Disparities in Pulmonary Disease Prevalence

A Comparison of Rural and Urban Kentucky

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INTRODUCTION

Chronic lower respiratory diseases (CLRD), including COPD, were the seventh leading cause of death in the United States between 2015 and 2020[1]. Prevalence is highest in poor, rural areas, where factors like limited healthcare access, lack of health education, and socioeconomic challenges worsen patient outcomes[2]. In Kentucky, CLRD is closely linked to coal mining exposure and poor healthcare access, with rural regions, particularly Eastern Kentucky, experiencing significantly higher mortality and readmission rates compared to urban areas[2].

PURPOSE OF STUDY

This study primarily aimed to explore the relationship between pulmonary diseases in rural and urban areas of Kentucky, a state with a higher-than-average incidence of lung disease. Secondary aims investigated readmission rates, and the length of hospital stays (LOS), examining their potential connection to disease and geography. Given that rural communities are often understudied, the study sought to uncover discrepancies that could inform future healthcare strategies. The goal was to highlight geographic trends, guide targeted healthcare interventions, and improve patient outcomes, particularly in rural areas where healthcare access is limited.

METHODS

This study employed a secondary analysis of de-identified data that was collected from electronic health records (EHRs) from the UK Center for Clinical and Translational Science (CCTS) from individuals with CLRD-related conditions from 2021-2024. A purposive sampling method was utilized and included key variables: demographic information, admission diagnosis, readmission rates, and length of hospital stay. Descriptive statistics were utilized to summarize demographic characteristics and diagnostic outcomes. Differences in diagnostic outcomes by urban- rural designation and readmission status were assessed using chi-square tests. Two-sample t-tests were used to assess the differences in log-transformed length of stay.

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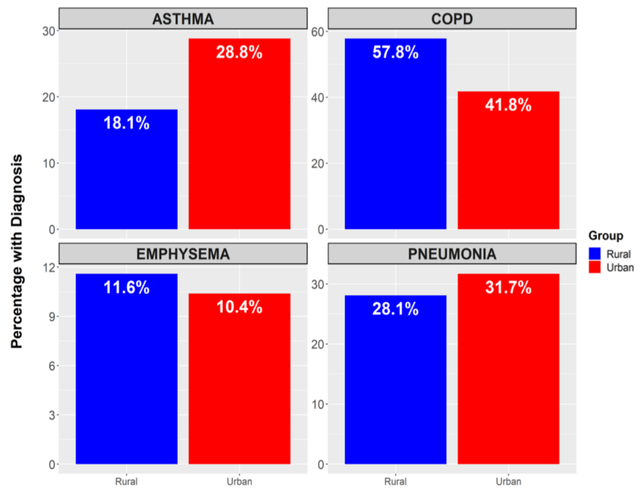
RESULTS

38,011 patients were identified with pulmonary disease, including 14,126 from urban Kentucky and 23,885 from rural Kentucky. The mean age was 59 (SD = 16.2), with nearly equal gender distribution (50.56% female, 49.43% male). Statistically significant findings ($p < 0.0001$) showed higher rates of **COPD** (58.18% rural vs 41.84% urban) and **emphysema** (11.65% rural vs 10.39% urban) in rural areas, while **asthma** (28.80% urban vs 17.86% rural) and **pneumonia** (31.68% urban vs 28.33% rural) were more prevalent in urban areas. These results highlight regional differences in pulmonary disease patterns in Kentucky. This data is summarized in **Figure 1**.

Figure 1: Diagnosis frequency by rural or urban area



Across all conditions, patients with a positive CRLD diagnosis had a significantly longer median length of stay than those with a negative diagnosis, with p-values indicating strong statistical significance (all < 0.0001). These findings suggest that the presence of these respiratory conditions is associated with longer hospitalization (**Table 1**).

Of the total diagnoses assessed (pneumonia, COPD, chronic bronchitis, emphysema, asthma, TB, IPF, ARDS), only the readmission rates for COPD were found to be clinically significant when comparing urban vs rural patients (P-value <0.05). For readmission rates in COPD patients, 9.0% of rural patients were readmitted and 11.5% of urban patients with COPD were readmitted.

Table 1. Length of stay for selected diagnoses

Diagnosis	Median LOS (Positive)	IQR LOS (Positive)	Median LOS (Negative)	IQR LOS (Negative)	*p*-value
Pneumonia	9.8	4.7 to 20.0	4.4	2.3 to 8.6	< 0.0001
COPD	5.5	2.7 to 10.7	5.5	2.7 to 12.5	< 0.0001
Bronchitis	7.2	3.5 to 16.2	5.5	2.7 to 11.5	< 0.0001
Emphysema	6.4	3.2 to 12.5	5.4	2.6 to 11.4	< 0.0001
Asthma	3.6	2.1 to 7.0	6.2	3.0 to 12.8	< 0.0001
TB	7.8	4.4 to 16.4	5.5	2.7 to 11.5	< 0.0001
IPF	8.2	3.8 to 16.8	5.5	2.7 to 11.5	< 0.0001
ARDS	15.5	7.2 to 28.4	5.4	2.7 to 11.1	< 0.0001

DISCUSSION

- Rural areas have higher rates of COPD and emphysema, while urban areas had more asthma and pneumonia.
- These findings contribute to the literature by showing that urban areas in Kentucky have higher rates of certain respiratory diseases than rural areas.
- Pneumonia had the longest length of stay, while asthma had the shortest.
- The analysis confirmed a significant difference in median length of stay between patients with and without these conditions, with the presence of pulmonary disease strongly linked to longer hospital stays.
- Readmission rates for COPD was lower in rural areas, which can indicate a higher quality of care in rural areas.

CONCLUSION

This study examined the prevalence of pulmonary diseases across Kentucky, revealing that asthma and pneumonia are more common in urban areas, while COPD and emphysema are more prevalent in rural areas. Clinically significant differences in disease prevalence were found between rural and urban communities, underscoring the need for further research on factors such as tobacco use, air pollution, and healthcare access. The study also showed significant differences in length of stay for all diagnoses, with COPD being the only diagnosis exhibiting a notable rural-urban disparity with readmission rates. These findings highlight the importance of improving care quality to reduce 30-day readmissions and address these disparities effectively. Limitations of this study include limited generalizability.

REFERENCES

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