

## Purpose of Study

The primary objective of this study was to investigate the incidence rates of neuroblastoma diagnoses in the pediatric population in rural versus non-rural areas of Kentucky. Additionally, we examined differences in mortality, cancer status, and SEER stage status between these regions, comparing trends from 2000–2017 and 2018–2022.

## Introduction

### Neuroblastoma

- A heterogeneous group of neuroblastic tumors that primarily affect children, originating from undifferentiated sympathetic ganglion cells, most commonly found in the adrenal glands<sup>1,3</sup>.
- Diverse Clinical Presentation: Symptoms range from abdominal masses, bone pain, and adrenal involvement to vague signs like fever, weakness, and GI changes, complicating diagnosis<sup>2,3</sup>.
- Neuroblastoma comprises 8–10% of childhood cancers, with 90% of cases diagnosed in children under five<sup>4</sup>.
- The annual incidence of neuroblastoma in the U.S. is approximately 8.7 cases per million, which translates to **700 to 800** new cases each year<sup>5</sup>.
- 70%** of cases are already in the advanced stages of the disease<sup>3</sup>
- There is little research on pediatric neuroblastoma with none specific to KY.

### Geographic Disparities in Cancer

- Research suggests rural populations experience higher cancer incidence, later-stage diagnoses, and worse outcomes<sup>6-8</sup>.
- Pediatric CNS tumor and neuroblastoma rates have increased in urban areas but remained stable in rural regions<sup>8,9</sup>.
- Possible contributing factors: Limited healthcare access, Environmental exposures (e.g., pesticides, ionizing radiation), Socioeconomic disparities.

## METHODS

- A secondary analysis of de-identified surveillance data was conducted using data obtained in collaboration with the Kentucky Cancer Registry (KCR).
- Chi-square tests or Fisher's exact tests, as appropriate, were used to assess associations between rural/non-rural status and each of the following outcomes: mortality, cancer status, and SEER stage classification for the periods 2000–2017 and 2019 onward.
- Fisher's exact tests were performed to compare SEER stage distributions between cases from 2000–2017 and those from 2018. The division in the between 2000-2017 and 2018 onward cohorts reflects an update to the SEER staging criteria implemented in 2018.
- IRB protocol was required and accepted, protocol number 100321.

## RESULTS

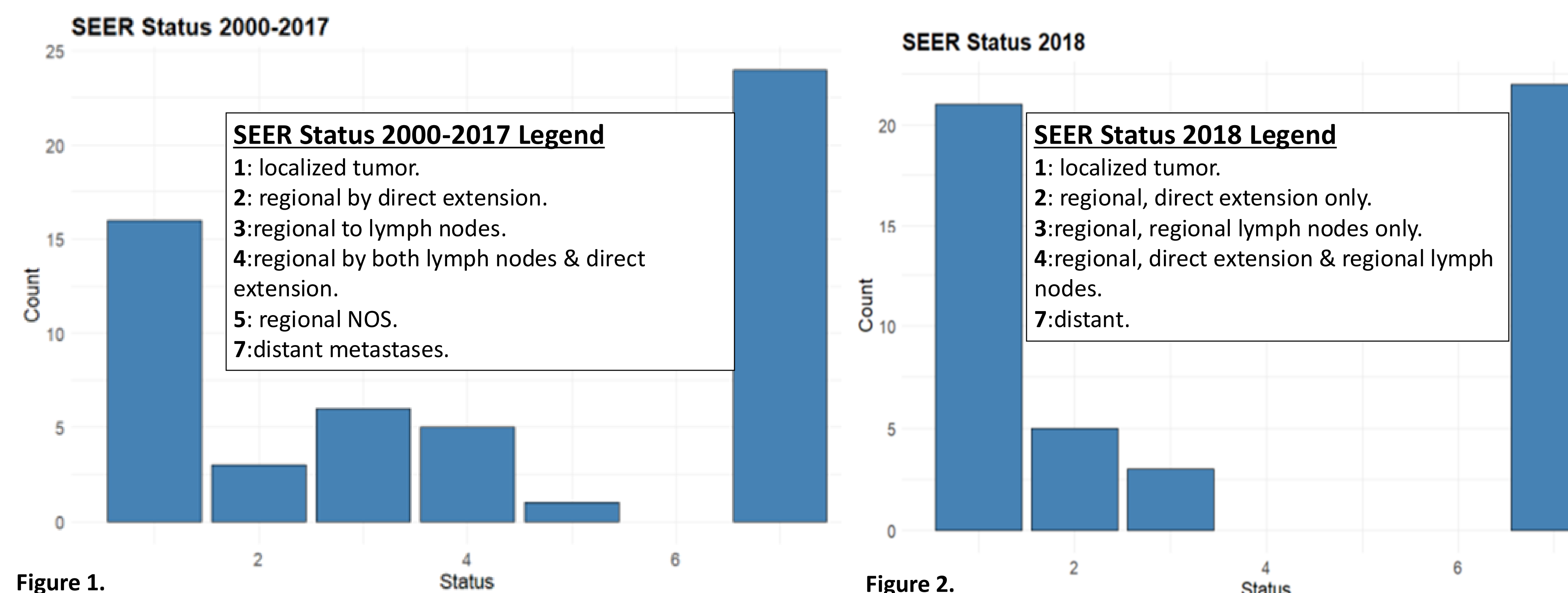


Figure 1.

Figure 2.

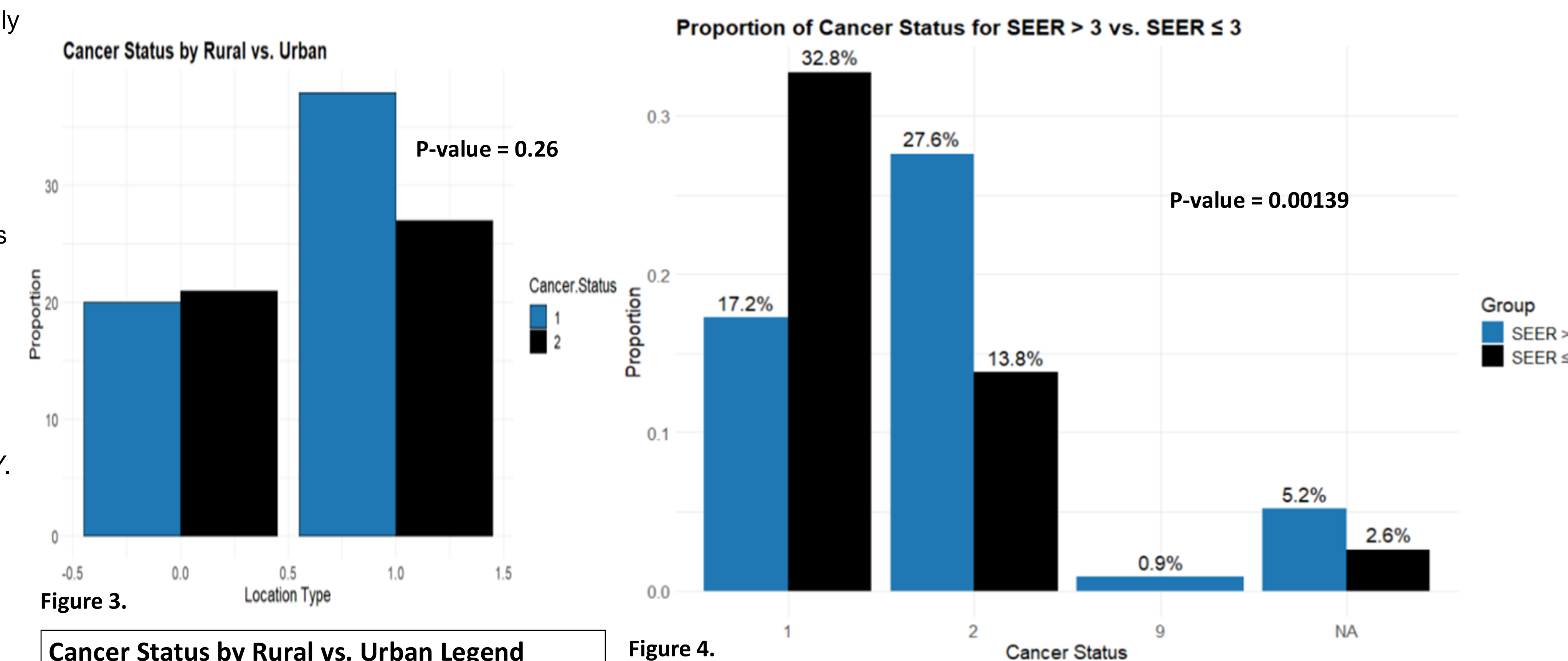


Figure 3.

Figure 4.

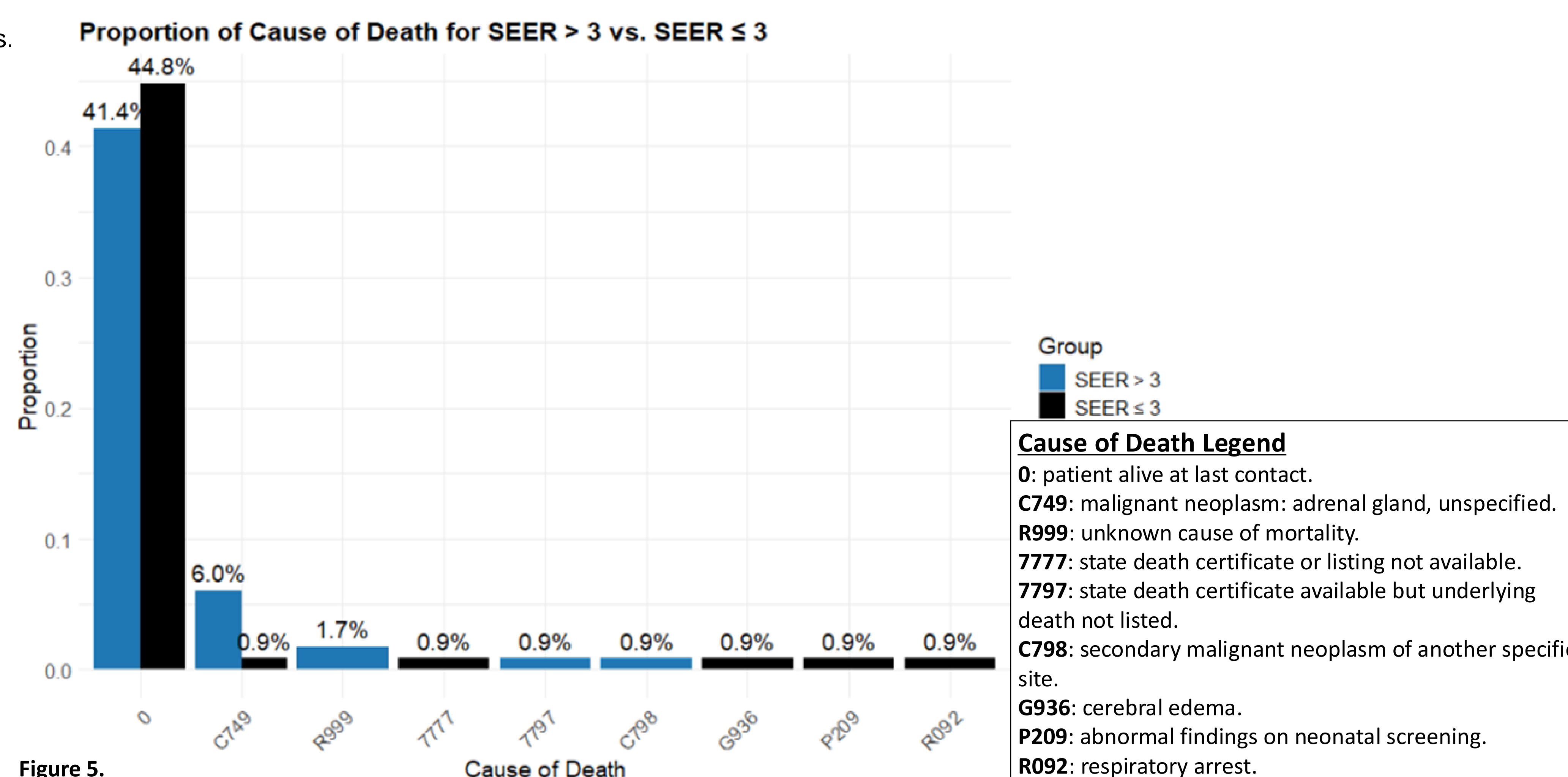


Figure 5.

## SUMMARY OF RESULTS

- Results showed no significant association between rural/urban status and cancer status (X-squared = 1.2629, df = 1, p-value = 0.26).
- Additionally, no other significant associations between rural/urban status and SEER status 2000, SEER status 2018, or cause of death could be determined (all p-values > 0.26).
- The first timeframe of interest from 2000 to 2017 showed no significant association with cancer status (p-value = 0.11).
- However, when evaluating the second timeframe of interest from 2018 to present with cancer status, a significant association was determined between the two variables (p-value = 0.00139).
- An association between cancer status and SEER status 2018 >3 was determined to have clinical significance (p-value = 0.00139).

## DISCUSSION

- The lack of association in this study regarding outcomes in rural vs urban location of diagnosis was a surprising one, considering past research. Further studies should explore what neuroblastoma risk factors are ubiquitous in Kentucky that may contribute to the parity across communities regardless of population.
- The observed association between cancer status and increasing SEER status may indicate an increased risk of distantly metastasizing neuroblastoma for pediatric patients in Kentucky.
- Future research should explore whether this association is significant because there have been more cases OR because of the 2018 change in SEER status criteria.
- Risk Factors such as pesticide use and environmental exposures for our pediatric population must be explored in future research in Kentucky, as well as surrounding states with similar agricultural practice and incidence of neuroblastoma.

## CONCLUSION

### Limitations

- The significant relationship between cancer status and SEER 2018 could be due to either a clinical trend or the changes in SEER criteria that year.
- The study's findings are not generalizable to providers in other states since the study focused solely on pediatric neuroblastoma cases in Kentucky.
- It is difficult to draw definitive conclusions about trends in the data due to the small sample size of neuroblastoma cases.

### Areas for Future Research:

- Explaining the underlying causes of differing neuroblastoma incidence in Kentucky
- Further investigation of specific risk factors, such as pesticides
- The consequences of higher SEER stage status on disease severity and prognosis
- Improving access to care, detection, diagnosis, treatment, and outcomes for children impacted by neuroblastoma

## REFERENCES

- <https://docs.google.com/document/d/1fTf4j8bMZ5YG4J7kb57iNy7oW5rZmlGLZozbwmfhEgE/edit?tab=t.0>