.059
SHB	0.984 (0.889 ;1.089)	0.749
SEHB	0.925 (0.820 ;1.043)	0.202
WHB	0.803 (0.708 ;0.910)	0.001

[21] The full multivariate models are given in Appendix 3, Table 1.5

6.6.2 Hazard ratios: NSCLC patients having surgery

a Univariate model

Table 6.28. Hazard ratios for NSCLC, patients having surgery, by health board

	NSCLC	
Area of residence	**Hazard ratio**	**P**
ERHA	1.000	
MHB	1.204 (0.827 ;1.754)	0.333
MWHB	0.823 (0.551 ;1.230)	0.342
NEHB	1.131 (0.818 ;1.564)	0.455
NWHB	0.648 (0.416 ;1.009)	0.055
SHB	1.132 (0.893 ;1.436)	0.305
SEHB	0.994 (0.745 ;1.326)	0.965
WHB	0.762 (0.489 ;1.186)	0.229

Uncorrected (univariate) hazard ratios for patients having surgery were similar to those for all patients, again showing a no significant differences between health boards (Table 6.28).

b Multivariate model[22]

The univariate model was expanded by the addition of the variables already listed. For patients having surgery, the following factors significantly improved model fit:

- Patient sex
- Patient age
- Marital status
- T stage
- N stage
- M stage
- Tumour grade

Following correction for these factors, lung cancer survival for NSCLC patients having surgery was not significantly different in any area (Table 6.29).

Table 6.29. Multivariate hazard ratios for NSCLC patients having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.00	
MHB	1.251 (0.839 ;1.866)	0.273
MWHB	0.680 (0.442 ;1.046)	0.079
NEHB	1.077 (0.763 ;1.522)	0.672
NWHB	0.778 (0.489 ;1.236)	0.287
SHB	0.797 (0.610 ;1.040)	0.095
SEHB	0.917 (0.675 ;1.245)	0.578
WHB	0.726 (0.457 ;1.153)	0.174

[22] The full multivariate models are given in Appendix 3, Table 1.6.

6.6.3 Hazard ratios: NSCLC not having surgery

a Univariate model

Table 6.30. Hazard ratios for NSCLC, patients not having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.000	
MHB	**0.837 (0.709 ;0.987)**	**0.035**
MWHB	0.990 (0.850 ;1.151)	0.892
NEHB	**0.803 (0.691 ;0.933)**	**0.004**
NWHB	**0.838 (0.718 ;0.979)**	**0.026**
SHB	0.971 (0.868 ;1.085)	0.601
SEHB	0.916 (0.802 ;1.046)	0.194
WHB	**0.794 (0.695 ;0.908)**	**0.001**

For patients not having surgery, survival was better for all non-ERHA health boards, significantly so in the MHB, NEHB, NWHB and WHB (Table 6.30).

b Multivariate model[23]

A similar range of variables was fitted to the model of patients not having surgery. These were:

- Sex
- Age
- Deprivation score
- T stage
- N stage
- M stage
- Grade

After the inclusion of these variables for patients not having surgery, survival was better for all non-ERHA health boards, significantly so in the MHB, NEHB, NWHB and WHB (Table 6.31).

Table 6.31. Multivariate hazard ratios for NSCLC, patients not having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.00	
MHB	**0.826 (0.696 ;0.981)**	**0.029**
MWHB	1.035 (0.885 ;1.211)	0.663
NEHB	**0.804 (0.689 ;0.939)**	**0.006**
NWHB	**0.818 (0.697 ;0.962)**	**0.015**
SHB	0.989 (0.879 ;1.113)	0.856
SEHB	0.966 (0.842 ;1.108)	0.620
WHB	**0.772 (0.671 ;0.887)**	**0.000**

[23] The full multivariate models are given in Appendix 3, Table 1.7.

6.6.4 SCLC

Univariate hazard ratios for all SCLC patients are given below (Table 6.32). There were no significant differences between health boards in hazard, however, the hazard in most of the non-ERHA health boards was greater than in the ERHA, and the hazard ratio for these areas combined was 1.145 compared to the ERHA (p=.040)

Table 6.32. Univariate hazard ratios for SCLC, all patients by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.000	
MHB	1.107 (0.796; 1.539)	0.547
MWHB	0.966 (0.714; 1.308)	0.825
NEHB	1.085 (0.842; 1.397)	0.530
NWHB	1.197 (0.904; 1.584)	0.210
SHB	1.107 (0.910; 1.345)	0.309
SEHB	1.197 (0.943; 1.519)	0.140
WHB	1.233 (0.916; 1.660)	0.168

A Cox model was fitted to the survival of all patients, with the following factors

- Age
- Deprivation
- Metastases

There were no significant differences in survival between health board areas (Table 6.33).[24]

Table 6.33. Multivariate hazard ratios for SCLC, non-surgical patients by health board

Area of residence	Hazard ratio (95% confidence limits)	p
ERHA	1.000	
MHB	0.967 (0.685 ;1.366)	0.850
MWHB	1.016 (0.742 ;1.391)	0.919
NEHB	1.108 (0.853 ;1.441)	0.442
NWHB	1.164 (0.870 ;1.556)	0.306
SHB	1.057 (0.863 ;1.294)	0.593
SEHB	1.126 (0.876 ;1.447)	0.355
WHB	1.191 (0.877 ;1.619)	0.264

[24] The full multivariate models are given in Appendix 3, Table 1.5

6.7 Treatment differences by health board

6.7.1 Descriptive analysis

Surgical treatment levels were relatively low, with only 15% of patients having surgery (Table 6.35). This varied from 8% in the WHB to 18% in the ERHA (χ^2=40.1; p<.001). Chemotherapy rates were similar, ranging from 10% in the MHB to 22% in the WHB (χ^2=115.7; p<.001). Radiotherapy was the commonest modality, being administered in 29% of cases, from 21% in the MWHB and WHB to 34% in the SHB. Apart from the combination of surgery and either radio- or chemotherapy, multimodality treatment was uncommon.

Table 6.35. Treatments given for all lung cancers, by health board of residence

	Number (%) of Registrations								
	Health board of residence								
	Ireland	**E**	**M**	**MW**	**NE**	**NW**	**S**	**SE**	**W**
All cases	**7207**	**2968**	**365**	**536**	**533**	**475**	**997**	**736**	**597**
Has treatment	3636(50%)	1713(58%)	177(48%)	192(36%)	238(45%)	211(44%)	557(56%)	302(41%)	246(41%)
Has surgery	1078(15%)	540(18%)	55(15%)	54(10%)	77(14%)	49(10%)	152(15%)	102(14%)	49(8%)
Has chemotherapy	1033(14%)	460(15%)	36(10%)	57(11%)	63(12%)	61(13%)	142(14%)	85(12%)	129(22%)
Has radiotherapy	2088(29%)	968(33%)	112(31%)	112(21%)	126(24%)	130(27%)	342(34%)	175(24%)	123(21%)
Mutually exclusive therapies:									
Surgery only	878(12%)	448(15%)	42(12%)	44(8%)	65(12%)	40(8%)	122(12%)	83(11%)	34(6%)
Chemotherapy only	635(9%)	283(10%)	23(6%)	34(6%)	45(8%)	40(8%)	84(8%)	38(5%)	88(15%)
Radiotherapy only	1566(22%)	737(25%)	88(24%)	84(16%)	99(19%)	102(21%)	270(27%)	119(16%)	67(11%)
Surgery + C	29(<1%)	13(<1%)	0(0%)	2(<1%)	1(<1%)	1(<1%)	8(1%)	4(1%)	0(0%)
Surgery + R	153(2%)	67(2%)	11(3%)	7(1%)	10(2%)	8(2%)	22(2%)	13(2%)	15(3%)
Surgery + C+R	18(<1%)	12(<1%)	2(1%)	1(<1%)	1(<1%)	0(0%)	0(0%)	2(<1%)	0(0%)
Surgery + (R or C)	200(3%)	92(3%)	13(4%)	10(2%)	12(2%)	9(2%)	30(3%)	19(3%)	15(3%)
Chemo + Radio	351(5%)	152(5%)	11(3%)	20(4%)	16(3%)	20(4%)	50(5%)	41(6%)	41(7%)

Treatment levels for patients not having histological typing of their cancer were very low. (Table 6.36). As with all cancers, radiotherapy was the most frequent treatment, ranging from 9% in the SEHB to 18% in the ERHA (χ^2=18.1; p=.011).

Table 6.36. Treatments given for lung cancers with unconfirmed histology, by health board of residence

	Number (%) of Registrations								
	Health board of residence								
	Ireland	E	M	MW	NE	NW	S	SE	W
All cases	**1765**	**526**	**81**	**212**	**139**	**150**	**232**	**247**	**178**
Has treatment	268(15%)	99(19%)	9(11%)	29(14%)	17(12%)	21(14%)	40(17%)	22(9%)	31(17%)
Has surgery	4(<1%)	1(<1%)	1(1%)	0(0%)	0(0%)	0(0%)	2(1%)	0(0%)	0(0%)
Has chemotherapy	40(2%)	7(1%)	0(0%)	8(4%)	3(2%)	5(3%)	4(2%)	0(0%)	13(7%)
Has radiotherapy	238(13%)	93(18%)	8(10%)	23(11%)	15(11%)	16(11%)	38(16%)	22(9%)	23(13%)
Mutually exclusive therapies:									
Surgery only	3(<1%)	1(<1%)	1(1%)	0(0%)	0(0%)	0(0%)	1(<1%)	0(0%)	0(0%)
Chemotherapy only	27(2%)	5(1%)	0(0%)	6(3%)	2(1%)	5(3%)	1(<1%)	0(0%)	8(4%)
Radiotherapy only	224(13%)	91(17%)	8(10%)	21(10%)	14(10%)	16(11%)	34(15%)	22(9%)	18(10%)
Surgery + C	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Surgery + R	1(<1%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(0%)	0(0%)	0(0%)
Surgery + C+ R	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Surgery + (R or C)	1(<1%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(<1%)	0(0%)	0(0%)
Chemo + Radio	13(1%)	2(0%)	0(0%)	2(1%)	1(1%)	0(0%)	3(1%)	0(0%)	5(3%)

Radiotherapy was the most frequent treatment for NSCLC (Table 6.37), and surgery was more frequent than for all lung cancers combined. Surgery was most frequent in the ERHA (26%) and least frequent in the NWHB (18%) (χ^2=34.9; p<.001). Radiotherapy rates ranged from 26% in the WHB to 42% in the SHB (χ^2=42.0; p<.001)

Table 6.37. Treatments given for NSCLC, by health board of residence

	Number (%) of Registrations								
	Health board of residence								
	Ireland	E	M	MW	NE	NW	S	SE	W
All cases	**4440**	**1999**	**238**	**267**	**311**	**263**	**608**	**395**	**359**
Has treatment	2674(60%)	1284(64%)	141(59%)	137(51%)	167(54%)	149(57%)	397(65%)	224(57%)	175(49%)
Has surgery	1040(23%)	524(26%)	54(23%)	53(20%)	74(24%)	48(18%)	144(24%)	95(24%)	48(13%)
Has chemotherapy	396(9%)	169(8%)	12(5%)	27(10%)	14(5%)	20(8%)	37(6%)	38(10%)	79(22%)
Has radiotherapy	1606(36%)	760(38%)	95(40%)	79(30%)	99(32%)	100(38%)	257(42%)	121(31%)	95(26%)
Mutually exclusive therapies:									
Surgery only	859(19%)	442(22%)	41(17%)	43(16%)	62(20%)	40(15%)	118(19%)	80(20%)	33(9%)
Chemotherapy only	183(4%)	72(4%)	5(2%)	13(5%)	4(1%)	9(3%)	16(3%)	18(5%)	46(13%)
Radiotherapy only	1264(28%)	607(30%)	77(32%)	60(22%)	80(26%)	81(31%)	220(36%)	92(23%)	47(13%)
Surgery + C	20(<1%)	9(<1%)	0(0%)	2(1%)	1(<1%)	0(0%)	5(1%)	3(1%)	0(0%)
Surgery + R	149(3%)	65(3%)	11(5%)	7(3%)	10(3%)	8(3%)	21(3%)	12(3%)	15(4%)
Surgery + C+R	12(<1%)	8(<1%)	2(1%)	1(<1%)	1(<1%)	0(0%)	0(0%)	0(0%)	0(0%)
Surgery + (R or C)	181(4%)	82(4%)	13(5%)	10(4%)	12(4%)	8(3%)	26(4%)	15(4%)	15(4%)
Chemo + Radio	181(4%)	80(4%)	5(2%)	11(4%)	8(3%)	11(4%)	16(3%)	17(4%)	33(9%)

For small cell cancer, chemotherapy was the most frequent treatment (Table 6.38), with rates from 39% in the MWHB to 64% in the ERHA and SHB (χ^2=95.4; p<.001).

Table 6.38. Treatments given for all SCLC, by health board of residence

	Number (%) of Registrations								
	Health board of residence								
	Ireland	E	M	MW	NE	NW	S	SE	W
All cases	**1002**	**443**	**46**	**57**	**83**	**62**	**157**	**94**	**60**
Has treatment	694(69%)	330(74%)	27(59%)	26(46%)	54(65%)	41(66%)	120(76%)	56(60%)	40(67%)
Has surgery	34(3%)	15(3%)	0(0%)	1(2%)	3(4%)	1(2%)	6(4%)	7(7%)	1(2%)
Has chemotherapy	597(60%)	284(64%)	24(52%)	22(39%)	46(55%)	36(58%)	101(64%)	47(50%)	37(62%)
Has radiotherapy	244(24%)	115(26%)	9(20%)	10(18%)	12(14%)	14(23%)	47(30%)	32(34%)	5(8%)
Mutually exclusive therapies:									
Surgery only	16(2%)	5(1%)	0(0%)	1(2%)	3(4%)	0(0%)	3(2%)	3(3%)	1(2%)
Chemotherapy only	425(42%)	206(47%)	18(39%)	15(26%)	39(47%)	26(42%)	67(43%)	20(21%)	34(57%)
Radiotherapy only	78(8%)	39(9%)	3(7%)	3(5%)	5(6%)	5(8%)	16(10%)	5(5%)	2(3%)
Surgery + C	9(1%)	4(1%)	0(0%)	0(0%)	0(0%)	1(2%)	3(2%)	1(1%)	0(0%)
Surgery + R	3(0%)	2(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	1(1%)	0(0%)
Surgery + C+R	6(1%)	4(1%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	2(2%)	0(0%)
Surgery + (R or C)	18(2%)	10(2%)	0(0%)	0(0%)	0(0%)	1(2%)	3(2%)	4(4%)	0(0%)
Chemo + Radio	157(16%)	70(16%)	6(13%)	7(12%)	7(8%)	9(15%)	31(20%)	24(26%)	3(5%)

6.8 Logistic regression analysis

To incorporate the possible effects of the many patient and tumour variables which might have influenced treatments, a series of logistic regression models was fitted to the data, using the different treatment modalities as outcomes.

a Surgery

The simplest model for surgery, incorporating only the health board effects, showed lower levels of surgery in all health boards relative to the ERHA, significantly so in the MWHB, NWHB and WHB (Table 6.39).

Table 6.39. Odds of surgical treatment by health board; univariate model

	All lung cancers		NSCLC	
Area of residence	odds ratio (95% confidence intervals)	p	odds ratio (95% confidence intervals)	p
ERHA	0.798 (0.590; 1.078)	0.142	1.000	
MHB	**0.504 (0.375; 0.677)**	**0.000**	0.826 (0.600 ;1.137)	0.241
MWHB	**0.759 (0.586; 0.984)**	**0.037**	**0.697 (0.508 ;0.957)**	**0.026**
NEHB	**0.517 (0.379; 0.705)**	**0.000**	0.879 (0.665 ;1.162)	0.365
NWHB	**0.809 (0.665; 0.984)**	**0.034**	**0.628 (0.453 ;0.873)**	**0.006**
SHB	**0.723 (0.575; 0.909)**	**0.006**	0.874 (0.707 ;1.080)	0.211
SEHB	**0.402 (0.296; 0.546)**	**0.000**	0.891 (0.693 ;1.146)	0.370
WHB	0.798 (0.590; 1.078)	0.142	**0.434 (0.316 ;0.598)**	**0.000**

A number of patient and tumour factors were significantly related to the probability of having surgery. The chances of having surgery decreased with age, with increasing deprivation, for the unmarried, for cancers of undefined on non-specific cell type, and for patients with clinically advanced cancers.

The following factors significantly improved model fit:

- Patient age
- Deprivation
- Marital status
- Smoker status
- Histological confirmation
- Tumour morphology
- Tumour grade
- T stage
- N stage
- M stage

If these factors are added to the model, the pattern of surgery with health boards does not alter significantly, with the exception of the NEHB for NSCLC (Table 6.40).

Table 6.40.Odds of surgical treatment by health board; multivariate model[25]

	All cancers		NSCLC	
Area of residence	odds ratio (95% confidence intervals)	p	odds ratio (95% confidence intervals)	p
ERHA	1.000		1.000	
MHB	0.907 (0.631; 1.303)	0.597	0.913 (0.629; 1.324)	0.632
MWHB	**0.559 (0.388; 0.804)**	**0.002**	**0.559 (0.384; 0.812)**	**0.002**
NEHB	0.730 (0.529; 1.007)	0.055	**0.703 (0.504; 0.981)**	**0.038**
NWHB	**0.571 (0.392; 0.832)**	**0.004**	**0.567 (0.385; 0.834)**	**0.004**
SHB	0.940 (0.733; 1.206)	0.628	0.894 (0.690; 1.159)	0.398
SEHB	0.932 (0.699; 1.243)	0.631	0.851 (0.631; 1.149)	0.292
WHB	**0.460 (0.322; 0.655)**	**0.000**	**0.450 (0.313; 0.645)**	**0.000**

[25] Full multivariate model is described in Appendix 4, Table 1.13

b Chemotherapy

In the simple model, the odds of having chemotherapy for NSCLC were highest in the WHB and lowest in the NEHB, both statistically significant. The odds of having chemotherapy for SCLC were lower in general outside the ERHA, and significantly lower in the MWHB and SEHB.

Table 6.41.Odds of chemotherapy by health board; univariate model

	All cancers		NSCLC		SCLC	
Area of residence	odds ratio (95% confidence intervals)	P	odds ratio (95% confidence intervals)	P	odds ratio (95% confidence intervals)	P
ERHA	1.000		1.000		1.000	
MHB	**0.597 (0.417; 0.854)**	**0.005**	0.575 (0.315 ;1.049)	0.071	0.611 (0.332 ;1.124)	0.113
MWHB	**0.649 (0.484; 0.869)**	**0.004**	1.218 (0.794 ;1.869)	0.366	**0.352 (0.200 ;0.621)**	**0.000**
NEHB	**0.731 (0.552; 0.968)**	**0.029**	**0.510 (0.292 ;0.892)**	**0.018**	0.696 (0.433 ;1.119)	0.134
NWHB	0.803 (0.603; 1.070)	0.134	0.891 (0.550 ;1.444)	0.640	0.775 (0.452 ;1.331)	0.356
SHB	0.906 (0.739; 1.110)	0.339	0.702 (0.486 ;1.014)	0.059	1.010 (0.691 ;1.476)	0.960
SEHB	**0.712 (0.556; 0.911)**	**0.007**	1.153 (0.796 ;1.668)	0.451	**0.560 (0.358 ;0.877)**	**0.011**
WHB	**1.503 (1.208; 1.870)**	**0.000**	**3.055 (2.274 ;4.105)**	**0.000**	0.901 (0.517 ;1.570)	0.712

The odds of having chemotherapy were related to the expected patient and tumour factors . Older patients were much less likely to have chemotherapy, while those with more advanced tumour and nodal stages were more likely. The odds of having of chemotherapy increased significantly between 1996 and 1998, by about 19% per year.

The following factors significantly improved model fit:

- Patient age
- Sex
- Marital status
- Smoker status
- Deprivation
- T stage
- N stage
- M stage
- Tumour grade

After correction for the above factors, only the odds of chemotherapy in the WHB were statistically significant from those in the ERHA, with an odds of 3.5 (Table 6.42).

Table 6.42. Odds of chemotherapy by health board; multivariate model[26]

	All cancers		NSCLC		SCLC	
Area of residence	odds ratio (95% confidence intervals)	P	odds ratio (95% confidence intervals)	P	odds ratio (95% confidence intervals)	P
E	1.000		1.000		1.000	
M	**0.626 (0.400; 0.978)**	**0.039**	0.644 (1.220; 0.177)	0.177	0.581 (1.146; 0.000)	0.117
MW	0.864 (0.600; 1.246)	0.435	1.243 (1.979; 0.360)	0.360	**0.299 (0.565; 0.000)**	**0.000**
NE	0.730 (0.513; 1.040)	0.081	0.577 (1.032; 0.064)	0.064	0.713 (1.205; 0.000)	0.206
NW	1.031 (0.715; 1.486)	0.869	1.068 (1.800; 0.804)	0.804	0.739 (1.348; 0.000)	0.324
S	0.966 (0.742; 1.258)	0.798	0.739 (1.101; 0.137)	0.137	1.140 (1.755; 0.000)	0.553
SE	**0.660 (0.478; 0.912)**	**0.012**	1.096 (1.647; 0.659)	0.659	**0.452 (0.746; 0.000)**	**0.002**
W	**3.062 (2.319; 4.044)**	**0.000**	**3.549 (4.979; 0.000)**	**0.000**	1.065 (1.969; 0.000)	0.842

[26] Full multivariate model is described in Appendix 4, Table 1.15

c Radiotherapy

For half of the health board areas, the odds of having radiotherapy were significantly lower than in the ERHA. The rates of radiotherapy were significantly lower overall in the MWHB, NEHB, SEHB and WHB for all lung cancers (Table 6.43).

Table 6.43. Odds of radiotherapy by health board; univariate model

	All cancers		NSCLC		SCLC	
Area of residence	**odds ratio (95% confidence intervals)**	**P**	**odds ratio (95% confidence intervals)**	**P**	**odds ratio (95% confidence intervals)**	**P**
ERHA	1.000		1.000		1.000	
MHB	0.915 (0.723; 1.157)	0.457	1.083 (0.823; 1.425)	0.569	0.694 (1.482; 0.325)	0.345
MWHB	**0.546 (0.437; 0.681)**	**0.000**	**0.685 (0.519; 0.904)**	**0.008**	0.607 (1.240; 0.297)	0.171
NEHB	**0.640 (0.516; 0.792)**	**0.000**	**0.761 (0.590; 0.983)**	**0.036**	**0.482 (0.921; 0.252)**	**0.027**
NWHB	**0.779 (0.627; 0.966)**	**0.023**	1.000 (0.767; 1.303)	0.999	0.832 (1.565; 0.442)	0.568
SHB	1.079 (0.927; 1.255)	0.327	1.194 (0.993; 1.436)	0.060	1.219 (1.822; 0.815)	0.335
SEHB	**0.645 (0.535; 0.776)**	**0.000**	**0.720 (0.571; 0.908)**	**0.006**	1.472 (2.371; 0.914)	0.112
WHB	**0.536 (0.433; 0.663)**	**0.000**	**0.587 (0.456; 0.754)**	**0.000**	**0.259 (0.664; 0.101)**	**0.005**

The following factors significantly improved model fit:

- Patient age
- Sex
- Marital status
- Co-morbidity
- T stage
- N stage
- M stage

After correction for the above factors, the odds of radiotherapy treatment were significantly lower than in the ERHA for patients living in the MWHB, SEHB and WHB and higher in the SHB (Table 6.44).

Table 6.44 Odds of radiotherapy by health board; multivariate model[27]

	All cancers		NSCLC		SCLC	
Area of residence	**odds ratio (95% confidence intervals)**	**P**	**odds ratio (95% confidence intervals)**	**P**	**odds ratio (95% confidence intervals)**	**P**
ERHA	1.000		1.000		1.000	
MHB	0.918 (0.716; 1.177)	0.501	1.098 (0.826; 1.459)	0.521	0.683 (0.304 ;1.532)	**0.307**
MWHB	0.631 (0.499; 0.797)	**0.000**	**0.682 (0.513; 0.907)**	**0.009**	0.729 (0.344 ;1.543)	**0.378**
NEHB	0.715 (0.571; 0.896)	**0.003**	0.803 (0.618; 1.043)	0.100	0.572 (0.289 ;1.130)	**0.108**
NWHB	0.861 (0.684; 1.085)	0.206	0.965 (0.733; 1.269)	0.797	0.970 (0.495 ;1.904)	**0.960**
SHB	1.178 (1.001; 1.386)	**0.048**	**1.219 (1.006; 1.478)**	**0.043**	1.231 (0.790 ;1.918)	**0.358**
SEHB	0.648 (0.531; 0.790)	**0.000**	**0.675 (0.531; 0.858)**	**0.001**	1.300 (0.763 ;2.214)	**0.358**
WHB	0.563 (0.450; 0.704)	**0.000**	**0.567 (0.438; 0.734)**	**0.000**	**0.241 (0.091 ;0.640)**	**0.004**

[27] Full multivariate model is described in Appendix 4, Table 1.14

7 Prostate cancer

7.1 Cases analysed and their characteristics

7.1.1 Patients

The cases analysed are shown in Table 7.1. There were 5576 cases of prostate cancer in total during the five years. The number rose slightly each year. The age distribution of cases varied between health board areas, with the highest numbers of patients under 65 (19%) in the ERHA, and the highest number over 75 (47%) in the NWHB (?²=54.0; p<.001).

There was a lower percentage than expected of smokers in the ERHA and SEHB and a higher percentage in the WHB and NWHB. The proportion of married patients was highest (68%) in the ERHA and lowest (57%) in the NWHB (?²=68.2; p<.001). The number of patients living in areas described as "deprived " was particularly high in the NWHB (39%) but was also above average in the NEHB and WHB (?²=951.2; p<.001).

Table 7.1. Prostate cancer cases: patient characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**ERHA**	**MHB**	**MWHB**	**NEHB**	**NWHB**	**SHB**	**SEHB**	**WHB**
All cases		**5576**	**1686**	**351**	**446**	**455**	**396**	**907**	**701**	**634**
Age	<65	888(16%)	334(20%)	55(16%)	75(17%)	58(13%)	54(14%)	130(14%)	110(16%)	72(11%)
	65-75	2446(44%)	729(43%)	142(40%)	208(47%)	224(49%)	156(39%)	403(44%)	311(44%)	273(43%)
	75+	2242(40%)	623(37%)	154(44%)	163(37%)	173(38%)	186(47%)	374(41%)	280(40%)	289(46%)
Smoking status	Non-smoker	1973(35%)	474(28%)	118(34%)	174(39%)	152(33%)	117(30%)	446(49%)	241(34%)	251(40%)
	Ex-smoker	1034(19%)	323(19%)	66(19%)	75(17%)	107(24%)	91(23%)	105(12%)	132(19%)	135(21%)
	Smoker	1230(22%)	290(17%)	73(21%)	113(25%)	111(24%)	109(28%)	205(23%)	151(22%)	178(28%)
	Unknown	1339(24%)	599(36%)	94(27%)	84(19%)	85(19%)	79(20%)	151(17%)	177(25%)	70(11%)
Year of incidence	1994	1045(19%)	307(18%)	57(16%)	84(19%)	83(18%)	67(17%)	192(21%)	131(19%)	124(20%)
	1995	1077(19%)	323(19%)	71(20%)	98(22%)	97(21%)	70(18%)	180(20%)	115(16%)	123(19%)
	1996	1121(20%)	328(19%)	60(17%)	87(20%)	91(20%)	77(19%)	168(19%)	166(24%)	144(23%)
	1997	1130(20%)	346(21%)	79(23%)	98(22%)	85(19%)	94(24%)	158(17%)	137(20%)	133(21%)
	1998	1203(22%)	382(23%)	84(24%)	79(18%)	99(22%)	88(22%)	209(23%)	152(22%)	110(17%)
Marital status	Married	3519(63%)	1141(68%)	218(62%)	255(57%)	285(63%)	224(57%)	576(64%)	439(63%)	381(60%)
	Not married	1855(33%)	469(28%)	125(36%)	163(37%)	155(34%)	168(42%)	296(33%)	247(35%)	232(37%)
	Unknown	202(4%)	76(5%)	8(2%)	28(6%)	15(3%)	4(1%)	35(4%)	15(2%)	21(3%)
Deprivation	Affluent	1329(24%)	723(43%)	50(14%)	107(24%)	47(10%)	25(6%)	201(22%)	58(8%)	118(19%)
	Intermediate	2518(45%)	379(22%)	211(60%)	263(59%)	244(54%)	194(49%)	535(59%)	350(50%)	342(54%)
	Deprived	1085(19%)	368(22%)	51(15%)	62(14%)	93(20%)	154(39%)	92(10%)	175(25%)	90(14%)
	Unknown	644(12%)	216(13%)	39(11%)	14(3%)	71(16%)	23(6%)	79(9%)	118(17%)	84(13%)

7.1.2 Cancers

Characteristics of the cancer studied are shown in Table 7.2. Only a very small number of cancers was discovered incidentally or through screening, and this did not vary much between health boards. The number discovered incidentally was higher than for the other cancers studied, especially in the SHB. The percentage of histological confirmation varied considerably, from 73% in the NWHB to 94% in the MHB.

Table 7.2. Prostate cancer cases: tumour characteristics

		Number (%) of Registrations								
		Health board of residence								
		Ireland	**ERHA**	**MHB**	**MWHB**	**NEHB**	**NWHB**	**SHB**	**SEHB**	**WHB**
All cases		**5576**	**1686**	**351)**	**446**	**455**	**396**	**907**	**701**	**634**
Presentation	Screening	32(1%)	8(<1%)	1(<1%)	0(0%)	0(0%)	3(1%)	13(1%)	7(1%)	0(0%)
	Incidental	354(6%)	112(7%)	17(5%)	8(2%)	28(6%)	16(4%)	117(13%)	31(4%)	25(4%)
	Symptoms	4899(88%)	1389(82%)	316(90%)	421(94%)	412(91%)	372(94%)	772(85%)	627(89%)	590(93%)
	Unknown	291(5%)	177(10%)	17(5%)	17(4%)	15(3%)	5(1%)	5(1%)	36(5%)	19(3%)
Histological confirmation	Yes	4875(87%)	1586(94%)	312(89%)	347(78%)	384(84%)	291(73%)	803(89%)	603(86%)	549(87%)
	No	701(13%)	100(6%)	39(11%)	99(22%)	71(16%)	105(27%)	104(11%)	98(14%)	85(13%)
T stage	T1	898(16%)	182(11%)	56(16%)	108(24%)	30(7%)	21(5%)	264(29%)	134(19%)	103(16%)
	T2	1120(20%)	266(16%)	73(21%)	126(28%)	113(25%)	25(6%)	240(26%)	199(28%)	78(12%)
	T3	336(6%)	128(8%)	18(5%)	10(2%)	38(8%)	23(6%)	47(5%)	50(7%)	22(3%)
	T4	233(4%)	81(5%)	27(8%)	13(3%)	18(4%)	14(4%)	24(3%)	32(5%)	24(4%)
	TX	2989(54%)	1029(61%)	177(50%)	189(42%)	256(56%)	313(79%)	332(37%)	286(41%)	407(64%)
N stage	N0	620(11%)	189(11%)	26(7%)	47(11%)	57(13%)	17(4%)	97(11%)	166(24%)	21(3%)
	N1	47(1%)	19(1%)	3(1%)	3(1%)	6(1%)	4(1%)	4(<1%)	5(1%)	3(<1%)
	N2	45(1%)	12(1%)	7(2%)	7(2%)	3(1%)	1(<1%)	2(<1%)	10(1%)	3(<1%)
	N3	9(<1%)	4(<1%)	0(0%)	1(<1%)	2(<1%)	0(0%)	0(0%)	1(<1%)	1(<1%)
	NX	4855(87%)	1462(87%)	315(90%)	388(87%)	387(85%)	374(94%)	804(89%)	519(74%)	606(96%)
M stage	M0	1384(25%)	467(28%)	88(25%)	99(22%)	113(25%)	95(24%)	227(25%)	205(29%)	90(14%)
	M1	1146(21%)	300(18%)	89(25%)	78(17%)	98(22%)	85(21%)	187(21%)	154(22%)	155(24%)
	MX	3046(55%)	919(55%)	174(50%)	269(60%)	244(54%)	216(55%)	493(54%)	342(49%)	389(61%)
Summary stage	0	47(1%)	4(<1%)	0(0%)	9(2%)	5(1%)	0(0%)	10(1%)	18(3%)	1(<1%)
	I	62(1%)	7(<1%)	3(1%)	5(1%)	0(0%)	3(1%)	25(3%)	16(2%)	3(<1%)
	II	186(3%)	57(3%)	8(2%)	16(4%)	22(5%)	6(2%)	29(3%)	46(7%)	2(<1%)
	III	59(1%)	17(1%)	5(1%)	2(<1%)	5(1%)	3(1%)	12(1%)	10(1%)	5(1%)
	IV	1236(22%)	328(19%)	98(28%)	90(20%)	104(23%)	88(22%)	198(22%)	170(24%)	160(25%)
	Unknown	3986(71%)	1273(76%)	237(68%)	324(73%)	319(70%)	296(75%)	633(70%)	441(63%)	463(73%)
Grade	I	1135(20%)	351(21%)	91(26%)	127(28%)	98(22%)	38(10%)	180(20%)	138(20%)	112(18%)
	II	1705(31%)	625(37%)	89(25%)	90(20%)	111(24%)	118(30%)	293(32%)	221(32%)	158(25%)
	III	1293(23%)	395(23%)	87(25%)	76(17%)	101(22%)	68(17%)	233(26%)	161(23%)	172(27%)
	IV	68(1%)	8(<1%)	0(0%)	5(1%)	5(1%)	18(5%)	10(1%)	16(2%)	6(1%)
	Unknown	1375(25%)	307(18%)	84(24%)	148(33%)	140(31%)	154(39%)	191(21%)	165(24%)	186(29%)

Staging was poor for prostate cancer, with fewer than half of the cases having a T stage recorded and only 13% a nodal stage. As only 25% of cases had summary stage, no many conclusion can be drawn about inter-area variation. Recording of grade was much better, with 75% of cases having a grade. The percentage was highest in the ERHA (82%) and lowest in the NWHB (61%).

7.2 Survival

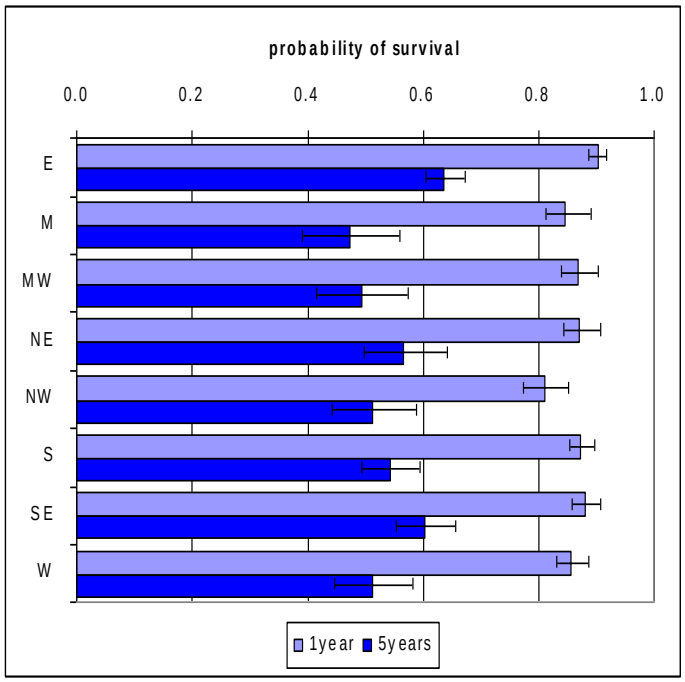
Overall survival for patients with prostate cancer was 38.0% at five years (Table 7.3). However deaths specifically from prostate cancer were far fewer, with a five year survival of 62.5%.. Deaths from other causes would be expected to be frequent in this population of elderly males.

Table 7.3. Prostate cancer survival

	Probability of survival	
Years from diagnosis	**All causes**	**Cause-specific**
1	81.2% (80.1%; 82.2%)	87.4% (86.5%; 88.3%)
2	66.8% (65.5%; 68.0%)	76.8% (75.6%; 78.0%)
3	55.6% (54.2%; 57.0%)	68.3% (66.8%; 69.7%)
4	46.8% (45.2%; 48.4%)	62.5% (60.9%; 64.1%)
5	38.0% (36.1%; 39.9%)	56.6% (54.5%; 58.6%)

Table 7.4. Prostate cancer: one- and five-year survival by health board

	Cause specific survival (95% confidence limits)	
Area of residence	**One year**	**Five years**
ERHA	90.2% (88.6%; 91.5%)	63.7% (60.2%; 67.0%)
MHB	84.7% (80.4%; 88.2%)	47.2% (38.5%; 55.4%)
MWHB	86.8% (83.3%; 89.7%)	49.2% (41.0%; 56.9%)
NEHB	87.1% (83.5%; 89.9%)	56.5% (48.9%; 63.3%)
NWHB	80.9% (76.6%; 84.5%)	51.2% (43.6%; 58.2%)
SHB	87.3% (84.8%; 89.3%)	54.3% (49.0%; 59.3%)
SEHB	88.0% (85.3%; 90.2%)	60.3% (54.9%; 65.2%)
WHB	85.7% (82.6%; 88.2%)	51.2% (44.2%; 57.7%)



The highest survival at one year was seen in the ERHA (90%) and the lowest in the NWHB (81%) (Table 7.4). Survival at five years was also best in the ERHA (64%) but poorest in the MWHB.

Figure 7.1. Zero to six year Kaplan-Meier survival curves: by health board

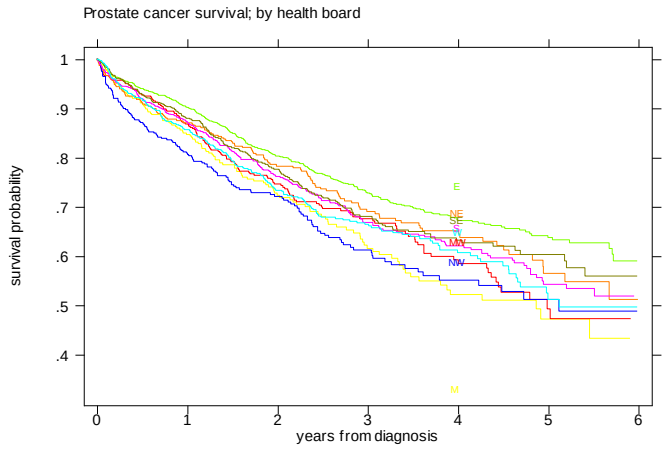
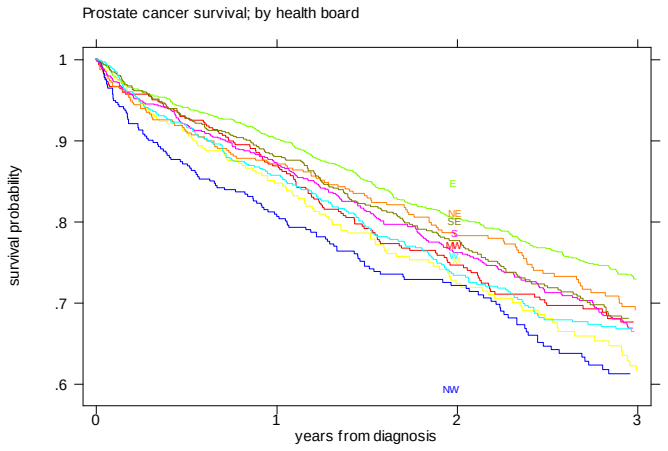


Figure 7.2. Zero to three year Kaplan-Meier survival curves: by health board



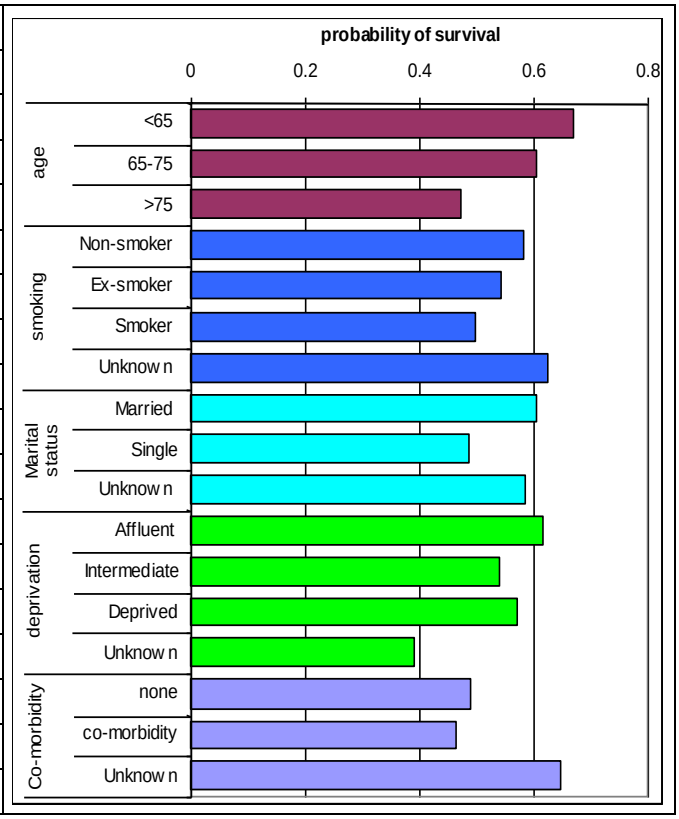
Plots of cause-specific survival by health board (Figure 7.1, Figure 7.2) show generally better survival in the ERHA and at most times, and poorer survival in the NWHB and WHB. However, after five years' follow-up, the lines begin to converge, probably due to the relatively small number of patients followed up for this long. As a consequence, modelling of the overall survival patterns through proportional hazards models is a more accurate measure of differences between health boards than are comparisons of five-year survival, which is based on a relatively few number of cases and survivors.

7.3 Factors affecting survival

A number of patient, tumour and treatment factors were tested for their relationship to survival. The data are summarised in Figure 7.3 and 7.4, Table 7.5 and Table 7.6

Table 7.5. Figure 7.3 Patient characteristics and five-year survival

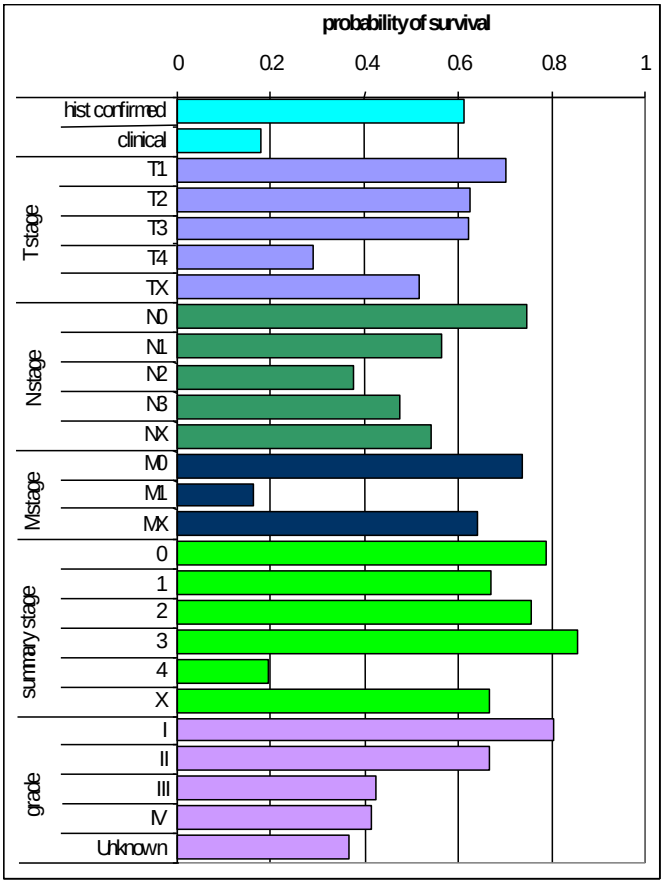
		Five year survival
Age	<65	0.670 (0.620 :0.715)
	65-75	0.606 (0.575 :0.636)
	>75	0.473 (0.439 :0.506)
Smoking	Non-smoker	0.583 (0.549 :0.614)
	Ex-smoker	0.544 (0.488 :0.596)
	Smoker	0.499 (0.455 :0.540)
	Unknown	0.627 (0.582 :0.668)
Marital status	Married	0.606 (0.580 :0.630)
	Not married	0.488 (0.451 :0.524)
	Unknown	0.587 (0.487 :0.674)
Deprivation index	Affluent	0.617 (0.578 :0.653)
	Intermediate	0.542 (0.511 :0.572)
	Deprived	0.572 (0.527 :0.615)
	Unknown	0.617 (0.578 :0.653
Co-morbidity	Low	0.491 (0.453 :0.528)
	High	0.465 (0.371 :0.554)
	Unknown	0.645 (0.620 :0.674)



Survival decreased with increasing age (χ^2 267.9;p<0.001), with non-married status (χ^2 75.5;p<0.001, with deprivation (χ2=13.6; p< 0.001), and with non-smoking status (χ^2=30.8; p<.001).

Table 7.6. Figure 7.4 Tumour characteristics and five-year survival

		Five year survival
Histological confirmation	Confirmed	0.179 (0.127 :0.237)
	Not confirmed	0.614 (0.592 :0.635)
T stage	T1	0.701 (0.652 :0.745)
	T2	0.626 (0.578 :0.671)
	T3	0.621 (0.535 :0.696)
	T4	0.289 (0.206 :0.377)
	TX	0.515 (0.487 :0.543)
N stage	N0	0.747 (0.691 :0.795)
	N1	0.564 (0.357 :0.727)
	N2	0.375 (0.176 :0.575)
	N3	0.474 (0.072 :0.809)
	NX	0.543 (0.520 :0.565)
M stage	M0	0.736 (0.696 :0.773)
	M1	0.176 (0.132 :0.225)
	MX	0.642 (0.613 :0.669)
Summary stage	0	0.789 (0.552 :0.909)
	1	0.671 (0.504 :0.793)
	2	0.757 (0.627 :0.847)
	3	0.855 (0.673 :0.940)
	4	0.194 (0.161 :0.229)
	Unknown	0.667 (0.642 :0.691)
Grade	I	0.805 (0.765 :0.838)
	II	0.667 (0.628 :0.703)
	III	0.422 (0.381 :0.463)
	IV	0.413 (0.262 :0.558)
	Unknown	0.367 (0.322 :0.411)



Of tumour factors, the most strongly correlated with survival were histological confirmation of diagnosis (χ2=830.1;p<0.001), T stage (χ^2=187.9;p<0.001), N stage (χ^2 =79.3; p<. 001), M stage (χ^2 1350.8,p<. 001), summary stage (χ^2=1230.5; p<.001) and grade (χ^2=682.7; p<.001).

Table 7.7. Treatment and five-year survival

Surgery	**Five year survival (95% confidence limits)**
No surgery	0.485 (0.456 :0.514)
surgery	0.632 (0.603 :0.660)
Any tumour-related treatment	
Not treated	0.582 (0.543 :0.618)
Treated	0.558 (0.534 :0.583)
Any tumour-related treatment other than surgery	
Not treated	0.582 (0.543 :0.618)
Treated	0.374 (0.328 :0.420)

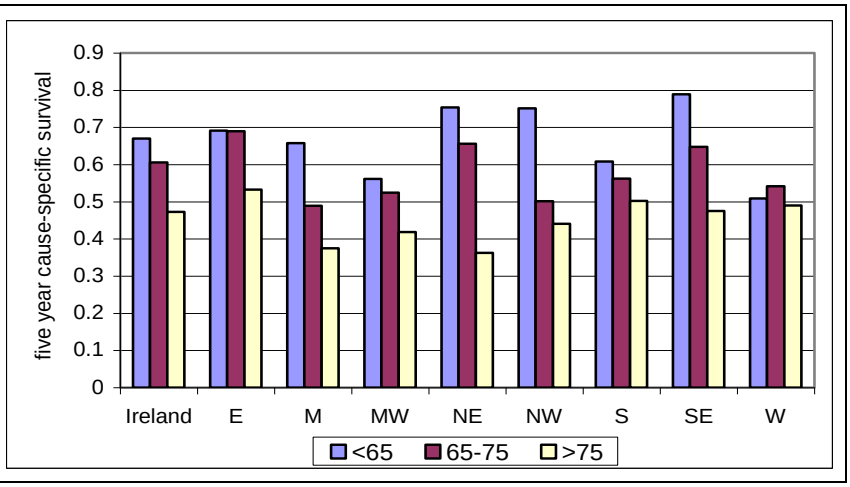
Surgery was strongly related to survival (χ^2=180.9; p<.001), as was any tumour-related treatment (χ^2=9.0; p=.003) (Table 7.7). Even in the absence of surgery, any other tumour related treatment was strongly related to survival (χ^2=29.1, p=.001).

7.3.1 Age

The decrease in survival was seen for all areas, except for the WHB (Table 7.8). The gradient with age was steepest in the NEHB and SEHB and least in the ERHA and WHB.

Table 7.8; Figure 7.5. Five year prostate cancer survival by health board and patient age

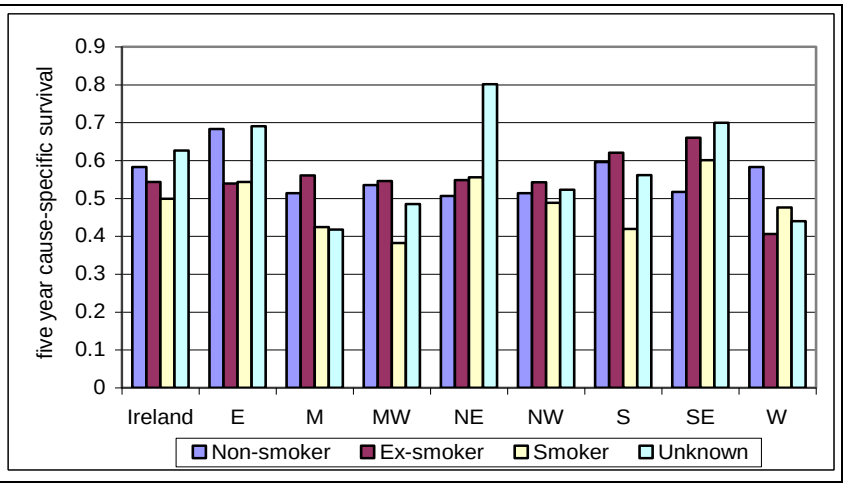
Area of residence	<65	65-75	>75
Ireland	0.67	0.61	0.47
ERHA	0.69	0.69	0.53
MHB	0.66	0.49	0.37
MWHB	0.56	0.52	0.42
NEHB	0.75	0.66	0.36
NWHB	0.75	0.5	0.44
SHB	0.61	0.56	0.5
SEHB	0.79	0.65	0.48
WHB	0.51	0.54	0.49



7.3.2 Smoking

Table 7.9; Figure 7.6. Five year prostate cancer survival by health board and smoking

Area of residence	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.58	0.54	0.5	0.63
ERHA	0.68	0.54	0.54	0.69
MHB	0.51	0.56	0.42	0.42
MWHB	0.54	0.55	0.38	0.48
NEHB	0.51	0.55	0.56	0.8
NWHB	0.51	0.54	0.49	0.52
SHB	0.6	0.62	0.42	0.56
SEHB	0.52	0.66	0.6	0.7
WHB	0.58	0.41	0.48	0.44



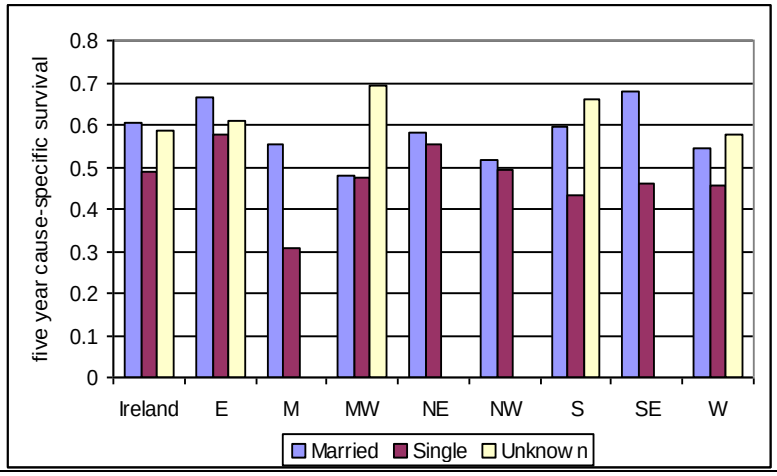
While smokers tended to have a better survival than non-smokers in most areas, this was not consistent (Table 7.9). However some of the differences may be due to relatively small numbers.

7.3.3 Marital status

Married men had a survival advantage over those who were never married in all areas (Table 7.10)

Table 7.10; Figure 7.7. Five year prostate cancer survival by health board and marital status

Area of residence	Married	Not married	Unknown
Ireland	0.61	0.49	0.59
ERHA	0.66	0.58	0.61
MHB	0.56	0.31	—
MWHB	0.48	0.47	0.69
NEHB	0.58	0.55	—
NWHB	0.52	0.49	—
SHB	0.6	0.43	0.66
SEHB	0.68	0.46	—
WHB	0.54	0.46	0.58

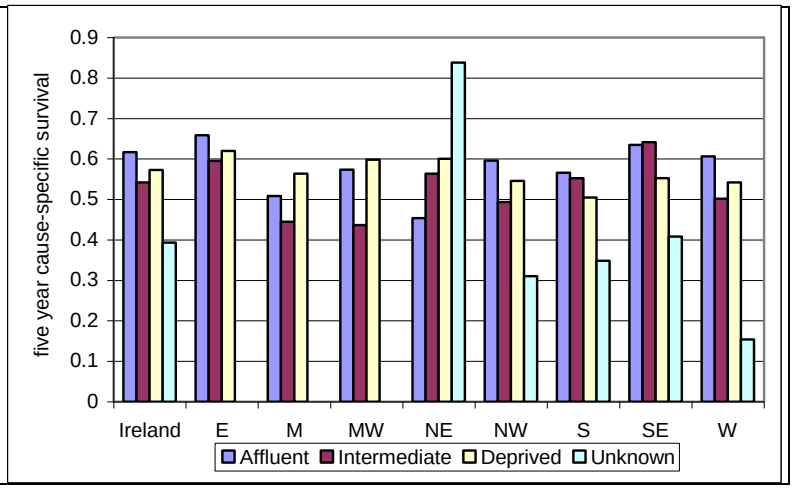


7.3.4 Deprivation

Although there was an overall trend in survival with deprivation, there was no consistency across health boards (Table 7.11), with decrease in survival with deprivation in the NWHB, SHB, SEHB, and WHB no definite trend in the ERHA, MHB and MWHB, and an increase in survival with deprivation in the NEHB.

Table 7.11; Figure 7.8. Five year prostate cancer survival by health board and deprivation status

Area of residence	Affluent	Intermediate	Deprived	Unknown
Ireland	0.62	0.54	0.57	0.39
ERHA	0.66	0.6	0.62	--
MHB	0.51	0.44	0.56	--
MWHB	0.57	0.44	0.6	--
NEHB	0.45	0.56	0.6	0.84
NWHB	0.6	0.49	0.55	0.31
SHB	0.57	0.55	0.5	0.35
SEHB	0.63	0.64	0.55	0.41
WHB	0.61	0.5	0.54	0.15

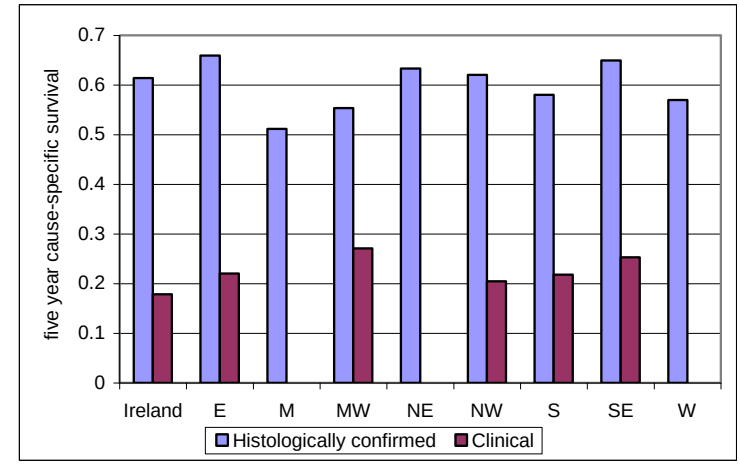


7.3.5 Histological confirmation

The relationship between histological confirmation and survival was consistent across health board areas, in those areas where some patients were diagnosed with such confirmation (Table 7.12).

Table 7.12; Figure 7.9. Five year prostate cancer survival by health board and histological confirmation

Area of residence	No histological confirmation	Histological confirmation
Ireland	0.61	0.18
ERHA	0.66	0.22
MHB	0.51	--
MWHB	0.55	0.27
NEHB	0.63	--
NWHB	0.62	0.20
SHB	0.58	0.22
SEHB	0.65	0.25
WHB	0.57	--



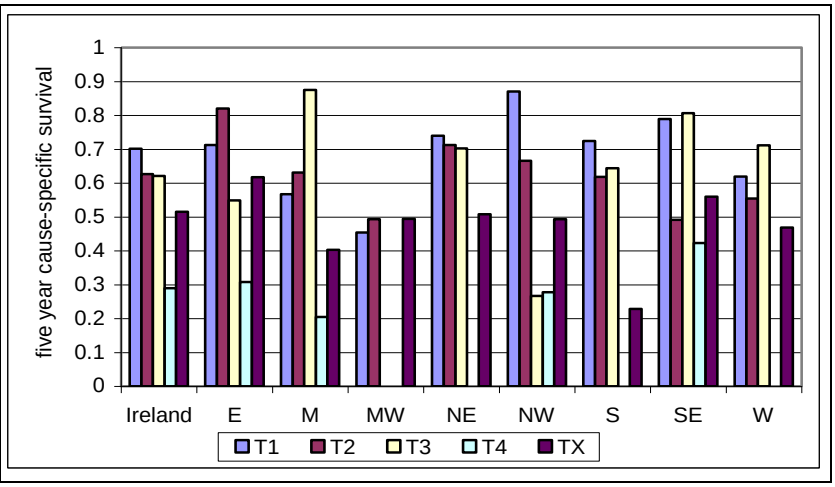
7.3.6 Stage

a T stage

Prognosis even for T1 and T2 cancers was quite variable (Table 7.13). The large number of unstaged cancers makes interpretation of the trend difficult. However it can be seen that for the unstaged group, there is a very wide variation in survival, from 62% in the ERHA to 23% in the SHB, suggesting that these are not the same group of cancers in each area.

Table 7.13; Figure 7.10. Five year prostate cancer survival by health board and T stage

Area of residence	T1	T2	T3	T4	TX
Ireland	0.70	0.63	0.62	0.29	0.52
ERHA	0.71	0.82	0.55	0.31	0.62
MHB	0.57	0.63	0.88	0.20	0.40
MWHB	0.45	0.49	—	—	0.49
NEHB	0.74	0.71	0.7	—	0.51
NWHB	0.87	0.67	0.27	0.28	0.49
SHB	0.72	0.62	0.64	—	0.23
SEHB	0.79	0.49	0.81	0.42	0.56
WHB	0.62	0.55	0.71	—	0.47

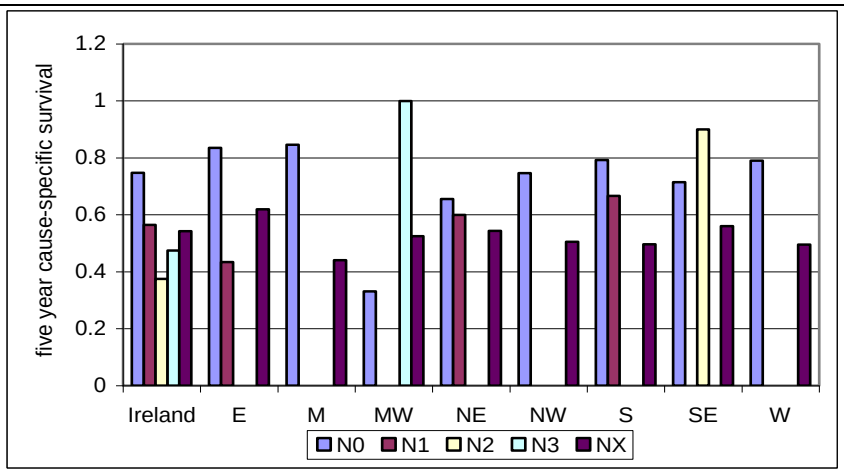


b N stage

Nodal stage was so rarely reported that trends across health boards are meaningless (Table 7.14). The heterogeneity of the NX group seems to be less than that o f the TX cancers.

Table 7.14; Figure 7.11. Five year prostate cancer survival by health board and N stage

Area of residence	N0	N1	N2	N3	NX
Ireland	0.75	0.56	0.38	0.47	0.54
ERHA	0.84	0.43	—	—	0.62
MHB	0.85	—	—	—	0.44
MWHB	0.33	—	—	1.00	0.53
NEHB	0.66	0.6	—	—	0.54
NWHB	0.75	—	—	—	0.50
SHB	0.79	0.67	—	—	0.50
SEHB	0.71	—	0.9	—	0.56
WHB	0.79	—	—	—	0.50

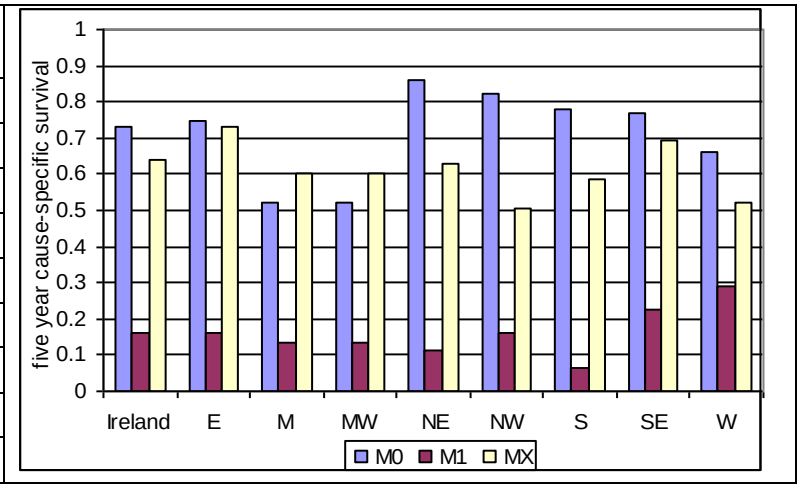


c M stage

The relationship between M stage and survival was string and consistent across health board areas (Table 7.15). For most areas, the prognosis for MX cases close to that for M0 cases.

Table 7.15; Figure 7.12. Five year prostate cancer survival by health board and M stage

Area of residence	M0	M1	MX
Ireland	0.73	0.16	0.64
ERHA	0.75	0.16	0.73
MHB	0.52	0.13	0.60
MWHB	0.52	0.13	0.60
NEHB	0.86	0.11	0.63
NWHB	0.82	0.16	0.51
SHB	0.78	0.07	0.59
SEHB	0.77	0.22	0.69
WHB	0.66	0.29	0.52

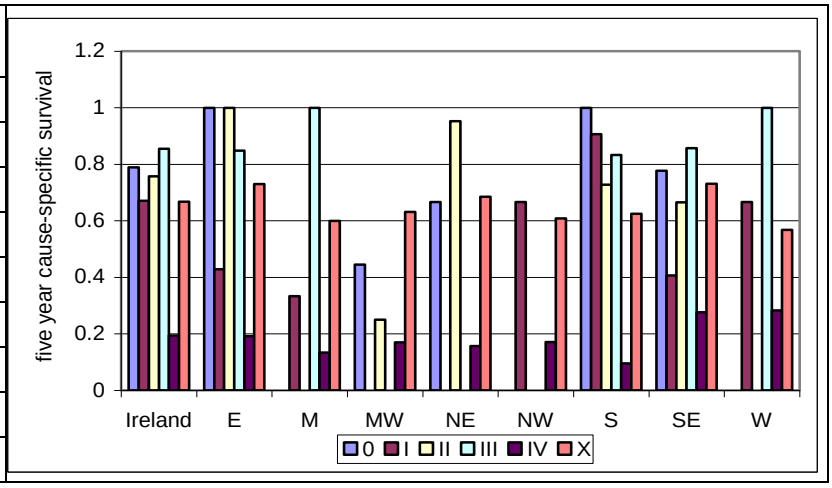


d Summary stage

Because of the small number of staged cases, there were no clear trends (Table 7.16).

Table 7.16; Figure 7.13. Five year prostate cancer survival by health board and summary stage

Area of residence	0	I	II	III	IV	X
Ireland	0.79	0.67	0.76	0.85	0.19	0.67
ERHA	1.00	0.43	1.00	0.85	0.19	0.73
MHB	—	0.33	—	1.00	0.13	0.6
MWHB	0.44	—	0.25	—	0.17	0.63
NEHB	0.67	—	0.95	—	0.16	0.69
NWHB	—	0.67	—	—	0.17	0.61
SHB	1.00	0.91	0.73	0.83	0.10	0.62
SEHB	0.78	0.41	0.67	0.86	0.28	0.73
WHB	—	0.67	—	1.00	0.28	0.57

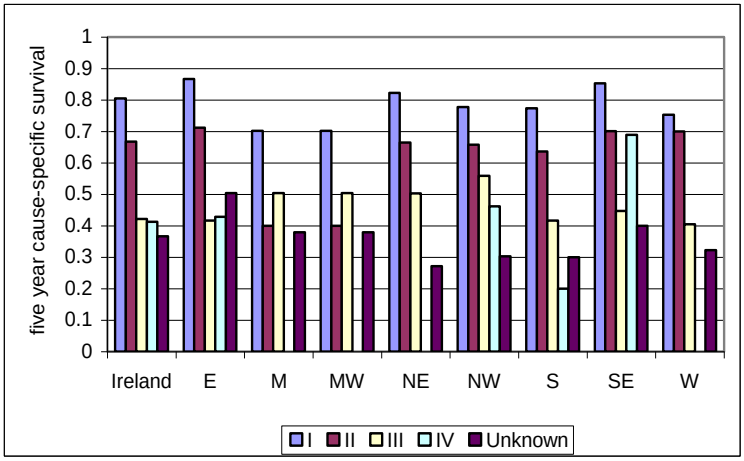


7.3.7 Grade

With a few minor exceptions, higher-grade cancers were associated with a poorer prognosis in all health board areas (Table 7.17). Cancers with unknown grade tended to have a poor prognosis.

Table 7.17; Figure 7.14. Five year prostate cancer survival by health board and grade

Area of residence	I	II	III	IV	Unknown
Ireland	0.8	0.67	0.42	0.41	0.37
ERHA	0.87	0.71	0.42	0.43	0.50
MHB	0.70	0.40	0.50	—	0.38
MWHB	0.70	0.40	0.50	—	0.38
NEHB	0.82	0.67	0.50	—	0.27
NWHB	0.78	0.66	0.56	0.46	0.30
SHB	0.77	0.64	0.42	0.2	0.30
SEHB	0.85	0.70	0.45	0.69	0.40
WHB	0.75	0.70	0.41	—	0.32



7.4 Survival modelling

A range of Cox proportional hazards models was fitted to the data, in an attempt to adjust for confounders among the patient and tumour characteristics.

When tested in a Cox proportional hazards model, hazard ratios for all areas were higher than in the ERHA (Table 7.18). Survival in all areas, apart from the NEHB, was statistically significantly poorer than in the ERHA.

Table 7.18. Hazard ratios for prostate cancer, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	**1.000**	
MHB	**1.548 (1.266 ;1.894)**	**0.000**
MWHB	**1.381 (1.145 ;1.665)**	**0.001**
NEHB	1.182 (0.971 ;1.439)	0.096
NWHB	**1.618 (1.336 ;1.959)**	**0.000**
SHB	**1.267 (1.088 ;1.476)**	**0.002**
SEHB	**1.190 (1.006 ;1.408)**	**0.042**
WHB	**1.364 (1.154 ;1.611)**	**0.000**

The following factors significantly improved model fit:[28]

- Patient age
- Marital status
- Smoking
- T stage
- N stage
- M stage
- Tumour grade
- Co-morbidity

After correcting for the above factors, the hazards were similar for all health board areas (Table 7.19).

Table 7.19. Multivariate hazard ratios for prostate cancer, all patients, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.00	
MHB	1.064 (0.851 ;1.331)	0.584
MWHB	1.108 (0.895 ;1.372)	0.346
NEHB	0.871 (0.700 ;1.083)	0.213
NWHB	1.078 (0.873 ;1.330)	0.485
SHB	1.148 (0.967 ;1.363)	0.114
SEHB	0.938 (0.780 ;1.130)	0.502
WHB	0.915 (0.761 ;1.099)	0.342

[28] The full multivariate models are given in Appendix 3, Table 1.8

Prognosis, and factors affecting prognosis (Table 7.18), are quite different for the prostate cancer patients who did not have surgery (Table 7.21), so these groups were separated for further analysis.

Table 7.20. Hazard ratios for prostate cancer, by treatment

	Hazard ratio	
Area of residence	**No surgery**	**Surgery**
ERHA	1.000	0.589
MHB	1.485	0.891
MWHB	1.857	0.635
NEHB	1.313	0.600
NWHB	1.584	0.715
SHB	1.292	0.642
SEHB	1.160	0.703
WHB	1.185	0.661

Table 7.21. Number of prostate cancer patients having surgery, by health board

	Patients having surgery	
Area of residence	**Number**	**% of total**
Ireland	3002	54%
ERHA	1055	63%
MHB	193	55%
MWHB	267	60%
NEHB	259	57%
NWHB	148	37%
SHB	451	50%
SEHB	417	59%
WHB	212	33%

7.4.1 Hazard ratios: Patients having surgery

a Univariate model

Table 7.22. Hazard ratios for prostate cancer, in patients having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.000	
MHB	**1.535 (1.147 ;2.053)**	**0.004**
MWHB	1.062 (0.806 ;1.400)	0.669
NEHB	1.010 (0.755 ;1.351)	0.946
NWHB	1.207 (0.859 ;1.697)	0.278
SHB	1.077 (0.854 ;1.358)	0.530
SEHB	1.198 (0.948 ;1.513)	0.130
WHB	1.130 (0.829 ;1.540)	0.439

In contrast to the results for all patients combined, uncorrected (univariate) hazard ratios for patients having surgery although still all worse than in the ERHA, were significantly poorer only for those living in the MHB (Table 7.22).

b Multivariate model[29]

The univariate model for patients having surgery was expanded by the addition of the variables listed below. For patients having surgery, the following factors significantly improved model fit:

- Patient age
- Marital status
- Smoking
- T stage
- N stage
- M stage
- Tumour grade
- Co-morbidity

Following correction for these factors, survival for prostate cancer patients was not significantly poorer than for the ERHA in any area (Table 7.23).

Table 7.23. Multivariate hazard ratios for prostate cancer, patients having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.00	
MHB	1.24 (0.90 ;1.69)	0.185
MWHB	1.32 (0.98 ;1.77)	0.070
NEHB	0.83 (0.61 ;1.12)	0.223
NWHB	1.00 (0.70;1.43)	0.998
SHB	1.22 (0.94 ;1.58)	0.136
SEHB	1.15 (0.89 ;1.48)	0.280
WHB	0.86 (0.62;1.19)	0.358

[29] The full multivariate models are given in Appendix 3, Table 1.8

7.4.2 Hazard ratios: Patients not having surgery

a Univariate model

Table 7.24. Hazard ratios for prostate cancer, patients not having surgery, by health board

Area of residence	Hazard ratio (95% confidence limits)	P
ERHA	1.00	
MHB	**1.465 (1.107 ;1.939)**	**0.008**
MWHB	**1.791 (1.387 ;2.313)**	**0.000**
NEHB	**1.310 (1.001 ;1.713)**	**0.049**
NWHB	**1.543 (1.214 ;1.962)**	**0.000**
SHB	**1.271 (1.034 ;1.563)**	**0.023**
SEHB	1.151 (0.903 ;1.467)	0.255
WHB	1.181 (0.957 ;1.457)	0.121

For patients not having surgery, survival was significantly poorer than in the ERHA in most areas (Table 7.24).

b Multivariate model[30]

A similar range of variables was fitted to the model of patients not having surgery. These were:

- Patient age
- Marital status
- Smoking
- Histological confirmation
- T stage
- N stage
- M stage
- Tumour grade
- Co-morbidity

After the inclusion of these variables, hazard ratios associated with health board of residence, in general, decreased and none was significantly higher than that for the ERHA (Table 7.25). That for the SEHB fell significantly below that for the ERHA.

Table 7.25. Multivariate hazard ratios for prostate cancer, patients not having surgery, by health board

Area of residence	Hazard ratio (95%confidence limits)	p
ERHA	1.00	
MHB	0.96 (0.71 ;1.29)	0.764
MWHB	0.95 (0.71;1.26)	0.710
NEHB	0.83 (0.62;1.11)	0.210
NWHB	1.02 (0.78 ;1.32)	0.901
SHB	1.05 (0.84 ;1.31)	0.660
SEHB	**0.73 (0.57 ;0.95)**	0.018
WHB	0.87 (0.69 ;1.09)	0.214

[30] The full multivariate models are given in Appendix 3, Table 1.8

7.5 Treatment differences by health board

7.5.1 Descriptive analysis

As noted earlier, “hormone treatment” did not exist as a separate category of treatment in 1994 or 1995, so all 1994 and many 1995 cases which were registered as having chemotherapy were in fact treated by hormone therapy. However, for prostate cancer the number of cases treated by non-hormonal chemotherapy was very small, and we have treated all pre-1996 “chemotherapy” as hormonal treatment.

Most patients (77%) had some cancer directed treatment. The highest proportion (86%) was in the NWHB and the lowest (71%) in the MHB (χ^2=46.6; p<.001). There was a larger variation in the percentage treated surgically, from 37% in the NWHB to 63% in the ERHA.

Table 7.26. Treatments given for prostate cancer, by health board of residence (all years)

	Number (%) of Registrations								
	Health board of residence								
	Ireland	E	M	MW	NE	NW	S	SE	W
All cases	5576	1686	351	446	455	396	907	701	634
Has treatment	4283(77%)	1292(77%)	248(71%)	368(83%)	326(72%)	341(86%)	702(77%)	542(77%)	464(73%)
Has surgery	3002(54%)	1055(63%)	193(55%)	267(60%)	259(57%)	148(37%)	451(50%)	417(59%)	212(33%)
Has radiotherapy	286(5%)	94(6%)	11(3%)	29(7%)	10(2%)	10(3%)	66(7%)	23(3%)	43(7%)
Has hormone therapy	1902(34%)	363(22%)	106(30%)	144(32%)	132(29%)	284(72%)	341(38%)	205(29%)	327(52%)
Mutually exclusive therapies:									
Surgery only	2189(39%)	861(51%)	137(39%)	203(46%)	188(41%)	52(13%)	318(35%)	322(46%)	108(17%)
Radiotherapy only	124(2%)	44(3%)	4(1%)	9(2%)	2(<1%)	2(1%)	32(4%)	8(1%)	23(4%)
Hormone only	1086(19%)	171(10%)	48(14%)	88(20%)	61(13%)	187(47%)	202(22%)	112(16%)	217(34%)
Surgery + Radiotherapy	68(1%)	24(1%)	1(0%)	12(3%)	4(1%)	3(1%)	11(1%)	7(1%)	6(1%)
Surgery + H	722(13%)	166(10%)	52(15%)	48(11%)	67(15%)	92(23%)	116(13%)	85(12%)	96(15%)
Surgery + R + H	23(<1%)	4(<1%)	3(1%)	4(1%)	0(0%)	1(<1%)	6(1%)	3(<1%)	2(<1%)
Surgery + R or H	813(15%)	194(12%)	56(16%)	64(14%)	71(16%)	96(24%)	133(15%)	95(14%)	104(16%)
Radio + Hormone	71(1%)	22(1%)	3(1%)	4(1%)	4(1%)	4(1%)	17(2%)	5(1%)	12(2%)

*S: surgery C: chemotherapy R radiotherapy H hormone therapy

7.5.2 Logistic regression analysis

To incorporate the possible effects of the many patient and tumour variables which might have influenced treatments, a series of logistic regression models was fitted to the data, using the different treatment modalities as outcomes. As previously mentioned, hormone therapy could be modeled only from 1996 to 1998. Because of the very small numbers we did not model chemotherapy rates.

a Surgery

The simplest model for surgery, incorporating only the health board effects, showed less surgical intervention outside the ERHA, with significantly lower rates in the NEHB, NWHB, SHB and WHB (Table 7.27)

Table 7.27. Odds of surgical treatment by health board; univariate model

Area of residence	odds ratio (95% confidence intervals)	p
ERHA	1.000	
MHB	0.731 (0.579 ;0.922)	0.008
MWHB	0.892 (0.721 ;1.104)	0.295
NEHB	**0.790 (0.641 ;0.975)**	**0.028**
NWHB	**0.357 (0.285 ;0.448)**	**0.000**
SHB	**0.592 (0.502 ;0.696)**	**0.000**
SEHB	0.878 (0.733 ;1.052)	0.158
WHB	**0.300 (0.248 ;0.364)**	**0.000**

A number of patient and tumour factors were significantly related to the probability of having surgery. The chances of having surgery decreased with age, with increasing deprivation, for the unmarried, for cancers of undefined on non-specific cell type, and for patients with clinically advanced cancers.

The following factors significantly improved model fit:

- Patient age
- Deprivation
- Marital status
- Method of presentation
- Year of incidence
- Histological confirmation
- Tumour grade
- T stage
- M stage

If these factors are added to the model, the relative odds of having surgery change. While rates of surgery remain well below ERHA rates in the NWHB, SHB and WHB, they are above the ERHA rate in the MWHB (Table 7.28).

Table 7.28. Odds of surgical treatment by health board; multivariate model[31]

Area of residence	odds ratio(95% confidence intervals)	p
ERHA	1.000	
MHB	0.814 (0.624 ;1.062)	0.129
MWHB	**1.640 (1.250 ;2.151)**	**0.000**
NEHB	0.991 (0.773 ;1.271)	0.946
NWHB	**0.439 (0.336 ;0.575)**	**0.000**
SHB	**0.687 (0.567 ;0.834)**	**0.000**
SEHB	1.139 (0.919 ;1.412)	0.234
WHB	**0.290 (0.234 ;0.361)**	**0.000**

[31] Full multivariate model is described in Appendix 4, Table 1.16

b Hormone therapy

The simplest model for hormone therapy, incorporating only the health board effects, showed a much higher rate of hormone therapy in all areas compared to that in the ERHA, with the highest level in the NWHB, with an odds ratio of over 9 (Table 7.29).

Table 7.29.Odds of hormone treatment by health board; univariate model

Area of residence	odds ratio (95% confidence intervals)	P
ERHA	1.00	
MHB	**1.58 (1.22 ;2.04)**	**0.000**
MWHB	**1.74 (1.38 ;2.19)**	**0.000**
NEHB	**1.49 (1.18 ;1.88)**	**0.001**
NWHB	**9.24 (7.21 ;11.80)**	**0.000**
SHB	**2.20 (1.84 ;2.62)**	**0.000**
SEHB	**1.51 (1.23 ;1.84)**	**0.000**
WHB	**3.88 (3.20 ;4.71)**	**0.000**

As with surgery, a range of patient and tumour factors seemed to be influential in determining hormone treatment.

The following factors significantly improved model fit:

- Patient age
- Deprivation
- Smoker status
- Method of presentation
- Year of incidence
- Co-morbidity
- Histological confirmation
- Tumour grade
- T stage
- M stage
- N stage

When these factors have been corrected for the odds ratios are slightly reduced for all health boards relative to the ERHA, but remain statistically significant for the MHB, NEHB, NWHB and SEHB.(Table 7.30).

Table 7.30. Odds of hormone treatment by health board; multivariate model[32]

Area of residence	odds ratio (95% confidence intervals)	P
ERHA	1.00	
MHB	**1.34 (1.01 ;1.80)**	**0.046**
MWHB	**1.91 (1.47; 2.50)**	**0.000**
NEHB	1.25 (0.96 ;1.63)	0.104
NWHB	**9.96 (7.50 ;13.2)**	**0.000**
SHB	**2.30 (1.86 ;2.84)**	**0.000**
SEHB	**1.28 (1.01; 1.61)**	**0.039**
WHB	**4.14 (3.31 ;5.19)**	**0.000**

[32] Full multivariate model is described in Appendix 4, Table 1.16

c Radiotherapy

For most health board areas, the odds of having radiotherapy were lower than in the ERHA (Table 7.31) and were significantly so in the NEHB and NWHB.

Table 7.31. Odds of radiotherapy by health board; univariate model

Area of residence	odds ratio (95% confidence intervals)	P
ERHA	1.000	
MHB	0.548 (0.290 ;1.034)	0.064
MWHB	1.178 (0.766 ;1.811)	0.456
NEHB	**0.381 (0.197 ;0.737)**	**0.004**
NWHB	**0.439 (0.226 ;0.850)**	**0.015**
SHB	1.329 (0.960 ;1.841)	0.087
SEHB	**0.575 (0.361 ;0.914)**	**0.019**
WHB	1.232 (0.849 ;1.789)	0.272

The following factors significantly improved the model fit:

- Age
- Smoker status
- Co-morbidity
- M stage
- Tumour grade

The odds of having radiotherapy decreased with age, and increased with tumour grade. After correction for the above factors, the odds of radiotherapy treatment were significantly lower than in the ERHA for patients living in the NEHB, NWHB and SEHB and higher in the SHB (Table 7.32).

Table 7.32 Odds of radiotherapy by health board; multivariate model[33]

Area of residence	odds ratio (95% confidence intervals)	P
ERHA	1.000	
MHB	0.530 (0.277 ;1.014)	0.055
MWHB	1.232 (0.786 ;1.933)	0.363
NEHB	**0.376 (0.192 ;0.735)**	**0.004**
NWHB	**0.421 (0.214 ;0.828)**	**0.012**
SHB	**1.639 (1.160 ;2.318)**	**0.005**
SEHB	**0.549 (0.341 ;0.883)**	**0.013**
WHB	1.443 (0.970 ;2.146)	0.070

[33] Full multivariate model is described in Appendix 4, Table 1.16

8 Discussion

8.1 Survival and place of residence

This report shows significant differences between health board areas in the patterns of treatment and survival for cancer patients living in these areas (Table 8.1). The cancers studied are the commonest non-cutaneous cancers and account for 50% of the annual mortality from malignant disease, so their contribution to differences in cancer mortality between health boards is substantial. One of the key recommendations in the 1996 document "Cancer Services in Ireland"[34] was that there should be an investigation of the apparent disparities in both the death rate and incidence of cancer in Ireland. This report provides strong evidence that survival from some types of cancer is influenced by the area in which the patient lives. Previous reports have also indicated that survival and likelihood of receiving cancer-specific therapy is influenced by area of residence (Bain and Campbell, 2000; Campbell et al., 2000,2002, 2002; Howe et al., 1992,1995; Launoy et al., 1992; Mahmud et al., 2003; Mettlin et al., 1997; Quinn et al., 1998; Sainsbury et al., 1995; Schootman and Aft, 2001; Twelves et al., 2001). For two of the four cancers here, breast and colorectal cancer, there were significant differentials between the ERHA and other areas of the country in cancer survival, even after correction for other risk factors such as patient age and stage of cancer. These were, a 33% higher risk for patients with breast cancer in the SHB, and excess risk of 31% for female patients with colorectal cancer living in the WHB and excess risks from 21% to 36% for male patients living in the SEHB, MWHB, SHB and MHB. For prostate cancer, the significant differences in survival which appear on simple comparison of health boards disappear on adjustment for differences in the patients and tumours treated. This finding is in line with expectation, in that outcome for lung and prostate cancer would not be expected to be as sensitive to management differences as that for breast and colorectal cancer.

Table 8.1. Adjusted (multivariate) hazard ratios for all cancers studied, by health board. Ranked by hazard ratio for each cancer type.(Values shown in bold were statistically significantly different from those in the ERHA)

Breast		Colorectal, females		Colorectal, males		All lung		NSCLC		SCLC		Prostate	
Area	**hazard**	**Area**	**hazard**	**Area**	**hazard**	**Area**	**hazard**	**Area**	**hazard**	**Area**	**hazard**	**Area**	**hazard**
ERHA	1.000	NEHB	0.884	NEHB	0.952	MHB	0.969	NEHB	0.922	MWHB	0.999	NEHB	0.871
MHB	1.076	MWHB	0.918	ERHA	1.000	NEHB	0.980	SEHB	0.925	ERHA	1.000	WHB	0.915
MWHB	1.122	SHB	1.000	WHB	1.073	ERHA	1.000	NWHB	0.941	NEHB	1.085	SEHB	0.938
NEHB	1.144	NWHB	1.004	NWHB	1.144	WHB	1.006	MHB	0.957	SHB	1.123	ERHA	1.000
NWHB	0.960	SEHB	1.028	SEHB	**1.214**	NWHB	1.022	WHB	0.981	MHB	1.140	MHB	1.064
SEHB	0.955	MHB	1.065	MWHB	**1.238**	MWHB	1.052	ERHA	1.000	SEHB	1.212	NWHB	1.078
SHB	**1.332**	ERHA	1.133	SHB	**1.305**	SHB	1.073	MWHB	1.037	NWHB	1.217	MWHB	1.108
WHB	1.127	WHB	**1.306**	MHB	**1.357**	SEHB	1.074	SHB	1.051	WHB	1.291	SHB	1.148

It is important to note the limitation of a simple comparison of survival or hazard between health boards, without correction for the many patient and tumour factors which vary between health boards and may also affect outcome. For prostate cancer, for instance, and initial analysis suggest a much worse survival for patients outside the ERHA. However, analysis shows all of this survival difference to be due to patient and tumour factors. The conclusions to be drawn will depend on the purpose of a comparison. In comparing treatment services, it is important to correct for stage; on the other hand a comparison of diagnostic or screening services should not include a correction for stage, as early presentation, and its effect on survival, is one of the outcomes to be studied. As the object of this study was, largely, to contrast patterns of care, we have considered it appropriate to include correction for stage.

[34] Cancer Services in Ireland. Dublin, 1996. Department of Health and Children.

The ERHA has been used as the standard of comparison throughout the report, not because it is regarded as a reference for the rest of the country, but because almost half of the cancer patients in the country are treated there, and these large numbers offer the most stable statistical baseline. However, it is striking that survival in the ERHA tends to be better than in most other areas, even after correction for patient and tumour factors. The single notable exception to this was the poor survival for ERHA patients with non-small cell lung cancer. The ratio of non-small cell cancer to cancers of undefined type was much higher in the ERHA, in keeping with the higher rate of histological confirmation. Poorer survival may therefore be due to the inclusion of more poor-prognosis cancers in the group of “”non-small cell lung cancer” in the ERHA. Apart from this finding, there was no overall consistency between health board areas in survival rankings for the different cancers. With the exception of non-small cell lung cancer, the ERHA was in the top half of all of the rankings. On the other had patients living in the SHB tended to have high hazards for most cancers, with the exception of colorectal in females. Similarly, with the single exception of small cell lung cancer, survival in the MWHB was consistently poorer than average.

The cancers where statistically significant inter-area differences were found to exist, breast and colorectal, were those with the highest rates of surgical intervention, and comparison of survival in surgically treated patients shows no consistency, other than the generally high survival of ERHA residents.

8.1.1 Breast cancer

For all health board areas, survival over the six year follow-up period was poorer than for the ERHA. However, this difference was statistically significant only for the NEHB, NWHB and SHB areas. When adjustment was made for patient and tumour prognostic factors, survival remained statistically significantly poorer for NEHB and SHB residents. This was true also for the subgroup of patients who had surgery, both with and without adjustment for other prognostic factors, but not for those having no surgery.

Rates of surgery were significantly lower for patients in the SHB, and higher than the ERHA rates for those living in the MWHB, NEHB and WHB areas. After adjustment for other factors, chemotherapy rates in the MWHB and radiotherapy rates in the MWHB, NWHB and WHB were also below the ERHA rates. Radiotherapy rates in the SEHB were significantly above those in the ERHA. The poorer survival in the SHB and NEHB areas does not appear to be correlated with these simple measures of treatment.

8.1.2 Colorectal cancer

Overall survival was poorer in most areas than in the ERHA, the sole exception being the NEHB. The differences were statistically significant for females living in the MWHB, NWHB, SHB and WHB and for males in the MHB, NWHB, SHB, SEHB and WHB.

For surgical patients, the pattern was very similar, which would be expected in view of the high rate of surgery, with significantly poorer survival in the MWHB and WHB. For non-surgical patients, survival was significantly poorer in the SHB for both male and females, and better in the MHB. However, after adjustment for other factors survival was poorer only in the MWHB for females and in the MHB, MWHB, NWHB, SHB and SEHB for males. For non-surgical patients survival was not significantly poorer in any area.

Rates of surgery for colorectal cancer were high, and above average in the NEHB. After adjusting for age, stage etc the rate was significantly higher than the ERHA rate in the MWHB only. Radiotherapy use was significantly below ERHA rates for males living in the MWHB, SHB and SEHB and for females in the MWHB, NEHB, SHB and WHB. Chemotherapy rates for females were low in the MWHB, and SHB and for males in the SHB and SEHB.

As with breast cancer, it is difficult to identify any single factor in treatment variation between health boards which might have contributed to the difference. Two aspects of compliance with evidence –based guidelines for the management of prostate cancer were examined (Appendix 4). We found major differences between health boards in these. In the absence of any local generally accepted guidelines for the management of the common cancers, however, it is difficult to test current practice against best practice,

8.1.3 Lung cancer

Overall variation in survival between health boards was slight. As the rates of surgery were much lower than for other cancers, comparison of survival within "surgical" and "non-surgical" groups is less useful. Better prognosis for non-surgical patients in a particular area may be due to more rigorous selection of patients for surgery rather than better overall result. While correction for age, stage and co-morbidity should reduce this bias, it is unlikely to eliminate it completely, especially as the index of co-morbidity was relatively insensitive to factors such as respiratory and cardiac function. A second confounding factor is that the classification into "small cell" and "non-small cell" cancers is important therapeutically and prognostically, but can only be done if the tumour is biopsied or removed. In areas with a lower rate of intervention, more poor-prognosis tumours will be excluded from these two categories and be classed as "unconfirmed". This may, again, have the paradoxical effect of improving survival for small cell and non small scell cancers while reducing or at least not increasing overall survival.

The overall finding was of poor survival at five years—10% for all lung cancer, 12.5% for NSCLC and 5% for SCLC. Hazards for non-small cell cancer patients, particularly those not having surgery, were higher for those living in the ERHA and low in the NEHB, NWHB and WHB. Hazards for patients with SCLC were fairly uniform across areas, although the hazard in the SHB (hazard ratio 1.2, p=.068) was close to being significantly above the ERHA level.

Surgical intervention for NSCLC was more frequent in the ERHA than elsewhere and was significantly lower in the areas with a better survival for non-surgical patients. This strongly suggests that patient selection may be responsible for some of the survival differences in NSCLC between areas. The use of chemotherapy was particularly common in the WHB, but lowest in the NEHB, so this does not correlate well with survival.

8.2 Other factors determining survival

The descriptive analyses tested a wide range of patients and tumour variables against survival. Many of these had a clear correlation with five year survival. However, many of these variables are not independent, and their true impact on survival had to be tested in the models. Unfortunately, some of the risks did not have proportional hazards, that is, the ratio between survival in the different groups varied with time from follow-up, so although we can state that they were related to survival, this relationship cannot be quantified within a Cox model.

8.2.1 Patient factors

a Sex

Males had poorer survival than females for lung and colorectal cancers. For lung cancer survival was 29% poorer in male surgical patients and 9% worse in non-surgical NSCLC. Male colorectal cancer patients had 16% poorer survival following surgery, but there was no difference for non-surgical patients.

b Age

It is well documented that age influences cancer survival and likelihood of receiving therapy (Bergman et al., 1991,1992; Cummings et al., 1988; Fowler et al., 2000; Guadagnoli et al., 1990; Holli et al., 1997; Joslyn, 1999; Ludbrook et al., 2003; Merrill et al., 2002; Quinn et al., 1998; Svendsen et al., 1989). For all cancers analysed in this report, survival decreased with age, even after correcting for all other factors. This was true of surgical and non-surgical patients, with the exception of the very small number of non-surgical breast cancer patients. In almost all cases, the age-related hazards were non-proportional, but where they were not there was typically a 50-60% poorer survival in the oldest age groups. The use of cause-specific survival eliminates, to a large extent, the effects of underlying mortality in this group, so this finding reflects a real survival disadvantage of the elderly patient. The rate of almost all interventions also decreased with age, with the exception of hormone treatment.

c Smoking

Smoking status has also been shown to influence survival and treatment (Coughlin et al., 1996; Goodman et al., 1990; Holli et al., 1999; Manjer et al., 2000; Videtic et al., 2003; Xavier et al., 1996). Smokers, in general, had a poorer survival in this study. For breast cancer this was 26% poorer than lifetime non-smokers; for colorectal cancer 18% poorer (in males only) and for prostate cancer 20%. There was no difference for lung cancer, probably due to the very small number of non-smokers in this group. Part of this may be due to underlying morbidity not detected in this study. Some interventions were also less likely in smokers.

d Marital status

There was a fairly consistent survival disadvantage for the unmarried compared to ever-married patients for most cancers studied in this report. Other studies have published similar reports (Harvei and Kravdal, 1997; Krongrade et al., 1996; Neale et al., 1986). This was greater for men, being 92% poorer in prostate cancer, 25% poorer in lung cancer and 21% poorer in males with colorectal cancer. In some cases married patients were more likely to have surgical intervention. The better survival of married cancer patients has been previously noted. The higher rate of surgery may be due to a higher “value” being placed on the lives of those with family responsibilities, or may be due to the active intervention of patient’s families in the treatment planning process.

e Deprivation

For many cancers, deprivation, irrespective of treatment choices, was related to survival. Many previously published studies have also described similar disadvantages for the socially deprived (Bradley et al., 2002; Brewster et al., 2001; Campbell et al., 2002; Carnon et al., 1994; Coleman et al., 2001; Dayal et al., 1985; Eames et al., 1993; Farley et al., 1989; Greenberg et al., 1988; Greenwald et al., 1998; Harvei and Kravdal, 1997; Hole and McArdle, 2002; Ionescu et al., 1998; Kogevinas and Porta, 1997; Macleod et al., 2000; Monnet et al., 1993; Polednak., 2001; Pollock and Vickers, 1997; Schrijvers et al., 1995; Schrijvers and Mackenbach, 1994; Stavraky et al., 1996; Thomson et al., 2001; Wrigley et al., 2003).

For prostate cancer there was no apparent dependence of survival on deprivation. For breast, lung and colorectal cancers there was no difference in survival with deprivation index for surgical patients, but survival was 46% poorer for non-surgical breast cancer patients living in the most deprived areas compared to those living in the most affluent, 16% poorer for colorectal cancer patients and 23% poorer for non-small cell lung cancer patients.

Other work by the registry has shown that late stage cancers are more frequent in patients living in deprived areas. However, a deprived area has very different characteristics in a remote rural area compared to an urban one, and it is difficult to tell if the determining factors are personal (poverty, lack of access to transport) or area-based (poor GP service, lack of access to services) or, indeed both.

8.2.2 Tumour factors

a Histological confirmation

Absence of histological confirmation of diagnosis was a strong predictor of mortality for cancers not treated surgically. For prostate cancers, non-surgical patients without histological verification of diagnosis had 56% of the survival of those who had; for colorectal cancer this was 65%. For breast and lung cancer it was not a significant factor. In some cases, failure to confirm the cancer histologically would have been due to advanced disease in the patients, making it clinically unacceptable to subject them to further diagnostic procedures. However rational treatment is often based on confirmation that a cancer is actually present and on precise characterisation of its type. In lung cancer, for instance, treatment choices are quite different for small cell and non-small cell cancers.

b Stage

After histological confirmation, stage was the more important predictor of survival for all cancers. Unfortunately it was not always available from the medical records. In many cases hazards associated with stage were also non-proportional.

8.3 Treatment variations

Treatment of cancer patients has also been shown to vary by area of residence or socioeconomic status. Wide regional variations in treatment rates of lung cancer in Ireland have previously been shown (Mahmud et al., 2003). Other reports have shown that deprived patients are less likely to receive cancer-specific therapy for lung cancers and that lower rates of treatment may be a contributory factor in the poorer survival rates of socio-economically deprived patients (Greenwald et al, 1998; Campbell et al., 2002). Affluent communities are also more likely to receive therapy for breast cancer (Bradley et al., 2002). Similar reports have been published for colorectal cancer patients (Campbell et al, 2002; McLeod, 1999) and rural patients with colorectal cancers were also treated less frequently in a specialised health care centre than patients from an urban population (Launoy et al., 1992).

8.3.1 Surgery

Rates of surgery varied considerably between health boards (Table 8.2). For breast and colorectal cancers, rates of surgical intervention were above the ERHA rates in the NWHB, NEHB and WHB. The high rates of surgery in the NEHB may be related for the low hazards for these cancers in that area, although there does not seem to be the same relationship for the MWHB and WHB.

For lung and prostate cancer, rates of surgery were generally less than ERHA rates in all areas, significantly so in the NWHB and WHB areas for both cancers and for lung cancer in the NEHB.

Table 8.2. Odds of surgical treatment by health board; multivariate model (adjusted for patient and tumour factors)

		Colorectal cancer			Lung cancer		
Health board	**Breast cancer**	**Both sexes**	**females**	**males**	**All cancers**	**NSCLC**	**Prostate cancer**
E	1.00	1.00	1.00	1.00	1.00	1.00	1.00
M	0.95	0.88	0.87	0.90	0.91	0.91	0.81
MW	**1.68**	**1.56**	**1.93**	**1.43**	**0.56**	**0.56**	**1.64**
NE	**1.53**	**2.36**	**3.04**	**2.07**	0.73	**0.70**	0.99
NW	1.02	0.86	0.85	0.90	**0.57**	**0.57**	**0.44**
S	**0.76**	1.24	1.28	1.26	0.94	0.89	**0.69**
SE	1.15	0.98	0.94	1.03	0.93	0.85	1.14
W	**1.61**	**1.80**	**2.59**	**1.50**	**0.46**	**0.45**	**0.29**

8.3.2 Radiotherapy

Radiotherapy rates were also quite variable, and, generally, higher in the ERHA (Table 8.3). For breast cancer, radiotherapy was more frequently administered to SEHB residents, and les frequent for patients living in the MWHB, NWHB and WHB. Colorectal cancer radiotherapy rates were highest in the ERHA, and significantly lower in the MWHB, NEHB and SHB for both sexes. Radiotherapy rates for lung cancer were also significantly reduced in the MWHB, NEHB and WHB, and very low for SCLC in the WHB. The largest variation in rates was for prostate cancer, with odds ranging from 0.38 of the ERHA rate in the NEHB to 1.64 in the SHB.

Table 8.3. Odds of radiotherapy by health board; multivariate model (adjusted for patient and tumour factors)

		Colorectal cancer			Lung cancer			
Health board	**Breast cancer**	**Both sexes**	**females**	**males**	**All cancers**	**NSCLC**	**SCLC**	**Prostate cancer**
E	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
M	0.90	0.74	0.71	0.64	0.92	1.10	0.66	0.53
MW	**0.68**	**0.44**	**0.40**	**0.42**	**0.63**	**0.68**	0.71	1.23
NE	0.92	**0.46**	0.69	**0.38**	**0.72**	0.80	0.57	**0.38**
NW	**0.69**	0.81	1.03	0.75	0.86	0.97	0.98	**0.42**
S	1.15	**0.56**	**0.54**	**0.58**	**1.18**	**1.22**	1.23	**1.64**
SE	**1.30**	0.75	0.60	0.78	**0.65**	**0.68**	1.28	**0.55**
W	**0.44**	**0.63**	0.67	**0.62**	**0.56**	**0.57**	**0.24**	1.44

8.3.3 Chemotherapy

For breast cancer, chemotherapy patterns were close to those for radiotherapy, with the exception of the WHB (Table 8.4). Chemotherapy use was most common for colorectal cancer in the NWHB, more for males than females and significantly low in the SHB. The use of chemotherapy for lung cancer (mainly non-small cell) was very high in the WHB, in contrast to the low use of radiotherapy.

Table 8.4. Odds of chemotherapy by health board; multivariate model (adjusted for patient and tumour factors)

		Colorectal cancer			Lung cancer		
Health board	**Breast cancer**	**Both sexes**	**Females**	**Males**	**All cancers**	**NSCLC**	**SCLC**
E	1.00	1.00	1.00	1.00	1.00	1.00	1.00
M	1.08	1.08	1.02	1.14	**0.63**	0.64	0.58
MW	**0.67**	0.93	0.90	0.95	0.86	1.24	**0.30**
NE	0.99	0.98	0.87	1.08	0.73	0.58	0.71
NW	0.88	**1.49**	1.36	**1.70**	1.03	1.07	0.74
S	1.19	**0.52**	**0.59**	**0.51**	0.97	0.74	1.14
SE	1.16	**1.29**	1.11	**1.48**	**0.66**	1.10	**0.45**
W	1.27	0.89	0.83	0.95	**3.06**	**3.55**	1.07

8.3.4 Hormone therapy

As noted earlier, information on the use of hormone treatment was only available from 1996 to 1998. For prostate cancer, it has been assumed that almost all "chemotherapy" given in 1994 and 1995 was hormone therapy. The use of hormone therapy for both cancers was lowest in the ERHA (Table 8.5). The use of hormones for breast cancer was particularly frequent in the SHB and for prostate cancer in the NWHB.

Table 8.5. Odds of chemotherapy by health board; multivariate model (adjusted for patient and tumour factors)

Health board	Breast cancer (1996-1998)	Prostate cancer
E	1.00	1.00
M	1.18	**1.34**
MW	**1.64**	**1.91**
NE	**1.40**	1.25
NW	**1.44**	**9.96**
S	**5.32**	**2.30**
SE	**2.85**	**1.28**
W	**2.27**	**4.14**

8.4 Limitations of the study

8.4.1 Follow-up period

Ideally, all patients in the study should have been followed up for five years from diagnosis. This would have deferred the start of analysis to at least the end of 2003, and in practice for at least a further year, so results would not have been available until 2005. We judged the objectives sufficiently important to compensate for a certain lack of accuracy in the results. The primary effects of the short follow-up time were

1. Wide confidence intervals for five-year survival particularly for cancers with poor survival

2. Patients diagnosed in the earlier years, who have the longest follow-up times, will have a greater influence on the survival results than those diagnosed later.

As a consequence, the findings of the report with regard to survival are more representative of 1995-1996 than of 1998. This is not true of the treatment data.

8.4.2 Data availability

a Stage

As has been shown, one of the most important determinants of survival is cancer stage, and relatively small differences in stage composition of cases may have important consequences for overall survival While the models used here incorporated adjustments for T, N and M stage, three factors may make this correction inadequate.

1. Incomplete stage recording

In many cases, fewer than 50% of cases had full staging data recorded. Unstaged cases may be representative of the average case, or they may be of quite different type. If the reasons for lack of staging vary between health boards, then this may introduce a bias.

2. Stage "migration"

Although this term strictly applies to changes in stage on moving from one hospital to another, it more generally describes the fact that more extensive investigation is more likely to yield a later stage. Stage-specific survival for thoroughly investigated patients is therefore likely to be better than for those less investigated.

3. Subjectivity

Although TNM staging is subject to detailed rules, we have no guarantee that these are being uniformly of consistently applied through the country, or that the same level of detailed information is always in the medical record. As with stage migration, the more thorough the record, the more likely it is that the patient will be assigned a more advanced stage.

b Co-morbidity

The National Cancer Registry does not collect routine data on co-morbidity. The co-morbidity data used here is based on linked HIPE data and the Charlson index, and as noted this linkage could be made only for 70% of patients. S the main reason for lack of linkage was treatment in a private hospital, most of which are in the ERHA, this could introduce

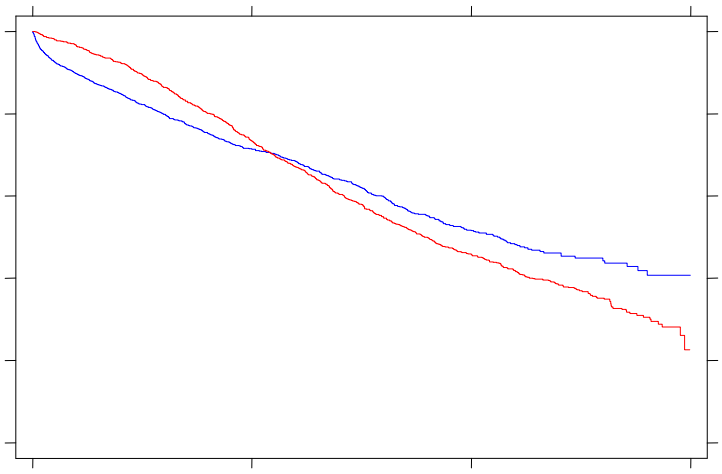
some bias into estimates of co-morbidity by health board. The sensitivity of the Charlson index may also be limited; only 9% of patients had non-zero scores. While this index is of value in predicting death, it may be insufficiently sensitive to give information on the fitness of patients for surgery, radiotherapy and chemotherapy, and treatment choices may have been influenced by levels of co-morbidity not recorded by the Charlson index.

c Socio-economic status

Information on socio-economic status was not available at an individual level. Although the National Cancer Registry records data on occupation, this is incomplete, and available for only 50% of patients. We attempted to compensate for this by using an area-based measure. The underlying assumption of this measure is that residence of a district electoral division (DED) or ward is important in indicating poverty. While this is often true in urban areas, it is less so in rural areas, where DEDs are typically heterogeneous in population. Indicators of affluence in urban areas (e.g. home ownership, car ownership) may also be less sensitive in rural areas.

8.5 Non-proportional hazards

Cox models of survival assume that the relationships between the hazard functions are unchanged with time. However, many of the categories used here are quite heterogeneous, and may have higher than expected hazards early in the follow-up period, and lower hazards later on. This lack of proportionality means that Cox models are invalid, and we have had to stratify the models by these non-proportional variables.



Error! Reference source not found. *Kaplan Meier survival curve for breast cancer*, by chemotherapy shows an example of non-proportional hazards, for chemotherapy of breast cancer. Survival for patients not given chemotherapy is at first poorer, presumably because these are poor-prognosis patients, but at two years after follow-up becomes better than for patients given chemotherapy. Clearly it is difficult to summarise the differences in survival between these two groups in a single hazard ratio.

8.6 Treatment-survival relationship

In the simplest model, treatment is an independent variable and survival a dependent variable; the relationship between them can be easily described. This is the case in clinical trials, where all factors other than treatment are fixed. In clinical practice, however, the choice of treatment is partly determined by the clinical estimate of survival, and so treatment depends on survival or at least anticipated survival almost as much as survival depends on treatment. Statistical modelling cannot help with the interpretation. Better survival for surgical patients in one area may therefore be due to better care, or on the other hand, to selecting only lower-risk patients for surgery. The latter course may, paradoxically, lead to better survival for both surgical and non-surgical patients separately, while reducing overall survival.

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Appendix 1. One, three and five-year survival by health board

Table 1. Breast cancer; one, three and five year survival

Years from diagnosis	Age	<=40	41-50	51-60	61-70	71-80	>80
1		0.953	0.973	0.954	0.924	0.877	0.810
3		0.812	0.856	0.837	0.793	0.744	0.647
5		0.721	0.746	0.737	0.704	0.657	0.530

	Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
1		0.932	0.940	0.929	0.912
3		0.811	0.801	0.795	0.780
5		0.711	0.705	0.706	0.676

	Year of incidence	1994	1995	1996	1997	1998
1		0.928	0.916	0.921	0.932	0.938
3		0.801	0.803	0.813	-	-
5		0.722	--	--	-	-

	Marital status	Married	Not married	Unknown
1		0.949	0.895	0.895
3		0.827	0.759	0.741
5		0.726	0.664	0.685

	Deprivation	Affluent	Intermediate	Deprived	Unknown
1		0.948	0.922	0.907	0.936
3		0.836	0.798	0.766	0.656
5		0.740	0.700	0.664	0.552

	Method of presentation	Screening	Incidental	Symptoms	Unknown
1		0.972	0.871	0.928	0.920
3		0.940	0.698	0.799	0.808
5		0.849	0.577	0.700	0.736

	Histological confirmation	Yes	No
1		0.942	0.549
3		0.817	0.355
5		0.721	0.199

	Morphology	Unspecified	Carcinoma	Adenocarcinoma	Specific
1		0.573	0.872	0.911	0.952
3		0.396	0.728	0.799	0.827
5		0.263	0.611	0.718	0.731

	T stage	T1	T2	T3	T4	TX
1		0.982	0.957	0.913	0.718	0.818
3		0.916	0.831	0.719	0.467	0.677
5		0.837	0.734	0.602	0.310	0.605

	N stage	N0	N1	N2	N3	NX
1		0.976	0.930	0.781	0.900	0.836
3		0.908	0.759	0.534	0.597	0.690
5		0.838	0.630	0.391	0.487	0.591

	M stage	M0	M1	MX
1		0.978	0.581	0.932
3		0.863	0.322	0.812
5		0.778	0.186	0.705

	Summary stage		1	IIA	IIB	IIIA	IV	Unknown
1		0.992	0.989	0.974	0.953	0.922	0.581	0.935
3		0.939	0.908	0.816	0.768	0.635	0.322	0.814
5		0.884	0.828	0.719	0.638	0.545	0.186	0.705

	Grade	1	2	3	4	Unknown
1		0.977	0.967	0.938	0.876	0.894
3		0.939	0.864	0.755	0.730	0.777
5		0.894	0.774	0.635	0.580	0.687

	Health board	E	M	MW	NE	NW	S	SE	W
1		0.936	0.924	0.913	0.922	0.913	0.920	0.925	0.938
3		0.823	0.820	0.794	0.766	0.781	0.776	0.789	0.789
5		0.730	0.703	0.689	0.673	0.682	0.669	0.695	0.704

	Has treatment	No	Yes	Has surgery	No	Yes
1		0.598	0.942		0.726	0.967
3		0.457	0.815		0.519	0.853
5		0.402	0.715		0.388	0.761

Table2. Breast cancer; one year survival by health board

Age	<=40	41-50	51-60	61-70	71-80	>80
Ireland	0.953	0.973	0.954	0.924	0.877	0.810
E	0.954	0.974	0.958	0.927	0.906	0.809
M	0.952	0.966	0.972	0.865	0.873	0.870
MW	0.983	0.969	0.889	0.937	0.854	0.809
NE	0.932	0.967	0.956	0.928	0.857	0.831
NW	0.974	1.000	0.942	0.934	0.841	0.790
S	0.955	0.978	0.975	0.920	0.857	0.737
SE	0.922	0.956	0.943	0.906	0.897	0.910
W	0.958	0.974	0.967	0.962	0.860	0.827

Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.932	0.940	0.929	0.912
E	0.940	0.933	0.941	0.927
M	0.927	0.973	0.907	0.914
MW	0.908	1.000	0.932	0.887
NE	0.930	0.870	0.924	0.925
NW	0.893	0.956	0.959	0.895
S	0.938	0.946	0.902	0.850
SE	0.939	0.940	0.910	0.907
W	0.939	0.957	0.934	0.920

Marital status	Married	Not married	Unknown
Ireland	0.949	0.895	0.895
E	0.955	0.903	0.940
M	0.924	0.923	0.929
MW	0.930	0.889	0.840
NE	0.948	0.877	0.957
NW	0.943	0.877	0.800
S	0.951	0.887	0.476
SE	0.948	0.887	0.960
W	0.960	0.901	0.923

Deprivation status	Affluent	Intermediate	Deprived	Unknown
Ireland	0.948	0.922	0.907	0.936
E	0.949	0.941	0.893	0.963
M	0.928	0.918	0.939	0.923
MW	0.945	0.900	0.909	0.813
NE	0.946	0.921	0.923	0.900
NW	0.964	0.898	0.918	1.000
S	0.948	0.920	0.908	0.864
SE	0.919	0.922	0.915	0.947
W	0.960	0.936	0.920	0.928

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histologicalconfirmation	Yes	No
Ireland	0.972	0.871	0.928	0.920	**Ireland**	0.942	0.549
E	1.000	0.923	0.936	0.914	**E**	0.949	0.423
M	1.000	0.667	0.923	1.000	**M**	0.927	0.643
MW	1.000	0.706	0.916	0.960	**MW**	0.933	0.593
NE	0.778	0.933	0.925	0.875	**NE**	0.938	0.588
NW	0.875	1.000	0.913	0.750	**NW**	0.932	0.583
S	1.000	0.872	0.922	0.750	**S**	0.941	0.515
SE	1.000	1.000	0.921	1.000	**SE**	0.935	0.718
W	0.889	0.786	0.941	1.000	**W**	0.950	0.589

Morphology	Unspecified	Carcinoma	Adenocarcinoma	Specific
Ireland	0.573	0.872	0.911	0.952
E	0.467	0.903	0.928	0.956
M	0.771	0.813	0.833	0.946
MW	0.636	0.885	0.943	0.946
NE	0.604	0.812	0.914	0.950
NW	0.561	0.655	0.893	0.950
S	0.523	0.775	0.875	0.951
SE	0.715	0.892	0.918	0.942
W	0.620	0.884	0.937	0.959

T stage	T1	T2	T3	T4	TX
Ireland	0.982	0.957	0.913	0.718	0.818
E	0.981	0.961	0.931	0.786	0.804
M	0.985	0.941	0.840	0.758	0.884
MW	0.981	0.951	0.830	0.620	0.842
NE	0.991	0.945	0.884	0.731	0.863
NW	0.993	0.955	0.876	0.714	0.720
S	0.983	0.958	0.916	0.650	0.745
SE	0.959	0.955	0.955	0.733	0.878
W	0.992	0.971	0.945	0.652	0.850

N stage	N0	N1	N2	N3	NX
Ireland	0.976	0.930	0.781	0.900	0.836
E	0.976	0.942	0.854	0.943	0.842
M	0.973	0.927	0.745	1.000	0.830
MW	0.977	0.899	0.824	0.667	0.805
NE	0.969	0.916	0.729	1.000	0.872
NW	0.985	0.920	1.000	1.000	0.741
S	0.973	0.949	0.651	0.583	0.804
SE	0.980	0.912	0.778	0.900	0.824
W	0.974	0.914	0.813	1.000	0.927

M stage	M0	M1	MX
Ireland	0.978	0.581	0.932
E	0.981	0.620	0.939
M	0.972	0.618	0.913
MW	0.958	0.498	0.936
NE	0.969	0.500	0.939
NW	0.978	0.576	0.913
S	0.987	0.532	0.916
SE	0.976	0.542	0.923
W	0.982	0.643	0.948

Summary Stage	I	IIA	IIB	IIIA	IIIB	IV	Unknown
Ireland	0.992	0.989	0.974	0.953	0.922	0.581	0.935
E	0.993	0.985	0.983	0.963	0.940	0.620	0.943
M	1.000	0.972	1.000	0.938	1.000	0.618	0.907
MW	0.987	0.990	0.912	0.941	0.700	0.498	0.939
NE	1.000	1.000	0.952	0.794	1.000	0.500	0.941
NW	0.986	1.000	0.958	1.000	0.909	0.576	0.912
S	0.987	0.995	0.986	0.964	0.889	0.532	0.920
SE	0.988	0.986	0.956	0.941	0.929	0.542	0.933
W	1.000	1.000	0.976	1.000	0.857	0.643	0.949

Grade	1	2	3	4	Unknown
Ireland	0.977	0.967	0.938	0.876	0.894
E	0.989	0.972	0.947	0.833	0.892
M	0.956	0.919	0.907	1.000	0.928
MW	0.936	1.000	0.953	0.886	0.892
NE	0.971	0.976	0.936		0.866
NW	1.000	0.941	0.907	1.000	0.870
S	0.936	0.968	0.949	0.667	0.866
SE	1.000	0.969	0.933	0.714	0.909
W	0.980	0.990	0.922	1.000	0.925

Has treatment	No	Yes
Ireland	0.598	0.942
E	0.640	0.951
M	0.756	0.931
MW	0.712	0.921
NE	0.669	0.933
NW	0.378	0.934
S	0.327	0.944
SE	0.708	0.932
W	0.621	0.949

Has surgery	No	Yes
Ireland	0.726	0.967
E	0.751	0.972
M	0.737	0.955
MW	0.649	0.961
NE	0.735	0.954
NW	0.673	0.966
S	0.712	0.968
SE	0.734	0.964
W	0.741	0.970

Table 3. Breast cancer; three year survival by health board

Age	<=40	41-50	51-60	61-70	71-80	>80
Ireland	0.812	0.856	0.837	0.793	0.744	0.647
E	0.852	0.876	0.863	0.802	0.778	0.634
M	0.703	0.898	0.866	0.830	0.680	0.803
MW	0.831	0.856	0.793	0.796	0.724	0.731
NE	0.722	0.839	0.797	0.748	0.717	0.687
NW	0.798	0.872	0.854	0.754	0.724	0.648
S	0.777	0.852	0.829	0.781	0.710	0.575
SE	0.783	0.840	0.802	0.781	0.753	0.708
W	0.881	0.779	0.817	0.822	0.763	0.600

Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.811	0.801	0.795	0.780
E	0.830	0.796	0.833	0.813
M	0.845	0.805	0.772	0.796
MW	0.801	0.893	0.805	0.746
NE	0.796	0.690	0.759	0.751
NW	0.784	0.772	0.790	0.765
S	0.808	0.778	0.752	0.651
SE	0.797	0.772	0.777	0.786
W	0.790	0.907	0.755	0.721

Marital status	Married	Not married	Unknown
Ireland	0.827	0.759	0.741
E	0.854	0.777	0.776
M	0.839	0.787	0.619
MW	0.821	0.756	0.676
NE	0.768	0.753	0.900
NW	0.835	0.714	0.533
S	0.816	0.730	0.286
SE	0.808	0.756	0.872
W	0.803	0.763	0.923

Deprivation status	Affluent	Intermediate	Deprived	Unknown
Ireland	0.836	0.798	0.766	0.656
E	0.849	0.842	0.751	0.703
M	0.897	0.796	0.819	0.846
MW	0.836	0.800	0.674	0.609
NE	0.734	0.776	0.763	--
NW	0.879	0.783	0.765	0.615
S	0.792	0.788	0.780	0.520
SE	0.794	0.794	0.768	0.690
W	0.816	0.770	0.873	0.587

Presentation	Screening	Incidental	Symptoms	Other	Histological confirmation	Yes	No
Ireland	0.940	0.698	0.799	0.808	**Ireland**	0.817	0.355
E	1.000	0.777	0.821	0.811	**E**	0.837	0.289
M	--	--	0.818	1.000	**M**	0.825	--
MW	1.000	0.523	0.796	0.853	**MW**	0.822	0.356
NE	0.622	0.702	0.772	0.656	**NE**	0.782	0.443
NW	0.875	0.857	0.778	--	**NW**	0.799	0.476
S	1.000	0.677	0.776	0.600	**S**	0.801	0.296
SE	0.847	1.000	0.783	0.950	**SE**	0.801	0.500
W	0.778	0.714	0.793	--	**W**	0.807	0.306

Morphology	Unspecified	Carcinoma	Adenocarcinoma	Specific
Ireland	0.396	0.728	0.799	0.827
E	0.336	0.755	0.836	0.846
M	0.514	0.813	0.703	0.843
MW	0.424	0.782	0.792	0.839
NE	0.466	0.754	0.763	0.784
NW	0.458	0.529	0.748	0.817
S	0.309	0.610	0.764	0.810
SE	0.521	0.684	0.817	0.809
W	0.398	0.606	0.849	0.819

T stage	T1	T2	T3	T4	TX
Ireland	0.916	0.831	0.719	0.467	0.677
E	0.925	0.853	0.739	0.539	0.697
M	0.949	0.821	0.731	0.562	0.735
MW	0.890	0.843	0.660	0.411	0.706
NE	0.949	0.794	0.635	0.426	0.793
NW	0.939	0.830	0.726	0.416	0.528
S	0.902	0.799	0.758	0.388	0.563
SE	0.878	0.835	0.701	0.472	0.718
W	0.925	0.824	0.704	0.426	0.585

N stage	N0	N1	N2	N3	NX
Ireland	0.908	0.759	0.534	0.597	0.690
E	0.911	0.802	0.642	0.607	0.719
M	0.918	0.797	0.566	1.000	0.688
MW	0.912	0.736	0.575	0.667	0.670
NE	0.889	0.689	0.227	0.857	0.742
NW	0.934	0.735	1.000	--	0.508
S	0.915	0.733	0.394	0.292	0.638
SE	0.874	0.756	0.601	0.480	0.686
W	0.913	0.696	0.504	0.667	0.733

M stage	M0	M1	MX
Ireland	0.863	0.322	0.812
E	0.871	0.381	0.844
M	0.892	0.228	0.818
MW	0.848	0.299	0.825
NE	0.810	0.214	0.798
NW	0.880	0.224	0.779
S	0.862	0.345	0.761
SE	0.837	0.364	0.799
W	0.870	0.228	0.808

Summary stage	I	IIA	IIB	IIIA	IIIB	IV	Unknown
Ireland	0.939	0.908	0.816	0.768	0.635	0.322	0.705
E	0.924	0.917	0.864	0.768	0.717	0.381	0.843
M	0.884	0.972	0.892	0.938	0.467	0.228	0.817
MW	0.910	0.904	0.744	0.796	0.375	0.299	0.832
NE	0.964	0.821	0.818	0.618	0.656	0.214	0.796
NW	0.941	0.946	0.769	0.813	0.818	0.224	--
S	0.953	0.902	0.748	0.816	0.534	0.345	0.765
SE	0.960	0.878	0.723	0.794	0.465	0.364	0.813
W	0.981	0.905	0.868	0.470	0.612	0.228	0.809

Grade	1	2	3	4	Unknown
Ireland	0.939	0.864	0.755	0.730	0.777
E	0.964	0.875	0.781	0.718	0.788
M	0.900	0.802	0.731	--	0.844
MW	0.891	0.963	0.820	0.752	0.763
NE	0.907	0.827	0.691	--	0.776
NW	0.952	0.817	0.721	0.400	0.780
S	0.870	0.863	0.743	0.667	0.735
SE	0.941	0.929	0.754	0.571	0.774
W	0.958	0.853	0.731	0.857	0.780

Has treatment	No	Yes
Ireland	0.457	0.815
E	0.514	0.839
M	0.605	0.829
MW	0.525	0.806
NE	0.568	0.776
NW	0.283	0.800
S	0.229	0.799
SE	0.558	0.797
W	0.296	0.804

Has surgery	No	Yes
Ireland	0.519	0.853
E	0.578	0.870
M	0.498	0.872
MW	0.503	0.847
NE	0.551	0.803
NW	0.399	0.858
S	0.473	0.846
SE	0.511	0.843
W	0.465	0.842

Table 4. Breast cancer; five year survival by health board

Age	<=40	41-50	51-60	61-70	71-80	>80
Ireland	0.721	0.746	0.737	0.704	0.657	0.530
E	0.763	0.756	0.777	0.720	0.706	0.521
M	0.483	0.837	0.607	0.781	0.593	0.803
MW	0.712	0.746	0.762	0.697	0.548	0.590
NE	0.722	0.794	0.665	0.663	0.617	0.326
NW	0.798	0.760	0.724	0.528	0.706	0.648
S	0.627	0.717	0.736	0.671	0.636	0.415
SE	0.753	0.691	0.730	0.764	0.611	0.487
W	0.770	0.712	0.685	0.743	0.704	--

Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.711	0.705	0.706	0.676
E	0.740	0.718	0.743	0.707
M	0.721	0.690	0.641	0.713
MW	0.667	0.819	0.722	0.688
NE	0.661	0.658	0.719	0.680
NW	0.707	0.708	0.718	0.590
S	0.705	0.627	0.627	0.557
SE	0.710	0.772	0.692	0.641
W	0.708	0.724	0.698	0.673

Marital status	Married	Not married	Unknown
Ireland	0.726	0.664	0.685
E	0.757	0.687	0.707
M	0.701	0.710	0.619
MW	0.719	0.638	--
NE	0.717	0.595	--
NW	0.719	0.638	--
S	0.699	0.633	--
SE	0.713	0.657	0.872
W	0.703	0.699	--

Deprivation status	Affluent	Intermediate	Deprived	Unknown
Ireland	0.740	0.700	0.664	0.552
E	0.756	0.749	0.658	--
M	0.852	0.668	0.660	--
MW	0.726	0.692	0.585	0.609
NE	0.673	0.678	0.672	--
NW	0.817	0.689	0.648	--
S	0.693	0.675	0.670	0.455
SE	0.711	0.709	0.664	0.460
W	0.676	0.710	0.761	--

Presentation	Screening	Incidental	Symptoms	Other/unknown
Ireland	0.849	0.577	0.700	0.736
E	0.904	0.777	0.724	0.742
M	--	--	0.698	1.00
MW	0.750	0.523	0.691	0.683
NE	0.622	0.468	0.686	--
NW	0.729	0.857	0.679	--
S	1.000	0.475	0.670	--
SE	0.424	1.000	0.690	0.950
W	0.778	0.536	0.708	--

Histological confirm.	Yes	No
Ireland	0.721	0.199
E	0.742	0.261
M	0.708	--
MW	0.717	--
NE	0.699	0.152
NW	0.706	0.238
S	0.694	0.173
SE	0.729	0.185
W	0.719	--

Morphology	Unspecified	Carcinoma	Adenocarcinoma	Specific
Ireland	0.263	0.611	0.718	0.731
E	0.314	0.616	0.777	0.753
M	0.514	0.650	0.595	0.725
MW	0.343	0.656	0.706	0.740
NE	0.160	0.712	0.520	0.709
NW	0.229	0.340	0.599	0.735
S	0.196	0.523	0.713	0.698
SE	0.209	0.638	0.755	0.731
W	0.398	0.556	0.774	0.727

T stage	T1	T2	T3	T4	TX
Ireland	0.837	0.734	0.602	0.310	0.605
E	0.866	0.770	0.603	0.354	0.614
M	0.816	0.718	0.509	0.562	0.657
MW	0.797	0.723	0.542	--	0.638
NE	0.758	0.727	0.523	0.426	0.727
NW	0.866	0.743	0.650	0.179	0.528
S	0.796	0.698	0.622	0.246	0.511
SE	0.848	0.721	0.668	0.235	0.637
W	0.873	0.689	0.660	0.335	0.531

N stage	N0	N1	N2	N3	NX
Ireland	0.838	0.630	0.391	0.487	0.591
E	0.855	0.685	0.433	0.440	0.603
M	0.832	0.627	--	--	0.688
MW	0.841	0.557	0.431	--	0.604
NE	0.819	0.565	0.227	0.857	0.553
NW	0.858	0.614	--	--	0.422
S	0.819	0.611	0.313	--	0.523
SE	0.805	0.645	0.364	--	0.596
W	0.842	0.546	0.504	0.667	0.704

M stage	M0	M1	MX
Ireland	0.778	0.186	0.705
E	0.775	0.216	0.769
M	0.774	--	0.715
MW	0.751	0.230	0.705
NE	0.741	0.214	0.656
NW	0.810	--	0.672
S	0.793	0.171	0.612
SE	0.783	0.266	0.635
W	0.771	0.152	0.745

Summary stage	I	IIA	IIB	IIIA	IIIB	IV	unknown
Ireland	0.884	0.828	0.719	0.638	0.545	0.186	0.705
E	0.890	0.838	0.773	0.590	0.589	0.216	0.755
M	0.796	0.796	0.727	0.938	0.467	--	0.720
MW	0.856	0.770	0.563	0.697	--	0.230	0.731
NE	0.857	0.735	0.818	0.463	0.656	0.214	0.657
NW	0.900	0.850	0.642	0.813	0.818	--	0.671
S	0.876	0.869	0.651	0.816	0.334	0.171	0.621
SE	0.934	0.813	0.699	0.605	0.465	0.266	0.662
W	0.918	0.835	0.719	0.313	0.490	0.152	0.738

Grade	I	II	III	IV	Unknown
Ireland	0.894	0.774	0.635	0.580	0.687
E	0.922	0.789	0.663	0.592	0.701
M	0.720	0.536	0.641	--	0.749
MW	0.810	0.963	0.715	0.559	0.680
NE	0.907	0.723	0.562	--	0.713
NW	0.952	0.686	0.654	0.400	0.672
S	0.870	0.758	0.595	--	0.642
SE	0.941	0.929	0.674	0.571	0.651
W	0.878	0.807	0.565	0.857	0.715

Has treatment	No	Yes
Ireland	0.402	0.715
E	0.465	0.743
M	0.605	0.709
MW	0.467	0.698
NE	--	0.683
NW	--	0.698
S	0.229	0.687
SE	0.335	0.708
W	0.296	0.716

Has surgery	No	Yes
Ireland	0.388	0.761
E	0.438	0.784
M	0.427	0.748
MW	0.388	0.742
NE	0.410	0.718
NW	0.191	0.784
S	0.357	0.738
SE	0.325	0.770
W	0.430	0.749

Table 5. Colorectal cancer; one, three and five year survival

Years from diagnosis	Sex	Female	Male
1		0.726	0.722
3		0.549	0.518
5		0.484	0.432

	Age	<=60	61-70	71-80	80+
1		0.815	0.774	0.687	0.551
3		0.599	0.572	0.502	0.405
5		0.484	0.505	0.437	0.360

	Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
1		0.743	0.728	0.717	0.681
3		0.549	0.536	0.511	0.508
5		0.477	0.458	0.411	0.451

	Year of incidence	1994	1995	1996	1997	1998
1		0.708	0.734	0.713	0.729	0.734
3		0.523	0.549	0.530	--	--
5		0.458	--	--	--	--

	Marital status	Married	Not married	Unknown
1		0.772	0.664	0.602
3		0.579	0.474	0.402
5		0.482	0.423	0.402

	Deprivation	Affluent	Intermediate	Deprived	Unknown
1		0.753	0.722	0.692	0.740
3		0.564	0.532	0.512	0.461
5		0.494	0.446	0.445	0.433

	Method of presentation	Screening	Incidental	Symptoms	Unknown
1		0.941	0.770	0.723	0.727
3		0.882	0.629	0.528	0.604
5		0.706	0.604	0.451	0.564

	Histological confirmation	Yes	No
1		0.765	0.210
3		0.565	0.114
5		0.484	0.098

	T stage	T1	T2	T3	T4	TX
1		0.918	0.896	0.811	0.481	0.387
3		0.834	0.780	0.576	0.233	0.261
5		0.825	0.666	0.481	0.191	0.235

	N stage	N0	N1	N2	N3	NX
1		0.891	0.750	0.623	0.477	0.470
3		0.740	0.453	0.342	0.320	0.320
5		0.661	0.346	0.274	0.218	0.275

	M stage	M0	M1	MX
1		0.878	0.344	0.762
3		0.697	0.113	0.579
5		0.608	0.079	0.493

	Site	Colon	Junction	rectal/anal
1		0.711	0.745	0.745
3		0.535	0.517	0.529
5		0.468	0.446	0.429

	Summary stage	I	II	III	IV	Unknown
1		0.959	0.903	0.843	0.343	0.756
3		0.891	0.743	0.552	0.111	0.574
5		0.802	0.669	0.440	0.075	0.488

	Grade	I	II	III	IV	Unknown
1		0.816	0.811	0.636	0.384	0.524
3		0.635	0.597	0.428	0.362	0.383
5		0.532	0.503	0.376	0.310	0.356

	Health board	E	M	MW	NE	NW	S	SE	W
1		0.761	0.747	0.713	0.753	0.674	0.697	0.700	0.681
3		0.567	0.540	0.528	0.583	0.510	0.503	0.505	0.470
5		0.478	0.469	0.432	0.519	0.455	0.439	0.430	0.401

	Has treatment	No	Yes
1		0.287	0.808
3		0.174	0.600
5		0.153	0.514

	Has surgery	No	Yes
1		0.320	0.827
3		0.163	0.624
5		0.141	0.534

Table 6. Colorectal cancer; one year survival by health board

Sex	Female	Male	Age	<=60	61-70	71-80	80+
Ireland	0.726	0.722		0.815	0.774	0.687	0.551
E	0.749	0.770		0.844	0.793	0.720	0.617
M	0.807	0.696		0.831	0.793	0.705	0.614
MW	0.700	0.721		0.829	0.756	0.663	0.558
NE	0.734	0.767		0.788	0.842	0.715	0.596
NW	0.690	0.662		0.817	0.690	0.663	0.540
S	0.697	0.697		0.760	0.773	0.675	0.504
SE	0.736	0.673		0.800	0.769	0.664	0.435
W	0.674	0.684		0.823	0.719	0.641	0.488

Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.743	0.728	0.717	0.681
E	0.768	0.773	0.772	0.734
M	0.775	0.703	0.752	0.705
MW	0.758	0.654	0.740	0.617
NE	0.779	0.805	0.708	0.674
NW	0.675	0.670	0.620	0.753
S	0.722	0.710	0.713	0.559
SE	0.729	0.677	0.721	0.610
W	0.728	0.680	0.616	0.613

Marital status	Married	Not married	Unknown
Ireland	0.772	0.664	0.602
E	0.801	0.708	0.688
M	0.800	0.684	0.600
MW	0.760	0.664	0.581
NE	0.789	0.706	0.676
NW	0.743	0.609	0.333
S	0.757	0.633	0.227
SE	0.744	0.640	0.643
W	0.734	0.612	0.490

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.753	0.722	0.692	0.740
E	0.770	0.773	0.720	0.799
M	0.704	0.762	0.744	0.674
MW	0.727	0.699	0.721	0.797
NE	0.837	0.751	0.755	0.681
NW	0.647	0.685	0.650	0.806
S	0.730	0.707	0.638	0.634
SE	0.733	0.703	0.646	0.772
W	0.706	0.679	0.657	0.682

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
Ireland	0.941	0.770	0.723	0.727		0.765	0.210
E	0.857	0.857	0.758	0.801		0.783	0.241
M	--	1.000	0.746	0.667		0.774	0.401
MW	1.000	1.000	0.716	0.599		0.741	0.309
NE	--	0.750	0.755	0.571		0.786	0.286
NW	1.000	--	0.675	0.625		0.742	0.117
S	1.000	0.665	0.699	--		0.762	0.168
SE	1.000	0.714	0.700	0.667		0.758	0.171
W	1.000	0.833	0.678	0.800		0.726	0.195

Site	Colon	junction	rectal/anal
Ireland	0.711	0.745	0.745
E	0.761	0.751	0.762
M	0.750	0.793	0.729
MW	0.712	0.721	0.713
NE	0.728	0.810	0.792
NW	0.646	0.833	0.691
S	0.685	0.706	0.721
SE	0.678	0.764	0.730
W	0.642	0.664	0.766

T stage	T1	T2	T3	T4	TX
Ireland	0.918	0.896	0.811	0.481	0.387
E	0.957	0.926	0.821	0.521	0.478
M	0.893	0.888	0.803	0.442	0.523
MW	0.886	0.838	0.797	0.464	0.423
NE	0.853	0.890	0.824	0.558	0.344
NW	0.968	0.899	0.771	0.355	0.323
S	0.972	0.869	0.838	0.450	0.237
SE	0.738	0.869	0.822	0.476	0.351
W	0.878	0.945	0.759	0.520	0.366

N stage	N0	N1	N2	N3	NX
Ireland	0.891	0.750	0.623	0.477	0.470
E	0.910	0.773	0.638	0.648	0.525
M	0.900	0.838	0.558	0.333	0.524
MW	0.877	0.757	0.655	0.333	0.509
NE	0.862	0.768	0.650	0.778	0.531
NW	0.887	0.644	0.400	--	0.427
S	0.892	0.728	0.708	0.693	0.338
SE	0.865	0.734	0.663	0.191	0.368
W	0.887	0.764	0.501	0.389	0.517

M stage	M0	M1	MX
Ireland	0.878	0.344	0.762
E	0.889	0.413	0.804
M	0.873	0.388	0.755
MW	0.868	0.331	0.692
NE	0.887	0.384	0.829
NW	0.841	0.321	0.680
S	0.896	0.253	0.725
SE	0.878	0.316	0.702
W	0.820	0.272	0.771

Summary stage	I	2	3	4	Unknown
Ireland	0.959	0.903	0.843	0.343	0.756
E	0.974	0.926	0.850	0.411	0.794
M	0.924	0.859	0.889	0.380	0.755
MW	0.925	0.918	0.848	0.328	0.706
NE	0.974	0.902	0.861	0.384	0.822
NW	0.960	0.851	0.764	0.321	0.676
S	0.979	0.904	0.850	0.253	0.725
SE	0.916	0.884	0.889	0.316	0.697
W	0.971	0.896	0.741	0.273	0.761

Grade	I	II	III	IV	Unknown
Ireland	0.816	0.811	0.636	0.384	0.524
E	0.935	0.816	0.647	0.667	0.562
M	0.805	0.774	0.666	--	0.627
MW	0.804	0.796	0.544	0.519	0.545
NE	0.836	0.834	0.644	0.250	0.627
NW	0.801	0.783	0.652	0.214	0.440
S	0.734	0.813	0.651	0.167	0.410
SE	0.825	0.807	0.564	---	0.509
W	0.789	0.800	0.632	0.370	0.525

Has treatment	No	Yes
Ireland	0.287	0.808
E	0.324	0.835
M	0.389	0.827
MW	0.287	0.786
NE	0.320	0.812
NW	0.200	0.783
S	0.207	0.808
SE	0.304	0.796
W	0.288	0.754

Has surgery	No	Yes
	0.320	0.827
	0.366	0.854
	0.406	0.838
	0.319	0.793
	0.331	0.823
	0.283	0.808
	0.217	0.835
	0.330	0.816
	0.325	0.770

Table 7. Colorectal cancer; three year survival by health board

Sex	Female	Male	Age	<=60	61-70	71-80	80+
Ireland	0.549	0.518	**Ireland**	0.599	0.572	0.502	0.405
E	0.576	0.559	**E**	0.637	0.597	0.519	0.466
M	0.632	0.457	**M**	0.570	0.607	0.509	0.435
MW	0.487	0.551	**MW**	0.585	0.597	0.497	0.356
NE	0.584	0.580	**NE**	0.572	0.674	0.550	0.501
NW	0.504	0.513	**NW**	0.611	0.528	0.535	0.312
S	0.530	0.482	**S**	0.560	0.529	0.496	0.381
SE	0.537	0.481	**SE**	0.564	0.576	0.480	0.282
W	0.486	0.458	**W**	0.608	0.461	0.421	0.393

Smoker	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.549	0.536	0.511	0.508
E	0.568	0.568	0.580	0.554
M	0.605	0.517	0.448	0.510
MW	0.569	0.492	0.520	0.457
NE	0.598	0.604	0.551	0.563
NW	0.517	0.495	0.464	0.568
S	0.535	0.531	0.466	0.390
SE	0.503	0.515	0.526	0.477
W	0.518	0.477	0.407	0.385

Married	Married	Not married	Unknown
Ireland	0.579	0.474	0.402
E	0.603	0.524	0.447
M	0.586	0.489	0.375
MW	0.595	0.446	0.407
NE	0.623	0.538	0.405
NW	0.616	0.398	--
S	0.554	0.447	0.136
SE	0.547	0.441	0.563
W	0.504	0.426	0.306

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.564	0.532	0.512	0.461
E	0.587	0.562	0.543	--
M	0.501	0.577	0.439	0.569
MW	0.548	0.522	0.504	0.476
NE	0.556	0.607	0.580	--
NW	0.444	0.510	0.510	0.588
S	0.529	0.516	0.439	0.452
SE	0.656	0.509	0.486	0.405
W	0.484	0.469	0.473	0.448

Presentation	Screening	Incidental	Symptoms	Other/Unknown	Histological confirmation	Yes	No
Ireland	0.882	0.629	0.528	0.604		0.565	0.114
E	0.857	0.762	0.560	0.650		0.586	0.123
M	--	0.400	0.540	0.667		0.568	0.138
MW	1.000	--	0.524	0.545		0.550	0.206
NE	--	0.500	0.584	0.571		0.611	0.182
NW	1.000	--	0.507	0.625		0.565	0.052
S	1.000	0.576	0.501	--		0.554	0.077
SE	0.667	0.714	0.503	0.467		0.545	0.140
W	1.000	0.556	0.468	0.600		0.506	0.084

Site	colon	junction	rectal/anal
Ireland	0.535	0.517	0.529
E	0.579	0.497	0.564
M	0.564	0.515	0.480
MW	0.537	0.578	0.492
NE	0.566	0.605	0.612
NW	0.504	0.593	0.485
S	0.512	0.500	0.483
SE	0.510	0.577	0.476
W	0.440	0.410	0.551

T stage	T1	T2	T3	T4	TX

Ireland	0.834	0.780	0.576	0.233	0.261
E	0.883	0.843	0.581	0.230	0.362
M	0.727	0.653	0.576	0.301	0.360
MW	0.827	0.693	0.562	0.224	0.323
NE	0.798	0.789	0.619	0.367	0.212
NW	0.887	0.841	0.537	0.174	0.203
S	0.861	0.752	0.598	0.189	0.087
SE	0.618	0.720	0.575	0.293	0.252
W	0.878	0.801	0.526	0.149	0.219

N stage	**N0**	**N1**	**N2**	**N3**	**NX**
Ireland	0.740	0.453	0.342	0.320	0.320
E	0.764	0.468	0.376	0.463	0.375
M	0.755	0.529	0.194	0.250	0.339
MW	0.721	0.466	0.387	0.333	0.341
NE	0.719	0.583	0.336	0.444	0.381
NW	0.794	0.354	0.320	--	0.280
S	0.734	0.411	0.380	0.490	0.198
SE	0.710	0.383	0.397	0.191	0.273
W	0.687	0.500	0.238	0.200	0.335

M stage	**M0**	**M1**	**MX**
Ireland	0.697	0.113	0.579
E	0.717	0.138	0.632
M	0.682	0.186	0.522
MW	0.690	0.070	0.552
NE	0.749	0.169	0.662
NW	0.689	0.097	0.531
S	0.706	0.035	0.526
SE	0.664	0.154	0.517
W	0.616	0.062	0.560

Summary	**I**	**II**	**III**	**IV**	**Unknown**
Ireland	0.891	0.743	0.552	0.111	0.574
E	0.928	0.756	0.607	0.134	0.619
M	0.777	0.721	0.566	0.175	0.532
MW	0.860	0.735	0.563	0.061	0.555
NE	0.867	0.794	0.670	0.169	0.654
NW	0.944	0.747	0.323	0.097	0.525
S	0.913	0.753	0.497	0.035	0.529
SE	0.813	0.739	0.513	0.154	0.508
W	0.861	0.642	0.521	0.062	0.556

Grade	**I**	**II**	**III**	**IV**	**Unknown**
Ireland	0.635	0.597	0.428	0.362	0.383
E	0.748	0.614	0.422	0.667	0.420
M	0.625	0.503	0.456	--	0.444
MW	0.624	0.615	0.294	0.519	0.346
NE	0.659	0.645	0.474	0.250	0.496
NW	0.649	0.606	0.440	0.214	0.337
S	0.649	0.578	0.455	0.167	0.302
SE	0.507	0.588	0.332	--	0.405
W	0.612	0.538	0.448	-	0.340

Has treatment	**No**	**Yes**
Ireland	0.174	0.600
E	0.223	0.625
M	0.213	0.610
MW	0.166	0.590
NE	0.201	0.635
NW	0.100	0.604
S	0.085	0.595
SE	0.220	0.574
W	0.155	0.527

Has surgery	**No**	**Yes**
Ireland	0.163	0.624
E	0.212	0.650
M	0.198	0.628
MW	0.200	0.594
NE	0.203	0.646
NW	0.100	0.651
S	0.075	0.622
SE	0.197	0.601
W	0.124	0.555

Table 8. Colorectal cancer; five year survival by health board

Sex	Female	Male	Age	<=60	61-70	71-80	80+
Ireland	0.484	0.432	**Ireland**	0.484	0.505	0.437	0.360
E	0.504	0.456	**E**	0.516	0.510	0.443	0.422
M	0.563	0.381	**M**	0.436	0.536	0.509	0.322
MW	0.408	0.443	**MW**	0.447	0.521	0.373	0.326
NE	0.517	0.518	**NE**	0.523	0.584	0.494	0.445
NW	0.453	0.454	**NW**	0.494	0.501	0.489	0.260
S	0.473	0.413	**S**	0.464	0.461	0.447	0.357
SE	0.465	0.404	**SE**	0.443	0.509	0.420	0.259
W	0.446	0.369	**W**	0.468	0.454	0.347	0.324

Smoker	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.477	0.458	0.411	0.451
E	0.480	0.468	0.465	0.494
M	0.530	0.474	0.403	0.407
MW	0.452	0.438	0.403	0.430
NE	0.518	0.539	0.480	0.563
NW	0.476	0.479	0.352	0.520
S	0.469	0.443	0.396	0.373
SE	0.446	0.427	0.444	0.362
W	0.483	0.387	0.273	0.355

Married	Married	Not married	Unknown
Ireland	0.482	0.423	0.402
E	0.488	0.468	0.447
M	0.498	0.433	0.375
MW	0.470	0.388	0.407
NE	0.554	0.471	0.405
NW	0.538	0.369	--
S	0.465	0.416	--
SE	0.464	0.374	0.563
W	0.421	0.376	--

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.494	0.446	0.445	0.433
E	0.511	0.461	0.448	--
M	0.459	0.490	0.402	--
MW	0.444	0.402	0.504	0.476
NE	0.556	0.527	0.522	--
NW	0.444	0.442	0.469	0.588
S	0.478	0.446	0.381	0.387
SE	0.627	0.415	0.424	0.405
W	0.403	0.398	0.415	0.448

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
Ireland	0.706	0.604	0.451	0.564		0.484	0.098
E	--	0.653	0.471	0.594		0.495	0.082
M	--	--	0.467	--		0.496	--
MW	0.500	--	0.430	--		0.449	--
NE	--	--	0.518	0.571		0.543	--
NW	1.000	--	0.451	0.625		0.504	--
S	1.000	0.576	0.436	--		0.483	0.077
SE	--	0.714	0.425	--		0.463	0.140
W	1.000	--	0.399	--		0.431	0.084

site	colon	junction	rectal/anal
Ireland	0.468	0.446	0.429
E	0.499	0.439	0.447
M	0.498	0.412	0.398
MW	0.438	0.435	0.415
NE	0.520	0.538	0.496
NW	0.461	0.593	0.385
S	0.447	0.474	0.412
SE	0.445	0.477	0.387
W	0.396	0.297	0.434

T stage	T1	T2	T3	T4	TX
Ireland	0.825	0.666	0.481	0.191	0.235
E	0.868	0.693	0.488	0.185	0.296
M	0.727	0.553	0.497	0.301	0.303
MW	0.827	0.524	0.462	--	0.323
NE	0.798	0.724	0.528	0.340	0.212
NW	0.837	0.810	0.426	0.174	0.203
S	0.861	0.692	0.489	0.165	0.087
SE	0.618	0.624	0.485	0.230	0.221
W	0.878	0.652	0.440	0.099	0.219

N stage	N0	N1	N2	N3	NX
Ireland	0.661	0.346	0.274	0.218	0.275
E	0.667	0.366	0.319	0.347	0.308
M	0.657	0.442	0.194	--	0.287
MW	0.587	0.356	--	--	0.297
NE	0.685	0.421	0.294	0.296	0.354
NW	0.767	0.215	--	--	0.267
S	0.660	0.330	0.259	0.272	0.189
SE	0.654	0.272	0.304	--	0.206
W	0.614	0.382	0.181	--	0.291

M stage	M0	M1	MX
Ireland	0.608	0.079	0.493
E	0.620	0.101	0.526
M	0.566	0.186	0.467
MW	0.585	0.035	0.403
NE	0.669	0.125	0.608
NW	0.650	0.097	0.433
S	0.625	--	0.474
SE	0.577	0.123	0.425
W	0.538	0.039	0.477

Summary	I	II	III	IV	Unknown
Ireland	0.802	0.669	0.440	0.075	0.488
E	0.761	0.695	0.499	0.096	0.515
M	0.699	0.616	0.439	0.175	0.469
MW	0.726	0.598	0.482	0.024	0.457
NE	0.867	0.745	0.509	0.125	0.602
NW	0.925	0.747	0.194	0.097	0.424
S	0.880	0.665	0.372	--	0.481
SE	0.761	0.674	0.380	0.123	0.412
W	0.765	0.558	0.469	0.039	0.470

grade	1	2	3	4	Unknown
Ireland	0.532	0.503	0.376	0.310	0.356
E	0.659	0.510	0.375	0.444	0.378
M	0.530	0.437	0.411	--	0.414
MW	0.503	0.508	0.196	--	0.303
NE	0.604	0.558	0.415	0.250	0.496
NW	0.581	0.523	0.407	--	0.337
S	0.590	0.489	0.421	--	0.294
SE	0.456	0.502	0.241	--	0.348
W	0.444	0.465	0.384	--	0.329

Has treatment	No	Yes
Ireland	0.153	0.514
E	0.183	0.529
M	0.189	0.527
MW	0.133	0.483
NE	0.134	0.568
NW	0.100	0.536
S	0.074	0.520
SE	0.208	0.483
W	0.155	0.447

Has surgery	No	Yes
Ireland	0.141	0.534
E	0.161	0.552
M	0.178	0.542
MW	0.167	0.485
NE	0.136	0.578
NW	0.100	0.577
S	0.065	0.543
SE	0.187	0.503
W	0.124	0.470

Table 9.All lung cancer; one year survival by health board

Years from diagnosis	Sex	Female	Male	Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
1		0.267	0.261		0.295	0.293	0.254	0.228
3		0.131	0.108		0.175	0.133	0.103	0.104
5		0.103	0.088		0.159	0.107	0.076	0.098

	Age	<50	50-54	55-59	60-64	65-69	70-74	74-79
1		0.423	0.336	0.295	0.290	0.285	0.258	0.219
3		0.239	0.148	0.141	0.120	0.136	0.128	0.064
5		0.219	0.097	0.105	0.097	0.101	0.110	0.054

	Year of incidence	1994	1995	1996	1997	1998
1		0.260	0.245	0.265	0.259	0.284
3		0.129	0.122	0.120	--	--
5		0.108	--	--	--	--

	Marital status	Married	Not married	Unknown	Cell type	NSCLC	SCLC	Unconfirmed
1		0.293	0.223	0.239		0.307	0.233	0.165
3		0.129	0.100	0.077		0.145	0.060	0.069
5		0.102	0.081	0.077		0.115	0.054	0.056

	Deprivation	Affluent	Intermediate	Deprived	Unknown
1		0.269	0.252	0.240	0.364
3		0.127	0.111	0.105	0.109
5		0.101	0.087	0.088	0.073

	Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
1		0.629	0.461	0.255	0.304		0.293	0.165
3		0.183	0.265	0.110	0.135		0.130	0.069
5		.	0.182	0.091	0.091		0.104	0.056

	T stage	T1	T2	T3	T4	TX
1		0.523	0.375	0.271	0.167	0.189
3		0.329	0.183	0.101	0.046	0.069
5		0.253	0.145	0.076	0.046	0.057

	N stage	N0	N1	N2	N3	NX
1		0.539	0.345	0.254	0.173	0.187
3		0.340	0.141	0.068	0.057	0.068
5		0.280	0.106	0.052	0.029	0.057

	M stage	M0	M1	MX
1		0.441	0.110	0.275
3		0.230	0.035	0.115
5		0.186	0.030	0.091

	Summary	1	2	3A	3B	4	Unknown
1		0.665	0.586	0.349	0.257	0.109	0.284
3		0.463	0.289	0.123	0.066	0.035	0.119
5		0.390	0.206	0.095	0.052	0.029	0.095

	Grade	I	II	III	IV	Unknown
1		0.369	0.420	0.316	0.231	0.208
3		0.188	0.222	0.134	0.085	0.086
5		0.108	0.172	0.110	0.078	0.070

	Health board	E	M	MW	NE	NW	S	SE
1		0.277	0.274	0.242	0.259	0.269	0.243	0.241
3		0.116	0.118	0.093	0.121	0.127	0.107	0.118
5		0.088	0.087	0.086	0.099	0.113	0.078	0.101

	Has treatment	No	Yes	Has surgery	No	Yes
1		0.189	0.666		0.159	0.358
3		0.061	0.409		0.066	0.161
5		0.049	0.329		0.054	0.128

Table 10. All lung cancer; one year survival by health board

Sex	Female	Male	Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.267	0.261	Ireland	0.295	0.293	0.254	0.228
E	0.294	0.267	E	0.361	0.292	0.265	0.258
M	0.312	0.258	M	0.297	0.296	0.262	0.319
MW	0.206	0.259	MW	0.273	0.275	0.235	0.180
NE	0.305	0.235	NE	0.284	0.294	0.247	0.233
NW	0.236	0.281	NW	0.289	0.322	0.261	0.135
S	0.236	0.246	S	0.257	0.283	0.244	0.153
SE	0.198	0.260	SE	0.215	0.294	0.225	0.229
W	0.265	0.268	W	0.274	0.302	0.264	0.202

Age	<50	50-54	55-59	60-64	65-69	70-74	74-79	>=80
Ireland	0.423	0.336	0.295	0.290	0.285	0.258	0.219	0.173
E	0.408	0.337	0.298	0.286	0.314	0.259	0.250	0.181
M	0.563	0.267	0.409	0.394	0.201	0.319	0.214	0.117
MW	0.570	0.386	0.208	0.318	0.277	0.211	0.197	0.079
NE	0.432	0.260	0.444	0.225	0.274	0.260	0.196	0.186
NW	0.294	0.474	0.208	0.319	0.302	0.310	0.236	0.156
S	0.310	0.329	0.279	0.341	0.248	0.192	0.193	0.198
SE	0.455	0.331	0.311	0.181	0.273	0.253	0.167	0.192
W	0.500	0.301	0.221	0.315	0.283	0.324	0.212	0.185

Marital status	Married	Not married	Unknown
Ireland	0.293	0.223	0.239
E	0.297	0.247	0.253
M	0.324	0.203	0.480
MW	0.283	0.188	0.228
NE	0.298	0.221	0.091
NW	0.321	0.210	0.208
S	0.265	0.215	0.160
SE	0.281	0.196	0.211
W	0.304	0.222	0.323

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.269	0.252	0.240	0.364
E	0.277	0.253	0.249	0.428
M	0.245	0.222	0.350	0.520
MW	0.241	0.253	0.201	0.361
NE	0.307	0.247	0.256	0.284
NW	0.250	0.283	0.224	0.465
S	0.262	0.256	0.213	0.180
SE	0.215	0.250	0.199	0.323
W	0.283	0.245	0.275	0.308

Presentation	Screening	Incidental	Symptoms	Other/unknown
Ireland	0.629	0.461	0.255	0.304
E	1.000	0.518	0.267	0.313
M	--	0.571	0.265	0.267
MW	--	0.385	0.241	0.167
NE	--	0.481	0.249	0.267
NW	--	0.588	0.254	0.333
S	0.429	0.191	0.243	0.200
SE	--	0.258	0.232	0.513
W	1.000	0.647	0.255	0.200

Histological confirmation	Yes	No
	0.293	0.165
	0.303	0.146
	0.294	0.203
	0.272	0.196
	0.282	0.194
	0.316	0.159
	0.270	0.148
	0.291	0.135
	0.290	0.213

Cell type	NSCLC	SCLC	Unconfirmed
Ireland	0.307	0.233	0.165
E	0.316	0.246	0.146
M	0.309	0.214	0.203
MW	0.262	0.320	0.196
NE	0.313	0.165	0.194
NW	0.336	0.230	0.159
S	0.277	0.243	0.148
SE	0.311	0.201	0.135
W	0.306	0.190	0.213

T stage	T1	T2	T3	T4	TX
Ireland	0.523	0.375	0.271	0.167	0.189
E	0.570	0.405	0.244	0.155	0.184
M	0.489	0.333	0.286	0.090	0.238
MW	0.356	0.391	0.223	0.168	0.195
NE	0.425	0.302	0.241	0.182	0.224
NW	0.733	0.350	0.283	0.207	0.211
S	0.411	0.376	0.356	0.150	0.146
SE	0.489	0.327	0.213	0.175	0.182
W	0.659	0.376	0.333	0.239	0.193

N stage	N0	N1	N2	N3	NX
Ireland	0.539	0.345	0.254	0.173	0.187
E	0.587	0.308	0.259	0.193	0.185
M	0.489	0.216	0.283	0.154	0.243
MW	0.362	0.392	0.163	--	0.211
NE	0.480	0.318	0.276	0.091	0.214
NW	0.620	0.229	0.435	0.300	0.189
S	0.489	0.483	0.227	0.154	0.166
SE	0.479	0.392	0.201	0.107	0.154
W	0.581	0.449	0.338	0.325	0.184

M stage	M0	M1	MX
Ireland	0.441	0.110	0.275
E	0.456	0.101	0.289
M	0.380	0.134	0.304
MW	0.305	0.135	0.260
NE	0.453	0.105	0.262
NW	0.466	0.087	0.269
S	0.413	0.090	0.285
SE	0.438	0.109	0.245
W	0.558	0.176	0.249

Summary stage	1	2	3A	3B	4	Unknown
Ireland	0.665	0.586	0.349	0.257	0.109	0.284
E	0.717	0.583	0.354	0.214	0.101	0.300
M	0.429	1.000	0.335	--	0.134	0.319
MW	0.355	1.000	0.200	0.067	0.135	0.261
NE	0.729	0.333	0.375	0.385	0.096	0.276
NW	0.706	0.333	0.357	0.333	0.087	0.283
S	0.592	0.500	0.486	0.250	0.090	0.284
SE	0.600	0.750	0.231	0.426	0.104	0.253
W	0.786	0.500	0.550	0.500	0.176	0.256

Grade	I	II	III	IV	Unknown
Ireland	0.369	0.420	0.316	0.231	0.208
E	0.443	0.464	0.328	0.249	0.202
M	0.375	0.324	0.326	0.101	0.268
MW	0.152	0.376	0.394	0.228	0.204
NE	0.333	0.445	0.266	0.172	0.234
NW	0.750	0.387	0.316	0.298	0.209
S	0.397	0.373	0.270	0.323	0.189
SE	0.333	0.397	0.346	0.178	0.183
W	0.250	0.366	0.287	0.232	0.249

Has treatment	No	Yes
Ireland	0.159	0.358
E	0.149	0.362
M	0.208	0.339
MW	0.167	0.372
NE	0.184	0.347
NW	0.175	0.380
S	0.135	0.322
SE	0.137	0.383
W	0.187	0.374

Has surgery	No	Yes
Ireland	0.189	0.666
E	0.181	0.689
M	0.222	0.552
MW	0.192	0.684
NE	0.205	0.569
NW	0.208	0.754
S	0.170	0.623
SE	0.169	0.654
W	0.223	0.738

Table 11. All lung cancer; three year survival by health board

Sex	Female	Male	Smoker	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.131	0.108	Ireland	0.175	0.133	0.103	0.104
E	0.134	0.106	E	0.217	0.125	0.105	0.100
M	0.149	0.104	M	0.186	0.117	0.111	--
MW	0.078	0.101	MW	0.131	0.089	0.090	0.072
NE	0.143	0.108	NE	0.213	0.102	0.106	0.233
NW	0.146	0.121	NW	0.220	0.169	0.113	--
S	0.111	0.105	S	0.139	0.161	0.088	0.040
SE	0.120	0.118	SE	0.099	0.132	0.108	0.159
W	0.190	0.107	W	0.180	0.186	0.102	0.202

Age	<50	50-54	55-59	60-64	65-69	70-74	74-79
Ireland	0.239	0.148	0.141	0.120	0.136	0.128	0.064
E	0.214	0.167	0.129	0.123	0.151	0.110	0.067
M	0.482	--	0.242	0.253	--	0.171	--
MW	0.342	0.118	0.078	0.091	0.152	0.052	0.080
NE	0.216	0.162	0.247	0.103	0.133	0.142	0.025
NW	0.294	0.211	--	0.106	0.169	0.205	0.081
S	0.116	0.169	0.163	0.118	0.111	0.112	0.051
SE	0.227	0.126	0.149	0.107	0.141	0.142	0.060
W	0.338	--	0.131	0.135	0.125	0.187	0.116

Marital status	Married	Not married	Unknown
Ireland	0.129	0.100	0.077
E	0.134	0.094	0.049
M	0.160	0.063	--
MW	0.080	0.114	--
NE	0.149	0.087	0.091
NW	0.120	0.136	--
S	0.121	0.090	0.040
SE	0.133	0.102	0.105
W	0.133	0.121	0.323

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.127	0.111	0.105	0.109
E	0.123	0.108	0.107	0.112
M	0.204	0.081	0.134	0.236
MW	0.090	0.111	0.049	--
NE	0.176	0.092	0.134	0.142
NW	0.133	0.125	0.104	0.258
S	0.138	0.113	0.076	--
SE	0.067	0.126	0.112	0.060
W	0.174	0.117	0.127	0.144

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
Ireland	0.183	0.265	0.110	0.135		0.130	0.069
E	0.250	0.307	0.111	0.085		0.130	0.046
M	--	0.457	0.102	0.178		0.123	0.097
MW	--	--	0.094	--		0.115	0.056
NE	--	0.361	0.110	0.133		0.138	0.070
NW	--	0.275	0.123	--		0.149	0.077
S	0.143	0.143	0.107	--		0.117	0.073
SE	--	0.129	0.108	0.462		0.140	0.072
W	--	0.336	0.124	--		0.136	0.130

Cell type	NSCLC	SCLC	Unconfirmed
Ireland	0.145	0.060	0.069
E	0.145	0.063	0.046
M	0.139	--	0.097
MW	0.127	0.041	0.056
NE	0.156	0.060	0.070
NW	0.176	0.038	0.077
S	0.128	0.071	0.073
SE	0.158	0.064	0.072
W	0.147	0.071	0.130

T stage	T1	T2	T3	T4	TX
Ireland	0.329	0.183	0.101	0.046	0.069
E	0.373	0.179	0.084	0.041	0.054
M	0.343	0.094	0.154	--	0.104
MW	0.198	0.201	--	0.053	0.065
NE	0.236	0.187	0.166	0.068	0.076
NW	0.550	0.185	0.135	0.066	0.089
S	0.157	0.227	0.131	0.051	0.042
SE	0.347	0.173	0.084	0.045	0.094
W	0.448	0.191	0.143	0.051	0.113

N stage	N0	N1	N2	N3	NX
Ireland	0.340	0.141	0.068	0.057	0.068
E	0.367	0.093	0.073	0.040	0.058
M	0.361	0.108	--	--	0.093
MW	0.201	0.182	--	--	0.068
NE	0.335	0.214	--	0.091	0.071
NW	0.458	0.061	0.098	0.100	0.073
S	0.300	0.238	0.070	--	0.055
SE	0.291	0.130	0.091	--	0.082
W	0.313	0.287	0.092	0.090	0.097

M stage	M0	M1	MX
Ireland	0.230	0.035	0.115
E	0.226	0.030	0.110
M	0.136	0.036	0.145
MW	0.185	0.023	0.084
NE	0.277	0.067	0.093
NW	0.317	--	0.115
S	0.161	--	0.142
SE	0.245	0.047	0.115
W	0.306	0.100	0.112

Summary stage	1	2	3A	3B	4	Unknown
Ireland	0.463	0.289	0.123	0.066	0.035	0.119
E	0.498	0.192	0.134	0.059	0.030	0.114
M	0.321	1.000	--	--	0.036	0.144
MW	0.222	0.714	--	--	0.023	0.095
NE	0.606	0.333	0.188	0.144	0.058	0.104
NW	0.582	--	0.268	--	--	0.129
S	0.376	0.250	--	--	--	0.139
SE	0.419	0.444	0.103	0.095	0.049	0.121
W	0.400	--	0.367	--	0.100	0.120

Grade	I	II	III	IV	Unknown
Ireland	0.188	0.222	0.134	0.085	0.086
E	0.218	0.258	0.123	0.093	0.074
M	--	0.108	0.214	--	0.107
MW	0.046	0.220	0.163	0.051	0.071
NE	0.333	0.226	0.102	0.125	0.100
NW	0.625	0.222	0.145	0.038	0.095
S	0.243	0.167	0.113	0.179	0.077
SE	0.148	0.227	0.186	0.060	0.083
W	--	0.160	0.127	0.108	0.141

Has treatment	No	Yes
Ireland	0.066	0.161
E	0.055	0.156
M	0.064	0.177
MW	0.066	0.140
NE	0.085	0.162
NW	0.092	0.171
S	0.057	0.143
SE	0.057	0.201
W	0.093	0.185

Has surgery	No	Yes
Ireland	0.061	0.409
E	0.049	0.401
M	0.067	0.413
MW	0.053	0.437
NE	0.081	0.350
NW	0.073	0.551
S	0.053	0.382
SE	0.067	0.407
W	0.097	0.520

Table 12. All lung cancer; five year survival by health board

Sex	Female	Male	Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.103	0.088	Ireland	0.159	0.107	0.076	0.098
E	0.105	0.078	E	0.206	0.087	0.074	0.090
M	0.089	0.085	M	--	--	0.091	--
MW	0.078	0.090	MW	0.131	0.077	0.084	--
NE	0.098	0.101	NE	0.142	0.102	0.083	0.233
NW	0.146	0.104	NW	0.220	0.140	0.099	--
S	0.075	0.081	S	0.101	0.143	0.049	--
SE	0.101	0.104	SE	0.099	0.132	0.080	0.159
W	0.174	0.096	W	0.180	0.186	0.081	0.202

Age	<50	50-54	55-59	60-64	65-69	70-74	74-79
Ireland	0.219	0.097	0.105	0.097	0.101	0.110	0.054
E	0.184	0.093	0.066	0.097	0.110	0.097	0.053
M	--	--	0.242	0.126	--	0.100	--
MW	0.342	0.118	0.078	0.091	0.127	0.052	0.053
NE	0.216	--	0.186	0.103	0.089	0.142	--
NW	0.294	--	--	0.106	0.145	0.185	0.061
S	--	0.127	0.130	--	0.057	0.059	0.051
SE	0.114	0.126	0.124	0.072	0.127	0.142	0.060
W	0.338	--	0.131	0.108	--	0.160	0.116

Marital status	Married	Not married	Unknown
Ireland	0.102	0.081	0.077
E	0.101	0.069	0.049
M	0.134	0.021	--
MW	0.068	0.114	--
NE	0.140	0.055	0.091
NW	0.095	0.136	--
S	0.085	0.069	--
SE	0.107	0.091	0.105
W	0.116	0.112	0.323

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.101	0.087	0.088	0.073
E	0.090	0.070	0.088	--
M	0.153	0.050	0.134	0.236
MW	0.090	0.104	--	--
NE	0.176	0.064	0.134	--
NW	--	0.113	0.104	0.258
S	0.138	0.076	0.054	--
SE	--	0.110	0.092	--
W	0.130	0.106	0.127	--

Presentation	Screening	Incidental	Symptoms	Other/unknown
Ireland	--	0.182	0.091	0.091
E	--	0.140	0.089	--
M	--	0.305	0.085	--
MW	--	--	0.087	--
NE	--	0.361	0.087	0.133
NW	--	0.275	0.108	--
S	--	--	0.079	--
SE	--	0.065	0.092	0.462
W	--	0.336	0.111	--

Histological confirmation	Yes	No
	0.104	0.056
	0.099	0.033
	0.092	0.073
	0.104	0.056
	0.119	0.047
	0.136	--
	0.085	0.059
	0.116	0.072
	0.118	0.130

Cell type	NSCLC	SCLC	Unconfirmed
Ireland	0.115	0.054	0.056
E	0.110	0.052	0.033
M	0.104	--	0.073
MW	0.115	--	0.056
NE	0.130	0.060	0.047
NW	0.160	0.038	--
S	0.090	0.059	0.059
SE	0.129	0.064	0.072
W	0.126	0.071	0.130

T stage	T1	T2	T3	T4	TX
Ireland	0.253	0.145	0.076	0.046	0.057
E	0.278	0.137	0.056	0.041	0.039
M	0.275	--	--	--	0.069
MW	0.198	0.166	--	--	0.065
NE	0.147	0.156	0.166	0.068	0.068
NW	--	0.185	0.090	0.066	0.080
S	0.105	0.167	--	--	0.037
SE	0.297	0.121	0.084	0.045	0.086
W	0.448	0.167	--	--	0.097

N stage	N0	N1	N2	N3	NX
Ireland	0.280	0.106	0.052	0.029	0.057
E	0.296	0.065	0.041	--	0.042
M	0.361	--	--	--	0.066
MW	0.179	0.152	--	--	0.068
NE	0.219	0.214	--	0.091	0.063
NW	0.427	--	0.098	--	0.064
S	0.200	0.142	0.053	--	0.051
SE	0.249	0.114	0.046	--	0.073
W	0.261	0.251	0.092	--	0.097

M stage	M0	M1	MX
Ireland	0.186	0.030	0.091
E	0.176	0.022	0.081
M	0.068	--	0.122
MW	0.172	0.023	0.076
NE	0.250	0.067	0.069
NW	0.290	--	0.100
S	0.121	--	0.103
SE	0.166	0.047	0.110
W	0.306	0.100	0.091

Summary stage	1	2	3A	3B	4	Unknown
Ireland	0.390	0.206	0.095	0.052	0.029	0.095
E	0.412	0.165	0.072	0.044	0.022	0.083
M	0.321	--	--	--	--	0.122
MW	0.222	0.571	--	--	0.023	0.089
NE	0.505	--	--	0.144	0.058	0.083
NW	0.499	--	0.268	--	--	0.115
S	0.376	--	--	--	--	0.101
SE	0.314	0.296	0.103	--	0.049	0.106
W	0.400	--	0.367	--	0.100	0.099

Grade	I	II	III	IV	Unknown
Ireland	0.108	0.172	0.110	0.078	0.070
E	0.082	0.215	0.094	0.079	0.051
M	--	0.054	0.171	--	0.083
MW	0.046	0.157	0.163	0.051	0.071
NE	--	0.226	--	0.125	0.079
NW	0.417	0.222	0.145	--	0.077
S	0.203	0.054	0.094	--	0.066
SE	--	0.168	0.166	0.060	0.077
W	--	--	0.112	0.108	0.134

Has treatment	No	Yes
Ireland	0.054	0.128
E	0.036	0.121
M	0.043	0.139
MW	0.056	0.132
NE	0.073	0.132
NW	0.082	0.152
S	0.044	0.104
SE	0.057	0.159
W	0.093	0.153

Has surgery	No	Yes
Total	0.049	0.329
E	0.033	0.317
M	0.043	0.354
MW	0.047	0.408
NE	0.069	0.287
NW	0.061	0.514
S	0.042	0.264
SE	0.064	0.311
W	0.089	0.446

Table 13. Prostate cancer; one, three and five year survival

Years from diagnosis	Age	<65	65-75	75+	Smoker	Non-smoker	Ex-smoker	Smoker	Unknown
1		0.947	0.909	0.804		0.892	0.849	0.850	0.888
3		0.782	0.727	0.588		0.706	0.654	0.628	0.722
5		0.670	0.606	0.473		0.583	0.544	0.499	0.627

	Year of incidence	1994	1995	1996	1997	1998
1		0.854	0.878	0.869	0.867	0.897
3		0.669	0.696	0.694	--	--
5		0.568	--	--	--	--

	Marital status	Married	Not married	Unknown
1		0.902	0.825	0.826
3		0.721	0.613	0.630
5		0.606	0.488	0.587

	Deprivation	Affluent	Intermediate	Deprived	Unknown
1		0.897	0.870	0.841	0.897
3		0.725	0.665	0.676	0.615
5		0.617	0.542	0.572	0.393

	Method of presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
1		0.968	0.927	0.868	0.907		0.914	0.572
3		0.968	0.790	0.668	0.775		0.732	0.303
5		0.968	0.648	0.553	0.677		0.614	0.179

	T stage	T1	T2	T3	T4	TX
1		0.951	0.913	0.929	0.774	0.837
3		0.820	0.730	0.749	0.369	0.638
5		0.701	0.626	0.621	0.289	0.515

	N stage	N0	N1	N2	N3	NX
1		0.952	0.906	0.884	0.889	0.863
3		0.844	0.665	0.572	0.474	0.663
5		0.747	0.564	0.375	0.474	0.543

	M stage	M0	M1	MX
1		0.963	0.660	0.913
3		0.846	0.279	0.761
5		0.736	0.165	0.642

	Summary stage	O	I	II	III	IV	Other/unknown
1		0.955	0.936	0.967	1.000	0.679	0.926
3		0.860	0.811	0.869	0.929	0.310	0.783
5		0.789	0.671	0.757	0.855	0.194	0.667

	Grade	1	2	3	4	Unknown
1		0.966	0.939	0.870	0.813	0.716
3		0.889	0.784	0.575	0.459	0.482
5		0.805	0.667	0.422	0.413	0.367

	Health board	E	M	MW	NE	NW	S	SE	W
1		0.902	0.847	0.868	0.871	0.809	0.873	0.880	0.857
3		0.729	0.615	0.676	0.690	0.612	0.668	0.681	0.664
5		0.637	0.472	0.492	0.565	0.512	0.543	0.603	0.512

	Has treatment	No	Yes
1		0.807	0.893
3		0.665	0.688
5		0.582	0.558

Has surgery	No	Yes
	0.803	0.933
	0.596	0.754
	0.485	0.632

Table 14. Prostate cancer; oneyear survival by health board

Age	<65	65-75	75+
Ireland	0.947	0.909	0.804
E	0.955	0.929	0.839
M	0.871	0.919	0.771
MW	0.958	0.874	0.820
NE	0.929	0.926	0.774
NW	0.944	0.830	0.749
S	0.969	0.893	0.814
SE	0.945	0.937	0.787
W	0.942	0.899	0.794

Smoker	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.892	0.849	0.850	0.888
E	0.914	0.867	0.884	0.919
M	0.902	0.792	0.828	0.831
MW	0.881	0.892	0.827	0.878
NE	0.851	0.870	0.868	0.910
NW	0.818	0.812	0.762	0.857
S	0.908	0.819	0.856	0.827
SE	0.888	0.868	0.874	0.884
W	0.886	0.828	0.832	0.866

Married	Married	Not married	Unknown
Ireland	0.902	0.825	0.826
E	0.916	0.878	0.825
M	0.898	0.764	0.750
MW	0.896	0.826	0.857
NE	0.901	0.820	0.794
NW	0.848	0.758	0.750
S	0.902	0.820	0.817
SE	0.920	0.803	0.933
W	0.873	0.835	0.800

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.897	0.870	0.841	0.897
E	0.909	0.888	0.862	0.966
M	0.831	0.855	0.843	0.829
MW	0.902	0.859	0.869	0.786
NE	0.911	0.867	0.840	0.895
NW	0.874	0.840	0.759	0.822
S	0.874	0.884	0.807	0.866
SE	0.895	0.872	0.879	0.895
W	0.886	0.859	0.840	0.828

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
Ireland	0.968	0.927	0.868	0.907		0.914	0.572
E	1.000	0.955	0.895	0.918		0.926	0.451
M	1.000	1.000	0.832	1.000		0.885	0.536
MW	--	1.000	0.868	0.824		0.932	0.644
NE	--	0.880	0.870	0.867		0.927	0.510
NW	1.000	0.923	0.806	0.600		0.901	0.543
S	0.923	0.929	0.864	0.750		0.894	0.700
SE	1.000	0.867	0.873	1.000		0.925	0.569
W	--	0.833	0.860	0.790		0.899	0.570

T stage	T1	T2	T3	T4	TX
Ireland	0.951	0.913	0.929	0.774	0.837
E	0.961	0.966	0.936	0.808	0.877
M	0.925	0.889	0.875	0.808	0.808
MW	0.953	0.903	1.000	0.692	0.799
NE	0.964	0.870	0.918	0.778	0.860
NW	1.000	0.957	0.865	0.714	0.784
S	0.937	0.910	0.930	0.632	0.800
SE	0.977	0.882	0.980	0.778	0.825
W	0.929	0.905	0.864	0.831	0.830

N stage	N0	N1	N2	N3	NX
Ireland	0.952	0.906	0.884	0.889	0.863
E	0.974	0.947	1.000	1.000	0.890
M	0.923	1.000	0.571	--	0.846
MW	0.894	1.000	0.857	1.000	0.864
NE	0.923	0.800	1.000	1.000	0.862
NW	1.000	0.750	1.000	--	0.801
S	0.968	0.667	1.000	--	0.861
SE	0.951	1.000	0.900	--	0.857
W	0.900	1.000	1.000	1.000	0.853

M stage	M0	M1	MX
Ireland	0.963	0.660	0.913
E	0.980	0.668	0.936
M	0.931	0.604	0.927
MW	0.919	0.616	0.920
NE	0.953	0.679	0.909
NW	0.968	0.559	0.839
S	0.969	0.672	0.903
SE	0.965	0.678	0.920
W	0.943	0.710	0.895

Summary stage	O	I	II	III	IV	Other/unknown
Ireland	0.955	0.936	0.967	1.000	0.679	0.926
E	1.000	0.857	1.000	1.000	0.690	0.950
M	---	0.667	1.000	1.000	0.621	0.933
MW	0.889	0.800	0.938	1.000	0.647	0.924
NE	1.000	--	0.952	1.000	0.696	0.917
NW	--	1.000	1.000	1.000	0.574	0.873
S	1.000	1.000	0.926	1.000	0.684	0.919
SE	0.941	1.000	0.956	1.000	0.703	0.931
W	--	0.667	1.000	1.000	0.726	0.901

Grade	1	2	3	4	Unknown
Ireland	0.966	0.939	0.870	0.813	0.716
E	0.983	0.947	0.857	0.857	0.768
M	0.919	0.894	0.869	--	0.693
MW	0.967	0.966	0.877	0.800	0.721
NE	0.990	0.945	0.873	1.000	0.706
NW	1.000	0.921	0.865	0.770	0.649
S	0.948	0.928	0.861	0.875	0.723
SE	0.970	0.945	0.899	0.804	0.694
W	0.945	0.935	0.884	0.667	0.711

Has treatment	No	Yes	Has surgery	No	Yes
Ireland	0.807	0.893	Ireland	0.803	0.933
E	0.860	0.914	E	0.844	0.936
M	0.801	0.866	M	0.762	0.914
MW	0.680	0.906	MW	0.754	0.943
NE	0.740	0.920	NE	0.758	0.952
NW	0.633	0.835	NW	0.751	0.903
S	0.802	0.893	S	0.812	0.933
SE	0.830	0.894	SE	0.805	0.929
W	0.835	0.865	W	0.821	0.927

Table 15. Prostate cancer; threeyear survival by health board

Age	<65	65-75	75+	Smoker status	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.782	0.727	0.588		0.706	0.654	0.628	0.722
E	0.774	0.762	0.662		0.766	0.675	0.648	0.767
M	0.708	0.664	0.532		0.649	0.561	0.532	0.669
MW	0.792	0.679	0.616		0.691	0.701	0.610	0.707
NE	0.791	0.767	0.543		0.663	0.649	0.708	0.801
NW	0.789	0.644	0.525		0.645	0.625	0.577	0.593
S	0.795	0.718	0.558		0.723	0.646	0.603	0.605
SE	0.852	0.737	0.543		0.645	0.660	0.670	0.749
W	0.734	0.720	0.590		0.710	0.639	0.625	0.635

Married	Married	Not married	Unknown
Ireland	0.721	0.613	0.630
E	0.745	0.699	0.652
M	0.687	0.499	0.469
MW	0.681	0.664	0.693
NE	0.735	0.608	0.715
NW	0.655	0.563	--
S	0.717	0.574	0.659
SE	0.747	0.558	0.653
W	0.702	0.605	0.578

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.725	0.665	0.676	0.615
E	0.752	0.696	0.699	--
M	0.660	0.594	0.676	0.692
MW	0.729	0.654	0.708	--
NE	0.530	0.683	0.763	0.838
NW	0.670	0.601	0.614	0.621
S	0.705	0.661	0.628	0.697
SE	0.668	0.705	0.659	0.544
W	0.729	0.664	0.664	0.463

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
Ireland	0.968	0.790	0.668	0.775		0.732	0.303
E	1.000	0.868	0.707	0.810		0.755	0.221
M	--	0.875	0.594	0.771		0.663	0.246
MW	--	0.700	0.675	0.688		0.756	0.391
NE	--	0.880	0.680	0.693		0.746	0.327
NW	1.000	0.923	0.599	0.400		0.710	0.328
S	0.923	0.704	0.661	0.250		0.701	0.390
SE	1.000	0.809	0.662	0.841		0.736	0.253
W	--	0.681	0.662	0.733		0.727	0.208

T stage	T1	T2	T3	T4	TX
Ireland	0.820	0.730	0.749	0.369	0.638
E	0.881	0.836	0.715	0.342	0.704
M	0.660	0.631	0.875	0.409	0.600
MW	0.777	0.676	0.648	0.539	0.626
NE	0.822	0.741	0.851	0.370	0.660
NW	0.871	0.777	0.499	0.278	0.610
S	0.803	0.740	0.861	0.213	0.493
SE	0.864	0.622	0.806	0.508	0.625
W	0.821	0.764	0.711	0.326	0.619

N stage	N0	N1	N2	N3	NX
Ireland	0.844	0.665	0.572	0.474	0.663
E	0.898	0.632	0.341	--	0.713
M	0.846	1.000	0.571	--	0.597
MW	0.782	1.000	0.429	1.000	0.664
NE	0.866	0.600	--	1.000	0.665
NW	0.747	--	1.000	--	0.606
S	0.872	0.667	1.000	--	0.640
SE	0.792	0.750	0.900	--	0.640
W	0.791	0.667	0.667	--	0.662

M stage	M0	M1	MX
Ireland	0.846	0.279	0.761
E	0.865	0.236	0.815
M	0.699	0.254	0.762
MW	0.786	0.286	0.745
NE	0.884	0.269	0.772
NW	0.860	0.245	0.641
S	0.869	0.241	0.727
SE	0.850	0.306	0.757
W	0.797	0.391	0.743

Summary stage	O	1	2	3	4	Other/unknown
Ireland	0.860	0.811	0.869	0.929	0.310	0.783
E	1.000	0.857	1.000	0.849	0.268	0.829
M	--	0.333	1.000	1.000	0.287	0.743
MW	0.889	0.800	0.750	1.000	0.365	0.747
NE	0.667	--	0.952	1.000	0.295	0.802
NW	--	0.667	0.556	1.000	0.275	0.712
S	1.000	0.907	0.832	1.000	0.267	0.761
SE	0.777	0.813	0.771	0.857	0.352	0.795
W	--	0.667	0.500	1.000	0.397	0.755

grade	I	II	III	IV	Unknown
Ireland	0.889	0.784	0.575	0.459	0.482
E	0.937	0.780	0.557	0.429	0.593
M	0.824	0.693	0.521	--	0.391
MW	0.825	0.779	0.626	0.400	0.525
NE	0.924	0.782	0.664	0.200	0.458
NW	0.947	0.721	0.642	0.462	0.440
S	0.859	0.800	0.550	0.200	0.415
SE	0.890	0.815	0.550	0.689	0.417
W	0.846	0.822	0.602	0.667	0.465

Has treatment	No	Yes
Ireland	0.665	0.688
E	0.741	0.725
M	0.621	0.614
MW	0.503	0.709
NE	0.596	0.727
NW	0.470	0.632
S	0.653	0.672
SE	0.703	0.675
W	0.668	0.663

Has surgery	No	Yes
Ireland	0.596	0.754
E	0.663	0.767
M	0.534	0.678
MW	0.479	0.797
NE	0.581	0.770
NW	0.542	0.727
S	0.586	0.749
SE	0.582	0.744
W	0.624	0.743

Table 16. Prostate cancer; fiveyear survival by health board

Age	<65	65-75	75+	Smoker	Non-smoker	Ex-smoker	Smoker	Unknown
Ireland	0.670	0.606	0.473		0.583	0.544	0.499	0.627
E	0.691	0.689	0.533		0.683	0.539	0.544	0.691
M	0.657	0.489	0.374		0.513	0.561	0.424	0.418
MW	0.561	0.524	0.419		0.535	0.546	0.382	0.485
NE	0.754	0.656	0.362		0.506	0.549	0.556	0.801
NW	0.752	0.502	0.441		0.513	0.542	0.489	0.523
S	0.608	0.563	0.502		0.596	0.621	0.419	0.561
SE	0.789	0.648	0.475		0.517	0.660	0.601	0.700
W	0.509	0.541	0.490		0.583	0.406	0.476	0.439

Married	Married	Not married	Unknown
Ireland	0.606	0.488	0.587
E	0.663	0.575	0.608
M	0.556	0.305	--
MW	0.478	0.472	0.693
NE	0.579	0.553	--
NW	0.515	0.492	--
S	0.596	0.431	0.659
SE	0.681	0.460	--
W	0.544	0.457	0.578

Deprivation	Affluent	Intermediate	Deprived	Unknown
Ireland	0.617	0.542	0.572	0.393
E	0.659	0.595	0.620	--
M	0.508	0.444	0.564	--
MW	0.573	0.437	0.598	--
NE	0.454	0.564	0.600	0.838
NW	0.596	0.493	0.546	0.310
S	0.566	0.552	0.505	0.348
SE	0.635	0.641	0.552	0.408
W	0.607	0.502	0.542	0.154

Presentation	Screening	Incidental	Symptoms	Other/unknown	Histological confirmation	Yes	No
Ireland	0.968	0.648	0.553	0.677		0.614	0.179
E	1.000	--	0.611	0.746		0.659	0.221
M	--	0.750	0.456	--		0.511	--
MW	--	--	0.494	--		0.554	0.271
NE	--	--	0.558	0.693		0.633	--
NW	--	0.615	0.503	0.400		0.620	0.205
S	0.923	0.577	0.537	--		0.580	0.218
SE	--	--	0.595	0.449		0.650	0.253
W	--	0.363	0.513	--		0.570	--

T stage	T1	T2	T3	T4	TX
Ireland	0.701	0.626	0.621	0.289	0.515
E	0.712	0.820	0.549	0.308	0.618
M	0.567	0.631	0.875	0.205	0.403
MW	0.454	0.493	--	--	0.494
NE	0.740	0.712	0.702	--	0.508
NW	0.871	0.666	0.266	0.278	0.493
S	0.724	0.618	0.643	--	0.228
SE	0.789	0.491	0.806	0.423	0.560
W	0.619	0.555	0.711	--	0.468

N stage	N0	N1	N2	N3	NX
Ireland	0.747	0.564	0.375	0.474	0.543
E	0.835	0.434	--	--	0.619
M	0.846	--	--	--	0.441
MW	0.331	--	--	1.000	0.525
NE	0.655	0.600	--	--	0.544
NW	0.747	--	--	--	0.505
S	0.792	0.667	--	--	0.497
SE	0.714	--	0.900	--	0.561
W	0.791	--	--	--	0.495

M stage	M0	M1	MX
Ireland	0.963	0.660	0.913
E	0.750	0.159	0.729
M	0.524	0.134	0.601
MW	0.524	0.134	0.601
NE	0.860	0.113	0.630
NW	0.824	0.163	0.507
S	0.778	0.065	0.588
SE	0.770	0.225	0.692
W	0.662	0.291	0.520

Summary stage	O	1	2	3	4
Ireland	0.789	0.671	0.757	0.855	0.194
E	1.000	0.429	1.000	0.849	0.192
M	--	0.333	--	1.000	0.134
MW	0.444	--	0.250	--	0.170
NE	0.667	--	0.952	--	0.156
NW	--	0.667	--	--	0.171
S	1.000	0.907	0.728	0.833	0.096
SE	0.777	0.406	0.665	0.857	0.276
W	--	0.667	--	1.000	0.283

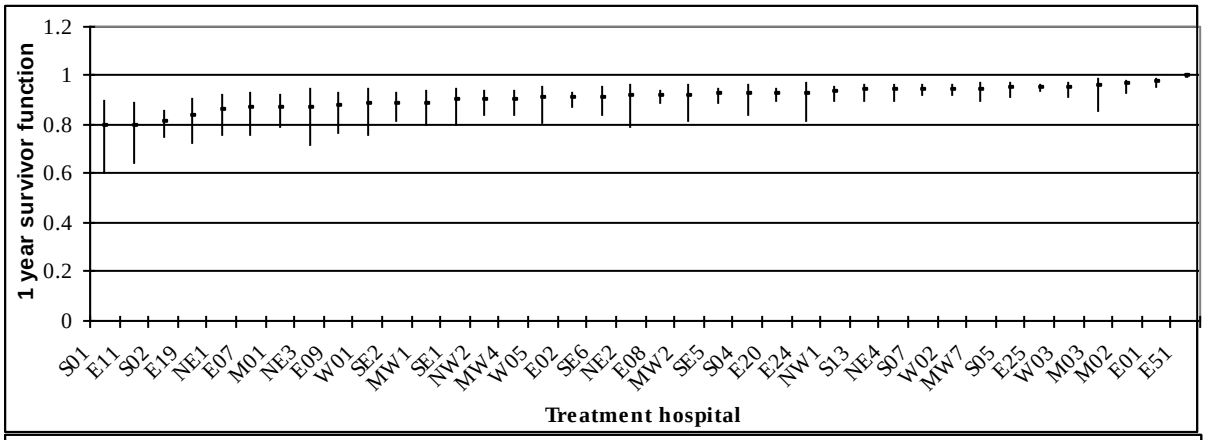
Grade	I	II	III	IV	Unknown
Ireland	0.805	0.667	0.422	0.413	--
E	0.867	0.712	0.416	0.429	0.504
M	0.702	0.400	0.504	--	0.379
MW	0.702	0.400	0.504	--	0.379
NE	0.823	0.665	0.503	--	0.271
NW	0.777	0.658	0.559	0.462	0.303
S	0.774	0.637	0.417	0.200	0.300
SE	0.853	0.701	0.447	0.689	0.400
W	0.753	0.700	0.405	--	0.323

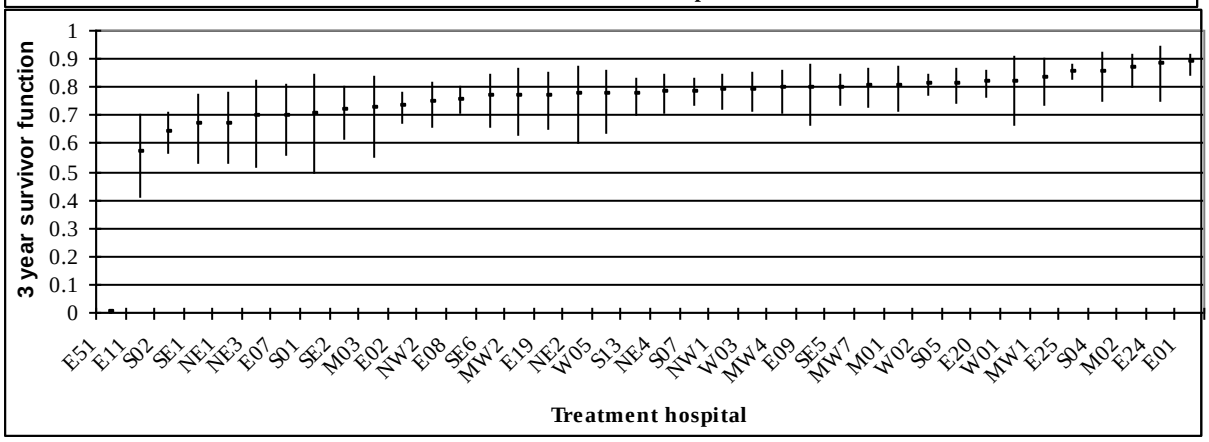
Has treatment	No	Yes
Ireland	0.582	0.558
E	0.661	0.626
M	0.480	0.466
MW	0.503	0.496
NE	0.572	0.563
NW	0.385	0.529
S	0.577	0.534
SE	0.637	0.595
W	0.492	0.519

Has surgery	No	Yes
Ireland	0.485	0.632
E	0.564	0.679
M	0.392	0.523
MW	0.347	0.581
NE	0.489	0.620
NW	0.438	0.628
S	0.463	0.620
SE	0.543	0.640
W	0.439	0.665

Appendix 2. 1,3 and 5 year survival by hospital, for acute general hospitals

Figure A1. Breast cancer: one, three and five year survival by hospital of treatment





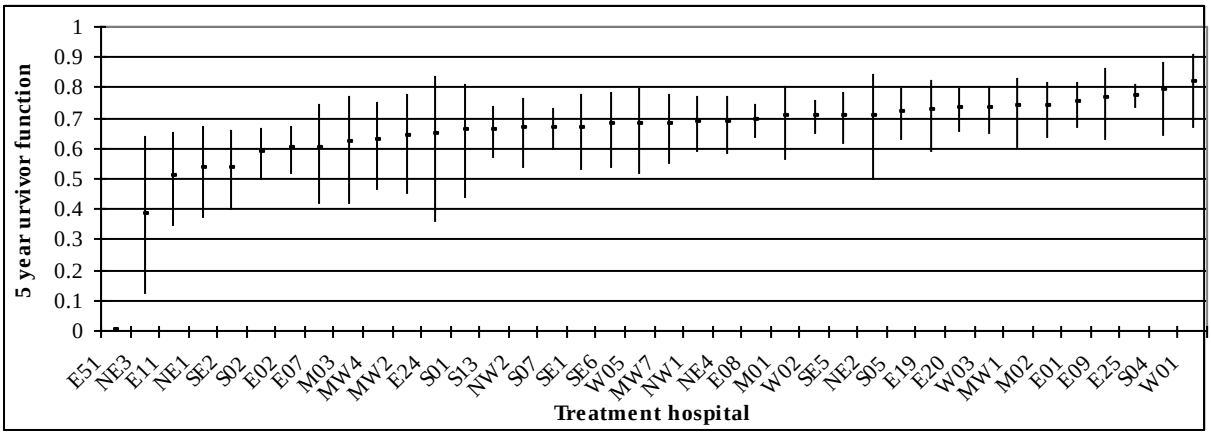
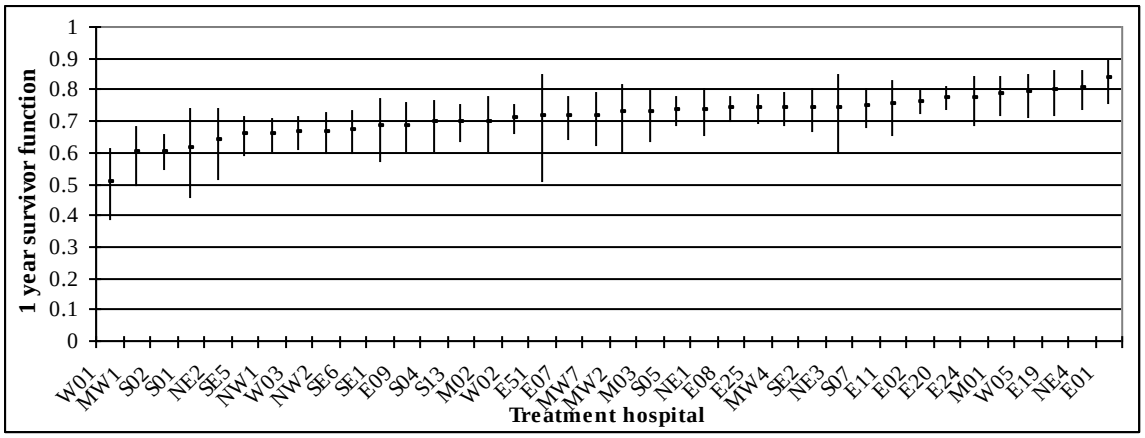
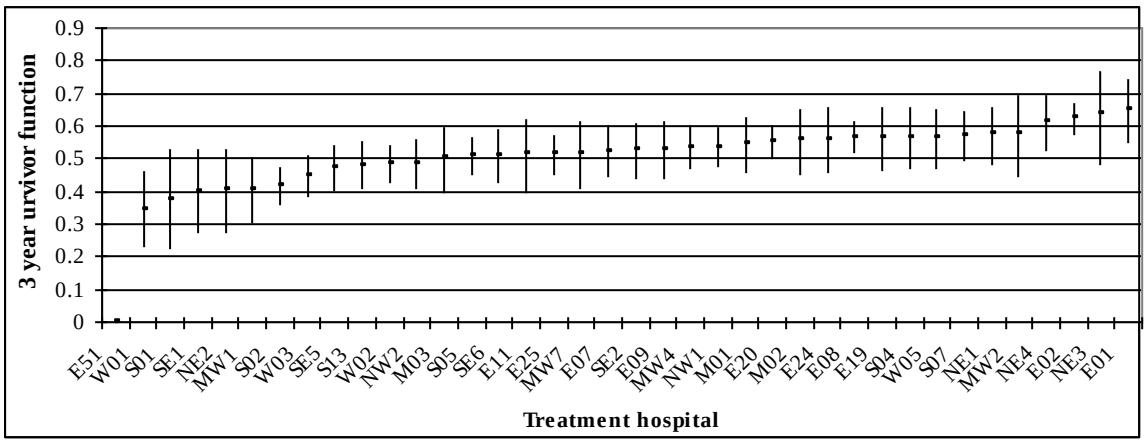


Figure A2. Colorectal cancer: one, three and five year survival by hospital of treatment





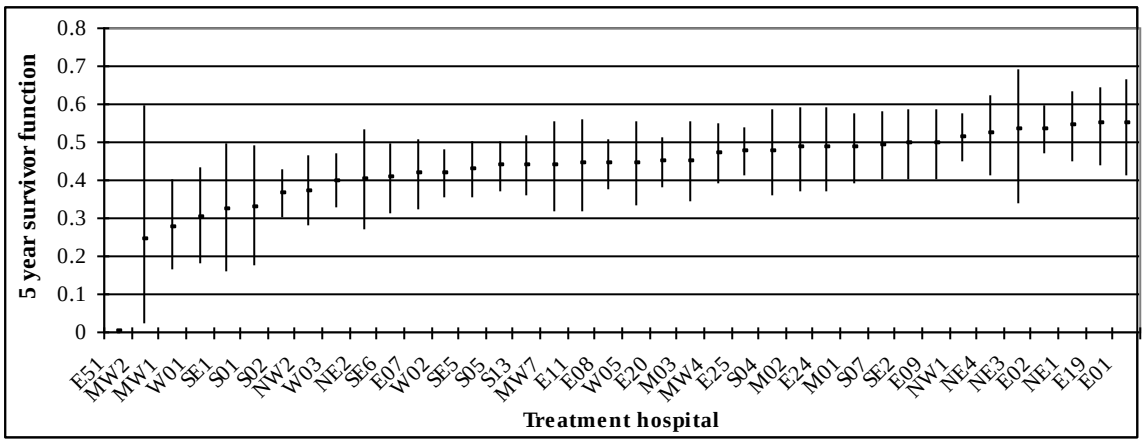
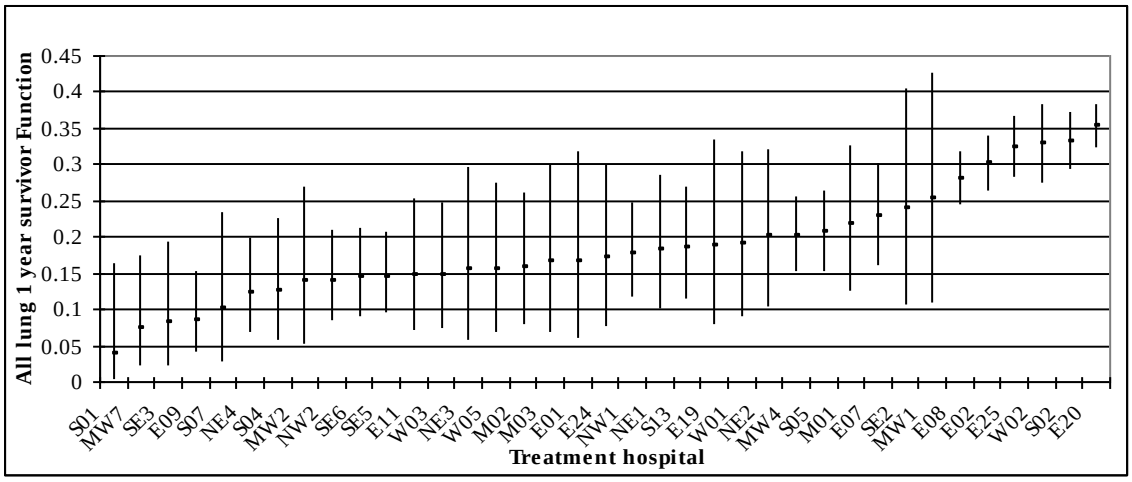
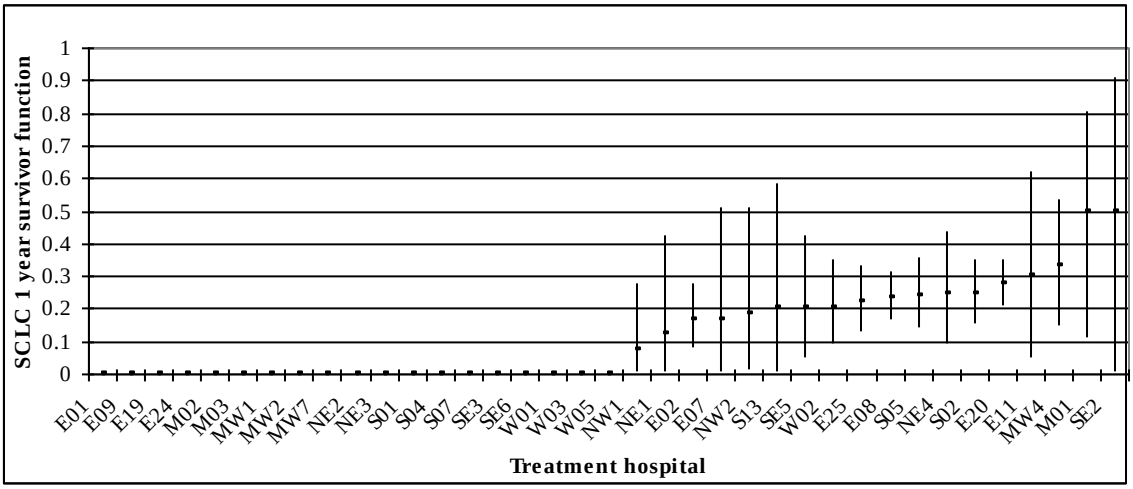


Figure A3. Lung cancer: one year survival by hospital of treatment

i. all lung cancers



ii. SCLC



iii. NSCLC

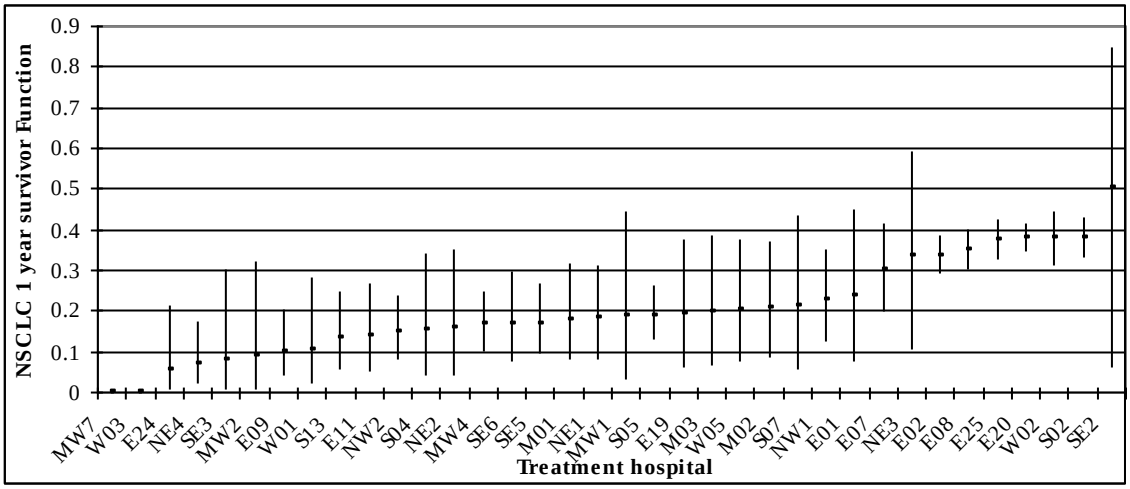
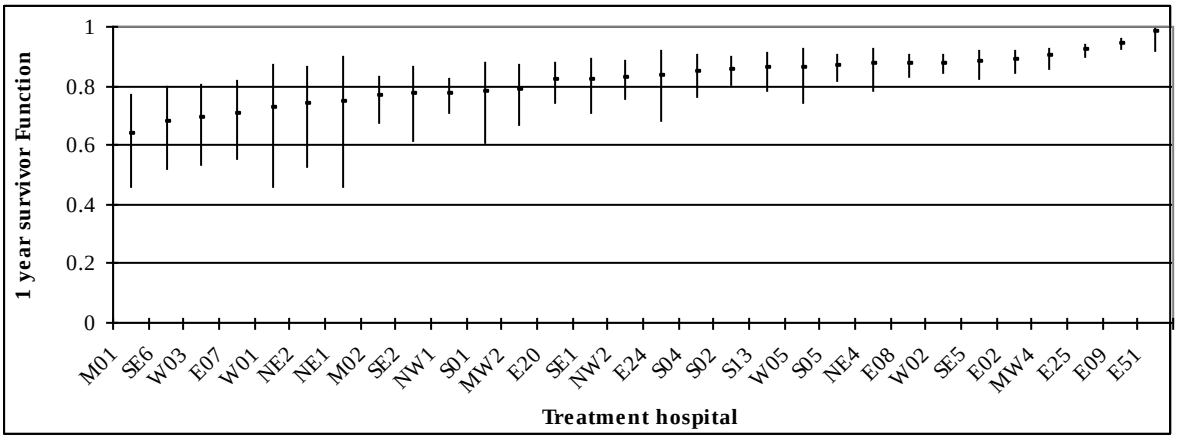
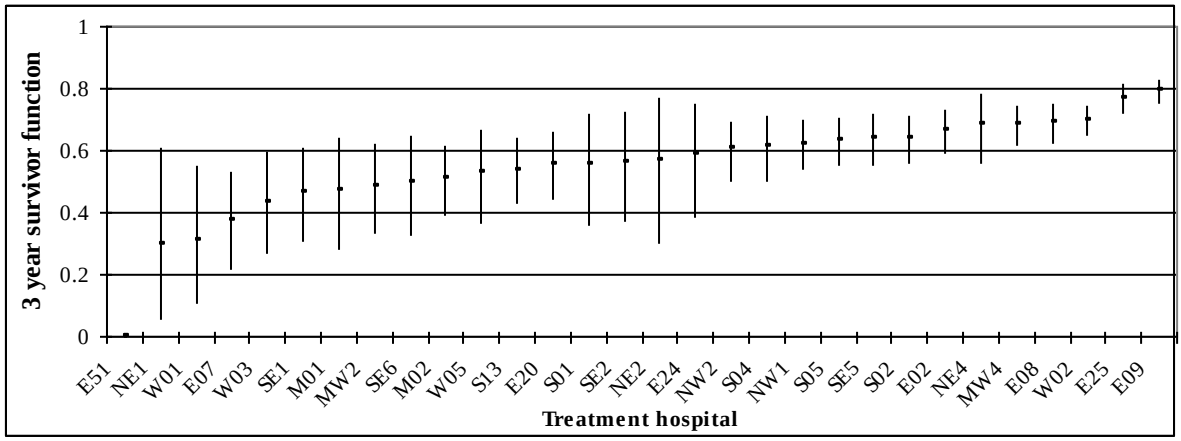
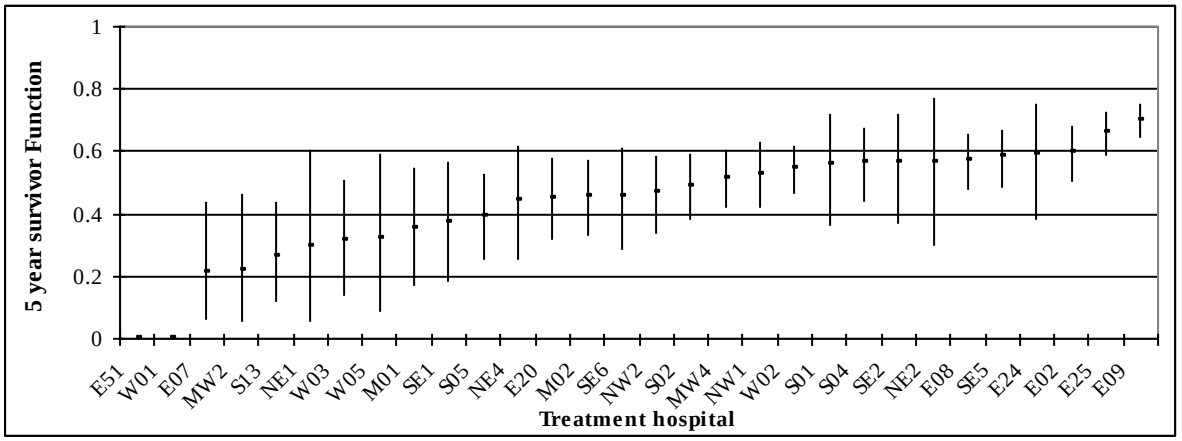


Figure A4. Prostate cancer: one, three and five year survival by hospital of treatment







Hospital code	Hospital name
E02	Beaumont Hospital
E07	James Connolly Memorial
E08	Mater Misercordiae Hospital
E09	Meath Hospital
E11	Naas General Hospital
E19	St. Columcilles Hospital
E20	St. James Hospital
E24	St. Michaels Hospital
E25	St. Vincents Hospital
E51	Tallaght Regional Hospital
M01	Mullingar General Hospital
M02	Portlaoise General Hospital
M03	Tullamore General Hospital
MW1	Ennis General Hospital
MW2	Nenagh General Hospital
MW4	Limerick Regional General Hosp
MW7	St. Johns Hospital
NE1	Cavan General Hospital
NE2	Louth County Hospital
NE3	Monaghan General Hospital
NE4	Our Lady of Lourdes Hospital
NW1	Letterkenny General Hospital
NW2	Sligo General Hospital
S01	Bantry General Hospital
S02	Cork University Hospital
S04	Mallow General Hospital
S05	Mercy Hospital
S07	South Infirmary Hospital
S13	Tralee General Hospital
SE1	Our Ladys Surgical Hospital
SE2	St. Lukes General Hospital
SE3	St.Josephs Medical & Maternity
SE5	Waterford Regional Hospital
SE6	Wexford General Hospital
W01	Roscommon County Hospital
W02	University College Galway Hosp
W03	Mayo General Hospital
W05	Portiuncula Hospital

Appendix 3. Cox models by cancer site

1.1 All breast cancer

		All Patients		Had surgery		No surgery	
		Hazard ratio (95% CI)	**P-value**	**Hazard ratio (95% CI)**	**P-value**	**Hazard ratio (95% CI)**	**P-value**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	1.041 (0.838; 1.294)	0.716	1.082 (0.828; 1.415)	0.564	1.029 (0.709; 1.493)	0.880
	MWHB	1.191 (0.990; 1.432)	0.063	1.229 (0.978; 1.545)	0.077	1.197 (0.877; 1.635)	0.257
	NEHB	1.323 (1.095; 1.598)	0.004	1.490 (1.187; 1.871)	0.001	1.126 (0.800; 1.586)	0.496
	NWHB	1.236 (1.005; 1.520)	0.045	1.043 (0.788; 1.380)	0.769	1.547 (1.135; 2.107)	0.006
	SHB	1.277 (1.109; 1.470)	0.001	1.228 (1.025; 1.471)	0.026	1.227 (0.980; 1.537)	0.074
	SEHB	1.167 (0.981; 1.388)	0.082	1.160 (0.931; 1.446)	0.185	1.168 (0.879; 1.551)	0.284
	WHB	1.133 (0.950; 1.351)	0.165	1.225 (0.988; 1.517)	0.064	1.073 (0.786; 1.465)	0.658
Multivariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	1.076 (0.836; 1.384)	0.571	1.188 (0.880; 1.603)	0.261	1.147 (0.773; 1.704)	0.496
	MWHB	1.122 (0.885; 1.421)	0.342	1.260 (0.942; 1.685)	0.119	0.990 (0.708; 1.383)	0.951
	NEHB	1.144 (0.915; 1.431)	0.237	1.331 (1.015; 1.745)	0.039	1.150 (0.801; 1.650)	0.449
	NWHB	0.960 (0.751; 1.226)	0.743	0.937 (0.668; 1.315)	0.707	1.195 (0.856; 1.668)	0.296
	SHB	1.332 (1.123; 1.581)	0.001	1.289 (1.048; 1.586)	0.016	1.216 (0.945; 1.563)	0.128
	SEHB	0.955 (0.774; 1.179)	0.667	1.101 (0.852; 1.423)	0.461	1.081 (0.797; 1.466)	0.616
	WHB	1.127 (0.915; 1.387)	0.261	1.122 (0.871; 1.445)	0.374	1.113 (0.799; 1.552)	0.526
T stage	T1					1.000	
	T2					2.420 (1.555; 3.766)	0.000
	T3					2.506 (1.587; 3.957)	0.000
	T4					3.010 (1.976; 4.583)	0.000
	TX					2.286 (1.492; 3.503)	0.000
N stage	N0	1.000		1.000		1.000	
	N1	2.222 (1.920; 2.572)	0.000	2.487 (2.098; 2.949)	0.000	1.388 (1.045; 1.843)	0.024
	N2	2.592 (2.010; 3.343)	0.000	2.901 (2.037; 4.132)	0.000	1.666 (1.185; 2.340)	0.003
	N3	3.072 (2.130; 4.429)	0.000	3.623 (2.366; 5.550)	0.000	0.605 (0.257; 1.422)	0.249
	NX	1.926 (1.588; 2.336)	0.000	1.658 (1.256; 2.189)	0.000	1.380 (1.058; 1.800)	0.018
Grade	I	1.000					
	II	2.106 (1.422; 3.119)	0.000				
	III	3.386 (2.309; 4.966)	0.000				
	IV	4.596 (2.608; 8.102)	0.000				
	Unknown	2.379 (1.626; 3.479)	0.000				
Deprivation status	Affluent	1.000				1.000	
	Intermediate	1.095 (0.944; 1.271)	0.231			1.117 (0.876; 1.425)	0.371
	Deprived	1.249 (1.061; 1.471)	0.008			1.474 (1.145; 1.899)	0.003
	Unknown	1.286 (0.995; 1.664)	0.055			1.100 (0.791; 1.529)	0.571
Smoker status	Non-smoker	1.000				1.000	
	Ex-smoker	1.083 (0.869; 1.351)	0.476			0.845 (0.602; 1.185)	0.329
	Smoker	1.177 (1.019; 1.359)	0.027			1.253 (0.987; 1.590)	0.064
	Unknown	1.114 (0.961; 1.290)	0.152			1.130 (0.931; 1.373)	0.217
Stratified by:		*Patient age, co-morbidity, T stage, N stage, Tumour morphology*		*Patient age, co-morbidity, T stage, M stage, Tumour grade*		*Tumour morphology M stage*	

1.2 Colorectal cancer, all patients

		All cancers		Female		Male	
		Hazard ratio (95% confidence intervals)	**p**	**Hazard ratio (95% confidence intervals)**	**p**	**Hazard ratio (95% confidence intervals)**	**p**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	1.073 (0.928; 1.241)	0.342	0.831 (0.659; 1.048)	0.118	1.330 (1.103; 1.603)	0.003
	MWHB	1.179 (1.036; 1.341)	0.012	1.288 (1.051; 1.579)	0.015	1.108 (0.937; 1.310)	0.229
	NEHB	0.961 (0.841; 1.097)	0.555	1.008 (0.824; 1.233)	0.935	0.926 (0.776; 1.105)	0.396
	NWHB	1.231 (1.079; 1.404)	0.002	1.244 (1.022; 1.514)	0.030	1.226 (1.028; 1.462)	0.024
	SHB	1.209 (1.098; 1.332)	0.000	1.180 (1.019; 1.367)	0.027	1.229 (1.081; 1.397)	0.002
	SEHB	1.211 (1.082; 1.356)	0.001	1.124 (0.943; 1.340)	0.192	1.280 (1.104; 1.483)	0.001
	WHB	1.319 (1.182; 1.472)	0.000	1.315 (1.104; 1.567)	0.002	1.318 (1.145; 1.518)	0.000
Multivariate model:							
Area of residence	ERHA			1.000		1.000	
	MHB			0.884 (0.678; 1.153)	0.364	1.356 (1.087; 1.693)	0.007
	MWHB			1.306 (1.024; 1.667)	0.032	1.238 (1.024; 1.497)	0.027
	NEHB			0.918 (0.733; 1.149)	0.455	0.952 (0.786; 1.154)	0.616
	NWHB			1.065 (0.850; 1.334)	0.584	1.144 (0.945; 1.386)	0.167
	SHB			1.028 (0.872; 1.213)	0.740	1.305 (1.133; 1.504)	0.000
	SEHB			1.004 (0.825; 1.221)	0.969	1.214 (1.035; 1.425)	0.017
	WHB			1.133 (0.931; 1.379)	0.211	1.073 (0.916; 1.257)	0.382
Marital status	Married					1.000	
	Not married					1.199 (1.085; 1.323)	0.000
	Unknown					1.075 (0.801; 1.442)	0.630
Histological confirmation	No			1.000		1.000	
	Yes			0.502 (0.396; 0.637)	0.000	0.562 (0.458; 0.690)	0.000
T stage	T1						
	T2					1.663 (1.170; 2.363)	0.005
	T3					2.245 (1.611; 3.129)	0.000
	T4					3.618 (2.572; 5.089)	0.000
	TX					2.931 (2.078; 4.132)	0.000
N stage	N0			1.000			
	N1			1.828 (1.563; 2.138)	0.000		
	N2			2.343 (1.904; 2.884)	0.000		
	N3			2.260 (1.459; 3.502)	0.000		
	NX			2.104 (1.730; 2.559)	0.000		
M stage	M0			1.000		1.000	
	M1			3.442 (2.949; 4.016)	0.000	4.065 (3.570; 4.629)	0.000
	MX			1.261 (1.090; 1.458)	0.002	1.176 (1.038; 1.332)	0.011
Smoker status	Non-smoker					1.000	
	Ex-smoker					1.098 (0.966; 1.248)	0.152
	Smoker					1.201 (1.067; 1.351)	0.002
	Unknown					1.170 (1.015; 1.349)	0.031
Stratified by:				Patient age, T stage		Patient age, co-morbidity Tumour grade, N stage	

1.3 Colorectal cancer, patients having surgery

		Female		Male	
		Hazard ratio (95% confidence intervals)	**p**	**Hazard ratio (95% confidence intervals)**	**p**
Univariate model:					
Area of residence	ERHA	1.000		1.000	
	MHB	0.961 (0.731; 1.264)	0.776	1.202 (0.946; 1.528)	0.133
	MWHB	1.574 (1.241; 1.996)	0.000	1.120 (0.916; 1.371)	0.270
	NEHB	1.126 (0.887; 1.430)	0.328	0.954 (0.773; 1.177)	0.658
	NWHB	1.026 (0.780; 1.349)	0.857	1.089 (0.866; 1.370)	0.464
	SHB	1.055 (0.871; 1.279)	0.584	1.099 (0.935; 1.292)	0.252
	SEHB	1.223 (0.981; 1.525)	0.074	1.189 (0.986; 1.433)	0.070
	WHB	1.470 (1.190; 1.816)	0.000	1.292 (1.085; 1.539)	0.004
Multivariate model:					
Multivariate	ERHA	1.000		1.000	
	MHB	1.222 (0.890; 1.679)	0.215	1.458 (1.086; 1.958)	0.012
	MWHB	1.714 (1.265; 2.321)	0.001	1.366 (1.077; 1.733)	0.010
	NEHB	0.929 (0.715; 1.207)	0.581	0.991 (0.786; 1.250)	0.941
	NWHB	1.087 (0.802; 1.473)	0.592	1.417 (1.100; 1.824)	0.007
	SHB	1.139 (0.920; 1.411)	0.233	1.339 (1.117; 1.603)	0.002
	SEHB	1.226 (0.960; 1.565)	0.102	1.321 (1.077; 1.621)	0.007
	WHB	1.295 (1.013; 1.656)	0.039	1.173 (0.957; 1.438)	0.125
Marital status	Married			1.000	
	Not married			1.231 (1.083; 1.400)	0.002
	Unknown			1.372 (0.914; 2.058)	0.127
Histological confirmation	No	1.000			
	Yes	0.262 (0.112; 0.610)	0.002		
T stage	T1			1.000	
	T2			1.972 (1.274; 3.051)	0.002
	T3			2.742 (1.805; 4.167)	0.000
	T4			4.557 (2.939; 7.066)	0.000
	TX			2.206 (1.342; 3.627)	0.002
M stage	M0			1.000	
	M1			4.412 (3.774; 5.157)	0.000
	MX			1.128 (0.977; 1.301)	0.100
Tumour grade	I	1.000			
	II	1.171 (0.910; 1.507)	0.220		
	III	1.715 (1.292; 2.276)	0.000		
	IV	1.714 (0.768; 3.828)	0.189		
	Unknown	1.259 (0.932; 1.700)	0.133		
Smoker status	Non-smoker			1.000	
	Ex-smoker			1.045 (0.890; 1.226)	0.594
	Smoker			1.263 (1.091; 1.463)	0.002
	Unknown			1.168 (0.971; 1.406)	0.100
Stratified by:		Patient age T, N, M stage		Patient age, co-morbidity Tumour grade, N stage	

1.4 Colorectal cancer, patients not having surgery

		Female		Male	
		Hazard ratio (95% confidence intervals)	**p**	**Hazard ratio (95% confidence intervals)**	**p**
Univariate model:					
Area of residence	ERHA	1.000		1.000	
	MHB	0.617 (0.397; 0.961)	0.033	1.458 (1.080; 1.967)	0.014
	MWHB	1.017 (0.679; 1.523)	0.935	1.257 (0.932; 1.695)	0.134
	NEHB	1.128 (0.771; 1.651)	0.534	1.200 (0.865; 1.666)	0.276
	NWHB	1.180 (0.886; 1.570)	0.258	1.264 (0.957; 1.670)	0.099
	SHB	1.373 (1.090; 1.729)	0.007	1.548 (1.253; 1.913)	0.000
	SEHB	0.750 (0.561; 1.002)	0.052	1.330 (1.044; 1.693)	0.021
	WHB	1.312 (0.955; 1.803)	0.094	1.265 (0.996; 1.607)	0.054
Multivariate model:					
Area of residence	ERHA	1.000		1.000	
	MHB	0.537 (0.326; 0.884)	0.015	1.166 (0.838; 1.622)	0.363
	MWHB	0.826 (0.521; 1.308)	0.414	1.160 (0.842; 1.599)	0.364
	NEHB	0.943 (0.627; 1.417)	0.776	1.455 (1.024; 2.068)	0.036
	NWHB	0.730 (0.525; 1.014)	0.060	0.878 (0.652; 1.181)	0.389
	SHB	0.984 (0.761; 1.272)	0.899	1.251 (0.999; 1.566)	0.051
	SEHB	0.690 (0.502; 0.948)	0.022	1.079 (0.833; 1.397)	0.567
	WHB	1.212 (0.852; 1.726)	0.285	0.985 (0.767; 1.266)	0.909
Deprivation index	Affluent	1.000			
	Intermediate	0.942 (0.738; 1.203)	0.633		
	Deprived	1.174 (0.894; 1.540)	0.248		
	Unknown	0.644 (0.455; 0.912)	0.013		
Histological confirmation	Not conf	1.000		1.000	
	Confirmed	0.625 (0.472; 0.827)	0.001	0.646 (0.519; 0.803)	0.000
T stage	T1			1.000	
	T2			1.774 (0.944; 3.332)	0.075
	T3			1.620 (0.910; 2.886)	0.101
	T4			2.014 (1.162; 3.493)	0.013
	TX			1.829 (1.071; 3.122)	0.027
N stage	N0			1.000	
	N1			1.386 (0.958; 2.006)	0.084
	N2			1.306 (0.801; 2.131)	0.285
	N3			1.306 (0.629; 2.715)	0.474
	NX			1.745 (1.273; 2.393)	0.001
M stage	M0	1.000		1.000	
	M1	2.220 (1.574; 3.132)	0.000	2.510 (1.929; 3.267)	0.000
	MX	1.147 (0.811; 1.624)	0.438	0.951 (0.719; 1.259)	0.728
Tumour grade	I	1.000		1.000	
	II	0.561 (0.328; 0.960)	0.035	0.886 (0.626; 1.256)	0.497
	III	0.771 (0.429; 1.386)	0.385	1.471 (1.000; 2.165)	0.050
	IV	0.599 (0.216; 1.662)	0.325	2.306 (0.809; 6.573)	0.118
	Unknown	0.491 (0.285; 0.846)	0.010	1.040 (0.728; 1.486)	0.831
Stratified by:		Patient age N stage, site		Patient age Marital status	

1.5 Lung cancer, all patients

		All cancers		NSCLC		SCLC	
		Hazard ratio (95% confidence intervals)	**p**	**Hazard ratio (95% confidence intervals)**	**p**	**Hazard ratio (95% confidence intervals)**	**p**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.988 (0.875; 0.843)	0.843	0.989 (0.850; 1.151)	0.887	1.107 (0.796; 1.539)	0.547
	MWHB	1.073 (0.970; 0.169)	0.169	1.066 (0.925; 1.228)	0.378	0.966 (0.714; 1.308)	0.825
	NEHB	0.983 (0.886; 0.738)	0.738	0.920 (0.803; 1.054)	0.229	1.085 (0.842; 1.397)	0.530
	NWHB	1.015 (0.912; 0.782)	0.782	0.928 (0.802; 1.074)	0.317	1.197 (0.904; 1.584)	0.210
	SHB	1.059 (0.979; 0.153)	0.153	1.038 (0.939; 1.149)	0.464	1.107 (0.910; 1.345)	0.309
	SEHB	1.096 (1.003; 0.043)	0.043	0.973 (0.862; 1.097)	0.651	1.197 (0.943; 1.519)	0.140
	WHB	0.986 (0.892; 0.773)	0.773	0.973 (0.857; 1.106)	0.677	1.233 (0.916; 1.660)	0.168
Multivariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.935 (0.818; 0.328)	0.328	0.848 (0.730; 0.986)	0.032	0.967 (0.685; 1.366)	0.850
	MWHB	0.963 (0.859; 0.514)	0.514	1.009 (0.878; 1.160)	0.898	1.016 (0.742; 1.391)	0.919
	NEHB	0.947 (0.845; 0.341)	0.341	0.849 (0.743; 0.969)	0.015	1.108 (0.853; 1.441)	0.442
	NWHB	0.914 (0.811; 0.143)	0.143	0.872 (0.757; 1.005)	0.059	1.164 (0.870; 1.556)	0.306
	SHB	0.954 (0.873; 0.302)	0.302	0.984 (0.889; 1.089)	0.749	1.057 (0.863; 1.294)	0.593
	SEHB	1.082 (0.977; 0.129)	0.129	0.925 (0.820; 1.043)	0.202	1.126 (0.876; 1.447)	0.355
	WHB	0.874 (0.783; 0.017)	0.017	0.803 (0.708; 0.910)	0.001	1.191 (0.877; 1.619)	0.264
Age	<50			1.000			
	50-54			1.285 (1.046; 1.580)	0.017		
	55-59			1.504 (1.238; 1.826)	0.000		
	60-64			1.385 (1.153; 1.664)	0.000		
	65-69			1.493 (1.252; 1.781)	0.000		
	70-74			1.724 (1.446; 2.057)	0.000		
	75-79			1.871 (1.562; 2.242)	0.000		
	>=80			2.216 (1.826; 2.689)	0.000		
Deprivation index	Affluent	1.000		1.000		1.000	
	Intermediate	1.019 (0.940; 0.652)	0.652	0.988 (0.903; 1.081)	0.793	1.057 (0.862; 1.297)	0.593
	Deprived	1.152 (1.062; 0.001)	0.001	1.109 (1.013; 1.214)	0.025	1.147 (0.937; 1.403)	0.184
	Unknown	0.807 (0.719; 0.000)	0.000	0.861 (0.754; 0.983)	0.027	0.822 (0.610; 1.108)	0.198
Sex	Female	1.000		1.000			
	Male	1.121 (1.055; 0.000)	0.000	1.109 (1.035; 1.188)	0.003		
T stage	T1			1.000			
	T2			1.276 (1.112; 1.463)	0.000		
	T3			1.661 (1.418; 1.945)	0.000		
	T4			1.992 (1.716; 2.312)	0.000		
	TX			1.746 (1.518; 2.008)	0.000		
N stage	N0	1.000		1.000			
	N1	1.563 (1.385; 0.000)	0.000	1.498 (1.326; 1.692)	0.000		
	N2	1.728 (1.521; 0.000)	0.000	1.677 (1.467; 1.916)	0.000		
	N3	2.161 (1.819; 0.000)	0.000	2.177 (1.825; 2.598)	0.000		
	NX	1.905 (1.712; 0.000)	0.000	1.982 (1.773; 2.216)	0.000		
M stage	M0					1.000	
	M1					2.317 (1.870; 2.869)	0.000
	MX					1.390 (1.133; 1.705)	0.002
Stratified by:		Age, marital status T, M stage Histological confirmation		M stage Tumour grade		Age	

1.6 Lung cancer, patients having surgery

		All cancers		NSCLC	
		Hazard ratio (95% confidence intervals)	**p**	**Hazard ratio (95% confidence intervals)**	**p**
Univariate analysis:					
Area of residence	ERHA	1.000		1.000	
	MHB	1.172 (0.805; 0.408)	0.408	1.204 (0.827; 1.754)	0.333
	MWHB	0.852 (0.574; 0.428)	0.428	0.823 (0.551; 1.230)	0.342
	NEHB	1.193 (0.871; 0.271)	0.271	1.131 (0.818; 1.564)	0.455
	NWHB	0.669 (0.434; 0.069)	0.069	0.648 (0.416; 1.009)	0.055
	SHB	1.115 (0.883; 0.362)	0.362	1.132 (0.893; 1.436)	0.305
	SEHB	1.029 (0.779; 0.841)	0.841	0.994 (0.745; 1.326)	0.965
	WHB	0.742 (0.477; 0.187)	0.187	0.762 (0.489; 1.186)	0.229
Multivariate analysis:					
Area of residence	ERHA	1.000		1.000	
	MHB	1.152 (0.786; 0.468)	0.468	1.251 (0.839; 1.866)	0.273
	MWHB	0.634 (0.423; 0.027)	0.027	0.680 (0.442; 1.046)	0.079
	NEHB	1.125 (0.818; 0.468)	0.468	1.077 (0.763; 1.522)	0.672
	NWHB	0.642 (0.413; 0.050)	0.050	0.778 (0.489; 1.236)	0.287
	SHB	0.743 (0.579; 0.019)	0.019	0.797 (0.610; 1.040)	0.095
	SEHB	0.769 (0.578; 0.071)	0.071	0.917 (0.675; 1.245)	0.578
	WHB	0.640 (0.408; 0.052)	0.052	0.726 (0.457; 1.153)	0.174
Marital status	Married	1.000		1.000	
	Not married	1.294 (1.082; 0.005)	0.005	1.223 (1.007; 1.485)	0.042
	Unknown	0.880 (0.452; 0.708)	0.708	0.979 (0.497; 1.928)	0.952
Sex	Female	1.000		1.000	
	Male	1.255 (1.040; 0.018)	0.018	1.292 (1.054; 1.585)	0.014
T stage	T1	1.000		1.000	
	T2	1.755 (1.355; 0.000)	0.000	1.536 (1.173; 2.012)	0.002
	T3	2.820 (2.071; 0.000)	0.000	2.562 (1.845; 3.559)	0.000
	T4	3.239 (2.271; 0.000)	0.000	3.196 (2.198; 4.649)	0.000
	TX	1.549 (1.003; 0.048)	0.048	1.252 (0.777; 2.018)	0.357
N stage	N0	1.000		1.000	
	N1	1.812 (1.487; 0.000)	0.000	1.721 (1.395; 2.124)	0.000
	N2	2.134 (1.620; 0.000)	0.000	2.282 (1.693; 3.075)	0.000
	N3	3.970 (2.237; 0.000)	0.000	4.216 (2.200; 8.079)	0.000
	NX	1.643 (1.235; 0.001)	0.001	1.707 (1.252; 2.327)	0.001
M stage	M0	1.000		1.000	
	M1	2.517 (1.795; 0.000)	0.000	2.296 (1.582; 3.332)	0.000
	MX	1.232 (1.024; 0.027)	0.027	1.214 (0.999; 1.474)	0.051
Stratified by:		Tumour grade		Tumour grade Patient age	

1.7 Lung cancer, patients not having surgery

		All cancers		NSCLC		SCLC	
		Hazard ratio (95% confidence intervals)	**p**	**Hazard ratio (95% confidence intervals)**	**p**	**Hazard ratio (95% confidence intervals)**	**p**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.890 (0.783; 1.012)	0.076	0.837 (0.709; 0.987)	0.035	1.068 (0.768; 1.485)	0.696
	MWHB	0.955 (0.860; 1.061)	0.391	0.990 (0.850; 1.151)	0.892	0.913 (0.672; 1.240)	0.561
	NEHB	0.887 (0.795; 0.989)	0.031	0.803 (0.691; 0.933)	0.004	1.019 (0.787; 1.320)	0.886
	NWHB	0.929 (0.831; 1.039)	0.197	0.838 (0.718; 0.979)	0.026	1.175 (0.885; 1.559)	0.264
	SHB	1.009 (0.927; 1.097)	0.837	0.971 (0.868; 1.085)	0.601	1.131 (0.928; 1.377)	0.222
	SEHB	1.050 (0.955; 1.153)	0.315	0.916 (0.802; 1.046)	0.194	1.237 (0.968; 1.581)	0.089
	WHB	0.856 (0.773; 0.948)	0.003	0.794 (0.695; 0.908)	0.001	1.251 (0.929; 1.686)	0.140
Multivariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.873 (0.753; 1.012)	0.072	0.826 (0.696; 0.981)	0.029	0.973 (0.688; 1.374)	0.875
	MWHB	0.939 (0.828; 1.065)	0.327	1.035 (0.885; 1.211)	0.663	0.968 (0.703; 1.334)	0.844
	NEHB	0.900 (0.795; 1.020)	0.100	0.804 (0.689; 0.939)	0.006	1.048 (0.802; 1.369)	0.732
	NWHB	0.926 (0.814; 1.054)	0.244	0.818 (0.697; 0.962)	0.015	1.143 (0.851; 1.535)	0.376
	SHB	1.010 (0.915; 1.115)	0.845	0.989 (0.879; 1.113)	0.856	1.108 (0.903; 1.359)	0.326
	SEHB	1.057 (0.943; 1.184)	0.341	0.966 (0.842; 1.108)	0.620	1.243 (0.961; 1.607)	0.097
	WHB	0.855 (0.758; 0.964)	0.011	0.772 (0.671; 0.887)	0.000	1.242 (0.914; 1.687)	0.166
Deprivation index	Affluent	1.000		1.000		1.000	
	Intermediate	1.015 (0.927; 1.111)	0.753	0.974 (0.878; 1.081)	0.625	1.037 (0.844; 1.274)	0.733
	Deprived	1.158 (1.056; 1.270)	0.002	1.133 (1.019; 1.259)	0.021	1.149 (0.938; 1.408)	0.180
	Unknown	0.856 (0.753; 0.972)	0.016	0.818 (0.703; 0.952)	0.010	0.794 (0.588; 1.073)	0.133
Sex	Female	1.000		1.000			
	Male	1.080 (1.011; 1.153)	0.022	1.098 (1.014; 1.189)	0.022		
Age	<50			1.000			
	50-54			1.203 (0.942; 1.536)	0.138		
	55-59			1.418 (1.125; 1.788)	0.003		
	60-64			1.276 (1.025; 1.588)	0.029		
	65-69			1.414 (1.145; 1.746)	0.001		
	70-74			1.564 (1.267; 1.931)	0.000		
	75-79			1.572 (1.268; 1.947)	0.000		
	80-84			1.922 (1.535; 2.405)	0.000		
T stage	T1			1.000			
	T2			1.300 (1.080; 1.566)	0.006		
	T3			1.405 (1.142; 1.728)	0.001		
	T4			1.651 (1.369; 1.990)	0.000		
	TX			1.419 (1.189; 1.693)	0.000		
N stage	N0			1.000			
	N1			1.126 (0.942; 1.346)	0.192		
	N2			1.039 (0.875; 1.235)	0.660		
	N3			1.322 (1.073; 1.630)	0.009		
	NX			1.295 (1.118; 1.500)	0.001		
M stage	M0					1.000	
	M1					2.183 (1.760; 2.708)	0.000
	MX					1.310 (1.066; 1.609)	0.010
Smoker status	Non-smoker	1.000					
	Ex-smoker	1.072 (0.945; 1.216)	0.281				
	Smoker	1.190 (1.061; 1.336)	0.003				
	Unknown	1.146 (0.998; 1.316)	0.054				
Stratified by:		Patient age, histological confirmation, T, N, M stage		M stage Tumour grade		Patient age	

1.8 All prostate cancer

		All Patients		Had surgery		No surgery	
		Hazard Ratio (95% CI)	**P-value**	**Hazard Ratio (95% CI)**	**P-value**	**Hazard Ratio (95% CI)**	**P-value**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	1.548 (1.266; 1.894)	0.000	1.535 (1.147; 2.053)	0.004	1.465 (1.107; 1.939)	0.008
	MWHB	1.381 (1.145; 1.665)	0.001	1.062 (0.806; 1.400)	0.669	1.791 (1.387; 2.313)	0.000
	NEHB	1.182 (0.971; 1.439)	0.096	1.010 (0.755; 1.351)	0.946	1.310 (1.001; 1.713)	0.049
	NWHB	1.618 (1.336; 1.959)	0.000	1.207 (0.859; 1.697)	0.278	1.543 (1.214; 1.962)	0.000
	SHB	1.267 (1.088; 1.476)	0.002	1.077 (0.854; 1.358)	0.530	1.271 (1.034; 1.563)	0.023
	SEHB	1.190 (1.006; 1.408)	0.042	1.198 (0.948; 1.513)	0.130	1.151 (0.903; 1.467)	0.255
	WHB	1.364 (1.154; 1.611)	0.000	1.130 (0.829; 1.540)	0.439	1.181 (0.957; 1.457)	0.121
Multivariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	1.063 (0.859; 1.316)	0.576	1.237 (0.903; 1.693)	0.185	0.956 (0.711; 1.285)	0.764
	MWHB	1.108 (0.903; 1.360)	0.327	1.316 (0.977; 1.772)	0.070	0.948 (0.715; 1.257)	0.710
	NEHB	0.915 (0.744; 1.125)	0.399	0.825 (0.606; 1.124)	0.223	0.832 (0.623; 1.110)	0.210
	NWHB	1.064 (0.868; 1.305)	0.548	1.000 (0.700; 1.428)	0.998	1.017 (0.785; 1.316)	0.901
	SHB	1.128 (0.955; 1.332)	0.156	1.219 (0.940; 1.583)	0.136	1.051 (0.842; 1.311)	0.660
	SEHB	0.950 (0.794; 1.137)	0.576	1.149 (0.893; 1.478)	0.280	0.733 (0.567; 0.948)	0.018
	WHB	0.916 (0.768; 1.093)	0.333	0.858 (0.620; 1.188)	0.358	0.868 (0.694; 1.085)	0.214
Marital status	Married	1.000		1.000			
	Not married	1.162 (1.043; 1.293)	0.006	1.011 (0.853; 1.198)	0.902		
	Unknown	1.548 (1.170; 2.048)	0.002	1.903 (1.161; 3.121)	0.011		
Smoker status	Non-smoker					1.000	
	Ex-smoker					1.049 (0.859; 1.280)	0.638
	Smoker					1.232 (1.039; 1.461)	0.016
	Unknown					1.071 (0.879; 1.305)	0.497
T stage	T1	1.000		1.000		1.000	
	T2	1.061 (0.865; 1.302)	0.57	1.040 (0.780; 1.386)	0.791	1.120 (0.832; 1.508)	0.455
	T3	1.172 (0.885; 1.553)	0.268	0.946 (0.648; 1.379)	0.772	1.295 (0.830; 2.021)	0.254
	T4	2.007 (1.554; 2.593)	0.000	1.760 (1.206; 2.568)	0.003	2.059 (1.441; 2.941)	0.000
	TX	1.148 (0.959; 1.373)	0.133	1.001 (0.765; 1.311)	0.993	1.248 (0.972; 1.601)	0.082
N stage	N0	1.000		1.000		1.000	
	N1	0.946 (0.529; 1.692)	0.851	1.102 (0.485; 2.503)	0.816	0.808 (0.357; 1.831)	0.610
	N2	1.550 (0.914; 2.629)	0.104	0.847 (0.352; 2.037)	0.710	2.543 (1.275; 5.071)	0.008
	N3	1.404 (0.433; 4.552)	0.572	1.393 (0.183; 10.616)	0.749	1.008 (0.226; 4.500)	0.992
	NX	1.191 (0.942; 1.505)	0.144	1.700 (1.246; 2.317)	0.001	1.024 (0.715; 1.468)	0.895
M stage	M0			1.000			
	M1			4.273 (3.396; 5.376)	0.000		
	MX			1.081 (0.872; 1.339)	0.479		
Tumour grade	I	1.000		1.000		1.000	
	II	1.586 (1.289; 1.951)	0.000	1.824 (1.383; 2.407)	0.000	1.393 (1.018; 1.905)	0.038
	III	2.870 (2.347; 3.511)	0.000	3.691 (2.819; 4.833)	0.000	2.152 (1.582; 2.926)	0.000
	IV	3.285 (2.187; 4.934)	0.000	4.976 (2.875; 8.614)	0.000	1.926 (1.038; 3.573)	0.038
	Unknown	2.465 (1.968; 3.087)	0.000	2.573 (1.868; 3.544)	0.000	2.224 (1.617; 3.060)	0.000
Histological confirmation	Yes	1.000				1.000	
	No	0.504 (0.421; 0.603)	0.000			0.568 (0.460; 0.702)	0.000
Stratified by:		Patient age, M stage Smoker status, co-morbidity		Patient age, Smoker status, co-morbidity		Patient age, marital status M stage, co-morbidity	

Appendix 4. Logistic regression models of treatment by cancer site

1.9 Breast cancer, treatment models

		Surgery		Radiotherapy		Chemotherapy (1996-1998)		Hormone therapy (1996-1998)	
		Odds ratio (95% CI)	**P-value**	**Odds ratio (95% CI)**	**P-value**	**Odds ratio (95% CI)**	**P-value**	**Odds ratio (95% CI)**	**P-value**
Univariate model:									
Area of residence	ERHA	1.000		1.000		1.000		1.000	
	MHB	1.142 (0.871; 1.496)	0.336	0.966 (0.794; 1.177)	0.733	1.209 (0.995; 1.468)	0.056	1.403 (1.093; 1.801)	0.008
	MWHB	1.064 (0.842; 1.344)	0.602	0.664 (0.554; 0.796)	0.000	0.910 (0.764; 1.084)	0.293	1.772 (1.420; 2.211)	0.000
	NEHB	1.127 (0.878; 1.445)	0.349	0.888 (0.739; 1.067)	0.206	1.000 (0.833; 1.199)	0.997	1.556 (1.245; 1.945)	0.000
	NWHB	0.873 (0.680; 1.120)	0.285	0.645 (0.525; 0.793)	0.000	1.277 (1.052; 1.550)	0.014	2.544 (1.971; 3.282)	0.000
	SHB	0.842 (0.709; 0.999)	0.049	1.027 (0.898; 1.174)	0.699	1.179 (1.032; 1.348)	0.016	5.648 (4.629; 6.892)	0.000
	SEHB	0.953 (0.772; 1.176)	0.653	1.282 (1.093; 1.503)	0.002	1.036 (0.882; 1.216)	0.669	3.106 (2.514; 3.838)	0.000
	WHB	1.180 (0.940; 1.482)	0.154	0.432 (0.359; 0.520)	0.000	1.361 (1.156; 1.601)	0.000	2.622 (2.108; 3.262)	0.000
Multivariate model:									
Area of residence	ERHA	1.000		1.000		1.000		1.000	
	ERHA	0.948 (0.668; 1.345)	0.765	0.899 (0.733; 1.103)	0.307	1.082 (0.791; 1.480)	0.621	1.179 (0.882; 1.576)	0.266
	MHB	1.679 (1.174; 2.399)	0.004	0.675 (0.558; 0.816)	0.000	0.673 (0.502; 0.904)	0.009	1.643 (1.263; 2.138)	0.000
	MWHB	1.535 (1.070; 2.203)	0.020	0.923 (0.761; 1.120)	0.417	0.988 (0.736; 1.325)	0.935	1.405 (1.076; 1.834)	0.012
	NEHB	1.021 (0.701; 1.487)	0.915	0.693 (0.558; 0.859)	0.001	0.881 (0.625; 1.242)	0.469	1.437 (1.069; 1.931)	0.016
	NWHB	0.764 (0.589; 0.992)	0.043	1.148 (0.996; 1.325)	0.058	1.185 (0.947; 1.483)	0.137	5.317 (4.227; 6.689)	0.000
	SHB	1.155 (0.849; 1.571)	0.359	1.305 (1.103; 1.542)	0.002	1.158 (0.887; 1.513)	0.281	2.850 (2.222; 3.657)	0.000
	SEHB	1.608 (1.152; 2.245)	0.005	0.436 (0.360; 0.529)	0.000	1.265 (0.963; 1.662)	0.091	2.269 (1.765; 2.916)	0.000
Age	<=40	1.000		1.000		1.000		1.000	
	41-50	0.760 (0.496; 1.166)	0.209	0.847 (0.702; 1.022)	0.083	0.694 (0.530; 0.908)	0.008	1.614 (1.223; 2.132)	0.001
	51-60	0.768 (0.504; 1.170)	0.219	0.851 (0.707; 1.024)	0.087	0.313 (0.240; 0.407)	0.000	3.660 (2.782; 4.815)	0.000
	61-70	0.697 (0.455; 1.067)	0.097	0.736 (0.607; 0.892)	0.002	0.092 (0.069; 0.122)	0.000	6.476 (4.859; 8.631)	0.000
	71-80	0.278 (0.183; 0.423)	0.000	0.414 (0.336; 0.511)	0.000	0.019 (0.013; 0.029)	0.000	9.812 (7.189; 13.39)	0.000
	>80	0.117 (0.075; 0.184)	0.000	0.158 (0.116; 0.214)	0.000	0.009 (0.004; 0.018)	0.000	12.785 (8.76; 18.66)	0.000
Deprivation status	Affluent	1.000						1.000	
	Intermediate	0.898 (0.718; 1.124)	0.348					1.126 (0.938; 1.352)	0.202
	Deprived	0.761 (0.594; 0.975)	0.031					1.111 (0.905; 1.365)	0.313
	Unknown	0.624 (0.465; 0.837)	0.002					0.640 (0.515; 0.796)	0.000
Marital status	Married	1.000		1.000		1.000		1.000	
	Not married	0.754 (0.621; 0.916)	0.004	0.862 (0.770; 0.965)	0.010	0.803 (0.673; 0.958)	0.015	1.079 (0.922; 1.263)	0.345
	Unknown	0.409 (0.281; 0.595)	0.000	1.335 (1.018; 1.751)	0.037	0.766 (0.529; 1.111)	0.160	0.353 (0.234; 0.532)	0.000
Smoker status	Non-smoker	1.000		1.000				1.000	
	Ex-smoker	0.811 (0.592; 1.111)	0.193	0.944 (0.783; 1.139)	0.549			0.971 (0.756; 1.247)	0.816
	Smoker	0.924 (0.731; 1.169)	0.511	0.976 (0.862; 1.106)	0.708			1.059 (0.889; 1.262)	0.521
	Unknown	0.625 (0.506; 0.771)	0.000	1.225 (1.078; 1.392)	0.002			0.496 (0.416; 0.592)	0.000
Year of incidence:						1.193 (1.091; 1.306)	0.000		
Histological confirmation	Yes	1.000							
	No	0.198 (0.057; 0.686)	0.011						
Tumour morphology	Malignant, NOS	1.000		1.000		1.000		1.000	
	Squamous	4.864 (1.974; 11.987)	0.001	2.717 (1.862; 3.963)	0.000	2.771 (1.366; 5.623)	0.005	1.791 (1.158; 2.770)	0.009

	Adenocarcinoma	12.934 (5.213;32.090)	0.000	2.583 (1.772; 3.767)	0.000	1.909 (0.948; 3.843)	0.070	2.565 (1.661; 3.961)	0.000
	Specific breast	25.038(10.379;60.40)	0.000	2.650 (1.882; 3.729)	0.000	2.443 (1.277; 4.674)	0.007	2.440 (1.688; 3.528)	0.000
Clinical T stage	T1	1.000		1.000		1.000			
	T2	1.001 (0.766; 1.309)	0.991	0.947 (0.834; 1.076)	0.403	1.618 (1.329; 1.968)	0.000		
	T3	0.454 (0.328; 0.627)	0.000	0.835 (0.690; 1.010)	0.063	3.037 (2.252; 4.095)	0.000		
	T3	0.170 (0.126; 0.231)	0.000	1.056 (0.863; 1.292)	0.597	2.590 (1.863; 3.601)	0.000		
	TX	0.566 (0.437; 0.734)	0.000	0.822 (0.718; 0.941)	0.005	1.389 (1.123; 1.718)	0.002		
Clinical N stage	N0	1.000				1.000		1.000	
	N1	0.640 (0.493; 0.830)	0.001			2.328 (1.849; 2.931)	0.000	0.686 (0.559; 0.842)	0.000
	N2	0.339 (0.219; 0.527)	0.000			2.589 (1.613; 4.156)	0.000	0.444 (0.294; 0.671)	0.000
	N3	0.839 (0.344; 2.050)	0.701			8.160 (3.209; 20.750)	0.000	0.342 (0.145; 0.808)	0.014
	NX	0.613 (0.492; 0.764)	0.000			1.363 (1.142; 1.628)	0.001	0.541 (0.463; 0.634)	0.000
Clinical M stage	M0	1.000		1.000		1.000		1.000	
	M1	0.078 (0.059; 0.104)	0.000	0.813 (0.654; 1.011)	0.062	0.746 (0.534; 1.042)	0.086	0.850 (0.638; 1.133)	0.268
	MX	0.840 (0.689; 1.025)	0.086	0.980 (0.885; 1.085)	0.698	0.708 (0.604; 0.829)	0.000	0.851 (0.734; 0.986)	0.032
Tumour grade	I	1.000				1.000		1.000	
	II	1.268 (0.843; 1.905)	0.254			1.830 (1.330; 2.516)	0.000	0.956 (0.723; 1.263)	0.751
	III	1.065 (0.721; 1.573)	0.751			3.129 (2.286; 4.283)	0.000	0.738 (0.562; 0.970)	0.029
	IV	1.382 (0.653; 2.927)	0.398			1.258 (0.520; 3.045)	0.611	0.772 (0.364; 1.637)	0.500
	Unknown	0.449 (0.312; 0.647)	0.000			1.533 (1.128; 2.085)	0.006	0.828 (0.635; 1.080)	0.164
Co-morbidity	Low			1.000		1.000		1.000	
	High			0.888 (0.699; 1.128)	0.330	0.871 (0.619; 1.225)	0.427	1.077 (0.798; 1.453)	0.628
	Unknown			0.694 (0.625; 0.770)	0.000	0.682 (0.564; 0.824)	0.000	0.505 (0.424; 0.601)	0.000

1.10 Colorectal cancer, patients having surgery

		Both sexes		Female		Male	
		Odds Ratio (95% CI)	**p**	**Odds Ratio (95% CI)**	**p**	**Odds Ratio (95% CI)**	**p**
Univariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.916 (0.726; 1.155)	0.457	1.213 (0.840; 1.754)	0.303	0.742 (0.549; 1.004)	0.053
	MWHB	1.233 (0.983; 1.545)	0.070	1.361 (0.937; 1.977)	0.106	1.158 (0.870; 1.540)	0.315
	NEHB	1.421 (1.133; 1.783)	0.002	1.477 (1.042; 2.093)	0.028	1.379 (1.023; 1.858)	0.035
	NWHB	0.708 (0.579; 0.867)	0.001	0.607 (0.454; 0.813)	0.001	0.812 (0.613; 1.075)	0.145
	SHB	0.807 (0.693; 0.940)	0.006	0.778 (0.622; 0.973)	0.028	0.833 (0.676; 1.027)	0.087
	SEHB	0.722 (0.606; 0.860)	0.000	0.731 (0.561; 0.952)	0.02	0.714 (0.565; 0.901)	0.005
	WHB	0.951 (0.792; 1.143)	0.594	1.215 (0.894; 1.651)	0.213	0.825 (0.654; 1.039)	0.102
Multivariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.875 (0.633; 1.211)	0.421	0.868 (0.526; 1.435)	0.582	0.896 (0.584; 1.375)	0.615
	MWHB	1.557 (1.135; 2.136)	0.006	1.926 (1.108; 3.349)	0.020	1.434 (0.971; 2.119)	0.070
	NEHB	2.356 (1.734; 3.200)	0.000	3.035 (1.813; 5.079)	0.000	2.074 (1.412; 3.049)	0.000
	NWHB	0.856 (0.631; 1.162)	0.318	0.852 (0.531; 1.367)	0.507	0.899 (0.601; 1.347)	0.607
	SHB	1.236 (0.991; 1.542)	0.061	1.275 (0.910; 1.784)	0.158	1.264 (0.941; 1.697)	0.120
	SEHB	0.984 (0.764; 1.269)	0.904	0.935 (0.634; 1.378)	0.734	1.031 (0.737; 1.442)	0.860
	WHB	1.803 (1.400; 2.322)	0.000	2.588 (1.698; 3.943)	0.000	1.495 (1.088; 2.055)	0.013
Age	<=60	1.000		1.000		1.000	
	61-70	0.825 (0.673; 1.010)	0.062	1.033 (0.742; 1.440)	0.847	0.708 (0.547; 0.917)	0.009
	71-80	0.646 (0.529; 0.788)	0.000	0.698 (0.516; 0.943)	0.019	0.601 (0.464; 0.778)	0.000
	>80	0.372 (0.293; 0.472)	0.000	0.407 (0.291; 0.568)	0.000	0.321 (0.232; 0.442)	0.000
Marital status	Married	1.000				1.000	
	Not married	0.792 (0.680; 0.923)	0.003			0.707 (0.582; 0.857)	0.000
	Unknown	0.750 (0.500; 1.124)	0.163			0.749 (0.441; 1.272)	0.285
Deprivation index	Affluent	1.000		1.000		1.000	
	Intermediate	0.885 (0.729; 1.075)	0.217	0.873 (0.644; 1.182)	0.380	0.900 (0.698; 1.161)	0.417
	Deprived	0.784 (0.634; 0.970)	0.025	0.775 (0.557; 1.078)	0.130	0.770 (0.582; 1.018)	0.066
	Unknown	0.544 (0.397; 0.744)	0.000	0.510 (0.312; 0.834)	0.007	0.551 (0.364; 0.833)	0.005
Smoker status	Non-smoker	1.000				1.000	
	Ex-smoker	0.923 (0.746; 1.143)	0.463			0.863 (0.666; 1.119)	0.267
	Smoker	0.785 (0.651; 0.945)	0.011			0.755 (0.596; 0.955)	0.019
	Unknown	0.686 (0.564; 0.833)	0.000			0.577 (0.439; 0.759)	0.000
Sex	Female	1.000					
	Male	0.836 (0.720; 0.970)	0.019				
Year of incidence	1994	1.000		1.000		1.000	
	1995	1.209 (0.976; 1.499)	0.082	1.198 (0.856; 1.678)	0.292	1.135 (0.842; 1.529)	0.406
	1996	1.601 (1.282; 1.999)	0.000	1.565 (1.099; 2.230)	0.013	1.422 (1.024; 1.975)	0.036
	1997	1.638 (1.314; 2.043)	0.000	1.735 (1.221; 2.466)	0.002	1.402 (1.011; 1.944)	0.043
	1998	2.005 (1.557; 2.580)	0.000	1.917 (1.288; 2.854)	0.001	1.887 (1.323; 2.692)	0.000
Histological confirmation	No	1.000		1.000		1.000	
	Yes	31.820 (21.853; 46.332)	0.000	33.806 (19.790; 57.751)	0.000	33.440 (19.489; 57.375)	0.000
Site	Colon	1.000		1.000		1.000	
	Junction	0.874 (0.671; 1.138)	0.316	0.973 (0.624; 1.515)	0.902	0.800 (0.574; 1.116)	0.189
	Rectal/anal	0.454 (0.391; 0.529)	0.000	0.404 (0.316; 0.517)	0.000	0.474 (0.390; 0.576)	0.000
Tumour grade	I	1.000		1.000		1.000	
	II	0.927 (0.703; 1.223)	0.594	0.823 (0.516; 1.311)	0.412	0.981 (0.693; 1.389)	0.914
	III	0.684 (0.501; 0.933)	0.017	0.508 (0.306; 0.843)	0.009	0.820 (0.548; 1.227)	0.335
	IV	0.363 (0.171; 0.770)	0.008	0.172 (0.055; 0.541)	0.003	0.675 (0.227; 2.008)	0.480
	Unknown	0.282 (0.212; 0.376)	0.000	0.222 (0.138; 0.359)	0.000	0.324 (0.226; 0.465)	0.000
Clinical T stage	T1	1.000		1.000		1.000	
	T2	1.915 (1.179; 3.113)	0.009	1.570 (0.737; 3.341)	0.242	2.085 (1.104; 3.940)	0.024
	T3	0.921 (0.619; 1.371)	0.685	0.996 (0.532; 1.865)	0.990	0.852 (0.507; 1.430)	0.544
	T4	0.311 (0.213; 0.454)	0.000	0.279 (0.154; 0.504)	0.000	0.332 (0.202; 0.545)	0.000
	TX	0.774 (0.557; 1.074)	0.126	0.746 (0.446; 1.248)	0.265	0.792 (0.515; 1.217)	0.287
	In situ	0.389 (0.043; 3.515)	0.400	0.047 (0.004; 0.636)	0.021		
	T0	0.414 (0.087; 1.974)	0.269	0.189 (0.033; 1.084)	0.061		
Clinical N stage	N0	1.000		1.000		1.000	
	N1	1.425 (0.964; 2.105)	0.076	1.420 (0.760; 2.655)	0.272	1.408 (0.848; 2.336)	0.186

	N2	1.042 (0.544; 1.999)	0.901	1.015 (0.361; 2.852)	0.977	1.033 (0.444; 2.405)	0.940
	N3	0.784 (0.342; 1.801)	0.567	0.805 (0.225; 2.878)	0.738	0.811 (0.260; 2.527)	0.718
	NX	0.729 (0.555; 0.957)	0.023	0.674 (0.441; 1.030)	0.068	0.747 (0.521; 1.070)	0.112
Clinical M stage	M0	1.000		1.000		1.000	
	M1	0.082 (0.066; 0.102)	0.000	0.078 (0.055; 0.109)	0.000	0.080 (0.060; 0.106)	0.000
	MX	0.432 (0.352; 0.531)	0.000	0.411 (0.298; 0.566)	0.000	0.436 (0.333; 0.571)	0.000
Co-morbidity	Low					1.000	
	High					0.714 (0.502; 1.016)	0.061
	Unknown					0.846 (0.671; 1.067)	0.158

1.11 Colorectal cancer, patients having radiotherapy

		Both sexes		Female		Male	
		Odds Ratio (95% confidence intervals)	**p**	**Odds Ratio (95% confidence intervals)**	**p**	**Odds Ratio (95% confidence intervals)**	**p**
Univariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.587 (0.410; 0.840)	0.004	0.682 (0.391; 1.191)	0.179	0.532 (0.333; 0.851)	0.008
	MWHB	0.397 (0.273; 0.577)	0.000	0.380 (0.190; 0.760)	0.006	0.386 (0.247; 0.602)	0.000
	NEHB	0.518 (0.375; 0.716)	0.000	0.666 (0.403; 1.100)	0.112	0.435 (0.285; 0.664)	0.000
	NWHB	0.824 (0.617; 1.099)	0.188	0.748 (0.457; 1.225)	0.248	0.867 (0.606; 1.239)	0.433
	SHB	0.522 (0.411; 0.663)	0.000	0.510 (0.343; 0.760)	0.001	0.529 (0.392; 0.715)	0.000
	SEHB	0.688 (0.529; 0.893)	0.005	0.661 (0.422; 1.034)	0.069	0.691 (0.500; 0.956)	0.026
	WHB	0.687 (0.529; 0.891)	0.005	0.611 (0.378; 0.988)	0.045	0.692 (0.506; 0.945)	0.021
Multivariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.742 (0.495; 1.114)	0.150	0.707 (0.382; 1.307)	0.268	0.636 (0.383; 1.057)	0.081
	MWHB	0.437 (0.288; 0.662)	0.000	0.396 (0.190; 0.825)	0.013	0.417 (0.259; 0.673)	0.000
	NEHB	0.464 (0.327; 0.659)	0.000	0.694 (0.399; 1.204)	0.194	0.380 (0.241; 0.597)	0.000
	NWHB	0.807 (0.577; 1.130)	0.213	1.031 (0.588; 1.808)	0.914	0.746 (0.493; 1.131)	0.168
	SHB	0.556 (0.427; 0.724)	0.000	0.542 (0.349; 0.842)	0.006	0.577 (0.415; 0.802)	0.001
	SEHB	0.745 (0.554; 1.001)	0.051	0.604 (0.362; 1.008)	0.054	0.777 (0.541; 1.116)	0.172
	WHB	0.625 (0.466; 0.837)	0.002	0.669 (0.393; 1.139)	0.138	0.619 (0.438; 0.874)	0.007
Age	<=60	1.000		1.000		1.000	
	61-70	0.636 (0.524; 0.772)	0.000	0.695 (0.504; 0.958)	0.026	0.604 (0.474; 0.771)	0.000
	71-80	0.300 (0.241; 0.374)	0.000	0.224 (0.152; 0.330)	0.000	0.336 (0.256; 0.440)	0.000
	>80	0.101 (0.065; 0.157)	0.000	0.060 (0.027; 0.134)	0.000	0.132 (0.078; 0.223)	0.000
Sex	Female	1.000					
	Male	1.190 (1.000; 1.416)	0.050				
Year of incidence	1994	1.000				1.000	
	1995	0.747 (0.546; 1.022)	0.069			0.842 (0.568; 1.248)	0.393
	1996	0.904 (0.661; 1.237)	0.529			0.947 (0.640; 1.400)	0.784
	1997	0.923 (0.679; 1.256)	0.612			1.073 (0.732; 1.574)	0.717
	1998	1.282 (0.955; 1.722)	0.098			1.595 (1.109; 2.294)	0.012
Histological confirmation	No	1.000		1.000		1.000	
	Yes	1.664 (0.989; 2.800)	0.055	2.092 (0.813; 5.384)	0.126		
Site	Colon	1.000		1.000		1.000	
	Junction	3.843 (2.860; 5.164)	0.000	3.165 (1.896; 5.286)	0.000	4.190 (2.908; 6.037)	0.000
	Rectal/anal	8.830 (7.270; 10.724)	0.000	9.782 (7.127; 13.426)	0.000	8.532 (6.661; 10.930)	0.000
Tumour grade	I	1.000					
	II	1.220 (0.879; 1.694)	0.234				
	III	1.639 (1.135; 2.369)	0.008				
	IV	3.838 (1.507; 9.771)	0.005				
	Unknown	1.250 (0.865; 1.808)	0.235				
Clinical T stage	T1	1.000		1.000		1.000	
	T2	1.542 (0.937; 2.538)	0.089	0.841 (0.362; 1.955)	0.688	2.041 (1.088; 3.829)	0.026
	T3	3.209 (2.053; 5.016)	0.000	2.750 (1.362; 5.551)	0.005	3.531 (1.980; 6.298)	0.000
	T4	4.953 (3.117; 7.871)	0.000	4.591 (2.206; 9.556)	0.000	4.959 (2.727; 9.019)	0.000
	TX	1.634 (1.092; 2.446)	0.017	1.340 (0.710; 2.529)	0.367	1.770 (1.047; 2.991)	0.033
	In situ	4.701 (0.316; 70.034)	0.261			6.225 (0.368; 105.361)	0.205
Clinical M stage	M0	1.000		1.000		1.000	
	M1	0.653 (0.505; 0.845)	0.001	0.625 (0.400; 0.976)	0.039	0.665 (0.487; 0.909)	0.011
	MX	1.144 (0.947; 1.383)	0.162	0.975 (0.715; 1.331)	0.874	1.221 (0.965; 1.545)	0.096
Co-morbidity	Low	1.000		1.000		1.000	
	High	0.799 (0.565; 1.130)	0.205	0.988 (0.529; 1.844)	0.969	0.736 (0.484; 1.120)	0.152
	Unknown	0.435 (0.349; 0.542)	0.000	0.402 (0.287; 0.564)	0.000	0.471 (0.360; 0.618)	0.000

1.12 Colorectal cancer, patients having chemotherapy

		Both sexes		Female		Male	
		Odds Ratio (95% CI)	**P-value**	**Odds Ratio (95% CI)**	**P-value**	**Odds Ratio (95% CI)**	**P-value**
Univariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.930 (0.744; 1.163)	0.523	0.985 (0.706; 1.373)	0.928	0.888 (0.657; 1.201)	0.442
	MWHB	0.771 (0.625; 0.952)	0.015	0.821 (0.584; 1.154)	0.256	0.735 (0.562; 0.960)	0.024
	NEHB	0.864 (0.710; 1.052)	0.146	0.825 (0.604; 1.125)	0.224	0.887 (0.687; 1.145)	0.357
	NWHB	1.325 (1.094; 1.604)	0.004	1.167 (0.869; 1.569)	0.305	1.456 (1.132; 1.873)	0.003
	SHB	0.529 (0.448; 0.626)	0.000	0.565 (0.441; 0.726)	0.000	0.502 (0.400; 0.630)	0.000
	SEHB	1.125 (0.950; 1.333)	0.171	1.017 (0.780; 1.326)	0.903	1.202 (0.965; 1.498)	0.101
	WHB	0.784 (0.654; 0.938)	0.008	0.713 (0.529; 0.961)	0.027	0.816 (0.650; 1.025)	0.080
Multivariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	1.083 (0.831; 1.413)	0.554	1.016 (0.683; 1.512)	0.937	1.142 (0.799; 1.633)	0.465
	MWHB	0.932 (0.726; 1.196)	0.579	0.899 (0.596; 1.356)	0.611	0.947 (0.691; 1.297)	0.733
	NEHB	0.980 (0.784; 1.225)	0.860	0.868 (0.606; 1.242)	0.438	1.081 (0.812; 1.439)	0.593
	NWHB	1.493 (1.170; 1.905)	0.001	1.359 (0.937; 1.973)	0.106	1.697 (1.234; 2.335)	0.001
	SHB	0.521 (0.431; 0.629)	0.000	0.594 (0.448; 0.787)	0.000	0.505 (0.392; 0.651)	0.000
	SEHB	1.288 (1.053; 1.575)	0.014	1.106 (0.807; 1.517)	0.531	1.475 (1.138; 1.912)	0.003
	WHB	0.887 (0.720; 1.093)	0.261	0.833 (0.586; 1.184)	0.308	0.948 (0.730; 1.231)	0.687
Age	<=60	1.000		1.000		1.000	
	61-70	0.519 (0.454; 0.592)	0.000	0.475 (0.387; 0.583)	0.000	0.535 (0.451; 0.636)	0.000
	71-80	0.162 (0.138; 0.189)	0.000	0.103 (0.080; 0.132)	0.000	0.199 (0.163; 0.243)	0.000
	>80	0.023 (0.015; 0.037)	0.000	0.013 (0.006; 0.026)	0.000	0.033 (0.019; 0.059)	0.000
Marital status	Married	1.000				1.000	
	Not married	0.670 (0.589; 0.763)	0.000			0.584 (0.489; 0.697)	0.000
	Unknown	0.643 (0.420; 0.983)	0.041			0.700 (0.392; 1.250)	0.228
Smoker status	Non-smoker	1.000				1.000	
	Ex-smoker	0.846 (0.714; 1.003)	0.054			0.782 (0.635; 0.962)	0.020
	Smoker	0.871 (0.751; 1.009)	0.066			0.857 (0.711; 1.033)	0.104
	Unknown	0.744 (0.626; 0.884)	0.001			0.684 (0.540; 0.866)	0.002
Year of incidence	1994	1.000				1.000	
	1995	0.844 (0.689; 1.034)	0.101			0.830 (0.638; 1.080)	0.166
	1996	1.063 (0.860; 1.314)	0.572			1.001 (0.764; 1.313)	0.992
	1997	1.090 (0.885; 1.343)	0.419			1.019 (0.778; 1.334)	0.891
	1998	1.366 (1.118; 1.669)	0.002			1.416 (1.095; 1.832)	0.008
Histological confirmation	No	1.000		1.000		1.000	
	Yes	4.315 (2.707; 6.880)	0.000	5.087 (2.226; 11.624)	0.000	4.099 (2.321; 7.238)	0.000
Site	Colon	1.000		1.000			
	Junction	0.881 (0.712; 1.090)	0.244	0.675 (0.468; 0.973)	0.035		
	Rectal/anal	0.870 (0.765; 0.990)	0.034	0.758 (0.611; 0.941)	0.012		
Tumour grade	I	1.000		1.000		1.000	
	II	1.203 (0.981; 1.475)	0.076	1.240 (0.896; 1.716)	0.194	1.175 (0.902; 1.529)	0.231
	III	1.651 (1.301; 2.095)	0.000	1.958 (1.353; 2.834)	0.000	1.424 (1.041; 1.948)	0.027
	IV	1.190 (0.547; 2.589)	0.661	1.683 (0.528; 5.363)	0.378	0.864 (0.297; 2.511)	0.788
	Unknown	0.882 (0.693; 1.121)	0.304	0.923 (0.630; 1.351)	0.680	0.816 (0.598; 1.114)	0.201
Clinical T stage	T1	1.000		1.000		1.000	
	T2	1.166 (0.823; 1.651)	0.388	0.801 (0.465; 1.382)	0.426	1.499 (0.952; 2.362)	0.081
	T3	2.517 (1.842; 3.440)	0.000	2.961 (1.847; 4.748)	0.000	2.435 (1.614; 3.673)	0.000
	T4	2.192 (1.569; 3.062)	0.000	1.967 (1.174; 3.296)	0.010	2.504 (1.620; 3.870)	0.000
	TX	1.650 (1.253; 2.174)	0.000	1.421 (0.936; 2.159)	0.099	1.839 (1.281; 2.639)	0.001
	In situ	2.143 (0.356; 12.907)	0.405	3.402 (0.271; 42.630)	0.343	1.426 (0.112; 18.195)	0.785
	T0	0.823 (0.218; 3.110)	0.774			1.608 (0.383; 6.754)	0.516
Clinical N stage	N0	1.000				1.000	
	N1	1.458 (1.125; 1.889)	0.004			1.458 (1.040; 2.044)	0.029
	N2	1.716 (1.018; 2.894)	0.043			1.527 (0.771; 3.023)	0.225
	N3	0.750 (0.353; 1.594)	0.454			0.624 (0.219; 1.775)	0.377
	NX	0.919 (0.767; 1.102)	0.362			0.882 (0.697; 1.116)	0.295
Clinical M stage	M0	1.000		1.000		1.000	
	M1	1.297 (1.092; 1.540)	0.003	1.033 (0.788; 1.354)	0.815	1.507 (1.210; 1.878)	0.000
	MX	0.784 (0.681; 0.904)	0.001	0.726 (0.592; 0.890)	0.002	0.800 (0.663; 0.965)	0.020
Co-morbidity	Low	1.000		1.000		1.000	
	High	0.696 (0.534; 0.908)	0.007	0.870 (0.543; 1.394)	0.563	0.650 (0.471; 0.897)	0.009
	Unknown	0.708 (0.612; 0.820)	0.000	0.624 (0.513; 0.760)	0.000	0.715 (0.592; 0.865)	0.001

1.13 Lung cancer, odds of having surgery

		All lung cancers		NSCLC	
		Odds ratio (95%CI)	**p**	Odds ratio (95%CI)	**p**
Univariate model:					
Area of residence	ERHA	1.000		1.000	
	MHB	0.798 (0.590; 1.078)	0.142	0.826 (0.600; 1.137)	0.241
	MWHB	0.504 (0.375; 0.677)	0.000	0.697 (0.508; 0.957)	0.026
	NEHB	0.759 (0.586; 0.984)	0.037	0.879 (0.665; 1.162)	0.365
	NWHB	0.517 (0.379; 0.705)	0.000	0.628 (0.453; 0.873)	0.006
	SHB	0.809 (0.665; 0.984)	0.034	0.874 (0.707; 1.080)	0.211
	SEHB	0.723 (0.575; 0.909)	0.006	0.891 (0.693; 1.146)	0.370
	WHB	0.402 (0.296; 0.546)	0.000	0.434 (0.316; 0.598)	0.000
Multivariate model:					
Area of residence	ERHA	1.000		1.000	
	MHB	0.907 (0.631; 1.303)	0.597	0.913 (0.629; 1.324)	0.632
	MWHB	0.559 (0.388; 0.804)	0.002	0.559 (0.384; 0.812)	0.002
	NEHB	0.730 (0.529; 1.007)	0.055	0.703 (0.504; 0.981)	0.038
	NWHB	0.571 (0.392; 0.832)	0.004	0.567 (0.385; 0.834)	0.004
	SHB	0.940 (0.733; 1.206)	0.628	0.894 (0.690; 1.159)	0.398
	SEHB	0.932 (0.699; 1.243)	0.631	0.851 (0.631; 1.149)	0.292
	WHB	0.460 (0.322; 0.655)	0.000	0.450 (0.313; 0.645)	0.000
Age	<50	1.000		1.000	
	50-54	0.530 (0.342; 0.821)	0.004	0.492 (0.311; 0.779)	0.002
	55-59	0.390 (0.257; 0.590)	0.000	0.366 (0.237; 0.565)	0.000
	60-64	0.486 (0.330; 0.716)	0.000	0.466 (0.310; 0.700)	0.000
	65-69	0.405 (0.280; 0.585)	0.000	0.389 (0.265; 0.573)	0.000
	70-74	0.361 (0.249; 0.524)	0.000	0.329 (0.223; 0.484)	0.000
	75-80	0.169 (0.113; 0.255)	0.000	0.155 (0.101; 0.237)	0.000
	>80	0.049 (0.027; 0.087)	0.000	0.044 (0.024; 0.081)	0.000
Marital status	Married	1.000		1.000	
	Not married	0.667 (0.560; 0.794)	0.000	0.682 (0.570; 0.816)	0.000
	Unknown	0.674 (0.387; 1.173)	0.163	0.693 (0.391; 1.228)	0.209
Smoker status	Non-smoker	1.000		1.000	
	Ex-smoker	0.859 (0.627; 1.177)	0.344	0.898 (0.649; 1.242)	0.517
	Smoker	0.716 (0.535; 0.960)	0.026	0.725 (0.536; 0.980)	0.036
	Unknown	0.725 (0.485; 1.083)	0.117	0.640 (0.420; 0.974)	0.037
T stage	T1	1.000		1.000	
	T2	0.785 (0.586; 1.052)	0.106	0.791 (0.584; 1.072)	0.131
	T3	0.325 (0.221; 0.477)	0.000	0.313 (0.210; 0.466)	0.000
	T4	0.109 (0.071; 0.167)	0.000	0.106 (0.068; 0.165)	0.000
	TX	0.446 (0.338; 0.588)	0.000	0.445 (0.334; 0.592)	0.000
N stage	N0	1.000		1.000	
	N1	0.602 (0.431; 0.841)	0.003	0.589 (0.417; 0.832)	0.003
	N2	0.329 (0.224; 0.482)	0.000	0.319 (0.215; 0.475)	0.000
	N3	0.076 (0.035; 0.166)	0.000	0.066 (0.029; 0.151)	0.000
	NX	0.654 (0.504; 0.849)	0.001	0.656 (0.501; 0.860)	0.002
M stage	M0	1.000		1.000	
	M1	0.105 (0.073; 0.149)	0.000	0.091 (0.063; 0.133)	0.000
	MX	0.827 (0.666; 1.026)	0.085	0.809 (0.647; 1.012)	0.063
Tumour grade	I	1.000		1.000	
	II	1.883 (1.275; 2.780)	0.001	1.860 (1.257; 2.753)	0.002
	III	1.025 (0.698; 1.505)	0.901	1.001 (0.680; 1.473)	0.996
	IV	0.613 (0.390; 0.963)	0.034	0.661 (0.415; 1.053)	0.081
	Unknown	0.257 (0.173; 0.382)	0.000	0.252 (0.169; 0.377)	0.000
Cell type	NSCLC	1.000			
	SCLC	0.179 (0.122; 0.264)	0.000		
	Unknown	0.033 (0.012; 0.091)	0.000		
Method of presentation	Screening	1.000		1.000	
	Incidental	0.450 (0.088; 2.304)	0.338	0.343 (0.061; 1.942)	0.226
	Symptoms	0.221 (0.045; 1.082)	0.062	0.183 (0.034; 0.986)	0.048
	Unknown	0.177 (0.033; 0.945)	0.043	0.164 (0.028; 0.963)	0.045

1.14 Lung cancer, odds of having radiotherapy

		All lung cancers		NSCLC		SCLC	
		Odds ratio (95% confidence intervals)	**p**	**Odds ratio (95% confidence intervals)**	**p**	**Odds ratio (95% confidence intervals)**	**p**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.915 (0.723; 1.157)	0.457	1.083 (0.823; 1.425)	0.569	0.694 (0.325; 1.482)	0.345
	MWHB	0.546 (0.437; 0.681)	0.000	0.685 (0.519; 0.904)	0.008	0.607 (0.297; 1.240)	0.171
	NEHB	0.640 (0.516; 0.792)	0.000	0.761 (0.590; 0.983)	0.036	0.482 (0.252; 0.921)	0.027
	NWHB	0.779 (0.627; 0.966)	0.023	1.000 (0.767; 1.303)	0.999	0.832 (0.442; 1.565)	0.568
	SHB	1.079 (0.927; 1.255)	0.327	1.194 (0.993; 1.436)	0.060	1.219 (0.815; 1.822)	0.335
	SEHB	0.645 (0.535; 0.776)	0.000	0.720 (0.571; 0.908)	0.006	1.472 (0.914; 2.371)	0.112
	WHB	0.536 (0.433; 0.663)	0.000	0.587 (0.456; 0.754)	0.000	0.259 (0.101; 0.664)	0.005
Multivariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.918 (0.716; 1.177)	0.501	1.098 (0.826; 1.459)	0.521	0.683 (0.304; 1.532)	0.355
	MWHB	0.631 (0.499; 0.797)	0.000	0.682 (0.513; 0.907)	0.009	0.729 (0.344; 1.543)	0.408
	NEHB	0.715 (0.571; 0.896)	0.003	0.803 (0.618; 1.043)	0.100	0.572 (0.289; 1.130)	0.108
	NWHB	0.861 (0.684; 1.085)	0.206	0.965 (0.733; 1.269)	0.797	0.970 (0.495; 1.904)	0.93
	SHB	1.178 (1.001; 1.386)	0.048	1.219 (1.006; 1.478)	0.043	1.231 (0.790; 1.918)	0.359
	SEHB	0.648 (0.531; 0.790)	0.000	0.675 (0.531; 0.858)	0.001	1.300 (0.763; 2.214)	0.334
	WHB	0.563 (0.450; 0.704)	0.000	0.567 (0.438; 0.734)	0.000	0.241 (0.091; 0.640)	0.004
Age	<50	1.000		1.000		1.000	
	50-54	0.996 (0.722; 1.374)	0.980	0.890 (0.612; 1.292)	0.539	0.993 (0.479; 2.057)	0.984
	55-59	0.998 (0.736; 1.353)	0.988	1.045 (0.736; 1.483)	0.807	0.723 (0.352; 1.481)	0.375
	60-64	1.105 (0.831; 1.469)	0.492	1.172 (0.843; 1.630)	0.345	0.540 (0.276; 1.057)	0.072
	65-69	0.847 (0.644; 1.114)	0.235	0.871 (0.634; 1.196)	0.393	0.544 (0.290; 1.022)	0.058
	70-74	0.736 (0.559; 0.970)	0.029	0.767 (0.557; 1.055)	0.102	0.563 (0.293; 1.081)	0.084
	75-80	0.713 (0.537; 0.948)	0.020	0.804 (0.579; 1.118)	0.195	0.480 (0.235; 0.979)	0.044
	>80	0.413 (0.301; 0.567)	0.000	0.575 (0.397; 0.832)	0.003	0.154 (0.052; 0.454)	0.001
Co-morbidity	Low	1.000		1.000		1.000	
	High	0.972 (0.788; 1.199)	0.792	0.990 (0.776; 1.262)	0.934	0.594 (0.301; 1.171)	0.133
	None	0.653 (0.561; 0.760)	0.000	0.724 (0.625; 0.840)	0.000	1.273 (0.896; 1.808)	0.177
Marital status	Married	1.000		1.000		1.000	
	Not married	0.788 (0.702; 0.884)	0.000	0.769 (0.671; 0.881)	0.000	0.687 (0.488; 0.968)	0.032
	Unknown	0.788 (0.558; 1.113)	0.176	0.837 (0.560; 1.252)	0.387	0.725 (0.197; 2.669)	0.628
Deprivation index	Affluent					1.000	
	Intermediate					0.818 (0.520; 1.288)	0.387
	Deprived					0.741 (0.471; 1.167)	0.196
	Unknown					1.627 (0.894; 2.960)	0.111
Year of incidence	1994	1.000					
	1995	0.697 (0.572; 0.849)	0.000				
	1996	0.701 (0.575; 0.854)	0.000				
	1997	0.720 (0.591; 0.878)	0.001				
	1998	0.889 (0.738; 1.072)	0.219				
	T1	1.000		1.000		1.000	
	T2	1.187 (0.931; 1.514)	0.167	1.152 (0.874; 1.518)	0.315	1.885 (0.818; 4.342)	0.137
	T3	1.842 (1.389; 2.444)	0.000	1.807 (1.307; 2.497)	0.000	2.848 (1.119; 7.245)	0.028
	T4	1.536 (1.190; 1.984)	0.001	1.466 (1.094; 1.964)	0.010	1.617 (0.691; 3.786)	0.268
	TX	0.990 (0.787; 1.245)	0.933	1.021 (0.788; 1.324)	0.874	1.221 (0.549; 2.713)	0.624
Clinical N stage	N0	1.000		1.000		1.000	
	N1	1.159 (0.899; 1.495)	0.254	1.344 (1.006; 1.794)	0.045	0.865 (0.399; 1.877)	0.714
	N2	1.727 (1.344; 2.218)	0.000	1.785 (1.336; 2.387)	0.000	1.777 (0.869; 3.631)	0.115
	N3	1.714 (1.240; 2.370)	0.001	2.020 (1.391; 2.934)	0.000	0.862 (0.348; 2.139)	0.749
	NX	1.069 (0.872; 1.310)	0.521	1.131 (0.899; 1.424)	0.294	0.874 (0.472; 1.619)	0.669
Clinical M stage	M0	1.000		1.000			
	M1	1.209 (1.009; 1.449)	0.040	1.259 (1.020; 1.553)	0.032		
	MX	0.897 (0.761; 1.057)	0.195	0.865 (0.718; 1.042)	0.127		
Cell type	NSCLC	1.000					
	SCLC	0.503 (0.428; 0.592)	0.000				
	Unknown	0.371 (0.316; 0.435)	0.000				

1.15 Lung cancer, odds of having chemotherapy

		All lung cancers		NSCLC		SCLC	
		Odds ratio (95% confidence intervals)	**p**	**Odds ratio (95% confidence intervals)**	**p**	**Odds ratio (95% confidence intervals)**	**p**
Univariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.597 (0.417; 0.854)	0.005	0.575 (0.315; 1.049)	0.071	0.611 (0.332; 1.124)	0.113
	MWHB	0.649 (0.484; 0.869)	0.004	1.218 (0.794; 1.869)	0.366	0.352 (0.200; 0.621)	0.000
	NEHB	0.731 (0.552; 0.968)	0.029	0.510 (0.292; 0.892)	0.018	0.696 (0.433; 1.119)	0.134
	NWHB	0.803 (0.603; 1.070)	0.134	0.891 (0.550; 1.444)	0.64	0.775 (0.452; 1.331)	0.356
	SHB	0.906 (0.739; 1.110)	0.339	0.702 (0.486; 1.014)	0.059	1.010 (0.691; 1.476)	0.960
	SEHB	0.712 (0.556; 0.911)	0.007	1.153 (0.796; 1.668)	0.451	0.560 (0.358; 0.877)	0.011
	WHB	1.503 (1.208; 1.870)	0.000	3.055 (2.274; 4.105)	0.000	0.901 (0.517; 1.570)	0.712
Multivariate model:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.626 (0.400; 0.978)	0.039	0.644 (0.340; 1.220)	0.177	0.581 (0.294; 1.146)	0.117
	MWHB	0.864 (0.600; 1.246)	0.435	1.243 (0.781; 1.979)	0.360	0.299 (0.158; 0.565)	0.000
	NEHB	0.730 (0.513; 1.040)	0.081	0.577 (0.323; 1.032)	0.064	0.713 (0.422; 1.205)	0.206
	NWHB	1.031 (0.715; 1.486)	0.869	1.068 (0.634; 1.800)	0.804	0.739 (0.405; 1.348)	0.324
	SHB	0.966 (0.742; 1.258)	0.798	0.739 (0.496; 1.101)	0.137	1.140 (0.740; 1.755)	0.553
	SEHB	0.660 (0.478; 0.912)	0.012	1.096 (0.730; 1.647)	0.659	0.452 (0.274; 0.746)	0.002
	WHB	3.062 (2.319; 4.044)	0.000	3.549 (2.529; 4.979)	0.000	1.065 (0.576; 1.969)	0.842
Age	<50	1.000		1.000		1.000	
	50-54	0.976 (0.651; 1.464)	0.907	1.100 (0.683; 1.772)	0.696	0.472 (0.195; 1.143)	0.096
	55-59	0.642 (0.434; 0.951)	0.027	0.668 (0.417; 1.071)	0.094	0.467 (0.199; 1.096)	0.080
	60-64	0.573 (0.396; 0.827)	0.003	0.591 (0.377; 0.925)	0.022	0.420 (0.189; 0.932)	0.033
	65-69	0.388 (0.271; 0.555)	0.000	0.389 (0.251; 0.604)	0.000	0.290 (0.135; 0.626)	0.002
	70-74	0.262 (0.181; 0.380)	0.000	0.264 (0.165; 0.421)	0.000	0.195 (0.090; 0.426)	0.000
	75-80	0.136 (0.090; 0.207)	0.000	0.105 (0.057; 0.192)	0.000	0.114 (0.050; 0.258)	0.000
	>80	0.055 (0.031; 0.097)	0.000	0.052 (0.020; 0.139)	0.000	0.051 (0.020; 0.129)	0.000
Sex	Female	1.000		1.000			
	Male	0.819 (0.685; 0.980)	0.029	0.748 (0.586; 0.955)	0.020		
Marital status	Married	1.000		1.000		1.000	
	Not married	0.623 (0.517; 0.750)	0.000	0.653 (0.505; 0.845)	0.001	0.622 (0.462; 0.837)	0.002
	Unknown	0.408 (0.201; 0.829)	0.013	0.410 (0.157; 1.067)	0.068	0.651 (0.215; 1.968)	0.447
Deprivation index	Affluent			1.000			
	Intermediate			0.858 (0.636; 1.158)	0.318		
	Deprived			0.614 (0.446; 0.846)	0.003		
	Unknown			0.716 (0.473; 1.083)	0.114		
Smoker status	Non-smoker	1.000		1.000		1.000	
	Ex-smoker	1.388 (0.978; 1.970)	0.067	1.384 (0.881; 2.173)	0.158	1.832 (0.991; 3.385)	0.053
	Smoker	1.034 (0.749; 1.427)	0.841	0.918 (0.605; 1.391)	0.686	1.349 (0.769; 2.367)	0.296
	Unknown	0.986 (0.644; 1.510)	0.950	1.557 (0.912; 2.658)	0.105	0.588 (0.290; 1.193)	0.141
	T1	1.000		1.000		1.000	
	T2	1.904 (1.228; 2.954)	0.004	2.001 (1.075; 3.724)	0.029	1.507 (0.734; 3.094)	0.264
	T3	3.104 (1.912; 5.038)	0.000	3.434 (1.777; 6.634)	0.000	3.411 (1.384; 8.406)	0.008
	T4	3.033 (1.940; 4.741)	0.000	3.406 (1.826; 6.354)	0.000	2.066 (0.985; 4.333)	0.055
	TX	1.819 (1.195; 2.769)	0.005	1.975 (1.081; 3.608)	0.027	1.490 (0.762; 2.916)	0.244
Clinical N stage	N0	1.000		1.000			
	N1	1.186 (0.802; 1.755)	0.392	1.574 (0.942; 2.629)	0.083		
	N2	1.914 (1.317; 2.781)	0.001	2.950 (1.827; 4.765)	0.000		
	N3	1.765 (1.107; 2.815)	0.017	2.495 (1.396; 4.458)	0.002		
	NX	0.916 (0.659; 1.271)	0.598	1.019 (0.650; 1.598)	0.933		
Clinical M stage	M0	1.000		1.000		1.000	
	M1	0.716 (0.547; 0.936)	0.015	1.222 (0.868; 1.721)	0.250	0.320 (0.200; 0.513)	0.000
	MX	0.778 (0.609; 0.994)	0.045	0.812 (0.589; 1.119)	0.203	0.663 (0.423; 1.037)	0.072
Tumour grade	I	1.000		1.000			
	II	1.263 (0.592; 2.695)	0.546	1.406 (0.609; 3.247)	0.425		
	III	1.919 (0.924; 3.985)	0.080	2.144 (0.958; 4.798)	0.064		
	IV	2.873 (1.367; 6.041)	0.005	3.994 (1.720; 9.274)	0.001		
	Unknown	2.222 (1.079; 4.575)	0.030	2.145 (0.961; 4.788)	0.062		
Cell type	NSCLC	1.000					

	SCLC	17.844 (14.470; 22.005)	0.000				
	Unknown	0.388 (0.270; 0.558)	0.000				
Year of incidence	1994	1.000					
	1995	1.368 (1.044; 1.794)	0.023				
	1996	1.305 (0.994; 1.714)	0.056				
	1997	1.502 (1.146; 1.967)	0.003				
	1998	1.067 (0.813; 1.402)	0.639				

1.16 Prostate cancer, treatment models

		Surgery		Radiotherapy		Hormone therapy	
		Odds ratio (95% CI)	**P-value**	**Odds ratio (95% CI)**	**P-value**	**Odds ratio (95% CI)**	**P-value**
Univariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.731 (0.579; 0.922)	0.008	0.548 (0.290; 1.034)	0.064	1.577 (1.221; 2.036)	0.000
	MWHB	0.892 (0.721; 1.104)	0.295	1.178 (0.766; 1.811)	0.456	1.738 (1.381; 2.187)	0.000
	NEHB	0.790 (0.641; 0.975)	0.028	0.381 (0.197; 0.737)	0.004	1.489 (1.179; 1.881)	0.001
	NWHB	0.357 (0.285; 0.448)	0.000	0.439 (0.226; 0.850)	0.015	9.242 (7.215; 11.838)	0.000
	SHB	0.592 (0.502; 0.696)	0.000	1.329 (0.960; 1.841)	0.087	2.196 (1.839; 2.623)	0.000
	SEHB	0.878 (0.733; 1.052)	0.158	0.575 (0.361; 0.914)	0.019	1.506 (1.233; 1.840)	0.000
	WHB	0.300 (0.248; 0.364)	0.000	1.232 (0.849; 1.789)	0.272	3.882 (3.197; 4.715)	0.000
Multivariate analysis:							
Area of residence	ERHA	1.000		1.000		1.000	
	MHB	0.814 (0.624; 1.062)	0.129	0.530 (0.277; 1.014)	0.055	1.345 (1.005; 1.799)	0.046
	MWHB	1.640 (1.250; 2.151)	0.000	1.232 (0.786; 1.933)	0.363	1.914 (1.467; 2.497)	0.000
	NEHB	0.991 (0.773; 1.271)	0.946	0.376 (0.192; 0.735)	0.004	1.248 (0.956; 1.630)	0.104
	NWHB	0.439 (0.336; 0.575)	0.000	0.421 (0.214; 0.828)	0.012	9.962 (7.504; 13.225)	0.000
	SHB	0.687 (0.567; 0.834)	0.000	1.639 (1.160; 2.318)	0.005	2.302 (1.865; 2.842)	0.000
	SEHB	1.139 (0.919; 1.412)	0.234	0.549 (0.341; 0.883)	0.013	1.277 (1.013; 1.609)	0.039
	WHB	0.290 (0.234; 0.361)	0.000	1.443 (0.970; 2.146)	0.070	4.142 (3.306; 5.190)	0.000
Age	<65	1.000		1.000		1.000	
	65-75	0.828 (0.697; 0.985)	0.033	0.537 (0.407; 0.709)	0.000	1.301 (1.071; 1.580)	0.008
	>75	0.939 (0.782; 1.127)	0.499	0.135 (0.091; 0.200)	0.000	1.152 (0.943; 1.408)	0.165
Marital status	Married	1.000					
	Not married	0.858 (0.751; 0.980)	0.024				
	Unknown	0.424 (0.303; 0.594)	0.000				
Year of incidence	1994	1.000				1.271 (1.204; 1.341)	0.000
	1995	1.071 (0.885; 1.296)	0.482				
	1996	1.824 (1.497; 2.223)	0.000				
	1997	1.680 (1.381; 2.043)	0.000				
	1998	1.179 (0.953; 1.460)	0.130				
Smoker status	Non-smoker			1.000		1.000	
	Ex-smoker			0.978 (0.675; 1.416)	0.906	1.035 (0.866; 1.237)	0.705
	Smoker			0.846 (0.596; 1.202)	0.351	1.155 (0.978; 1.365)	0.089
	Unknown			1.682 (1.223; 2.314)	0.001	0.580 (0.480; 0.701)	0.000
Tumour grade	I	1.000		1.000		1.000	
	II	0.885 (0.749; 1.046)	0.153	0.924 (0.634; 1.346)	0.681	1.837 (1.498; 2.252)	0.000
	III	1.227 (1.022; 1.474)	0.029	1.107 (0.748; 1.638)	0.611	2.829 (2.291; 3.494)	0.000
	IV	0.840 (0.498; 1.415)	0.511	2.149 (0.824; 5.601)	0.118	2.881 (1.626; 5.104)	0.000
	Unknown	0.528 (0.429; 0.650)	0.000	1.508 (1.018; 2.236)	0.041	1.723 (1.346; 2.206)	0.000
Clinical M stage	M0	1.000		1.000		1.000	
	M1	0.413 (0.341; 0.499)	0.000	1.565 (1.112; 2.204)	0.010	3.054 (2.515; 3.710)	0.000
	MX	1.006 (0.869; 1.164)	0.939	0.657 (0.482; 0.896)	0.008	0.804 (0.684; 0.944)	0.008
Method of presentation	Screening	1.000				1.000	
	Incidental	3.966 (1.833; 8.582)	0.000			0.582 (0.247; 1.370)	0.215
	Symptoms	3.355 (1.603; 7.022)	0.001			0.801 (0.353; 1.821)	0.597
	Unknown	2.785 (1.271; 6.102)	0.010			0.211 (0.081; 0.553)	0.002
Clinical T stage	T1	1.000				1.000	
	T2	1.001 (0.816; 1.228)	0.992			1.487 (1.187; 1.864)	0.001
	T3	1.158 (0.835; 1.605)	0.379			2.561 (1.829; 3.588)	0.000
	T4	1.257 (0.890; 1.777)	0.194			3.778 (2.629; 5.429)	0.000
	T0	1.589 (0.377; 6.699)	0.528			1.115 (0.210; 5.937)	0.898
	TX	1.547 (1.298; 1.843)	0.000			1.080 (0.884; 1.320)	0.451
Deprivation index	Affluent	1.000				1.000	
	Intermediate	1.219 (1.038; 1.431)	0.016			0.907 (0.763; 1.080)	0.273
	Deprived	1.107 (0.916; 1.336)	0.292			1.241 (1.013; 1.520)	0.037
	Unknown	1.380 (1.067; 1.785)	0.014			0.869 (0.674; 1.120)	0.278
Histological confirmation	No	1.000				1.000	
	Yes	22.798 (15.130; 34.354)	0.000			0.710 (0.551; 0.916)	0.008
Co-morbidity	Low			1.000		1.000	
	High			0.653 (0.354; 1.203)	0.171	1.050 (0.800; 1.380)	0.724
	Unknown			0.464 (0.351; 0.613)	0.000	0.732 (0.633; 0.846)	0.000

Appendix 5 Consistency with guidelines

The use of chemotherapy for colorectal cancer was tested against two Scottish SIGN guidelines[1] (2003)

Recommendation 1. Patients with Dukes B of colon or rectum should not be considered for adjuvant chemotherapy.

Overall, 18% of patients with Dukes B (T2, M0) had chemotherapy, with a wide range of variation (χ^2=21.3; p=0.003) from 8% in the SHB and WHB to 50% in the MHB (Table 1).

Table 1 Patients with Dukes B of colon or rectum having adjuvant chemotherapy.

Area of residence	cases	% of surgical patients having chemotherapy
Ireland	305	18
ERHA	141	13
MHB	10	50
MWHB	10	10
NEHB	29	10
NWHB	54	24
SHB	12	8
SEHB	37	35
WHB	12	8

Recommendation 2. Patients with Dukes B of colon or rectum should be considered for adjuvant chemotherapy.

37% of patients with Dukes C (T3 M0) had chemotherapy, ranging from 21% in the SHB to 49% in the NWHB (chi=18.0;p=0.012) (Table 2).

Table`2 Patients with Dukes C of colon or rectum having adjuvant chemotherapy.

Area of residence	cases	% of surgical patients having chemotherapy
Ireland	451	37
ERHA	194	34
MHB	30	23
MWHB	5	40
NEHB	22	45
NWHB	111	49
SHB	38	21
SEHB	38	39
WHB	13	62

[1] Scottish Intercollegiate Group. Colorectal cancer. 2003