

**Appendix 1**

Program selection codes for SEER database queries:

{Race, Sex, Year Dx.Year of diagnosis} = '2000-2016'

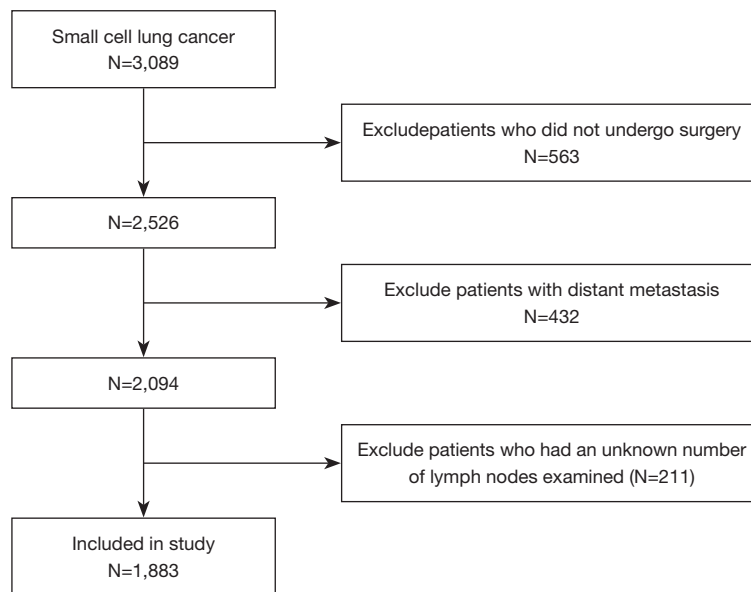
AND {Site and Morphology.Primary Site} = 341-343

AND {Site and Morphology.Histologic Type ICD-O-3} = 8041, 8045

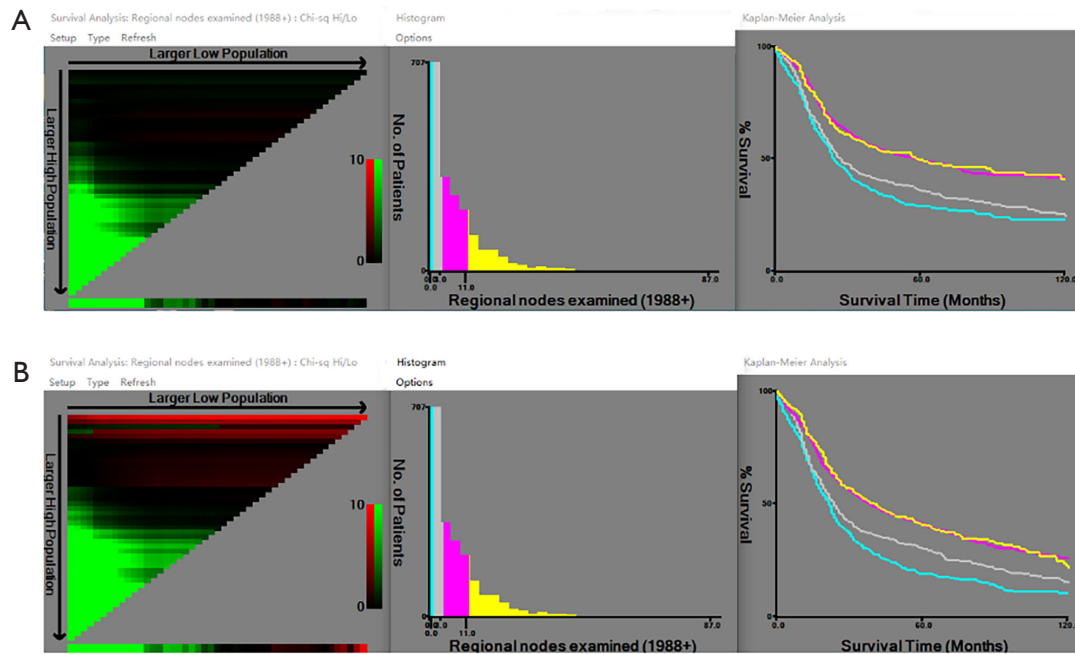
AND {Therapy.Reason no cancer-directed surgery} = 'Surgery performed'

AND {Site and Morphology.Diagnostic Confirmation} = 'Microscopically confirmed'

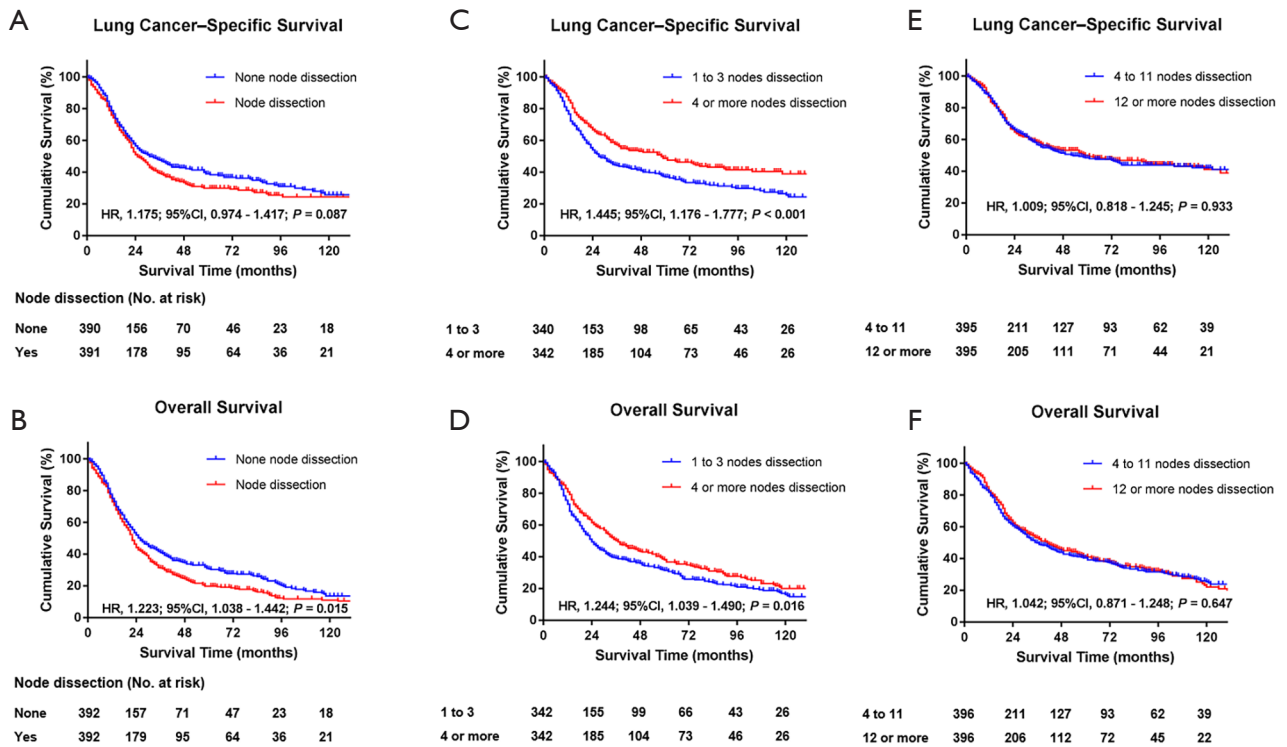
AND {Cause of Death (COD) and Follow-up.Survival months} = 0-204



**Figure S1** Patients included in and excluded from study.



**Figure S2** X-Tile analysis of lung cancer-specific survival (A) and overall survival (B) based on lymph nodes dissected from the entire cohort.



**Figure S3** Kaplan-Meier curves of survival estimates for patients of each group on the matched cohort. (A,B) Lung cancer-specific survival and overall survival for patients with or without lymph node dissected. (C,D) Lung cancer-specific survival and overall survival for patients with 1 to 3 lymph nodes dissected or  $\geq 4$  lymph nodes dissected. (E,F) Lung cancer-specific survival and overall survival for patients with 4 to 9 lymph nodes dissected or  $\geq 10$  lymph nodes dissected.

**Table S1** The characteristics of patients who underwent surgery for small cell lung cancer with or without lymph node dissection before and after propensity score matching

Variables	Full cohort			Matched cohort		
	None (n=430)	LN dissection (n=1,453)	Standardized difference, %	None (n=392)	LN dissection (n=392)	Standardized difference, %
<b>Age (years), n (%)</b>						
<65	133 (30.9)	494 (34.0)	6.6	125 (31.9)	137 (34.9)	6.4
65–75	184 (42.8)	677 (46.6)	7.6	165 (42.1)	170 (43.4)	2.1
>75	113 (26.3)	282 (19.4)	16.5	102 (26.0)	85 (21.7)	10.1
<b>Sex, n (%)</b>						
Female	221 (51.4)	786 (54.1)	5.4	206 (52.6)	197 (50.3)	4.6
Male	209 (48.6)	667 (45.9)	5.4	186 (47.4)	195 (49.7)	4.6
<b>Race, n (%)</b>						
White	380 (88.4)	1321 (90.9)	8.2	351 (89.5)	349 (89.0)	1.6
Black/other	50 (11.6)	132 (9.1)	8.2	41 (10.5)	43 (11.0)	1.6
<b>Location, n (%)</b>						
Metropolitan	348 (80.9)	1197 (82.4)	3.9	322 (82.1)	332 (84.7)	7.0
Nonmetropolitan	82 (19.1)	255 (17.5)	3.9	70 (17.9)	60 (15.3)	7.0
<b>Year of diagnosis, n (%)</b>						
2000–2004	121 (28.1)	361 (24.8)	7.5	115 (29.3)	102 (26.0)	7.4
2005–2008	96 (22.3)	349 (24.0)	4.0	85 (21.7)	85 (21.7)	0.0
2009–2012	131 (30.5)	364 (25.1)	12.1	116 (29.6)	110 (28.1)	3.3
2013–2016	82 (19.1)	379 (26.1)	16.8	76 (19.4)	95 (24.2)	11.6
<b>Tumor site, n (%)</b>						
Upper	270 (62.8)	899 (61.9)	1.9	247 (63.0)	256 (65.3)	4.8
Middle	26 (6.0)	98 (6.7)	2.9	23 (5.9)	21 (5.4)	2.2
Lower	134 (31.2)	456 (31.4)	0.4	122 (31.1)	115 (29.3)	3.9
<b>Tumor size (mm), n (%)</b>						
0–10	52 (12.1)	141 (9.7)	7.7	48 (12.2)	46 (11.7)	1.5
11–20	161 (37.4)	519 (35.7)	3.5	156 (39.8)	150 (38.3)	3.1
21–30	79 (18.4)	383 (26.4)	19.3	76 (19.4)	88 (22.4)	7.4
31–40	29 (6.7)	189 (13.0)	21.3	28 (7.1)	38 (9.7)	9.4
41–50	16 (3.7)	95 (6.5)	12.8	16 (4.1)	19 (4.8)	3.4
>50	35 (8.1)	90 (6.2)	7.4	30 (7.7)	26 (6.6)	4.3
Not determined	58 (13.5)	36 (2.5)	41.4	38 (9.7)	25 (6.4)	12.2
<b>T stage, n (%)</b>						
T1	182 (42.3)	740 (50.9)	17.3	180 (45.9)	192 (49.0)	6.2
T2	118 (27.4)	499 (34.3)	15.0	112 (28.6)	124 (31.6)	6.5
T3	38 (8.8)	94 (6.5)	8.7	32 (8.2)	31 (7.9)	1.1
T4	56 (13.0)	85 (5.8)	24.9	44 (11.2)	32 (8.2)	10.1
Not determined	36 (8.4)	35 (2.4)	26.8	24 (6.1)	13 (3.3)	13.3
<b>N stage</b>						
N0	302 (70.2)	856 (58.9)	23.8	280 (71.4)	259 (66.1)	11.5
N1	17 (4.0)	298 (20.5)	52.0	17 (4.3)	27 (6.9)	11.3
N2	84 (19.5)	291 (20.0)	1.3	80 (20.4)	98 (25.0)	11.0
Not determined	27 (6.3)	8 (0.6)	31.6	15 (3.8)	8 (2.0)	10.7
<b>TNM stage, n (%)</b>						
IA	150 (34.9)	491 (33.8)	2.3	149 (38.0)	149 (38.0)	0.0
IB	74 (17.2)	254 (17.5)	0.8	70 (17.9)	70 (17.9)	0.0
IIA	16 (3.7)	163 (11.2)	28.9	15 (3.8)	15 (3.8)	0.0
IIB	30 (7.0)	144 (9.9)	10.4	25 (6.4)	24 (6.1)	1.2
IIIA	66 (15.3)	301 (20.7)	14.1	66 (16.8)	93 (23.7)	17.2
IIIB	42 (9.8)	63 (4.3)	21.6	32 (8.2)	25 (6.4)	6.9
Not determined	52 (12.1)	37 (2.5)	37.5	35 (8.9)	16 (4.1)	19.6
<b>Grade, n (%)</b>						
Grade I	2 (0.5)	15 (1.0)	5.8	2 (0.5)	3 (0.8)	3.7
Grade II	13 (3.0)	47 (3.2)	1.2	12 (3.1)	14 (3.6)	2.8
Grade III	97 (22.6)	466 (32.1)	21.4	96 (24.5)	107 (27.3)	6.4
Grade IV	128 (29.8)	479 (33.0)	6.9	122 (31.1)	130 (33.2)	4.5
Not determined	190 (44.2)	446 (30.7)	28.2	160 (40.8)	138 (35.2)	11.6
<b>Surgical procedure, n (%)</b>						
Sublobar resection	274 (63.7)	315 (21.7)	93.8	258 (65.8)	243 (62.0)	7.9
Lobectomy	62 (14.4)	1006 (69.2)	133.6	61 (15.6)	75 (19.1)	9.3
Others	94 (21.9)	132 (9.1)	35.9	73 (18.6)	74 (18.9)	0.8
<b>Radiation</b>						
Yes	163 (37.9)	491 (33.8)	8.6	143 (36.5)	152 (38.8)	4.7
No	267 (62.1)	962 (66.2)	8.6	249 (63.5)	240 (61.2)	4.7
<b>Chemotherapy</b>						
Yes	266 (61.9)	956 (65.8)	8.1	241 (61.5)	262 (66.8)	11.1
No/unknown	164 (38.1)	497 (34.2)	8.1	151 (38.5)	130 (33.2)	11.1

**Table S2** The characteristics of patients who underwent surgery for small cell lung cancer with the dissection of 1 to 3 lymph nodes or  $\geq 4$  lymph nodes before and after propensity score matching

Variables	Full cohort			Matched cohort		
	1–3 regional LNs (n=386)	$\geq 4$ regional LNs (n=1,067)	Standardized difference, %	1–3 regional LNs (n=342)	$\geq 4$ regional LNs (n=342)	Standardized difference, %
Age (years), n (%)						
<65	130 (33.7)	364 (34.1)	0.8	118 (34.5)	117 (34.2)	0.6
65–75	171 (44.3)	506 (47.4)	6.2	152 (44.4)	154 (45.0)	1.2
>75	85 (22.0)	197 (18.5)	8.7	72 (21.1)	71 (20.8)	0.7
Sex, n (%)						
Female	200 (51.8)	586 (54.9)	6.2	180 (52.6)	183 (53.5)	1.8
Male	186 (48.2)	481 (45.1)	6.2	162 (47.4)	159 (46.5)	1.8
Race, n (%)						
White	351 (90.9)	970 (90.9)	0.0	312 (91.2)	319 (93.3)	7.9
Black/other	35 (9.1)	97 (9.1)	0.0	30 (8.8)	23 (6.7)	7.9
Location, n (%)						
Metropolitan	318 (82.6)	879 (82.4)	0.5	283 (82.7)	273 (79.8)	7.4
Nonmetropolitan	67 (17.4)	188 (17.6)	0.5	59 (17.3)	69 (20.2)	7.4
Year of diagnosis, n (%)						
2000–2004	126 (32.6)	235 (22.0)	24.0	116 (33.9)	83 (24.3)	21.3
2005–2008	95 (24.6)	254 (23.8)	1.9	93 (27.2)	86 (25.1)	4.8
2009–2012	96 (24.9)	268 (25.1)	0.5	77 (22.5)	82 (24.0)	3.6
2013–2016	69 (17.9)	310 (29.1)	26.6	56 (16.4)	91 (26.6)	25.0
Tumor site, n (%)						
Upper	240 (62.2)	659 (61.8)	0.8	213 (62.3)	217 (63.5)	2.5
Middle	30 (7.8)	68 (6.4)	5.5	23 (6.7)	25 (7.3)	2.4
Lower	116 (30.1)	340 (31.9)	3.9	106 (31.0)	100 (29.2)	3.9
Tumor size (mm), n (%)						
0–10	54 (14.0)	87 (8.2)	18.5	47 (13.7)	37 (10.8)	8.9
11–20	155 (40.2)	364 (34.1)	12.6	133 (38.9)	132 (38.6)	0.6
21–30	84 (21.8)	299 (28.0)	14.4	79 (23.1)	82 (24.0)	2.1
31–50	43 (11.1)	146 (13.7)	7.9	39 (11.4)	38 (11.1)	0.9
41–50	16 (4.1)	79 (7.4)	14.2	16 (4.7)	21 (6.1)	6.2
>50	15 (3.9)	75 (7.0)	13.7	15 (4.4)	22 (6.4)	8.9
Not determined	19 (4.9)	17 (1.6)	18.7	13 (3.8)	10 (2.9)	5.0
T stage, n (%)						
T1	196 (50.8)	544 (51.0)	0.4	180 (52.6)	177 (51.8)	1.6
T2	117 (30.3)	382 (35.8)	11.7	103 (30.1)	111 (32.5)	5.2
T3	24 (6.2)	70 (6.6)	1.6	19 (5.6)	23 (6.7)	4.6
T4	33 (8.5)	52 (4.9)	14.4	30 (8.8)	21 (6.1)	10.3
Not determined	16 (4.1)	19 (1.8)	13.6	10 (2.9)	10 (2.9)	0.0
N stage						
N0	219 (56.7)	637 (59.7)	6.1	195 (57.0)	201 (58.8)	3.6
N1	66 (17.1)	232 (21.7)	11.7	64 (18.7)	69 (20.2)	3.8
N2	100 (25.9)	191 (17.9)	19.4	82 (24.0)	72 (21.1)	6.9
Not determined	1 (0.3)	7 (0.7)	5.7	1 (0.3)	0 (0.0)	7.8
TNM stage, n (%)						
IA	127 (32.9)	364 (34.1)	2.5	116 (33.9)	117 (34.2)	0.6
IB	58 (15.0)	196 (18.4)	9.1	51 (14.9)	60 (17.5)	7.1
IIA	30 (7.8)	133 (12.5)	15.6	30 (8.8)	36 (10.5)	5.8
IIB	39 (10.1)	105 (9.8)	1.0	33 (9.6)	28 (8.2)	4.9
IIIA	94 (24.4)	207 (19.4)	12.1	80 (23.4)	75 (21.9)	3.6
IIIB	25 (6.5)	38 (3.6)	13.3	22 (6.4)	17 (5.0)	6.0
Not determined	13 (3.4)	24 (2.2)	7.3	10 (2.9)	9 (2.6)	1.8
Grade, n (%)						
Grade I	2 (0.5)	13 (1.2)	7.6	2 (0.6)	1 (0.3)	4.5
Grade II	9 (2.3)	38 (3.6)	7.7	9 (2.6)	12 (3.5)	5.2
Grade III	118 (30.6)	348 (32.6)	4.3	100 (29.2)	111 (32.5)	7.1
Grade IV	133 (34.5)	346 (32.4)	4.5	127 (37.1)	113 (33.0)	8.6
Not determined	124 (32.1)	322 (30.2)	4.1	104 (30.4)	105 (30.7)	0.7
Surgical procedure, n (%)						
Sublobar resection	190 (49.2)	125 (11.7)	89.2	147 (43.0)	121 (35.4)	15.6
Lobectomy	147 (38.1)	859 (80.5)	102.7	146 (42.7)	168 (49.1)	12.9
Others	49 (12.7)	83 (7.8)	16.2	49 (14.3)	53 (15.5)	3.4
Radiation						
Yes	143 (37.0)	348 (32.6)	9.2	118 (34.5)	122 (35.7)	2.5
No	243 (63.0)	719 (67.4)	9.2	224 (65.5)	220 (64.3)	2.5
Chemotherapy						
Yes	242 (62.7)	714 (66.9)	8.8	212 (62.0)	218 (63.7)	3.5
No/unknown	144 (37.3)	353 (33.1)	8.8	130 (38.0)	124 (36.3)	3.5

**Table S3** The characteristics of patients who underwent surgery for small cell lung cancer with the dissection of 4 to 11 lymph nodes or  $\geq 12$  lymph nodes before and after propensity score matching

Variables	Full cohort			Matched cohort		
	4–11 regional LNs (n=668)	$\geq 12$ regional LNs (n=399)	Standardized difference, %	4–11 regional LNs (n=396)	$\geq 12$ regional LNs (n=396)	Standardized difference, %
<b>Age (years), n (%)</b>						
<65	227 (34.0)	137 (34.3)	0.6	137 (34.6)	136 (34.3)	0.6
65–75	318 (47.6)	188 (47.1)	1.0	188 (47.5)	186 (47.0)	1.0
>75	123 (18.4)	74 (18.5)	0.3	71 (17.9)	74 (18.7)	2.1
<b>Sex, n (%)</b>						
Female	376 (56.3)	210 (52.6)	7.4	230 (58.1)	210 (53.0)	10.3
Male	292 (43.7)	189 (47.4)	7.4	166 (41.9)	186 (47.0)	10.3
<b>Race, n (%)</b>						
White	605 (90.6)	365 (91.5)	3.2	364 (91.9)	362 (91.4)	1.8
Black/other	63 (9.4)	34 (8.5)	3.2	32 (8.1)	34 (8.6)	1.8
<b>Location, n (%)</b>						
Metropolitan	535 (80.1)	344 (86.2)	16.4	319 (80.6)	341 (86.1)	14.8
Nonmetropolitan	133 (19.9)	55 (13.8)	16.4	77 (19.4)	55 (13.9)	14.8
<b>Year of diagnosis, n (%)</b>						
2000–2004	155 (23.2)	80 (20.1)	7.5	101 (25.5)	79 (19.9)	13.4
2005–2008	177 (26.5)	77 (19.3)	17.2	103 (26.0)	77 (19.4)	15.8
2009–2012	171 (25.6)	97 (24.3)	3.0	93 (23.5)	97 (24.5)	2.3
2013–2016	165 (24.7)	145 (36.3)	25.4	99 (25.0)	143 (36.1)	24.3
<b>Tumor site, n (%)</b>						
Upper	409 (61.2)	250 (62.7)	3.1	243 (61.4)	248 (62.6)	2.5
Middle	49 (7.3)	19 (4.8)	10.5	31 (7.8)	19 (4.8)	12.4
Lower	210 (31.4)	130 (32.6)	2.6	122 (30.8)	129 (32.6)	3.9
<b>Tumor size (mm), n (%)</b>						
0–10	58 (8.7)	29 (7.3)	5.2	41 (10.4)	29 (7.3)	10.9
11–20	231 (34.6)	133 (33.3)	2.7	136 (34.3)	133 (33.6)	1.5
21–30	202 (30.2)	97 (24.3)	13.3	112 (28.3)	97 (24.5)	8.6
31–40	87 (13.0)	59 (14.8)	5.2	47 (11.9)	59 (14.9)	8.8
41–50	37 (5.5)	42 (10.5)	18.5	26 (6.6)	39 (9.8)	11.7
>50	44 (6.6)	31 (7.8)	4.6	27 (6.8)	31 (7.8)	3.8
Not determined	9 (1.3)	8 (2.0)	5.5	7 (1.8)	8 (2.0)	1.5
<b>T stage, n (%)</b>						
T1	353 (52.8)	191 (47.9)	9.8	198 (50.0)	191 (48.2)	3.6
T2	223 (33.4)	159 (39.8)	13.3	141 (35.6)	156 (39.4)	7.9
T3	44 (6.6)	26 (6.5)	0.4	27 (6.8)	26 (6.6)	0.8
T4	34 (5.1)	18 (4.5)	2.8	21 (5.3)	18 (4.5)	3.7
Not determined	14 (2.1)	5 (1.3)	6.2	9 (2.3)	5 (1.3)	7.5
<b>N stage</b>						
N0	419 (62.7)	218 (54.6)	16.5	251 (63.4)	218 (55.1)	17.0
N1	139 (20.8)	93 (23.3)	6.0	76 (19.2)	92 (23.2)	9.8
N2	107 (16.0)	84 (21.1)	13.1	68 (17.2)	83 (21.0)	9.7
Not determined	3 (0.4)	4 (1.0)	7.2	1 (0.3)	3 (0.8)	6.8
<b>TNM stage, n (%)</b>						
IA	244 (36.5)	120 (30.1)	13.6	137 (34.6)	120 (30.3)	9.2
IB	123 (18.4)	73 (18.3)	0.3	79 (19.9)	73 (18.4)	3.8
IIA	83 (12.4)	50 (12.5)	0.3	37 (9.3)	50 (12.6)	10.6
IIB	60 (9.0)	45 (11.3)	7.6	43 (10.9)	44 (11.1)	0.6
IIIA	119 (17.8)	88 (22.1)	10.8	76 (19.2)	87 (22.0)	6.9
IIIB	23 (3.4)	15 (3.8)	2.1	14 (3.5)	15 (3.8)	1.6
Not determined	16 (2.4)	8 (2.0)	6.5	10 (2.5)	7 (1.8)	4.8
<b>Grade, n (%)</b>						
Grade I	11 (1.6)	2 (0.5)	10.8	4 (1.0)	2 (0.5)	5.8
Grade II	22 (3.3)	16 (4.0)	3.7	16 (4.0)	16 (4.0)	0.0
Grade III	221 (33.1)	127 (31.8)	2.8	137 (34.6)	126 (31.8)	5.9
Grade IV	228 (34.1)	118 (29.6)	9.7	125 (31.6)	118 (29.8)	3.9
Not determined	186 (27.8)	136 (34.1)	13.7	114 (28.8)	136 (33.8)	10.8
<b>Surgical procedure, n (%)</b>						
Sublobar resection	91 (13.6)	34 (8.5)	16.3	68 (17.2)	34 (8.6)	25.9
Lobectomy	529 (79.2)	330 (82.7)	8.9	296 (74.7)	328 (82.8)	19.9
Others	48 (7.2)	35 (8.8)	5.9	32 (8.1)	34 (8.6)	1.8
<b>Radiation</b>						
Yes	216 (32.3)	132 (33.1)	1.7	131 (33.1)	130 (32.8)	0.6
No	452 (67.7)	267 (66.9)	1.7	265 (66.9)	266 (67.2)	0.6
<b>Chemotherapy</b>						
Yes	441 (66.0)	273 (68.4)	5.1	254 (64.1)	271 (68.4)	9.1
No/unknown	227 (34.0)	126 (31.6)	5.1	142 (35.9)	125 (31.6)	9.1

**Table S4** Univariable and multivariable Cox regression analysis for patients who underwent surgery for small cell lung cancer with or without lymph node dissection on the matched cohort

Variables	Lung cancer specific survival				Overall survival			
	Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Age (years), n (%)		<0.001		<0.001		<0.001		<0.001
<65	Reference		Reference		Reference		Reference	
65–75	1.032 (0.832–1.280)	0.774	1.132 (0.902–1.420)	0.285	1.190 (0.983–1.440)	0.075	1.224 (1.001–1.496)	0.048
>75	1.591 (1.249–2.027)	<0.001	1.771 (1.358–2.308)	<0.001	1.822 (1.469–2.260)	<0.001	1.892 (1.496–2.393)	<0.001
Sex, n (%)		0.066		0.010		0.003		0.001
Female	Reference		Reference		Reference		Reference	
Male	1.189 (0.989–1.430)		1.288 (1.062–1.561)		1.277 (1.086–1.501)		1.346 (1.138–1.592)	
Race, n (%)		0.832				0.447		
White	Reference				Reference			
Black/other	0.969 (0.722–1.300)				0.903 (0.694–1.175)			
Location, n (%)		0.731				0.873		
Metropolitan	Reference				Reference			
Nonmetropolitan	1.044 (0.817–1.334)				1.018 (0.819–1.266)			
Year of diagnosis, n (%)		0.013		0.320		0.056		0.434
2000–2004	Reference		Reference		Reference		Reference	
2005–2008	0.833 (0.651–1.066)	0.147	0.883 (0.676–1.154)	0.363	0.947 (0.765–1.173)	0.619	0.974 (0.772–1.229)	0.832
2009–2012	0.857 (0.681–1.079)	0.190	0.940 (0.731–1.210)	0.632	0.941 (0.765–1.157)	0.562	0.991 (0.790–1.243)	0.938
2013–2016	0.582 (0.419–0.807)	0.001	0.725 (0.511–1.029)	0.072	0.666 (0.497–0.894)	0.007	0.784 (0.573–1.071)	0.126
Tumor site, n (%)		0.914				0.833		
Upper	Reference				Reference			
Middle	1.073 (0.718–1.603)	0.732			1.113 (0.779–1.590)	0.556		
Lower	0.980 (0.800–1.201)	0.849			1.021 (0.855–1.219)	0.816		
Tumor size (mm), n (%)		<0.001		0.097		0.012		0.162
0–10	Reference		Reference		Reference		Reference	
11–20	1.174 (0.853–1.616)	0.325	1.126 (0.814–1.556)	0.473	1.163 (0.885–1.528)	0.280	1.109 (0.840–1.464)	0.465
21–30	1.157 (0.814–1.643)	0.417	1.132 (0.927–1.815)	0.497	1.146 (0.850–1.545)	0.372	1.118 (0.824–1.517)	0.473
31–40	1.623 (1.074–2.451)	0.022	1.358 (0.930–2.017)	0.195	1.347 (0.931–1.948)	0.114	1.132 (0.749–1.713)	0.556
41–50	1.426 (0.875–2.325)	0.154	1.006 (0.996–2.381)	0.983	1.089 (0.692–1.714)	0.713	0.815 (0.494–1.344)	0.423
>50	1.661 (1.083–2.547)	0.020	1.260 (0.996–2.381)	0.367	1.426 (0.981–2.072)	0.063	1.082 (0.696–1.681)	0.726
Not determined	2.388 (1.618–3.525)	<0.001	1.989 (1.234–3.206)	0.005	1.891 (1.327–2.695)	<0.001	1.698 (1.098–2.628)	0.017
T stage, n (%)		<0.001		0.829		<0.001		0.710
T1	Reference		Reference		Reference		Reference	
T2	1.571 (1.262–1.956)	<0.001	1.070 (0.715–1.601)	0.743	1.402 (1.160–1.693)	<0.001	1.140 (0.785–1.655)	0.491
T3	2.195 (1.565–3.078)	<0.001	1.308 (0.742–2.306)	0.353	1.841 (1.350–2.511)	<0.001	1.386 (0.823–2.335)	0.220
T4	2.815 (2.108–3.758)	<0.001	1.095 (0.518–2.312)	0.813	2.173 (1.665–2.836)	<0.001	1.140 (0.568–2.285)	0.713
Not determined	1.565 (1.036–2.364)	0.033	0.829 (0.405–1.696)	0.607	1.305 (0.898–1.897)	0.163	0.883 (0.454–1.719)	0.715
N stage		<0.001		0.492		<0.001		0.787
N0	Reference		Reference		Reference		Reference	
N1	1.536 (1.047–2.253)	0.028	1.114 (0.678–1.831)	0.671	1.298 (0.913–1.843)	0.146	1.046 (0.664–1.648)	0.846
N2	1.937 (1.577–2.380)	<0.001	1.442 (0.863–2.409)	0.162	1.532 (1.269–1.848)	<0.001	1.238 (0.762–2.012)	0.388
Not determined	1.197 (0.709–2.020)	0.502	1.342 (0.594–3.029)	0.479	1.003 (0.630–1.597)	0.991	1.233 (0.591–2.573)	0.577
TNM stage, n (%)		<0.001		0.047		<0.001		0.144
IA	Reference		Reference		Reference		Reference	
IB	1.585 (1.195–2.104)	0.001	1.475 (0.910–2.389)	0.115	1.411 (1.112–1.789)	0.005	1.322 (0.857–2.039)	0.207
IIA	2.033 (1.268–3.261)	0.003	2.533 (1.367–4.694)	0.003	1.662 (1.095–2.522)	0.017	2.091 (1.205–3.628)	0.009
IIB	2.769 (1.876–4.088)	<0.001	2.253 (1.196–4.245)	0.012	2.151 (1.511–3.062)	<0.001	1.769 (0.993–3.152)	0.053
IIIA	2.324 (1.804–2.993)	<0.001	1.748 (0.933–3.275)	0.081	1.753 (1.405–2.186)	<0.001	1.601 (0.890–2.881)	0.116
IIIB	3.812 (2.735–5.313)	<0.001	2.432 (0.876–6.751)	0.088	2.697 (1.987–3.662)	<0.001	2.035 (0.783–5.288)	0.145
Not determined	1.654 (1.130–2.420)	0.010	1.031 (0.458–2.322)	0.940	1.293 (0.924–1.809)	0.134	0.939 (0.444–1.986)	0.870
Grade, n (%)		<0.001		0.001		<0.001		<0.001
Grade I	Reference		Reference		Reference		Reference	
Grade II	0.707 (0.203–2.462)	0.586	0.578 (0.160–2.087)	0.403	0.986 (0.291–3.334)	0.982	0.823 (0.236–2.878)	0.761
Grade III	0.703 (0.223–2.219)	0.548	0.691 (0.212–2.257)	0.541	0.996 (0.317–3.128)	0.994	1.012 (0.312–3.279)	0.984
Grade IV	0.830 (0.264–2.605)	0.749	0.956 (0.296–3.087)	0.941	1.069 (0.341–3.347)	0.909	1.265 (0.394–4.064)	0.693
Not determined	1.164 (0.372–3.646)	0.794	1.166 (0.361–3.761)	0.797	1.611 (0.515–5.036)	0.412	1.646 (0.513–5.287)	0.402
Surgical procedure, n (%)		0.007		0.063		0.051		0.222
Sublobar resection	Reference		Reference		Reference		Reference	
Lobectomy	0.751 (0.578–0.976)	0.032	0.726 (0.540–0.976)	0.034	0.807 (0.646–1.008)	0.059	0.842 (0.655–1.082)	0.179
Others	1.236 (0.980–1.559)	0.074	1.049 (0.803–1.371)	0.724	1.123 (0.910–1.385)	0.279	1.084 (0.852–1.378)	0.513
Radiation		0.898				0.376		
Yes	Reference				Reference			
No	0.988 (0.818–1.192)				1.078 (0.913–1.274)			
Chemotherapy		0.048		0.006		0.002		0.001
Yes	Reference		Reference		Reference		Reference	
No/unknown	1.212 (1.001–1.468)		1.349 (1.089–1.672)		1.297 (1.098–1.532)		1.358 (1.127–1.636)	
Lymph node dissection		0.046		0.018		0.008		0.003
Yes	Reference		Reference		Reference		Reference	
None	1.206 (1.003–1.451)		1.260 (1.041–1.525)		1.246 (1.059–1.465)		1.292 (1.092–1.529)	



**Table S5** Univariable and multivariable Cox regression analysis for patients who underwent surgery for small cell lung cancer with the dissection of 1 to 3 lymph nodes or  $\geq 4$  lymph nodes on the matched cohort

Variables	Lung cancer specific survival				Overall survival			
	Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Age (years), n (%)		0.022		0.003		<0.001		<0.001
<65	Reference		Reference		Reference		Reference	
65–75	1.276 (1.009–1.615)	0.042	1.399 (1.094–1.788)	0.007	1.485 (1.207–1.828)	<0.001	1.587 (1.276–1.973)	<0.001
>75	1.459 (1.099–1.936)	0.009	1.598 (1.190–2.147)	0.002	1.684 (1.313–2.160)	<0.001	1.695 (1.305–2.200)	<0.001
Sex, n (%)		0.077		0.104		0.020		0.052
Female	Reference		Reference		Reference		Reference	
Male	1.203 (0.980–1.477)		1.188 (0.965–1.463)		1.236 (1.034–1.478)		1.198 (0.998–1.438)	
Race, n (%)		0.583				0.242		
White	Reference				Reference			
Black/other	0.898 (0.610–1.320)				0.814 (0.577–1.149)			
Location, n (%)		0.265				0.550		
Metropolitan	Reference				Reference			
Nonmetropolitan	1.152 (0.898–1.478)				1.070 (0.857–1.338)			
Year of diagnosis, n (%)		0.408				0.692		
2000–2004	Reference				Reference			
2005–2008	0.996 (0.772–1.285)	0.973			0.981 (0.785–1.226)	0.864		
2009–2012	0.885 (0.671–1.168)	0.389			0.956 (0.749–1.218)	0.714		
2013–2016	0.756 (0.525–1.089)	0.133			0.822 (0.595–1.137)	0.237		
Tumor site, n (%)		0.234				0.374		
Upper	Reference				Reference			
Middle	0.787 (0.517–1.200)	0.266			0.880 (0.619–1.249)	0.473		
Lower	1.128 (0.904–1.409)	0.287			1.109 (0.913–1.347)	0.296		
Tumor size (mm), n (%)		0.031		0.114		0.116		
0–10	Reference		Reference		Reference			
11–20	1.325 (0.928–1.893)	0.122	1.555 (1.081–2.236)	0.017	1.243 (0.923–1.674)	0.152		
21–30	1.520 (1.042–2.218)	0.030	1.708 (1.160–2.513)	0.007	1.364 (0.991–1.875)	0.057		
31–40	1.560 (1.018–2.392)	0.041	1.828 (1.115–2.996)	0.017	1.302 (0.901–1.880)	0.160		
41–50	1.352 (0.788–2.318)	0.273	1.599 (0.859–2.978)	0.139	1.069 (0.667–1.711)	0.782		
>50	1.985 (1.177–3.348)	0.010	1.993 (1.092–3.637)	0.025	1.751 (1.119–2.739)	0.014		
Not determined	2.394 (1.383–4.145)	0.002	2.113 (1.133–3.940)	0.019	1.806 (1.094–2.982)	0.021		
T stage, n (%)		0.012		0.029		0.183		
T1	Reference		Reference		Reference			
T2	1.240 (0.982–1.566)	0.071	0.996 (0.673–1.475)	0.985	1.098 (0.896–1.344)	0.368		
T3	1.657 (1.096–2.506)	0.017	2.125 (1.171–3.856)	0.013	1.388 (0.949–2.030)	0.091		
T4	1.665 (1.170–2.369)	0.005	3.132 (1.383–7.091)	0.006	1.375 (0.999–1.892)	0.051		
Not determined	1.459 (0.841–2.530)	0.179	1.482 (0.459–4.789)	0.511	1.242 (0.771–1.999)	0.373		
N stage		<0.001		0.005		<0.001		0.045
N0	Reference		Reference		Reference		Reference	
N1	2.078 (1.613–2.677)	<0.001	1.916 (1.167–3.147)	0.010	1.775 (1.420–2.219)	<0.001	1.562 (1.054–2.316)	0.026
N2	2.164 (1.692–2.766)	<0.001	3.999 (1.874–8.532)	<0.001	1.856 (1.495–2.305)	<0.001	1.904 (1.195–3.033)	0.007
Not determined	0.000 (0.000–)	0.940	0.000 (0.000–)	0.941	0.000 (0.000–)	0.926	0.000 (0.000–)	0.930
TNM stage, n (%)		<0.001		0.013		<0.001		0.389
IA	Reference		Reference		Reference		Reference	
IB	1.271 (0.903–1.788)	0.169	1.279 (0.775–2.109)	0.336	1.028 (0.771–1.371)	0.851	1.108 (0.825–1.489)	0.495
IIA	2.751 (1.940–3.902)	<0.001	1.726 (0.967–3.078)	0.065	1.876 (1.363–2.582)	<0.001	1.637 (1.042–2.571)	0.032
IIB	2.007 (1.359–2.965)	<0.001	1.111 (0.574–2.149)	0.754	1.785 (1.289–2.471)	<0.001	1.720 (1.071–2.761)	0.025
IIIA	2.286 (1.722–3.035)	<0.001	0.541 (0.229–1.281)	0.162	1.748 (1.373–2.226)	<0.001	1.255 (0.780–2.021)	0.349
IIIB	2.227 (1.449–3.423)	<0.001	0.247 (0.063–0.961)	0.044	1.714 (1.173–2.503)	0.005	1.239 (0.736–2.085)	0.419
Not determined	1.439 (0.783–2.644)	0.241	0.745 (0.208–2.670)	0.652	1.149 (0.689–1.916)	0.593	1.308 (0.733–2.334)	0.364
Grade, n (%)		0.260				0.235		
Grade I	Reference				Reference			
Grade II	1.081 (0.138–8.452)	0.941			1.129 (0.147–8.694)	0.907		
Grade III	1.219 (0.170–8.749)	0.844			1.530(0.214–10.946)	0.672		
Grade IV	1.489(0.208–10.661)	0.692			1.731(0.242–12.371)	0.584		
Not determined	1.602(0.224–11.474)	0.639			1.882(0.263–13.457)	0.528		
Surgical procedure, n (%)		0.011		0.020		0.002		0.038
Sublobar resection	Reference		Reference		Reference		Reference	
Lobectomy	0.721 (0.576–0.902)	0.004	0.714 (0.561–0.908)	0.006	0.724 (0.595–0.881)	0.001	0.786 (0.638–0.968)	0.024
Others	0.971 (0.718–1.313)	0.849	0.893 (0.639–1.247)	0.506	0.993 (0.764–1.289)	0.955	1.017 (0.773–1.339)	0.903
Radiation		0.426				0.080		0.029
Yes	Reference				Reference		Reference	
No	1.091 (0.881–1.350)				1.183 (0.980–1.428)		1.289 (1.026–1.619)	
Chemotherapy		0.252				0.084		0.021
Yes	Reference				Reference		Reference	
No/unknown	1.131 (0.916–1.398)				1.175 (0.979–1.412)		1.293 (1.040–1.608)	
Lymph node dissection		0.001		0.001		0.016		0.023
4 or more	Reference		Reference		Reference		Reference	
1 to 3	1.428 (1.162–1.755)		1.449 (1.173–1.789)		1.244 (1.041–1.487)		1.233 (1.029–1.478)	

**Table S6** Univariable and multivariable Cox regression analysis for patients who underwent surgery for small cell lung cancer with the dissection of 4 to 11 lymph nodes or  $\geq 12$  lymph nodes on the matched cohort

Variables	Lung cancer specific survival				Overall survival			
	Univariable analysis		Multivariable analysis		Univariable analysis		Multivariable analysis	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Age (years), n (%)		0.001		<0.001		<0.001		<0.001
<65	Reference		Reference		Reference		Reference	
65–75	1.214 (0.959–1.536)	0.106	1.403 (1.100–1.788)	0.006	1.306 (1.067–1.598)	0.010	1.493 (1.213–1.839)	<0.001
>75	1.788 (1.330–2.402)	<0.001	1.933 (1.420–2.633)	<0.001	1.961 (1.517–2.535)	<0.001	2.107 (1.619–2.742)	<0.001
Sex, n (%)		0.018		0.152		0.006		0.086
Female	Reference		Reference		Reference		Reference	
Male	1.284 (1.043–1.580)		1.170 (0.944–1.451)		1.287 (1.077–1.538)		1.175 (0.977–1.414)	
Race, n (%)		0.204				0.294		
White	Reference				Reference			
Black/other	0.772 (0.518–1.151)				0.839 (0.605–1.164)			
Location, n (%)		0.411				0.370		
Metropolitan	Reference				Reference			
Nonmetropolitan	0.888 (0.669–1.179)				0.894 (0.699–1.142)			
Year of diagnosis, n (%)		0.393				0.473		
2000–2004	Reference				Reference			
2005–2008	0.987 (0.750–1.229)	0.924			0.936 (0.740–1.184)	0.582		
2009–2012	0.838 (0.629–1.116)	0.226			0.860 (0.670–1.103)	0.235		
2013–2016	0.804 (0.582–1.110)	0.185			0.812 (0.608–1.085)	0.158		
Tumor site, n (%)		0.258				0.593		
Upper	Reference				Reference			
Middle	1.133 (0.743–1.728)	0.563			1.091 (0.758–1.572)	0.638		
Lower	1.202 (0.962–1.502)	0.105			1.101 (0.908–1.335)	0.327		
Tumor size (mm), n (%)		0.116				0.641		
0–10	Reference				Reference			
11–20	1.146 (0.760–1.728)	0.515			1.057 (0.759–1.472)	0.745		
21–30	1.258 (0.829–1.911)	0.281			1.014 (0.720–1.427)	0.938		
31–40	1.660 (1.058–2.604)	0.027			1.272 (0.873–1.853)	0.210		
41–50	1.529 (0.932–2.511)	0.093			1.145 (0.745–1.758)	0.537		
>50	1.658 (1.002–2.741)	0.049			1.217 (0.791–1.870)	0.371		
Not determined	1.613 (0.763–3.409)	0.210			1.426 (0.769–2.646)	0.260		
T stage, n (%)		<0.001		0.046		0.004		0.114
T1	Reference		Reference		Reference		Reference	
T2	1.519 (1.208–1.908)	<0.001	1.172 (0.848–1.621)	0.336	1.314 (1.082–1.595)	0.006	1.093 (0.813–1.468)	0.556
T3	2.398 (1.633–3.521)	<0.001	2.138 (1.251–3.652)	0.005	1.841 (1.286–2.635)	0.001	1.804 (1.093–2.977)	0.021
T4	1.504 (0.969–2.336)	0.069	2.159 (0.833–5.595)	0.113	1.337 (0.913–1.960)	0.136	1.854 (0.782–4.394)	0.161
Not determined	1.338 (0.655–2.731)	0.425	4.870 (0.655–36.20)	0.122	1.270 (0.722–2.234)	0.406	4.643(0.620–34.765)	0.135
N stage		<0.001		0.004		<0.001		0.004
N0	Reference		Reference		Reference		Reference	
N1	2.476 (1.930–3.176)	<0.001	2.073 (1.292–3.327)	0.003	1.952 (1.575–2.419)	<0.001	2.062 (1.349–3.150)	0.001
N2	2.876 (2.223–3.721)	<0.001	3.309 (1.512–7.242)	0.003	2.242 (1.787–2.812)	<0.001	2.702 (1.333–5.478)	0.006
Not determined	2.592 (0.960–7.001)	0.060	10.995(1.021–118.4)	0.048	1.664 (0.619–4.474)	0.313	7.388(0.719–75.882)	0.092
TNM stage, n (%)		<0.001		0.119		<0.001		0.376
IA	Reference		Reference		Reference		Reference	
IB	1.556 (1.093–2.217)	0.014	1.422 (0.878–2.303)	0.152	1.280 (0.969–1.691)	0.082	1.306 (0.867–1.967)	0.202
IIA	3.013 (2.100–4.325)	<0.001	1.664 (0.945–2.930)	0.078	1.943 (1.422–2.656)	<0.001	1.163 (0.707–1.912)	0.553
IIB	2.905 (2.016–4.188)	<0.001	1.371 (0.728–2.582)	0.329	2.024 (1.498–2.736)	<0.001	1.073 (0.616–1.868)	0.803
IIIA	3.694 (2.720–5.018)	<0.001	1.056 (0.433–2.571)	0.905	2.505 (1.947–3.223)	<0.001	0.910 (0.412–2.012)	0.817
IIIB	2.109 (1.186–3.750)	0.011	0.493 (0.113–2.144)	0.346	1.621 (0.999–2.629)	0.050	0481 (0.131–1.763)	0.270
Not determined	2.203 (1.163–4.172)	0.015	0.263 (0.029–2.361)	0.233	1.600 (0.947–2.703)	0.079	0.261 (0.031–2.187)	0.215
Grade, n (%)		0.852				0.508		
Grade I	Reference				Reference			
Grade II	1.598 (0.365–6.993)	0.534			1.730 (0.403–7.434)	0.461		
Grade III	1.940 (0.479–7.853)	0.353			2.399 (0.594–9.681)	0.219		
Grade IV	1.926 (0.476–7.799)	0.358			2.336 (0.579–9.434)	0.233		
Not determined	1.881 (0.465–7.619)	0.376			2.377 (0.589–9.595)	0.224		
Surgical procedure, n (%)		0.208				0.011		0.078
Sublobar resection	Reference				Reference		Reference	
Lobectomy	0.843 (0.617–1.153)	0.285			0.728 (0.560–0.945)	0.017	0.730 (0.556–0.960)	0.024
Others	1.112 (0.716–1.725)	0.638			1.009 (0.695–1.466)	0.962	0.773 (0.521–1.148)	0.202
Radiation		0.027		0.639		0.402		
Yes	Reference		Reference		Reference			
No	0.787 (0.636–0.974)		1.058 (0.836–1.338)		0.923 (0.765–1.113)			
Chemotherapy		0.955				0.440		
Yes	Reference				Reference			
No/unknown	1.006 (0.806–1.257)				1.077 (0.892–1.299)			
Lymph node dissection		0.935		0.168		0.621		0.130
12 or more	Reference		Reference		Reference		Reference	
4 to11	1.009 (0.820–1.242)		1.161 (0.939–1.436)		1.046 (0.875–1.250)		1.152 (0.959–1.384)	