Supplementary Material

Supplementary Table 1. ICD-9 and ICD-10 codes

	ICD-9 (Before Sep 30, 2015)	ICD-10 (After Sep 30, 2015)
Primary tumor for lung cancer	162	C33-C34
Other cancers for exclusion	140-149 150-159 160-161 163-165 170-176 179-189 190-195, 199 200-209	C00-C14 C15-C26 C30-C32, C37-C39 C40-C41 C43-C44 C45-C49 C50 C51-C58 C60-C63 C64-C68 C69-C72 C73-C75 C76, C80 C7A C7B C81-C96
Secondary neoplasm	196-198	C77-C79

Supplementary Table 2. J codes for immune checkpoint inhibitors

Generic name	J code
ipilimumab	J9228
pembrolizumab	J9271, C9027
nivolumab	C9453, J9299
cemiplimab	J9119, C9044, J9119
atezolizumab	C9483, J9022
durvalumab	J9173, C9492

Supplementary Table 3. Characteristics of study population by quintiles of Black population in a county

	All N=17,022	By Black population quintiles				
		1 (Lowest percentage)	2	3	4	5 (Highest percentage)
Age, mean (SD)	71.5 (9.3)	71.5 (9.2)	72.1 (9.0)	71.7 (9.2)	71.5 (9.7)	70.6 (9.2)
Female, n (%)	8,967 (52.7)	1,791 (52.3)	1,794 (52.8)	1,842 (54.0)	1,801 (52.4)	1,739 (52.0)
Percentage of population living below poverty line, mean (SD)	13.1 (4.6)	11.6 (4.8)	11.7 (4.2)	12.2 (3.5)	13.2 (3.3)	16.9 (4.8)
Urbanity of county, n (%)						
Metro	14,632 (85.9)	2,225 (64.9)	2,951 (86.9)	3,268 (95.7)	3,286 (95.4)	2,905 (86.7)
Urban	2,049 (12.0)	992 (29.0)	399 (11.7)	136 (4.0)	145 (4.2)	377 (11.3)
Rural	351 (2.1)	212 (6.2)	48 (1.4)	11 (0.3)	12 (0.4)	68 (2.0)
Number of medical oncologists per 100,000 in the county, mean (SD)	4.5 (4.5)	2.4 (3.1)	3.8 (3.4)	4.5 (3.2)	5.8 (5.4)	6.5 (5.6)
Charlson comorbidity index, n (%)						
0	3,333 (19.6)	707 (20.6)	642 (18.9)	635 (18.6)	693 (20.1)	656 (19.6)
1-2	4,046 (23.8)	886 (25.9)	816 (24.1)	819 (24.0)	754 (21.9)	771 (23.0)
>=3	9,124 (53.6)	1,742 (50.9)	1,834 (54.0)	1,851 (54.2)	1,875 (54.5)	1,822 (54.4)
Medicare Advantage, n (%)	13,861 (81.4)	2,799 (81.7)	2,806 (82.6)	2,774 (81.2)	2,788 (81.0)	2,694 (80.4)
Checkpoint inhibitor initiation, n (%)						
Yes	6,988 (41.0)	1,479 (43.2)	1,330 (39.1)	1,265 (37.0)	1,432 (41.6)	1,482 (44.2)
Censored	10,044 (59.0)	1,947 (56.8)	2,068 (60.9)	2,150 (63.0)	2,011 (58.4)	1,868 (55.8)

Length of continuous enrollment after diagnosis, months	15.6 (14.2)	15.5 (13.8)	16.6 (15.1)	16.9 (15.5)	14.9 (13.5)	14.4 (12.8)

HR: Hazard ratio. CI: Confidence interval.

Supplementary Table 4. Characteristics of study population by quintiles of Hispanic population in a

county

	All N=17,022	By Hispanic population quintiles				
		1 (Lowest percentage)	2	3	4	5 (Highest percentage)
Age, mean (SD)	71.5 (9.3)	70.3 (9.3)	70.6 (9.4)	71.8 (9.0)	72.0 (9.5)	72.8 (9.2)
Female, n (%)	8,967 (52.7)	1,697 (49.7)	1,815 (53.1)	1,853 (53.9)	1,826 (53.7)	1,776 (53.1)
Percentage of population living below poverty line, mean (SD)	13.1 (4.6)	13.8 (5.8)	13.0 (5.0)	12.4 (4.1)	11.9 (3.8)	14.4 (3.5)
Urbanity of county, n (%)						
Metro	14,632 (85.9)	2,103 (61.6)	2,889 (84.3)	3,132 (91.0)	3,261 (95.9)	3,247 (97.0)
Urban	2,049 (12.0)	1,055 (30.9)	475 (13.9)	303 (8.8)	122 (3.6)	94 (2.8)
Rural	351 (2.1)	255 (7.5)	63 (1.8)	_[a]	19 (0.6)	_[a]
Number of medical oncologists per 100,000 in the county, mean (SD)	4.5 (4.5)	2.9 (3.9)	4.6 (4.9)	5.4 (4.7)	5.6 (5.4)	4.5 (2.6)
Charlson comorbidity index, n (%)						
0	3,333 (19.6)	661 (19.4)	691 (20.2)	647 (18.8)	705 (20.7)	629 (18.8)
1-2	4,046 (23.8)	871 (25.5)	819 (23.9)	852 (24.8)	807 (23.7)	697 (20.8)
>=3	9,124 (53.6)	1,796 (52.6)	1,806 (52.7)	1,845 (53.6)	1,776 (52.2)	1,901 (56.8)
Medicare Advantage, n (%)	13,861 (81.4)	2,679 (78.5)	2,685 (78.4)	2,926 (85.0)	2,746 (80.7)	2,825 (84.4)
Checkpoint inhibitor initiation, n (%)						
Yes	6,988 (41.0)	1,565 (45.9)	1,546 (45.1)	1,405 (40.8)	1,396 (41.0)	1,076 (32.2)
Censored	10,044 (59.0)	1,848 (54.2)	1,881 (54.9)	2,038 (59.2)	2,006 (59.0)	2,271 (67.9)

Length of continuous enrollment after diagnosis, months	15.6 (14.2)	13.8 (12.2)	13.8 (12.1)	15.6 (14.1)	15.5 (14.2)	19.6 (17.0)

HR: Hazard ratio. CI: Confidence interval.

[a] n is smaller than 11 therefore not presented.

Supplementary Table 5. Characteristics of study population by quintiles of other racialized population in a county

	All N=17,022	By other racialized population quintiles				
		1 (Lowest percentage)	2	3	4	5 (Highest percentage)
Age, mean (SD)	71.5 (9.3)	70.6 (9.0)	70.8 (9.2)	71.4 (9.4)	71.6 (9.2)	73.2 (9.3)
Female, n (%)	8,967 (52.7)	1,671 (48.7)	1,749 (51.5)	1,892 (54.7)	1,841 (54.3)	1,814 (54.4)
Percentage of population living below poverty line, mean (SD)	13.1 (4.6)	15.2 (5.6)	13.0 (4.2)	12.9 (4.4)	12.7 (3.6)	11.6 (4.1)
Urbanity of county, n (%)						
Metro	14,632 (85.9)	1,826 (53.2)	2,942 (86.5)	3,299 (95.2)	3,359 (99.0)	3,206 (96.1)
Urban	2,049 (12.0)	1,344 (39.1)	420 (12.4)	159 (4.6)	29 (0.9)	97 (2.9)
Rural	351 (2.1)	265 (7.7)	28 (1.1)	_[a]	_[a]	_[a]
Number of medical oncologists per 100,000 in the county, mean (SD)	4.5 (4.5)	1.8 (3.0)	3.7 (3.4)	6.1 (4.5)	5.8 (4.2)	5.5 (5.6)
Charlson comorbidity index, n (%)						
0	3,333 (19.6)	590 (17.2)	638 (18.8)	697 (20.1)	691 (20.4)	717 (21.5)
1-2	4,046 (23.8)	798 (23.2)	849 (25.0)	809 (23.3)	834 (24.6)	756 (22.7)
>=3	9,124 (53.6)	1,958 (57.0)	1,835 (54.0)	1,846 (53.2)	1,748 (51.5)	1,737 (52.1)
Medicare Advantage, n (%)	13,861 (81.4)	2,814 (81.9)	2,764 (81.3)	2,793 (80.6)	2,724 (80.3)	2,766 (82.9)
Checkpoint inhibitor initiation, n (%)						
Yes	6,988 (41.0)	1,490 (43.4)	1,526 (44.9)	1,522 (43.9)	1,372 (40.4)	1,078 (32.3)
Censored	10,044 (59.0)	1,945 (56.6)	1,874 (55.1)	1,945 (56.1)	2,021 (59.6)	2,259 (67.7)

Length of continuous enrollment after diagnosis, months	15.6 (14.2)	13.9 (12.3)	14.3 (13.0)	14.8 (13.4)	16.9 (15.3)	18.4 (16.2)

HR: Hazard ratio. CI: Confidence interval.

[a] n is smaller than 11 therefore not presented.

Supplementary Table 6. Cox proportional hazard regression output with racialized population quintiles,

12 months of continuous enrollment post metastatic cancer diagnosis.

	HR (95% CI)	P value
Percentage of racialized population in a county quintile; ref: quintile 1 (lowest percentage)		
2	0.89 (0.80, 1.01)	0.064
3	0.86 (0.77, 0.97)	0.011
4	0.80 (0.71, 0.91)	<0.001
5 (Highest percentage)	0.69 (0.59, 0.80)	<0.001
Age group (ref: <55)		
[55, 65)	1.18 (0.92, 1.51)	0.189
[65, 75)	1.08 (0.84, 1.38)	0.541
>=75	0.84 (0.65, 1.09)	0.195
Female (ref: Male)	0.81 (0.75, 0.86)	<0.001
Charlson comorbidities (ref: 0)		
1-2	0.97 (0.95, 1.10)	0.666
>=3	0.87 (0.87, 0.99)	0.002
Medicare Advantage	0.92 (0.81, 1.04)	0.190
Urbanity (ref: metro)		
Urban	1.09 (0.97, 1.22)	0.150
Rural	1.37 (1.11, 1.69)	0.003
Number of medical oncologists per 100,000	1.01 (1.00, 1.02)	0.130
Diagnosis year (ref: 2015)		
2016	1.19 (1.04, 1.36)	0.012

|		
2017	1.68 (1.49, 1.89)	<0.001
2018	2.29 (2.05, 2.56)	<0.001
2019	2.97 (2.65, 3.34)	<0.001

HR: hazard ratio; CI: confidence interval.

Supplementary Table 7. Cox proportional hazard regression output with Black, Hispanic, and other racialized population quintiles, 12 months of continuous enrollment post metastatic cancer diagnosis.

	HR (95% CI)	P value
Percentage of black in a county quintile; ref: quintile 1 (lowest percentage)		
2	0.95 (0.85, 1.07)	0.417
3	0.92 (0.81, 1.05)	0.211
4	0.93 (0.83, 1.05)	0.233
5 (Highest percentage)	0.98 (0.87, 1.10)	0.703
Percentage of Hispanic in a county quintile; ref: quintile 1 (lowest percentage)		
2	1.04 (0.93, 1.17)	0.473
3	0.94 (0.84, 1.06)	0.330
4	0.99 (0.87, 1.12)	0.880
5 (Highest percentage)	0.80 (0.70, 0.91)	0.001
Percentage of other racialized population in a county quintile; ref: quintile 1 (lowest percentage)		
2	1.06 (0.94, 1.19)	0.369
3	1.06 (0.93, 1.20)	0.366
4	1.00 (0.88, 1.15)	0.957
5 (Highest percentage)	0.74 (0.64, 0.86)	<0.001
Age group (ref: <55)		
[55, 65)	1.16 (0.91, 1.49)	0.236
[65, 75)	1.09 (0.85, 1.40)	0.487
>=75	0.87 (0.67, 1.13)	0.290

|	HR (95% CI)	p-value
Female (ref: male)	0.81 (0.75, 0.86)	<0.001
Charlson comorbidities (ref: 0)		
1-2	0.98 (0.90, 1.09)	0.782
>=3	0.86 (0.79, 0.94)	0.001
Medicare Advantage	0.91 (0.81, 1.03)	0.157
Urbanity (ref: metro)		
Urban	1.07 (0.94, 1.22)	0.284
Rural	1.35 (1.08, 1.69)	0.009
Number of medical oncologists per 100,000	1.01 (1.00, 1.02)	0.144
Diagnosis year (ref: 2015)		
2016	1.19 (1.04, 1.37)	0.010
2017	1.68 (1.49, 1.89)	<0.001
2018	2.31 (2.06, 2.59)	<0.001
2019	3.01 (2.67, 3.39)	<0.001

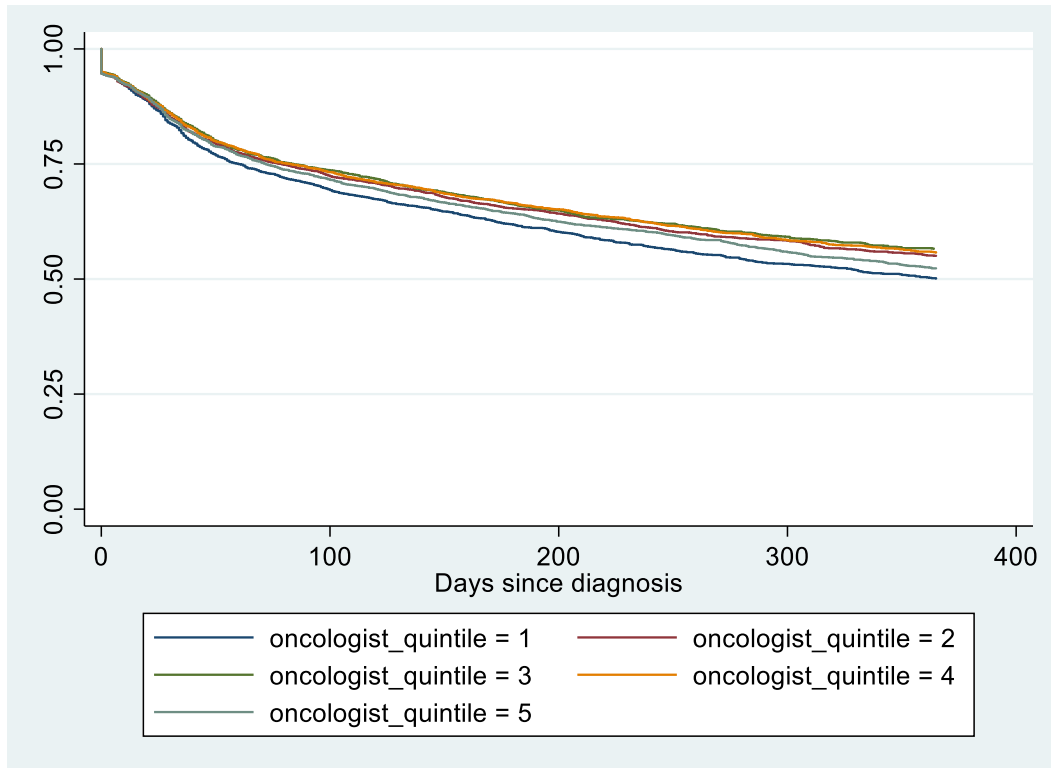HR: hazard ratio; CI: confidence interval.
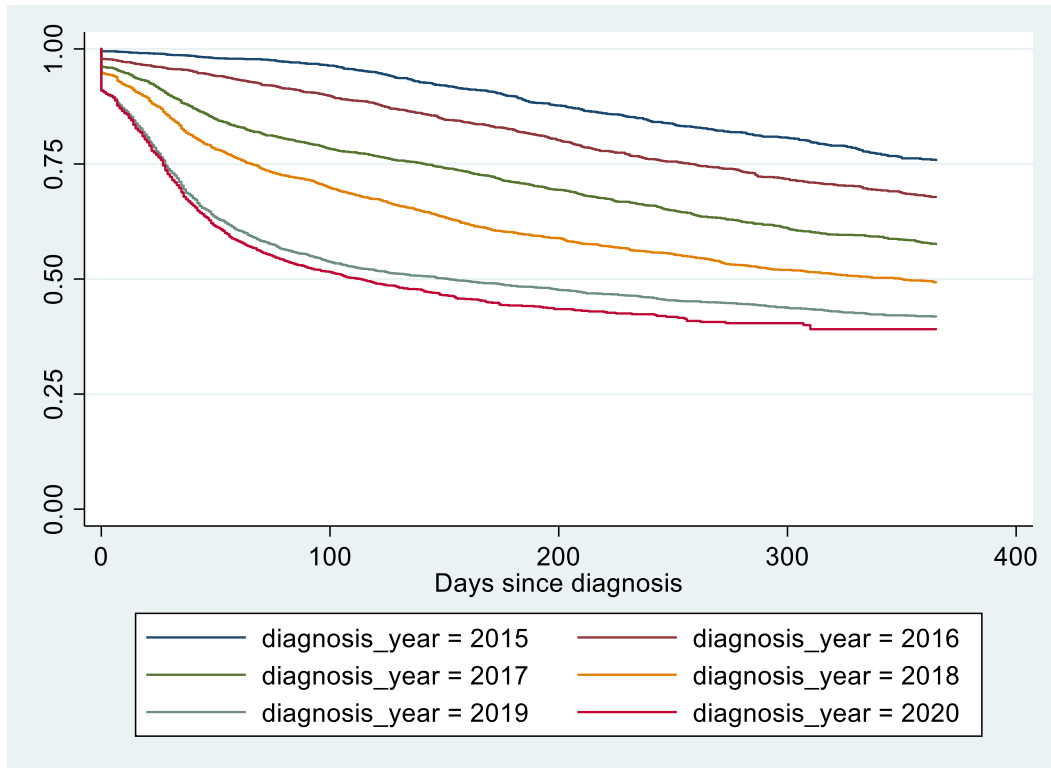
Supplementary Figure 1. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by diagnosis year, with follow-up truncated at 1 year. The restricted mean time (truncated at 1 year) for cohorts 2015-2020 were 325, 300, 264, 232, 191, and 180 days, respectively. P-value from log-rank test <0.05.
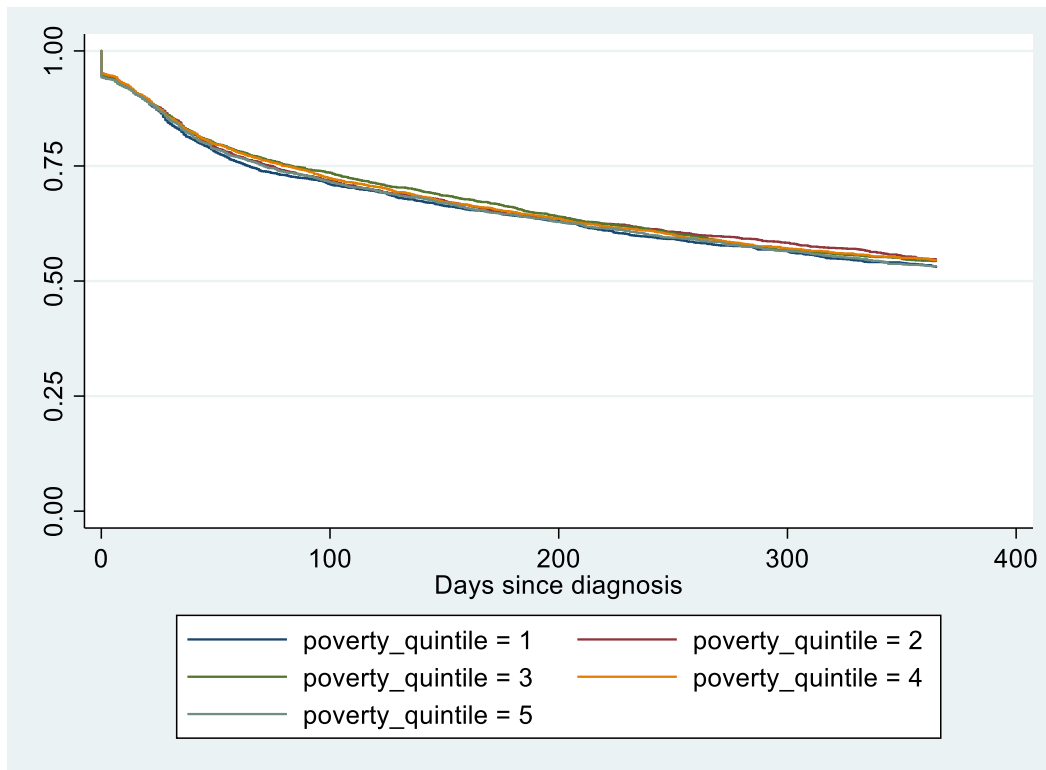
Supplementary Figure 2. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by quintiles of poverty in a county (higher quintiles indicate greater percentage of population living below poverty line), with follow-up truncated at 1 year. P-value from log-rank test >0.05.
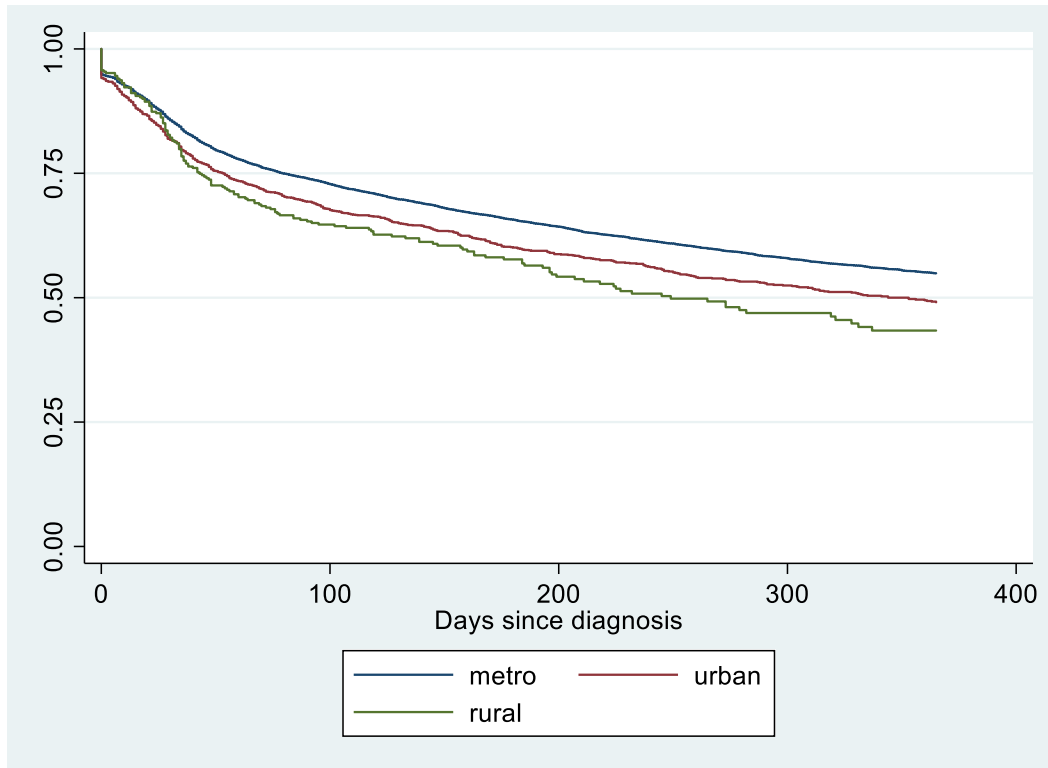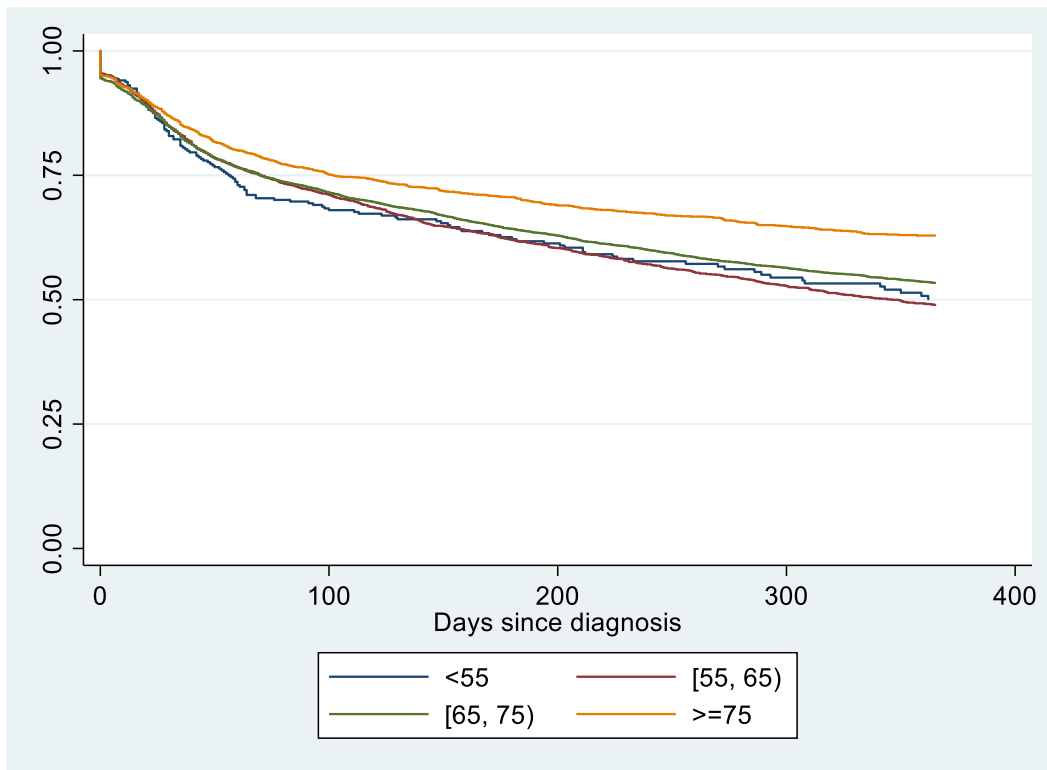
Supplementary Figure 3. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by urbanity, with follow-up truncated at 1 year. P-value from log-rank test <0.05.
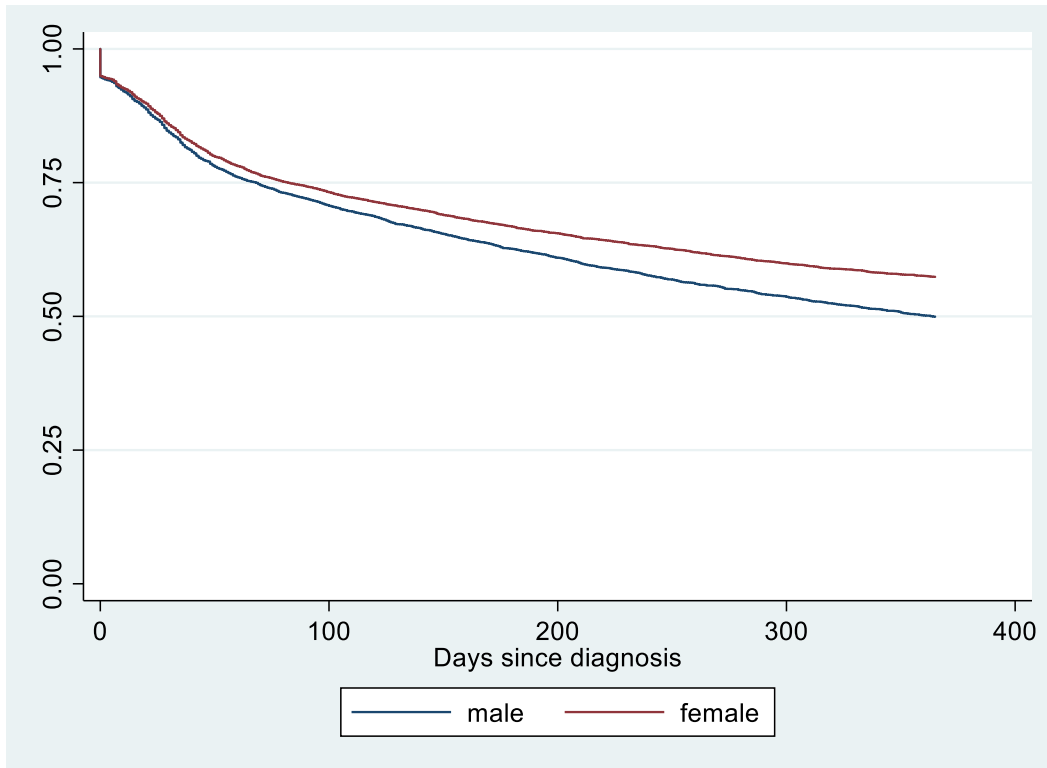
Supplementary Figure 4. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by quintiles of density of oncologists in a county (higher quintiles indicate greater number of oncologists per population in a county), with follow-up truncated at 1 year. P-value from log-rank test <0.05.
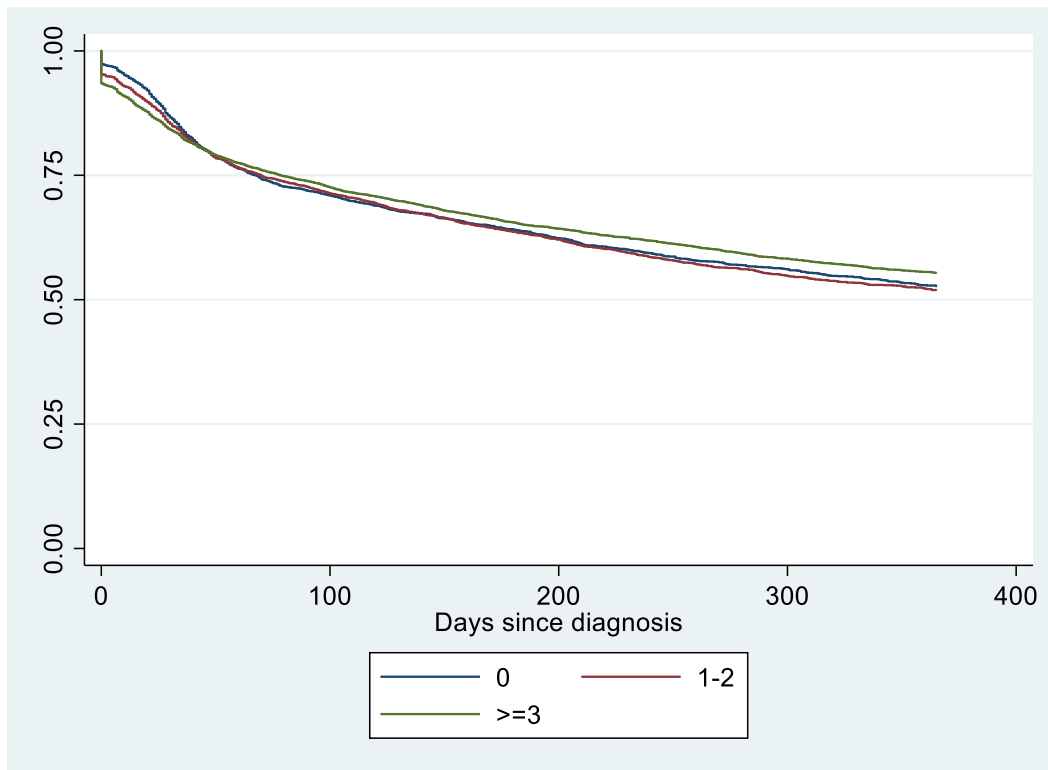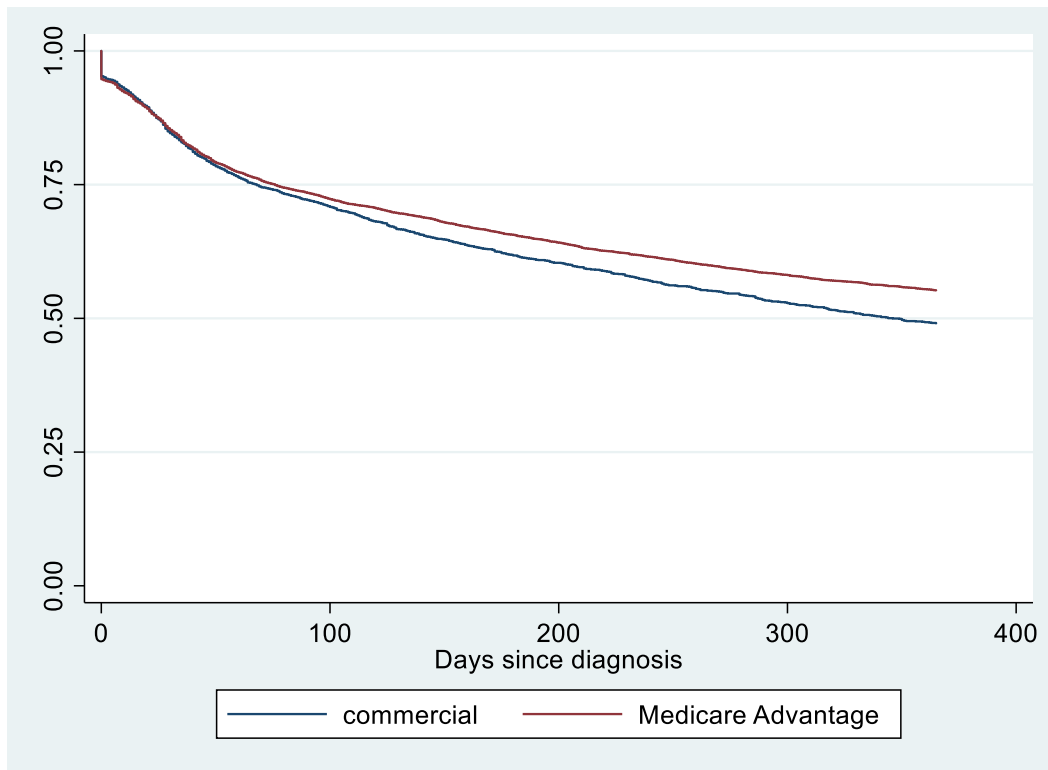
Supplementary Figure 5. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by patient's age, with follow-up truncated at 1 year. P-value from log-rank test <0.05.

Supplementary Figure 6. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by patient's sex, with follow-up truncated at 1 year. P-value from log-rank test <0.05.

Supplementary Figure 7. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by patient's Charlson comorbidity score, with follow-up truncated at 1 year. P-value from log-rank test <0.05.

Supplementary Figure 8. Kaplan-Meier curves of checkpoint inhibitor initiation following metastatic lung cancer diagnosis by employer-sponsored commercial insurance vs. Medicare Advantage, with follow-up truncated at 1 year. P-value from log-rank test <0.05.
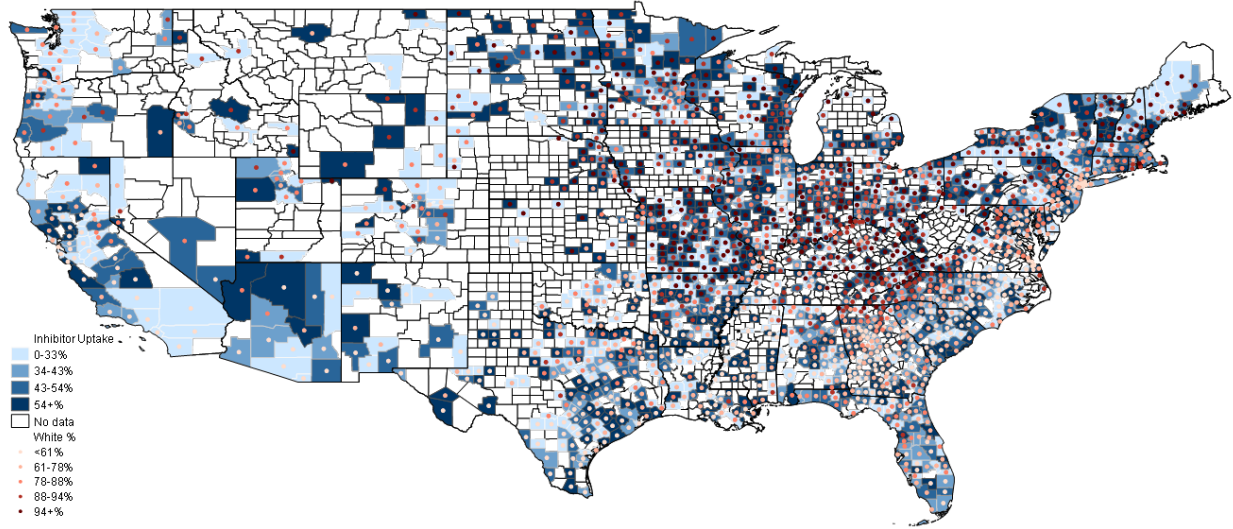
Supplementary Figure 9. Geographic variation in uptake of immune checkpoint inhibitors between 2015

and 2020 by metastatic lung cancer patients with employer-sponsored commercial insurance or

Medicare Advantage, overlaid with percentage of white population in a county.
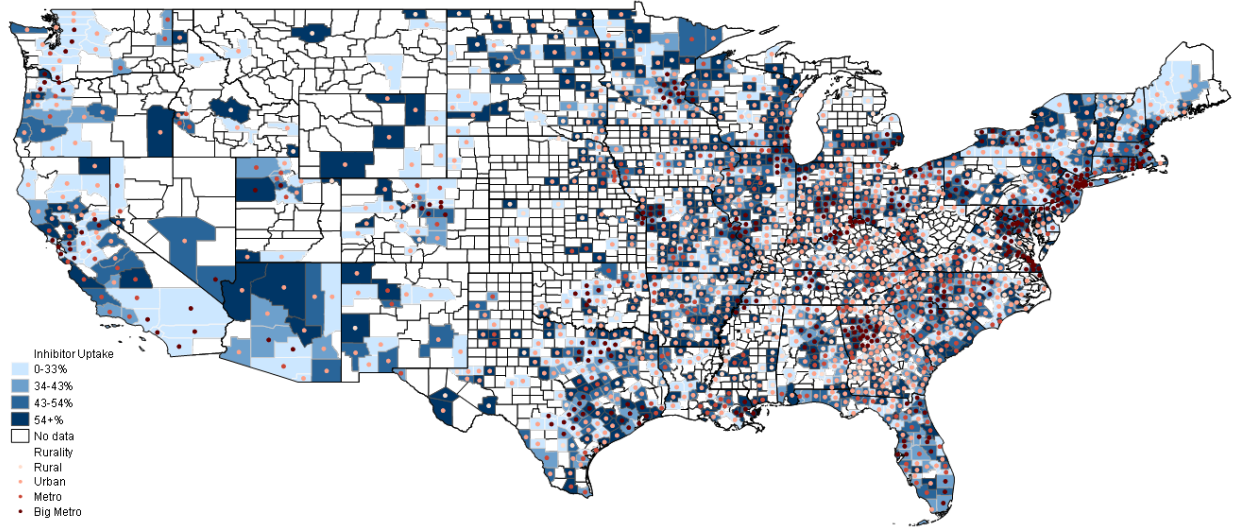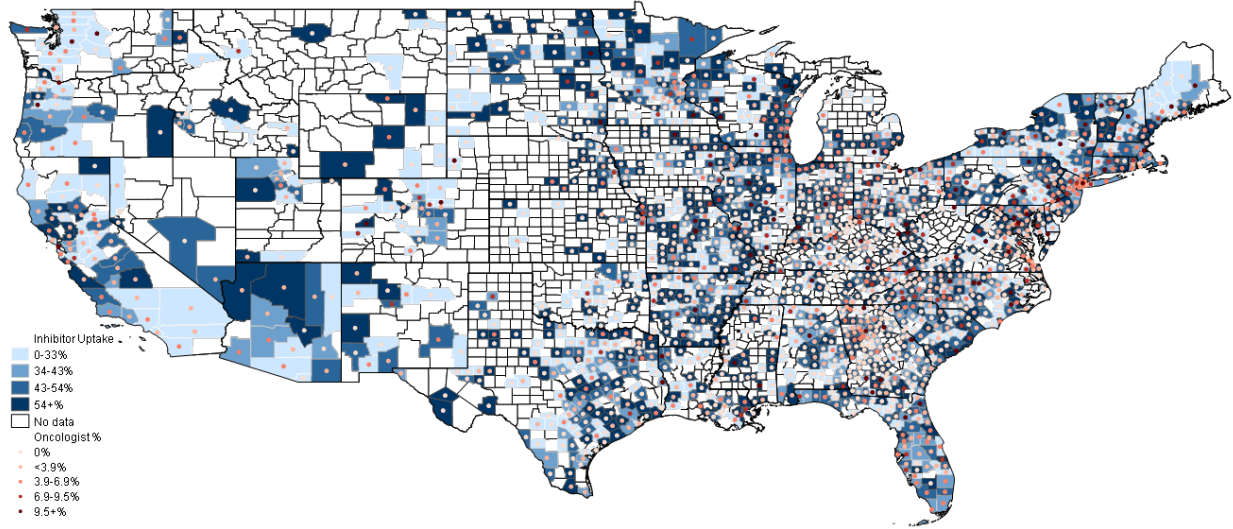
Supplementary Figure 10. Geographic variation in uptake of immune checkpoint inhibitors between 2015 and 2020 by metastatic lung cancer patients with employer-sponsored commercial insurance or Medicare Advantage, overlaid with rurality of a county.
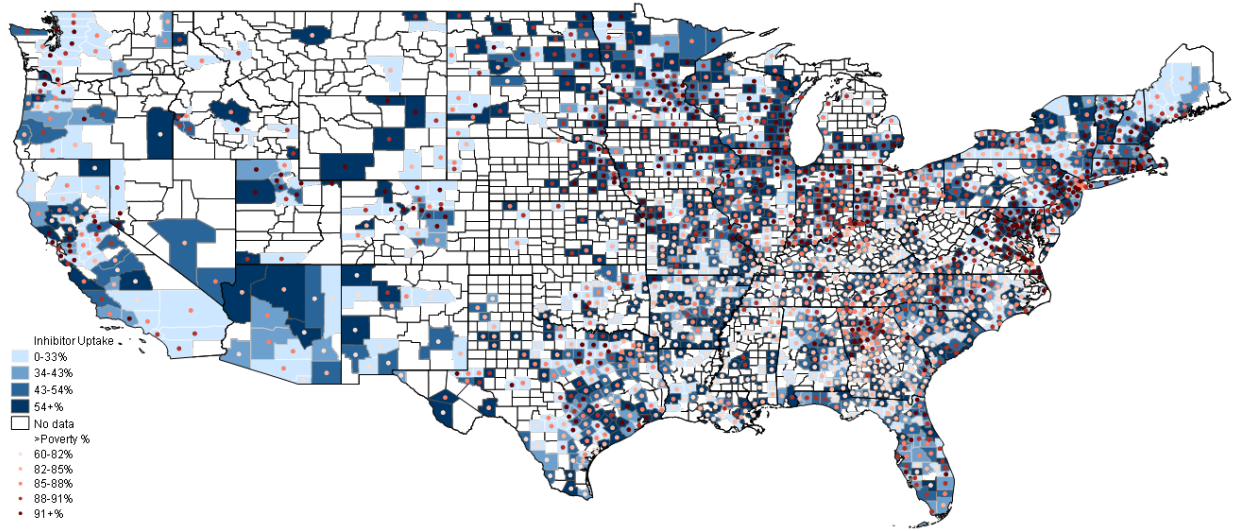
Supplementary Figure 11. Geographic variation in uptake of immune checkpoint inhibitors between

2015 and 2020 by metastatic lung cancer patients with employer-sponsored commercial insurance or

Medicare Advantage, overlaid with percentage of population in poverty of a county.

Supplementary Figure 12. Geographic variation in uptake of immune checkpoint inhibitors between

2015 and 2020 by metastatic lung cancer patients with employer-sponsored commercial insurance or

Medicare Advantage, overlaid with number of oncologists per population of a county.