

#### Danger In America's Small Towns: Rural-Urban Survival Disparities For Patients With Surgically Treated Lung Cancer

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# Introduction

There are an estimated 46 to 60 million people in the United States (15 - 19% of the population) who are considered rural. Rural populations have a lower life expectancy (76.8 years) when compared to US metropolitan or urban populations (78.8 years) [1]. Rural populations face numerous challenges with access to screening, diagnostic, and treatment modalities. These challenges have been exacerbated recently by an acceleration in rural hospital closures and persistent provider shortages. Also, a growing body of literature has demonstrated disproportionately worse cancer outcomes in rural populations, especially for lung cancer [2].

Rural lung cancer patients have worse survival outcomes based on increasing rurality with a dose-response relationship [3]. The largest disparity in survival between rural populations and metropolitan populations is observed in early-stage non-small cell lung cancer (NSCLC) lung cancer. Rural patients are less likely to undergo guideline concordant care, especially surgery, which affords the greatest survival benefit [3,4].

Disparities in rural health remain a key issue. The magnitude of the difference in survival on rural patients who undergo surgical treatment for NSCLC is not known. The purpose of this study is to investigate the relationship between rurality and survival for patients who underwent surgical treatment for NSCLC while controlling for patient, hospital, cancer stage, and travel distance characteristics.

## **Methods**

The National Cancer Database (NCDB) was used to identify surgically treated NSCLC patients from 2004-2016. Patients from rural and small-town counties were compared to urban and metropolitan counties. Differences in patient sociodemographic, clinical, hospital, and travel distance characteristics were described using Chi square tests. Kaplan-Meier methods with log-rank tests and Cox proportional hazards analysis was used to examine differences in mortality.

# Results

The study included 366,373 surgically treated NSCLC patients with 12.4% (n=45,304) categorized as rural/small-town. Rural/smalltown patients traveled farther for treatment and were from areas characterized by lower income and educational attainment (all p < 0.001). Survival probabilities for rural/small-town patients were worse at one year (85% vs 87%), five years (48% vs 54%), ten years (26% vs 31%), and fifteen years (11% vs 15%) (all p < 10.001). Living in a rural/small-town location remained an independent risk for death [HR=1.04, 95% CI 1.01-1.07] after controlling for cancer stage, patient and hospital characteristics, and travel distance. Risk of death increased as distance from the treating facility increased, with distance of 25-50 miles [HR 1.03, 95% CI 1.01-1.05], distance greater than 50 and less than 100 miles [HR 1.05, 95%] CI 1.01-1.09] and distance greater than 100 miles [HR 1.11, 95% CI 1.06-1.15].

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characteristics NCDB 2004-2016	Sample Percent n=366,373	Percent Rural/Small- Town n=45,304	Percent Urban/Metro n=321,069	Hazard Ratio (95% CI)
Rural/Small-town	12.4			1.04 (1.01 - 1.07)
Urban/Metropolitan	87.6			Reference
<u>Gender</u>	10.0	54.0	40.4	
Male Female	49.8	54.3	49.1	1.35 (1.34 - 1.36) Reference
Ano Croune				
Age Groups <40	0.4	0.3	04	0 62 (0 56 - 0 68)
40-49	4.0	4.2	3.9	0.71 (0.69 - 0.73)
50-59	16.6	17.3	16.5	0.81 (0.79 - 0.82)
60-69	34.1	35.8	33.8	Reference
70-79	35.1	34.4	35.2	1.35 (1.33 - 1.37)
>80	9.9	7.9	10.2	1.91 (1.87 - 1.94)
Race and Ethnicity	2.2	0.4	2.4	0.74 (0.66 0.76)
Riack	8.4	0.4 4 A	2.4	0.71(0.00 - 0.76) 0.98(0.96 - 1.00)
Hispanic	2.4	4.4 0.7	2.7	0.83 (0.79 - 0.87)
White	85.8	93.1	84.8	Reference
Other/Unknown	1.2	1.4	1.2	0.88 (0.81 - 0.95)
Median Income				
Quartiles				- <i>i</i>
1 (lowest)	15.7	36.7	12.7	Reference
2	20.6	35.7	18.5	0.98 (0.96 - 1.00)
) 1 (hiahest)	24.0 32.3	27	20.0	0.95(0.93 - 0.97) 0.89(0.86 - 0.92)
Not available	6.8	7.8	6.7	Excluded
No High School Degree				
Quartiles				
l (lowest)	15.0	31.5	12.7	Reference
2	22.4	30.8	21.3	1.00 (0.98 - 1.02)
3	22.9	21.8	23.1	0.98 (0.95 - 1.01)
i (highest) Not available	31.4 8.2	7.4 8.4	34.7 8.2	0.94 (0.91 - 0.97) Excluded
nsurance Status				
Medicaid or Uninsured	6.5	7.8	6.3	1.20 (1.17 - 1.23)
viedicare or Private	93.5	92.2	93.7	Reference
Distance from treatment				
aciiity 100 miles	3.8	12.8	25	1 11 (1 06 - 1 15)
>50-100 miles	7.7	31.2	4.4	1.05 (1.01 - 1.09)
25-50 miles	13.4	32.0	10.8	1.03 (1.01 - 1.05)
<25 miles	69.2	17.4	76.5	Reference
Not available	5.9	6.7	5.8	0.42 (0.37 - 0.48)
Charlson-Deyo Score	54.0		54.0	<b>D</b> (
	51.3	47.1	51.8 22.0	
	33.3 11 A	35.7	33.0 11.2	1.14 (1.12 - 1.15)
23	4.0	4.2	4.0	1.56 (1.52 - 1.6)
Facility Type				
Jnknown	0.4	0.3	0.4	Excluded
Academic	37.2	27.3	38.7	0.90 (0.85 - 0.94)
Comprehensive	41.5	55.3	39.6	0.93 (0.90 - 0.97)
ntegrated	14.0	7.2	14.9	0.93 (0.88 - 0.98)
Community	6.9	9.8	6.4	Reference
Annual Hospital				
Surgical Case Volume	40.7		10.1	5.4
<20	16.7	18.6	16.4	Reference
20-38	23.7	24.4	23.0	0.97 (0.94 - 1.00)
272	32.5	27.1	33.2	0.89 (0.84 - 0.93)
Pathological Stage				
Stage Missing	11.2	11.5	11.2	1.64 (1.60 - 1.68)
Stage 1	55.8	54.3	56.0	Reference
Stage 2	17.3	18.5	17.1	1.56 (1.53 - 1.58)
Stage 3	12.3	12.6	12.3	2.21 (2.17 - 2.25)
	11	21	2.4	~ ~ / 7 / 2 50 - 2 85)

Table 1



Rural and small-town patients with surgically treated NSCLC had worse survival outcomes compared to urban and metropolitan patients.

- J Prev Med, 2014. 46(2): p. e19-29.
- 2017. **14**(3): p. 403-411.



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Title: Kaplan-Meier model results for differences in survival of surgically treated NSCLC patients, National Cancer Database 2004-2016\*. Similar differences are seen when analysis is performed

#### Conclusions

#### References

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