

DESCRIPTIVE AND SPATIO-TEMPORAL ANALYSES OF 45 CANINE LEPTOSPIROSIS CASES FROM CHICAGO, ILLINOIS (2015-2018)

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INTRODUCTION

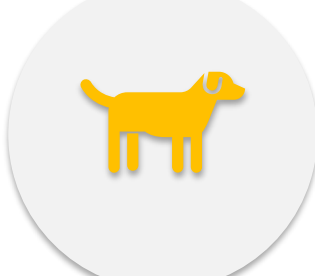



Leptospirosis is a reemerging zoonotic disease of concern that threatens companion animal and human health. Spread through the urine of infected animals, leptospirosis can infect dogs in a variety of settings across the United States. Dogs exhibit a wide spectrum of clinical illness, with the possibility of death. Chicago, Illinois has been previously identified as a high-risk area for canine leptospirosis, yet information on the epidemiology of canine leptospirosis cases in this location is lacking. A spatio-temporal analysis and an evaluation of the signalment, vaccination history, and treatment of recent canine leptospirosis cases in Chicago will provide a detailed look at the disease in a high-risk area, providing clues into targeted prevention strategies.

Hypothesis: Significant space-time case clusters will be identified.

Objectives: (1) Describe the signalment, vaccination history, treatment, and outcome of canine leptospirosis cases in Chicago, IL. (2) Investigate the presence of spatio-temporal canine leptospirosis case clusters in Chicago, IL.

MATERIALS AND METHODS

Data acquisition: Contacted 40 veterinary clinics in Chicago, IL to identify cases of canine leptospirosis. Designated staff member at each facility provided case medical record data using an online data collection survey form that included closed- and open-ended questions on:

	Signalment		Vaccination history (including dates of all leptospirosis vaccines received)
	Clinical illness and diagnostic testing		Treatment and outcome

Case definition: dog clinical signs consistent with leptospirosis and a positive diagnostic test (PCR, microscopic agglutination test (MAT), or in-clinic antibody test); dog's primary residence in the city of Chicago (60601-60661 zip code), and dog lived at that residence for at least 4 weeks prior to diagnosis.

Descriptive analysis: Descriptive statistics calculated for variables.

- Leptospirosis vaccination status based on AAHA vaccination guidelines (received two initial doses 2-4 weeks apart and continue to receive an annual booster; if ≥ 18 months elapse, initial two doses re-administered)¹.
 - Vaccination status confirmed with referring veterinary clinics, as applicable.

Spatio-temporal analysis:

- Clusters of cases in space and time evaluated using a space-time discrete poisson scan statistic (SaTScan 9.6).

- Centroid coordinates of dog's home zip code used; maximum spatial cluster size: 20% of population at risk; maximum temporal cluster size: 6 months.
- Population at-risk determined using the estimated dog population for each Chicago zip code (calculated using United States Census Bureau and AVMA dog population estimates).²⁻³

RESULTS

Forty-five canine leptospirosis cases from January 1, 2015 through December 31, 2018 collected from two clinics located in Chicago, IL – one large emergency referral hospital (41 cases from 22 referring clinics) and one multi-doctor private practice (4 cases).

Signalment: Predominately young (median: 3 years; range: 8 weeks – 11 years), small (median: 7.9 kgs; range: 1.3 – 33.6 kgs), and male (55%).

Vaccination history: Five cases (11%) had received a leptospirosis vaccine, but none were fully immunized (4 additional cases had no referring clinic and vaccination status was unknown).

Clinical illness: Clinical signs first observed a median of 2 days before presentation (range 0 – 20 days), with vomiting (84% of cases) most frequently reported (Table 1).

Table 1. Common clinical signs present for 45 canine leptospirosis cases in Chicago, Illinois (2015-2018).

Clinical sign	Number of cases where present (%)
Vomiting	38 (84)
Anorexia	35 (78)
Depression	34 (76)
Icterus	10 (22)
Diarrhea	7 (16)

Diagnostic testing: Most frequently based on PCR (n=30, 67%), followed by MAT (n=13, 29%), PCR and MAT (n=1, 2%), and in-clinic antibody test (n=1, 2%).

Treatment: Forty-one cases (91%) were hospitalized, with a median duration of 3 days (range: 1-13d). Intravenous fluids (n=37) and antiemetics (n=38) were commonly used.

- All cases received antimicrobial treatment: ampicillin only (n=23), doxycycline only (n=4), or both (n=5). The remainder of the cases received other antimicrobials (metronidazole, enrofloxacin, erythromycin) in combination with ampicillin and/or doxycycline (n=11), or alone (n=2).

Outcome: Case-fatality was 29%; 3 died (7%) and 10 (22%) were euthanized.

Spatio-temporal analysis:

- Most cases presented in 2016 (n=15) and 2017 (n=17), and during the months of June (n=7) and July (n=6) (Figure 1).
- Most cases lived in northern Chicago and were located near dog friendly areas (e.g. dog parks, dog beaches), the two enrolled clinics, and referring clinics (Figures 2-3).

- A significant space-time cluster was identified from August 2017 through November 2017 in the north-central region (Figure 2).

Figure 1. Number of canine leptospirosis cases by month, Chicago, Illinois (2015-2018).

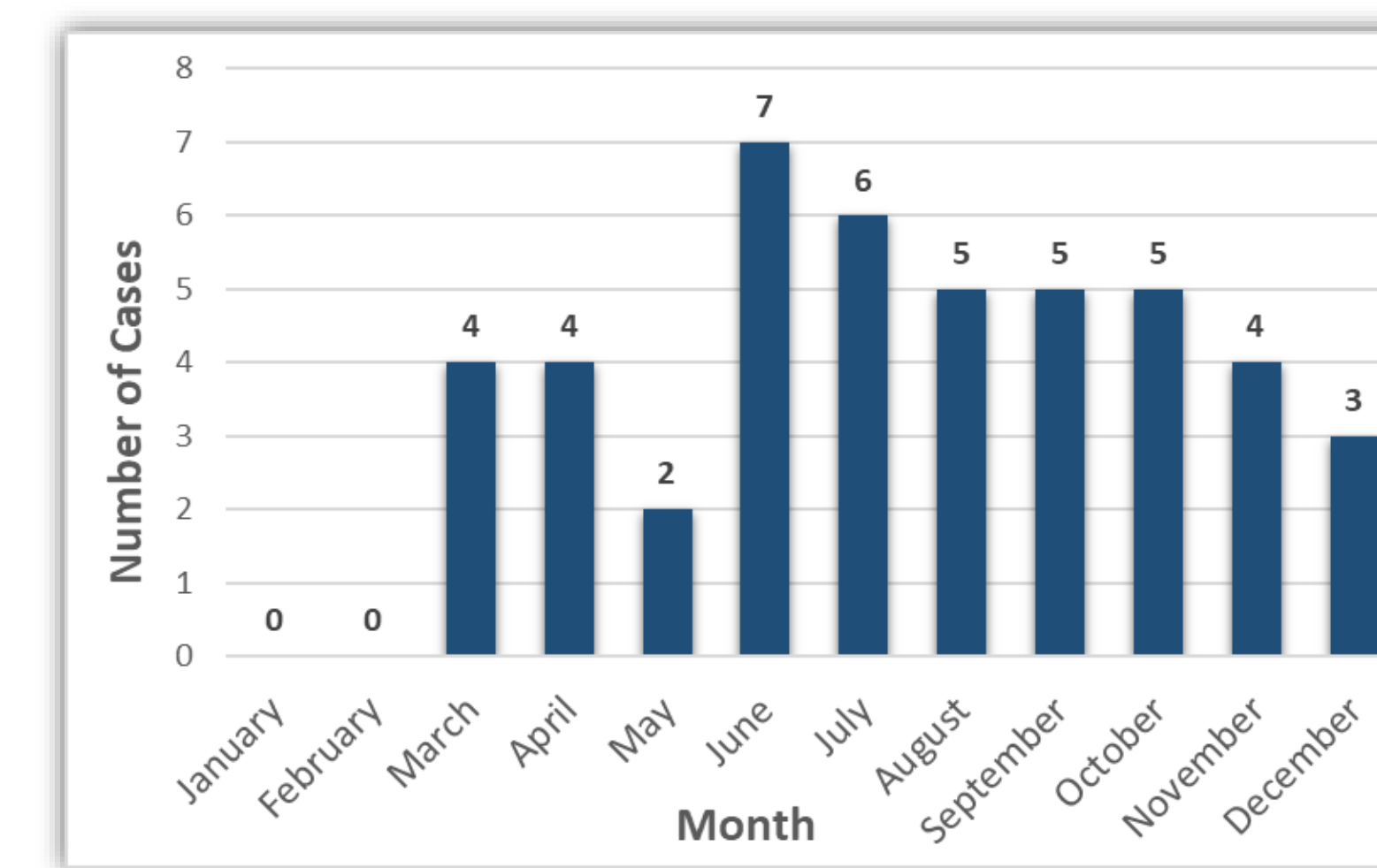


Figure 2. Cases by zip code, dog friendly areas, and spatial cluster location of canine leptospirosis cases in Chicago, Illinois (2015-2018) identified by spatial scan statistics.

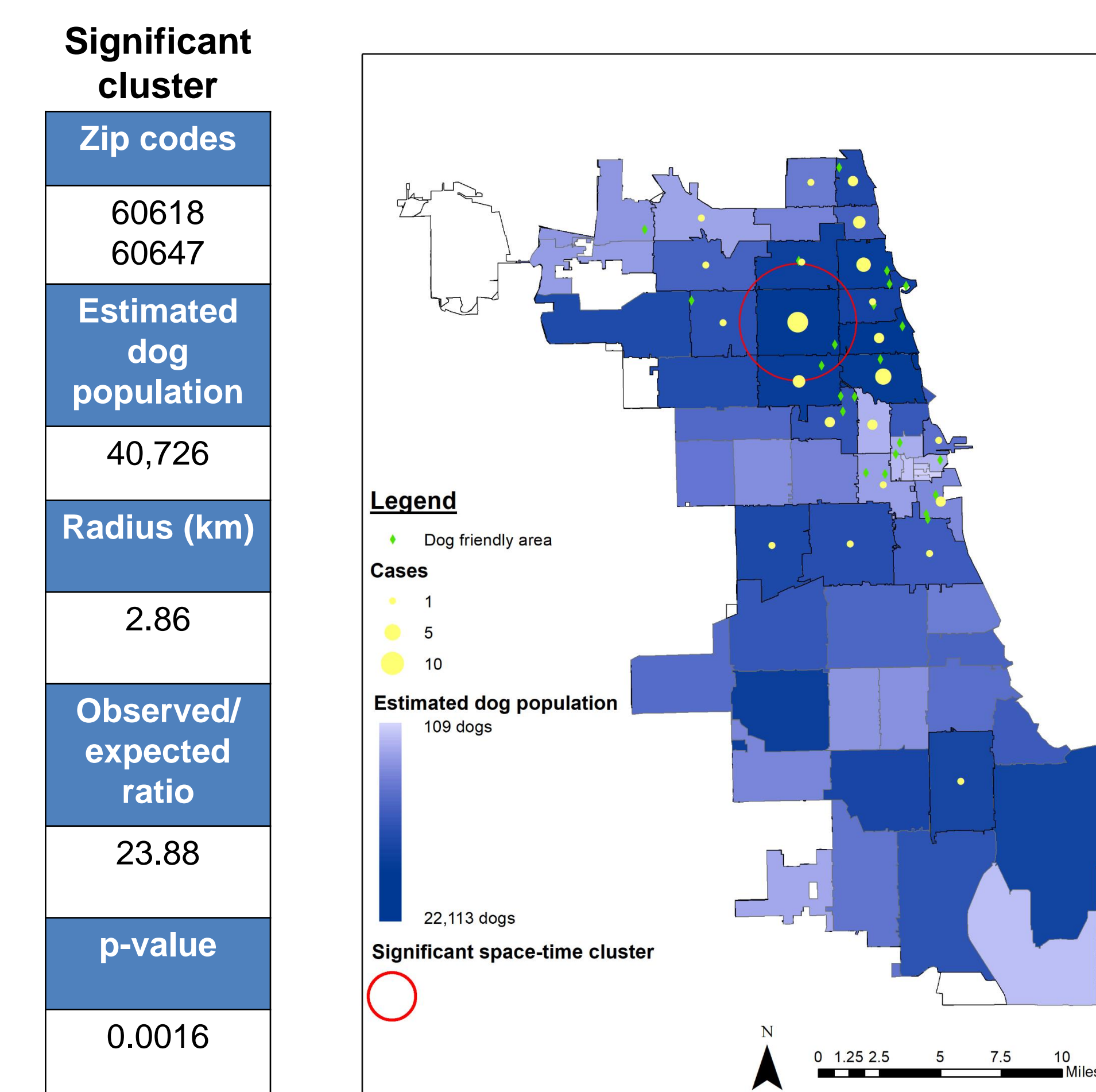
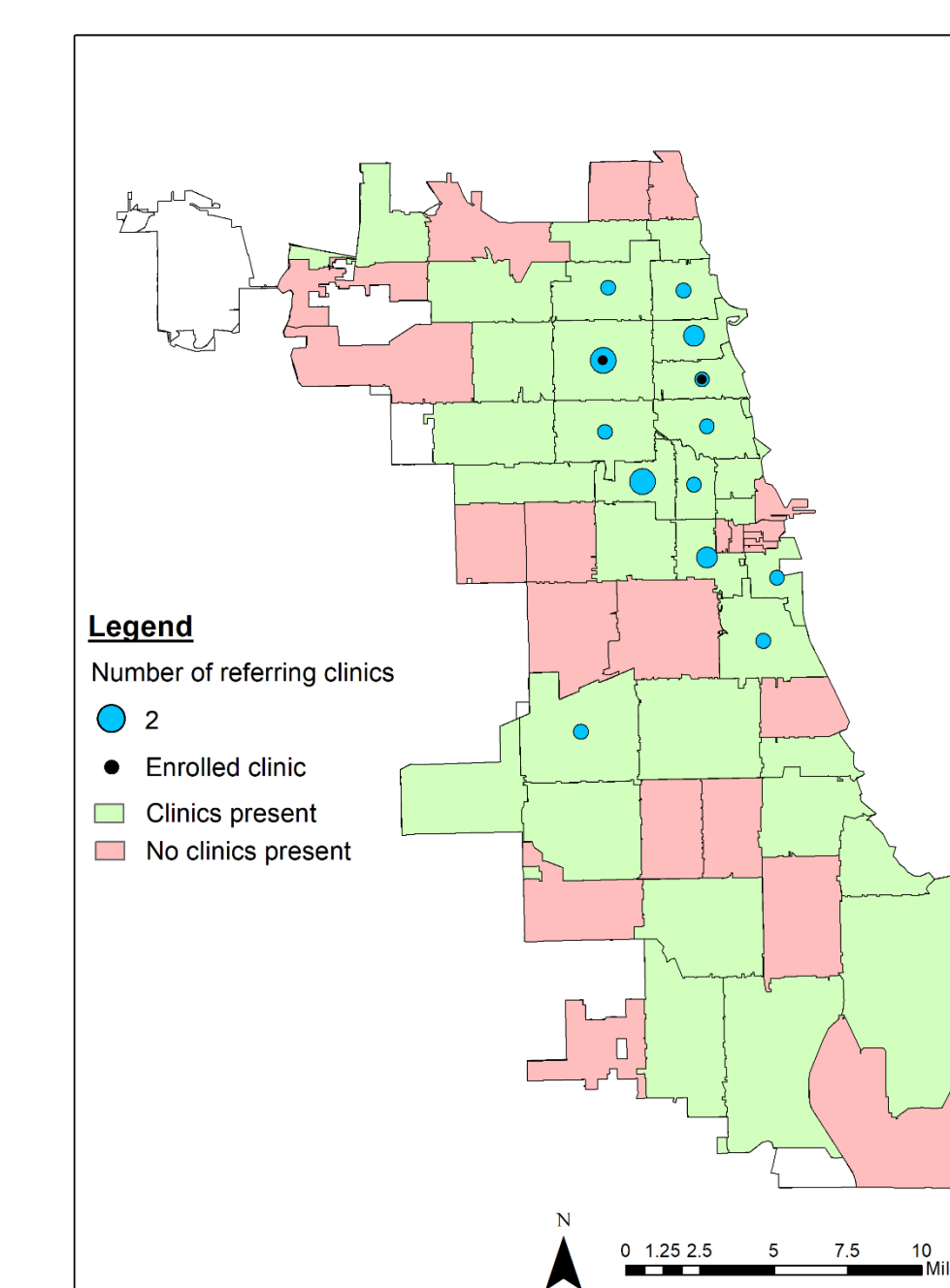


Figure 3. Clinics enrolled in the study, referring clinics*, and the presence of veterinary clinics in Chicago, Illinois by zip code.



*Three referring clinics not mapped, as they were not located in the city of Chicago.



CONCLUSIONS

Signalment: Sixteen cases (35% of the study population) were 6 months of age or younger. Young dogs have previously been identified as a high-risk group for canine leptospirosis.⁴ Of those 16 cases, only one had started the leptospirosis vaccination series. This demonstrates the need for improved awareness of the disease and prevention measures among puppy owners in Chicago.

Clinical signs and treatment: Clinical signs consistent with the common clinical signs observed in a previous case analysis.⁵ Most cases (96%) received doxycycline and/or ampicillin, which are the recommended antimicrobials for canine leptospirosis treatment.⁶ It is unknown why different antimicrobials were used; this may represent an area for needed education among veterinarians.

Vaccination: May be important in reducing disease risk, especially for dogs partaking in activities such as dog park or dog beach use. Information on local or nationwide canine leptospirosis vaccine coverage is not available, but a previous case-control study that collected vaccination history also found a large portion (74%) of the cases were not vaccinated against leptospirosis.⁵ Additional studies are needed to determine the effectiveness of current vaccines and protocols on reducing canine leptospirosis.

Spatio-temporal: Reasons for the significant space-time cluster need to be evaluated to determine potential risk factors and transmission opportunities that can be targeted for prevention. Peaks in leptospirosis cases have previously been identified during the late summer and early fall seasons across the United States.⁷ Increased awareness of the disease in Chicago during this time period might be beneficial.

Limitations: As information was collected from two clinics, this study is unlikely to include all canine leptospirosis cases during the study period. Any potential resulting biases are unknown.

Future Directions: Additional research using controls to compare case data (signalment, vaccination history, home zip code) is needed to further investigate canine leptospirosis in Chicago.

ACKNOWLEDGEMENTS

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FURTHER INFORMATION

Disclosure: There is no conflict of interest related to this research.
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