

Appendix 1 online text - methods

Other characteristics of patients

The following variables were obtained from cancer registry records: sex; age at diagnosis (grouped into four categories: 15–59, 60–69, 70–79 and ≥ 80 years); country of birth (grouped as Australian born, born in an English speaking country, born in a non English speaking country and unknown country of birth); socioeconomic status (allocated in five categories using the Australian Bureau of Statistics' Index of Relative Socioeconomic Disadvantage based on the 2001 or 2006 Census depending on the period of diagnosis¹) and year of diagnosis (grouped as 2000–2004 and 2005–2008).

Additional variables obtained from Admitted Patient Data Collection (APDC) records were: smoking status (non smoker, past smoker, current smoker based on ICD-10 codes Z86.43, Z72.0, Z71.6, F17 in any hospital admission record); any or no comorbidity (any condition in the Charlson index², except secondary cancer coded as a primary or other diagnosis in any record, or no condition); and any or no history of chronic obstructive airways disease (based on relevant four-digit ICD-10 codes in the range J41.0–J44.9 in any separation record).

Because of its relevance to which hospitals a person might have access to, patients' financial status at admission, as recorded in the APDC, was also included in the analysis, grouped into three categories: public patient in a public hospital, private patient in a private hospital and private patient in a public hospital.

Stage, pathology and treatment

Summary stage at diagnosis was classified, on the basis of the extent of disease notified to, or inferred by, the Central Cancer Registry (CCR), as localised, regional, distant or unknown³. Histological subtype of cancer was coded by the CCR from pathology reports using the ICD-O version 3 morphology codes⁴, which were grouped in accord with Cancer Incidence in Five Continents Vol IX⁵. Method of diagnosis, clinical, cytology or histopathology, which is recorded by the CCR, was also included because a number of studies have reported it to be a reliable indicator of lack of investigation.⁶ Time to surgery was recorded in months from diagnosis to the procedure.

Statistical methods: sensitivity analyses

Sensitivity analyses were conducted by modelling factors associated with the hazard of death for patients with unknown stage and those not admitted to hospital after diagnosis. A complete analysis was undertaken of all non-small cell lung cancer (NSCLC) patients and we applied multiple imputation using the “ice” (imputation by chained equations) command in Stata 12.1⁷ to impute unknown stage, creating 10 imputed datasets.(Available on request).

Determining model fit

To determine model fit we plotted the unadjusted Kaplan Meier survival curves and the adjusted survival curves predicted from our `stpm2` model after using the `Predict` command. We found very little difference between the survival curves within each of the covariates indicating good model fit.

Appendix 1 Table 1 New South Wales, NSCLC patients diagnosed between 2000-2008 distributed by patient, tumour and treatment factors

Characteristics	N	%
Total	23,871	100
Hospital of treatment distance from the NASH¹		
Specialist hospital 0-39.9	8,247	34.5
Specialist hospital 40-99.9	769	3.2
Specialist hospital 100 plus	1,029	4.3
General hospital 0-39.9	4,837	20.3
General hospital 40-99.9	2,364	9.9
General hospital 100 plus	5,573	23.3
No hospital ²	1,022	4.3
Index of remoteness		
Accessible	23,051	96.6
Not accessible	802	3.4
Area of residence		
Urban	8,572	35.9
Outer metropolitan	6,493	27.2
Rural	8,788	36.8
Sex		
Males	15,053	63.1
Females	8,800	36.9
Age at diagnosis		
15-59 years	4,244	17.8
60-69 years	6,143	25.77
70 -79 years	8,418	35.31
80 plus years	5,036	21.12
Country of birth		
Australian born	15,675	65.7
Born in an English Speaking country	1,760	7.4
Born in a Non English speaking country	5,393	22.6
Unknown country of birth	1,025	4.3
Socioeconomic status		
Lowest SES	4,917	20.6
Second lowest SES	4,383	18.4
Middle SES	5,404	22.6
Second highest SES	4,904	20.5
Highest SES	4,233	17.7
Period of diagnosis		
2000-2004	9,849	41.3
2005-2008	14,004	58.7
Comorbidity		
No comorbidity	15,611	65.4
Comorbidity	8,242	34.6
Smoking status³		
Non smoker	6,547	27.4
Previous smoker	8,755	36.7
Current smoker	8,551	35.8
Chronic obstructive airways disease⁴		
no COAD	16,495	69.2
COAD	7,358	30.8
Method of diagnosis⁵		
Cytology	3,355	14.1
Clinical	3,587	15.0
Histology coded by hospital	6,730	28.2
Histology coded by cancer registry	9,474	39.7
Discovered at Autopsy	51	0.2
Death certificate only	656	2.8
Order of lung cancer		
First cancer	22,336	93.6
Second or subsequent cancer	1,517	6.4
Histology⁶		
Squamous	4,808	20.2

Adenocarcinoma	7,596	31.9
Large Cell	7,760	32.6
Other	3,677	15.4
Stage		
Localised	5474	22.9
Regional	4156	17.4
Distant	8105	34.0
Unknown	6136	25.7
Emergency presentation		
Emergency	10,495	44.0
Planned admission	12,626	52.9
Other	750	3.1
Major surgery for the primary cancer⁷		
No admission to hospital ²	1,022 ²	4.3
Admitted to hospital for diagnostic purposes only	5,912	24.8
No cancer procedure	13,185	55.3
Lobectomy	2,224	9.3
Segmental resections	1,122	4.7
Pneumonectomies	388	1.6
Time from diagnosis to surgery or admission		
At diagnosis	8,607	36.1
2-3 months	1,287	5.4
3-6 months	782	3.3
7 to 12 months	525	2.2
More than 12 months	459	1.8
Admission to hospital before diagnosis	11,189	46.9
No admission ²	1,022	4.3
Financial status		
Public financial status treated in public hospitals	14,231	59.69
Private financial status treated in private hospitals	5,811	24.37
Private financial status treated in public hospitals	2,777	11.65
No admission to hospital	1,022	4.29

¹Nearest accessible specialist hospital.

²These patients were a combination of New South Wales patients that did not have any hospitalisations because they did not link or were patients who were death certificate or autopsy notifications

³Smoking codes (diagnosis codes Z86.43, Z72.0, Z71.6,F17)

⁴Chronic obstructive Airways Disease (diagnosis codes J41.0,J41.1,J41.8,J42.0,J42,J43,J43.1,J43.2,J43.8,J43.9,J44.0,J44.1,J44.8,J44.9

⁵Histology by cancer registry staff means the record is coded using a pathology report notified to the registry. Histology hospital means that hospital staff have coded records from a pathology report. When the cancer registry sights the histology report, coding of diagnosis is likely to be more accurate than when it does not.

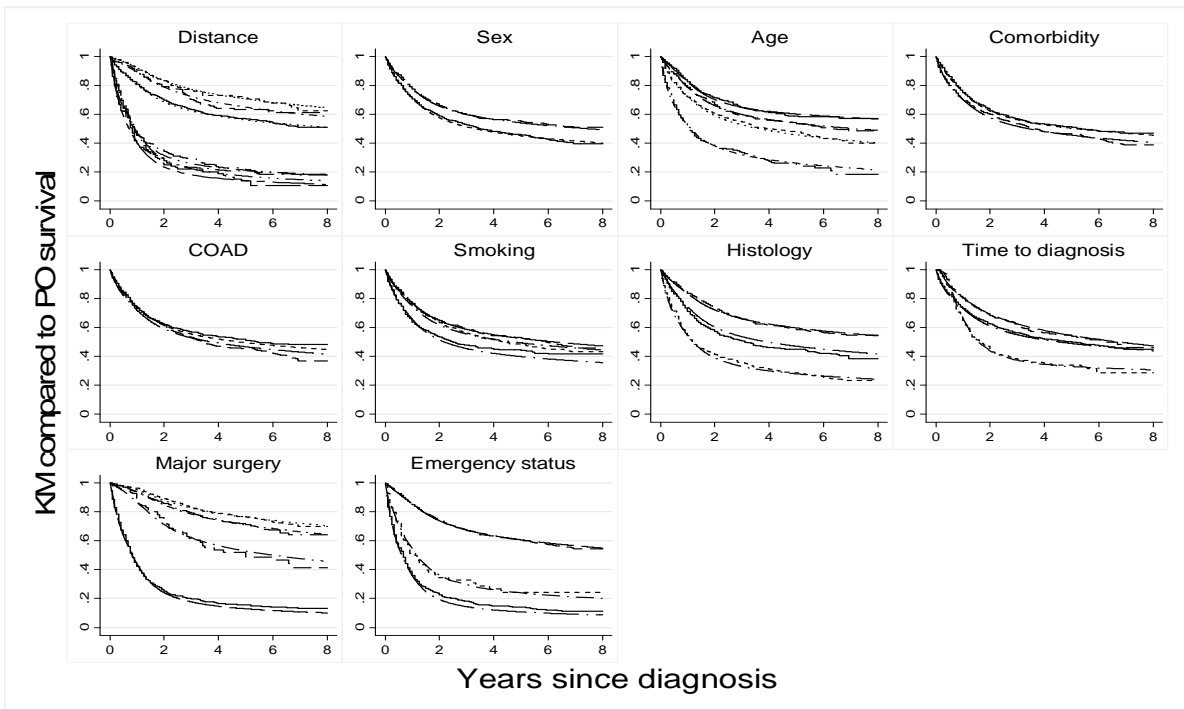
⁶Cancer codes: ICD0-3 morphology codes: Squamous 80503-80783, Large cell 80353, 83103,80103-80123,80143-80313, Adenocarcinoma 82303-82313, 82503-82603, 81403, 82113, 83233, 85763, 82463 Other 80003-80053, 88003, 88013, 88023, 8053 88113, 88303, 88903, 89203, 90403, 90413, 91203, 91333, 91503, 95403, 88403-89213, 89903-89913, 91203-91333, 95403-95813, 88303, 91503. There are two main morphology codes responsible for 81% of the 15.4% of "other" these are morphology code 80003 Neoplasm not otherwise specified (1,375 or 37% of "other") and 80463 non-small cell carcinoma not otherwise specified (1,609 or 44% of "other").

⁷Procedure codes Lobectomy (38438-01, 38441-00), Resection (38438-00, 38440-00, 38440-01, 90169-00,90181-00, Pneumonectomy (38441-01,38438-02).

Appendix 1 Table 2 New South Wales, NSCLC patients diagnosed between 2000-2008 and admitted to hospital within 12 months of diagnosis by patient, tumour and treatment factors and localised, regional and distant stage

	Localised stage patients				Regional stage patients				Distant stage patients			
		%	Died	%		%	Died	%		%	Died	%
Hospital of treatment and distance from the NASH	3,240	100	1,384	100	2,435	100	1,461	100	3,540	100	3,087	100
Specialist hospital 0-39.9	1,757	54.2	628	19.4	1,244	51.1	703	48.1	1,539	43.5	1,313	42.5
Specialist hospital 40-99.9	263	8.1	71	2.2	208	8.5	100	6.8	85	2.4	67	2.2
Specialist hospital 100 plus	371	11.5	86	2.7	293	12.0	134	9.2	131	3.7	97	3.1
General hospital 0-39.9	306	9.4	210	6.5	224	9.2	171	11.7	644	18.2	574	18.6
General hospital 40-99.9	153	4.7	116	3.6	117	4.8	98	6.7	351	9.9	323	10.5
General hospital 100 plus	390	12.0	273	8.4	349	14.3	255	17.5	790	22.3	713	23.1
Sex												
Males	2,005	61.9	927	28.6	1,527	62.7	965	66.1	2,221	62.7	1,953	63.3
Females	1,235	38.1	457	14.1	908	37.3	496	33.9	1,319	37.3	1,134	36.7
Age at diagnosis												
50-69 years	662	20.4	225	6.9	606	24.9	342	23.4	1,053	29.7	895	29.0
60-69 years	970	29.9	368	11.4	825	33.9	463	31.7	1,123	31.7	979	31.7
70 -79 years	1,176	36.3	528	16.3	792	32.5	505	34.6	990	28.0	877	28.4
80 plus years	432	13.3	263	8.1	212	8.7	151	10.3	374	10.6	336	10.9
Country of birth												
Australian born	2,094	64.6	924	66.8	1,557	63.9	946	64.8	2,223	62.8	1,965	63.7
English speaking	232	7.2	113	8.2	164	6.7	114	7.8	254	7.2	223	7.2
Non English speaking	772	23.8	315	22.8	626	25.7	369	25.3	970	27.4	826	26.8
Unknown	142	4.4	32	2.3	88	3.6	32	2.2	93	2.6	73	2.4
Comorbidity												
No comorbidity	2,035	62.8	831	60.0	1,633	67.1	974	66.7	2,498	70.6	2,169	70.3
Comorbidity	1,205	37.2	553	40.0	802	32.9	487	33.3	1,042	29.4	918	29.7
Smoking												
Non smoker	720	22.22	349	25.22	529	21.7	353	24.2	1,065	30.1	934	30.3
Previous smoker	1,371	42.31	557	40.25	986	40.5	580	39.7	1,209	34.2	1,040	33.7
Current smoker	1,149	35.46	478	34.54	920	37.8	528	36.1	1,266	35.8	1,113	36.1
Chronic obstructive airways disease												
no COAD	2,147	66.3	864	62.4	1,712	70.3	1,013	69.3	2,953	83.4	2,562	83.0
COAD	1,093	33.7	520	37.6	723	29.7	448	30.7	587	16.6	525	17.0
Method of diagnosis												
Cytology	164	5.1	107	3.3	150	6.2	122	8.4	498	14.1	452	14.6
Clinical	144	4.4	100	3.1	78	3.2	63	4.3	412	11.6	378	12.2
Histologically verified	2,932	90.5	1,124	93.7	2,207	90.6	1,276	87.3	1,241	35.1	1,121	36.3
Histology³												
Squamous	962	29.7	459	14.2	658	27.0	380	26.0	446	12.6	390	12.6
Adenocarcinoma	1,214	37.5	394	12.2	1,051	43.2	588	40.2	1,393	39.4	1,169	37.9
Large cell	692	21.4	431	13.3	522	21.4	383	26.2	1,288	36.4	1,162	37.6
Other	372	11.5	100	3.1	204	8.4	110	7.5	413	11.7	366	11.9
Type of admission												
Emergency	730	22.5	558	17.2	566	23.2	455	31.1	2,215	62.6	1,983	64.2
Planned	2,440	75.3	778	24.0	1,804	74.1	961	65.8	1,157	32.7	958	31.0
Other	70	2.2	48	1.5	65	2.7	45	3.1	168	4.7	146	4.7
Major surgery												
No surgery	1,322	40.8	994	30.7	1,080	44.4	885	60.6	3,296	93.1	2,940	95.2
Pneumonectomy	113	3.5	50	1.5	219	9.0	113	7.7	46	1.3	27	0.9
Lobectomy	1,185	36.6	211	6.5	812	33.3	318	21.8	119	3.4	74	2.4
Segmental resection	620	19.1	129	4.0	324	13.3	145	9.9	79	2.2	46	1.5
Time to diagnosis												
At diagnosis	2,600	80.2	1,090	78.8	1,831	75.2	1,107	75.8	2,899	81.9	2,546	82.5
2-3 months	409	12.6	152	11.0	344	14.1	177	12.1	373	10.5	314	10.2
3-6 months	154	4.8	92	6.6	168	6.9	110	7.5	179	5.1	150	4.9
7 to 12 months	77	2.4	50	3.6	92	3.8	67	4.6	89	2.5	77	2.5

Appendix 1 Figure 1 Testing model fit: a comparison of unadjusted Kaplan Meier survival curves with adjusted survival curves for primary localised NSCLC treated within 12 months of diagnosis, New South Wales, 2000-2008*



*When the unadjusted Kaplan Meier curve and the adjusted survival curve obtained from the model show little difference to one another then this variable is considered to have good fit

References

1. Pink B. *Socio-Economic Indexes for Areas (SEIFA)—Technical Paper*. Canberra Australian Capital Territory: Commonwealth of Australia;2006.
2. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987;40(5):373-383.
3. Tracey E, Barraclough H, Chen W, et al. *Survival from Cancer in NSW: 1980 to 2003*. Sydney 2007.
4. Fritz AG. *International classification of diseases for oncology: ICD-O*. Geneva: World Health Organization; 2000.
5. Curado M, Edwards B, Shin H, et al. *Cancer incidence in five continents, Vol. IX*. Lyon: IARC; 2007. IARC Scientific Publications; 2008.
6. Jones AP, Haynes R, Sauerzapf V, Crawford SM, Forman D. Geographical access to healthcare in Northern England and post-mortem diagnosis of cancer. *Journal of Public Health*; 2010. 14 ref 2010;32:4.
7. Royston P. Multiple imputation of missing values: further update of ice, with an emphasis on categorical variables. *Stata Journal*. 2009;9(3):466.