BACKGROUND

Lyme disease (LD) is emerging in Canada due to the northward expansion of *I. scapularis* populations. Early detection of emerging areas of Lyme disease risk is critical in order to prevent the disease. This study aims to i) summarize the surveillance data for LD cases reported in Canada between 2009 and 2015, ii) to analyse relationship between passive *I. scapularis* tick surveillance and reported LD cases, iii) to develop an acarological risk indicator of LD iv) and to create risk maps.

METHODS

DATA SOURCES

Passive tick surveillance system in Canada
- Passive surveillance for *I. scapularis* has occurred in Canada since 1990
- Our knowledge of environmental risk depends on passive surveillance
- Ticks collected from patients and pets, submitted from, medical and veterinary clinics
- Ticks collection and species identification by provincial public health organizations and PCR for *Borrelia burgdorferi* at Public Health Agency of Canada (PHAC) National Microbiology Lab (NML)
- Passive surveillance data:
  1. Provide a long dataset (1990 to present)
  2. Have a wide geographic coverage
  3. Are sensitive.....but non-specific due to detection of bird-dispersed ticks (particularly by ticks from dogs)

RESULTS

The number of reported LD cases increased more than six-fold overall, from 144 cases in 2009 to 917 cases in 2015, mainly due to locally acquired infections (Fig 1).
- Children below 15 years and adults of the 55–74 age groups reported highest incidence.
- The most common clinical features were a single erythema migrans rash (74.2%) and arthritis (35.7%) (Fig 2).

RESULTS Cont’d

- Relation between tick passive surveillance and human cases (Table 1)
- The number of human cases increased with the number of passive tick submissions in all three provinces
- In Ontario the number of nymphs submitted in passive surveillance was significantly associated with a greater number of human cases
- Performance of risk indicator based on passive surveillance (Table 2)
- In Ontario, 16 ticks removed from humans during five-year periods predicted a minimum of 3 LD cases at municipality level with high performance (AUC = 0.89, se = 0.80, sp = 0.87)
- In Manitoba, 4 ticks removed from humans during five-year periods predicted a minimum of 3 LD cases at municipality level (AUC = 0.89, se = 1, sp = 0.72)
- In Nova Scotia, 6 ticks removed from humans during a period of three-year period predicted > two LD cases at municipality level (AUC = 0.94, se = 1, sp = 0.84)
- Risk maps were created illustrating the acarological signal overlapping the human risk for Lyme disease for year 2015 (Figure 3)

DISCUSSION & CONCLUSION

- Our results showed that:
  - LD continues to increase in Canada, over the years and geographically.
  - The strong relationship between acarological passive surveillance data and human LD cases and the performance of the indicators developed offer a promising for use of passive surveillance data as a signal to identify risk areas for LD.
  - The main limitation of this study is under-reporting of human cases diagnosed by clinicians.
  - These findings provide relevant information for public health authorities to guide LD prevention strategies by identifying at-risk municipalities ahead of the increase in human cases and thus targeting awareness messaging for both the public and the frontline clinicians.

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