



Canine Nasal Tumors as a Sentinel for Environmental Exposure and Human Cancer Risk in Kansas and Surrounding States

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INTRODUCTION

- The State of Kansas offers agricultural land, harsh weather moving across the surface of the land, bodies of water, and dogs in the fields.
- Kansas and surrounding States offer unique topography suitable for large-scale farming which may provide opportunities to examine effects of chemical use and cancer incidence.
- The nasal cavity is a common site for malignant tumor development in dogs and has potential to be a valid model for the study of environmental exposure effects and human cancer susceptibility.
- Dogs and humans share the same environment, but the route of exposure to chemicals may be different. Dogs aggressively sniff fields for long periods of time, especially working and herding breeds, potentially resulting in highly concentrated chemical exposure during their lifetime. This results in more identifiable signature of the chemical exposure in dogs with nasal tumors than human cancer patients.
- We hypothesize that dogs living in Kansas and adjacent states have exposure to field chemicals and have an increased risk of developing nasal tumors.

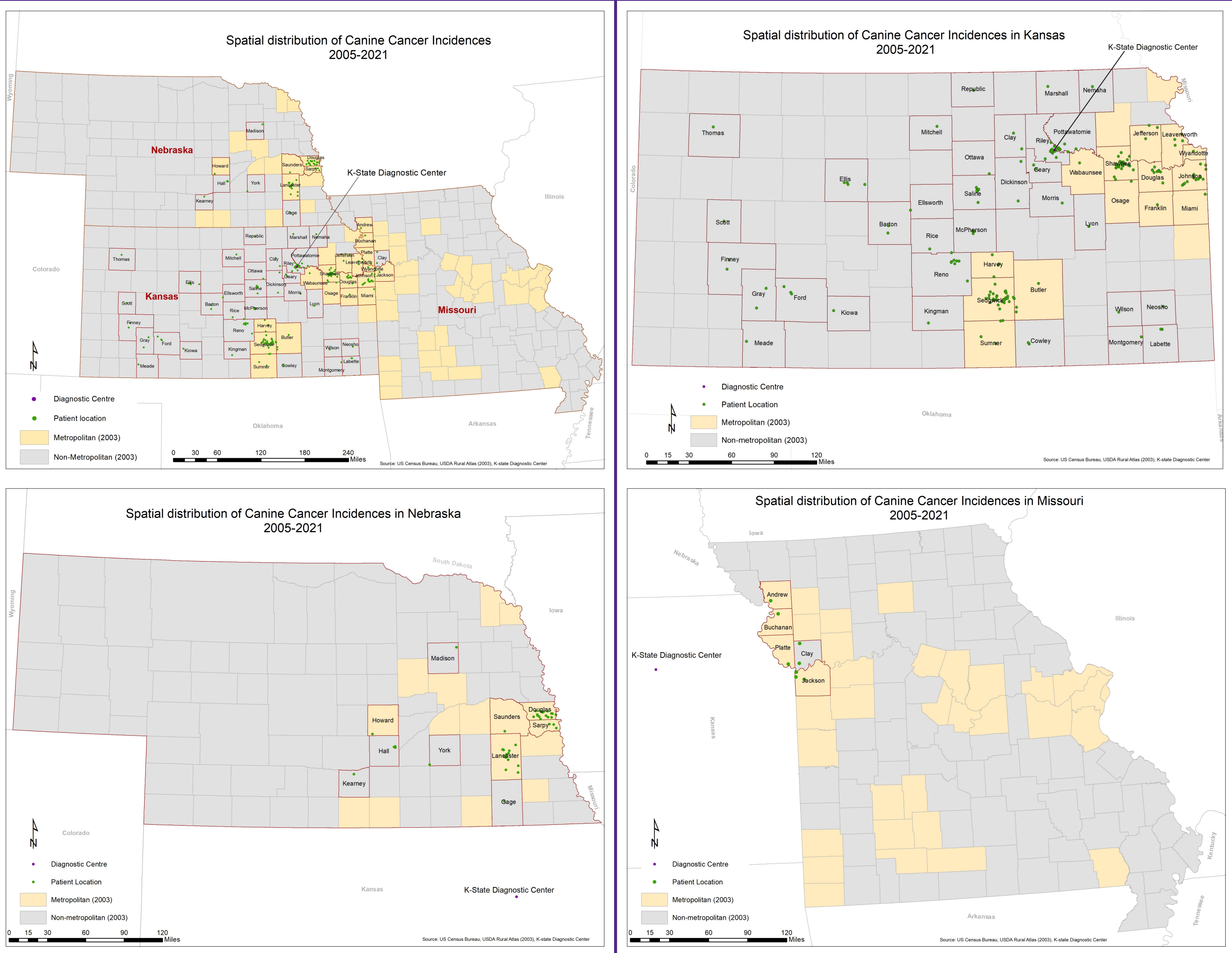
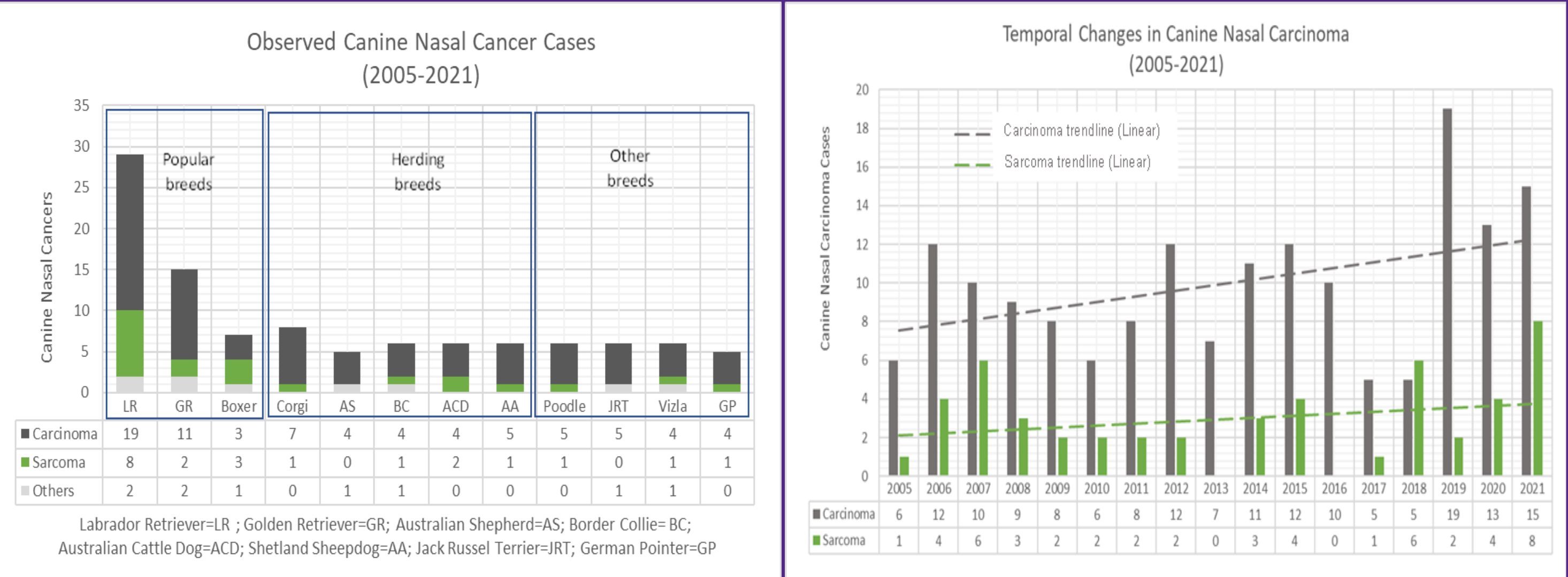
OBJECTIVE

The objectives of this pilot study are to:

- Investigate spatial variation in distribution of canine nasal tumor incidences in Kansas, Nebraska, and Missouri.
- To compare metropolitan and non-metropolitan occurrences of canine nasal tumors in Kansas, Nebraska, and Missouri.

MATERIAL AND METHODS

- Dogs histologically diagnosed with a nasal malignancy in the States of Kansas, Nebraska, and Missouri were searched in the Kansas State Veterinary Diagnostic Laboratory (KSVDL) database and Veterinary Health Center (VHC) database between 2005 and 2021.
- All histology reports were reviewed, and clinical information was utilized to supplement patient information when available.
- Other data collected included breed of dog, age at tumor diagnosis, and address or zip code of the owner.
- Nasal tumor cases were geocoded using an opensource address to latitude-longitude converter. Later, ESRI's ArcGIS 10.8 software was used for further cartographic analysis.
- For metropolitan and non-metropolitan classification, USDA's Economic Research Service (ERS) 2003 typology was used. This was done keeping in mind the range of data - 2005-2021.



RESULTS

- A total of 389 nasal tumor cases were identified. The dogs were located in three states, Kansas (n=279), Missouri (n=24) and Nebraska (n=86). There were 279 carcinomas (71.7%), 80 sarcomas (20.6%), 9 lymphomas (2.3%), 5 mast cell tumors (1.3%) and 16 other malignant tumors (4.1%).
- K-State's Veterinary Health Center was identified as the main diagnostic and treatment center for canine nasal tumors. Information of the dog's age at time of nasal tumor diagnosis was available in 249 dogs and the median age was 10 (range 1-17) years old. Breed information was available for 244 dogs.
- Full addresses were available for 237 dogs hence included in the pilot study. We have observed higher number of cases in metropolitan areas.

DISCUSSION

- Available breed distribution reflected herding dogs which may be unique to the Midwest including Kansas.
- The canine spontaneous cancer model has advantages for this research area including higher chemical exposure than humans, short life span (up to 17 years old in this population) and availability of tissue for exposure analysis.
- This study is ongoing. Association between canine nasal tumor incidence and GIS public information on chemical use and other environmental data will be examined to assess environmental exposure effects and cancer susceptibility.

FUTURE WORK

- We have observed a higher number of cases in metropolitan areas. Our future work will investigate if this observation is due to higher reporting in metropolitan areas or other environmental factors.
- Ultimate goals of the study are to identify environmental risk factors for carcinogenesis with canine nasal tumors as a sentinel for disease surveillance, early detection, and intervention of cancer development with potentially exposure control and prophylaxis using canine spontaneous cancer models.

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