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].

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 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-small-town 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 (95% vs 87%), five years (48% vs 54%), ten years (26% vs 31%), and fifteen years (11% vs 15%) (all p < 0.001). 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 treatment 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].

Conclusions

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

References


Table 1

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Stage</th>
<th>Pathologic Stage</th>
<th>Distance from Treatment</th>
<th>Area of Residence</th>
<th>Rural/Small-Town</th>
<th>Urban/Metropolitan</th>
<th>Academic</th>
<th>Integrated</th>
<th>Comprehensive</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCDB 2004-2016</td>
<td>2016</td>
<td>22.4%</td>
<td>30 (highest)</td>
<td>Not available</td>
<td>0.71 (0.69</td>
<td>0.97 (0.95)</td>
<td>0.98</td>
<td>1.02</td>
<td>1.05</td>
<td>0.94</td>
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<td></td>
<td>2017</td>
<td>23.6%</td>
<td>25 (highest)</td>
<td>Rural/Small-Town</td>
<td>0.78 (0.76</td>
<td>0.91 (0.90)</td>
<td>0.97</td>
<td>1.01</td>
<td>1.04</td>
<td>0.92</td>
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<tr>
<td></td>
<td>2018</td>
<td>24.6%</td>
<td>20 (highest)</td>
<td>Rural/Small-Town</td>
<td>0.82 (0.80</td>
<td>0.93 (0.92)</td>
<td>0.96</td>
<td>1.00</td>
<td>1.03</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>25.7%</td>
<td>15 (highest)</td>
<td>Rural/Small-Town</td>
<td>0.86 (0.84</td>
<td>0.95 (0.94)</td>
<td>0.99</td>
<td>1.03</td>
<td>1.05</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Figure 1

This Kaplan-Meier model results for differences in survival of surgically treated NSCLC patients, Retrospective Database 2004-2016. Similar differences were seen in other analyses performed by stage.