

Lyme disease surveillance in Canada

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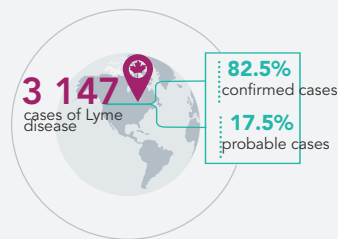
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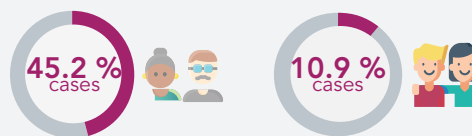


2021 SURVEILLANCE HIGHLIGHTS

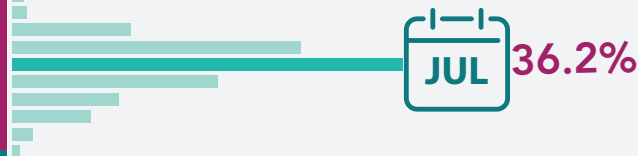
1. A total of 3,147 cases of Lyme disease were reported to the Public Health Agency of Canada, of which, 2,595 (82.5%) were confirmed cases and 552 (17.5%) probable cases.



2. Incidence was highest in adults aged 55–79 years (45.2% of cases) and children aged 5–14 years (10.9% of cases) with 56.3% of total cases reported in males.



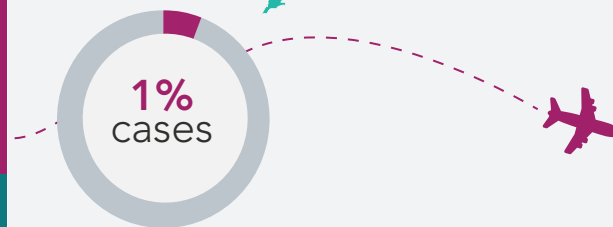
3. 36.2% of cases reported an illness onset in July.



4. 95.6% of cases were reported in Ontario, Québec, and Nova Scotia.



5. 1.0% of reported cases were likely infected during travel outside of Canada.



6. The national incidence rate has been increasing since 2009, underscoring the need for continued prevention and awareness efforts.



➤ INTRODUCTION

Vector-borne diseases are infectious diseases caused by bacteria, viruses and parasites that are transmitted to humans from insects. Lyme disease is the most commonly reported vector-borne disease in Canada. Lyme disease is a bacterial infection caused by *Borrelia burgdorferi* and transmitted to humans through the bite of an infected tick; the blacklegged tick, *Ixodes scapularis*, in Manitoba, central and eastern Canada and the western blacklegged tick, *Ixodes pacificus*, in British Columbia. In Alberta and Saskatchewan, no known endemic areas of blacklegged tick populations have been identified (1, 2). The ticks become infected after feeding on infected small mammals and birds.

Lyme disease can cause a range of clinical manifestations in humans. In the early stage of disease, flu-like symptoms, including joint pain, and erythema migrans rash are common. If untreated, individuals may experience cardiac, neurologic, and musculoskeletal manifestations such as arthritis. Over the past decade, there has been an increase in the number of locally acquired Lyme disease cases. This occurred in part due to changes in climate, which has contributed to increases in the abundance and geographic range of blacklegged tick populations in central and eastern Canada. Surveillance for ticks and human Lyme disease cases are conducted using a “One Health” approach. This helps provide information such as the burden of Lyme disease in Canada, trend in infection rates, and changes in tick populations. Applying this knowledge to public health actions including programs and policies can then help minimize the burden of Lyme disease and other emerging tick-borne diseases thereby protecting the health of Canadians. This report focuses on the human component of the Lyme disease surveillance program, by providing an overview of surveillance data on cases reported between January 1, 2021 and December 31, 2021.

➤ METHODS

Since becoming nationally notifiable in 2009, human cases of Lyme disease in Canada have been reported voluntarily to the Public Health Agency of Canada (PHAC) by provincial/territorial health ministries/agencies through the Canadian Notifiable Disease Surveillance System (CNDSS). Information collected through CNDSS include age, sex, and case classification (probable and confirmed cases). In 2011, in collaboration with provincial and territorial partners, PHAC developed and implemented the Lyme Disease Enhanced Surveillance (LDES) system whereby participating jurisdictions (eight provinces in 2021) report information in addition to what is collected by the CNDSS, including information on geographic location of infection acquisition, clinical features and laboratory results (3).

Data obtained from provincial/territorial notifiable disease systems represent a snapshot at the time of data extraction on December 14, 2022. As a result, potential future changes may cause the data to differ from previous/subsequent reports, data displayed by provincial health authorities and from CNDSS. Our partners classify Lyme disease cases reported to PHAC using the national Lyme disease 2016 case definition (3).

➤ RESULTS

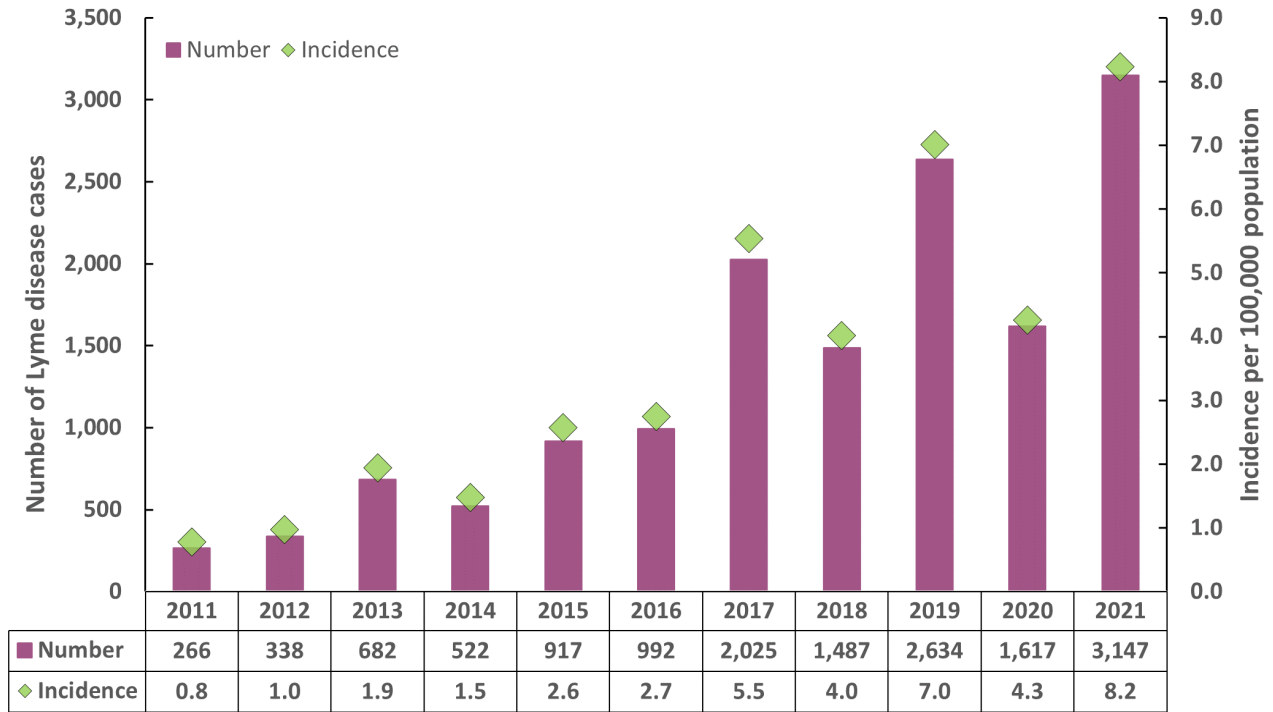
➤ Change in incidence over time

In 2021, 3,147 cases of Lyme disease including locally acquired and travel-related cases were reported in Canada. Of these, 2,595 (82.5%) were confirmed and 552 (17.5%) were probable cases. The number of cases reported in



2021 was the highest ever reported in the country (Figure 1).

Figure 1. The number and incidence per 100,000 population of all reported Lyme disease cases in Canada per year from 2011 to 2021

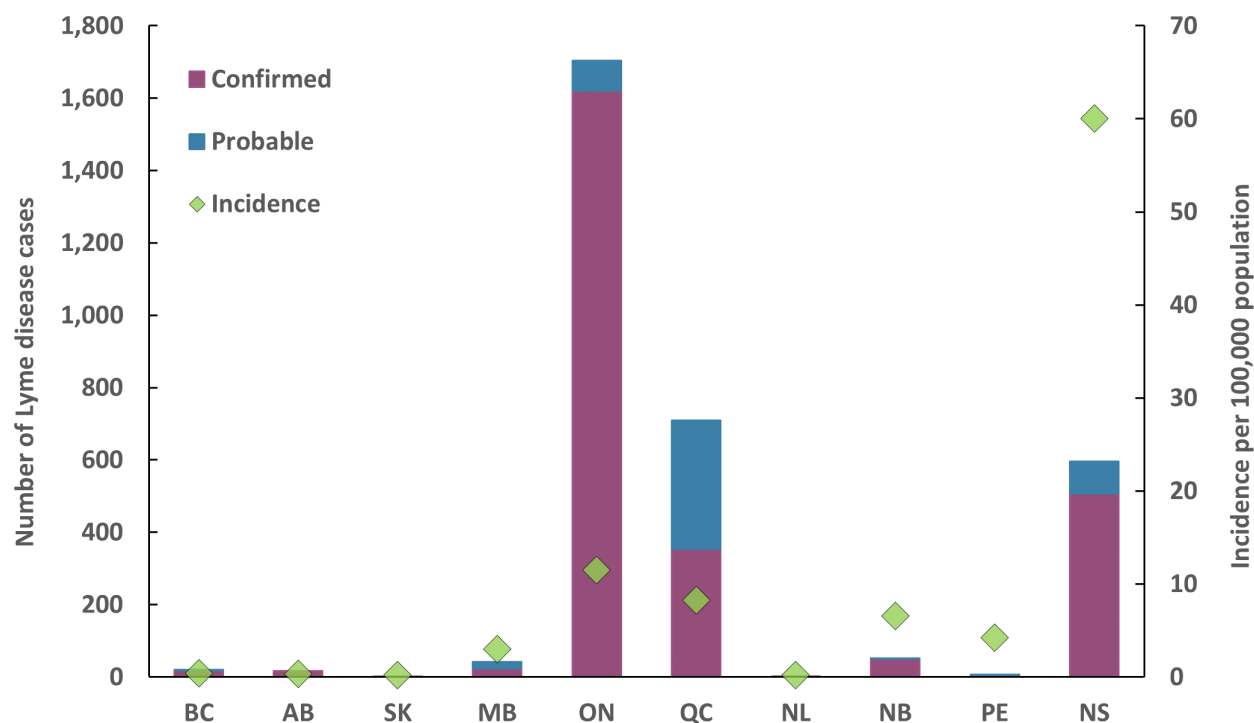


➤ Geographic distribution

As in 2020, most cases (95.6%) were reported from Ontario (n=1,704), Nova Scotia (n=595) and Québec (n=709) (Figure 2). The province with the highest incidence per 100,000 population was Nova Scotia (60.0 per 100,000 population) which was more than 7-fold greater than the national incidence (8.2 per 100,000 population). No cases were reported by the territories.



Figure 2. The number (confirmed and probable) and incidence¹ per 100,000 population of all reported Lyme disease cases in Canada by province of residence, 2021

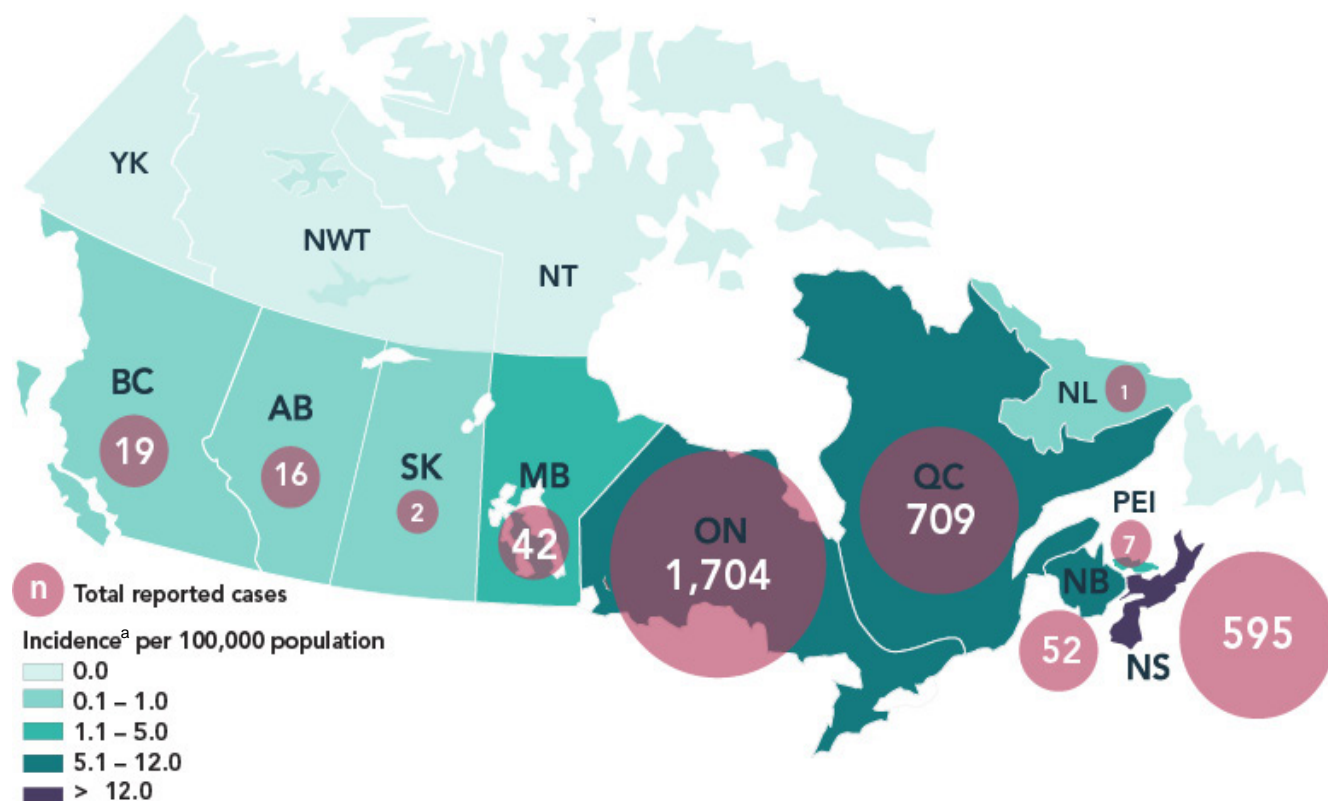


Notes: Probable cases are not reported in Saskatchewan. Cases reported by Prince Edward Island, Saskatchewan, Newfoundland and Labrador and Alberta were travel-related only. No cases have been reported by Yukon, Northwest Territories, and Nunavut for 2021. Abbreviations: BC, British Columbia; AB, Alberta; SK, Saskatchewan; MB, Manitoba; ON., Ontario; QC, Québec; NL, Newfoundland and Labrador; NB, New Brunswick; NS, Nova Scotia; PE, Prince Edward Island

¹ The denominators used to calculate incidence were obtained from [Statistics Canada, population estimates on July 1st](#).



Figure 3. Geographic distribution of all reported Lyme disease cases, 2021



› Travel-related cases

Lyme disease is commonly acquired in areas of Canada where blacklegged tick populations are established (i.e., at-risk areas) or through travel to countries where the disease is endemic. In 2021, information about travel history was available for 2,500 Lyme disease cases (79.4%). Of these, 26 Lyme disease cases (1.0%) were likely infected during travel outside of Canada.

› Demographic characteristics

In 2021, information on age and sex was available for 3,137 cases (99.7%). The average age of reported Lyme disease cases was 47 years old. The incidence per 100,000 population for all reported Lyme disease cases exhibited a bimodal pattern with peaks in children aged 5–14 years (10.9% of cases) and adults aged 55–79 years (45.2% of cases) (Figure 4). Except for the 65–69 age group, incidence in males was higher than females, and overall, 56.3% of cases were male (n=1,772).

› Seasonality

In 2021, 2,180 locally acquired cases included a date of illness onset. Lyme disease cases occurred in every month of the year; however, 95.3% occurred between May and November. More than 73.7% of the cases had a reported illness onset during the months of June (22.1%), July (36.2%), and August (15.5%) (Figure 5).



Figure 4. Incidence per 100,000 population of Lyme disease cases by age group and sex in Canada, 2021

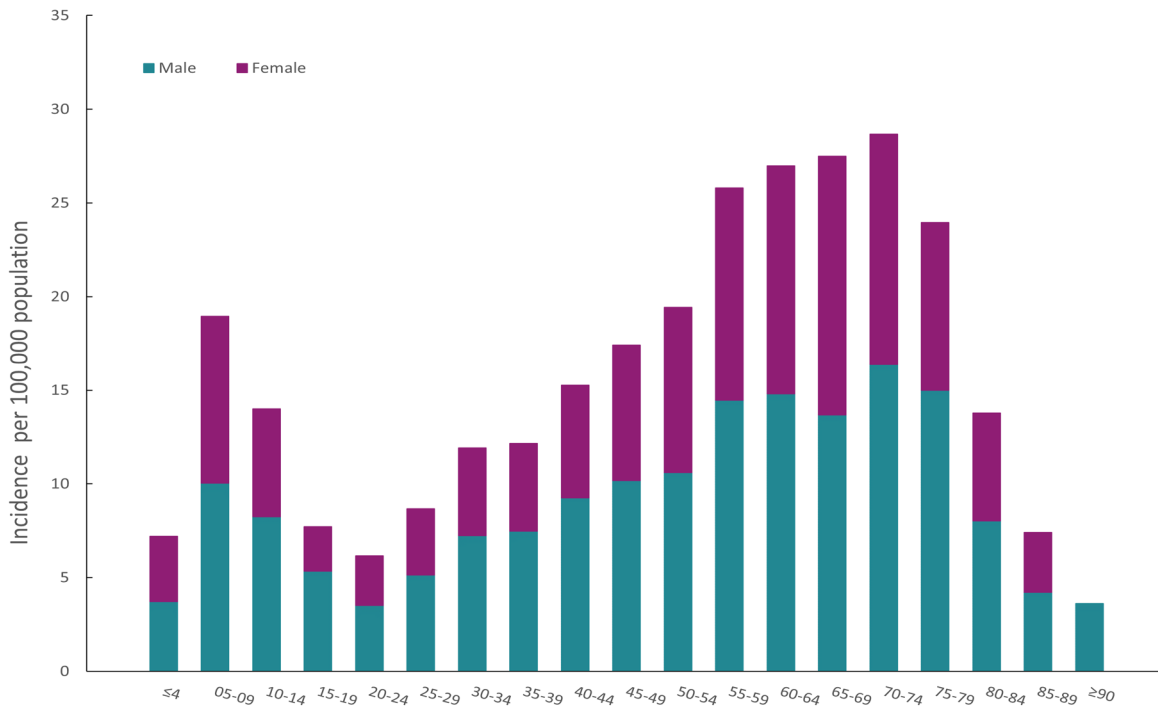
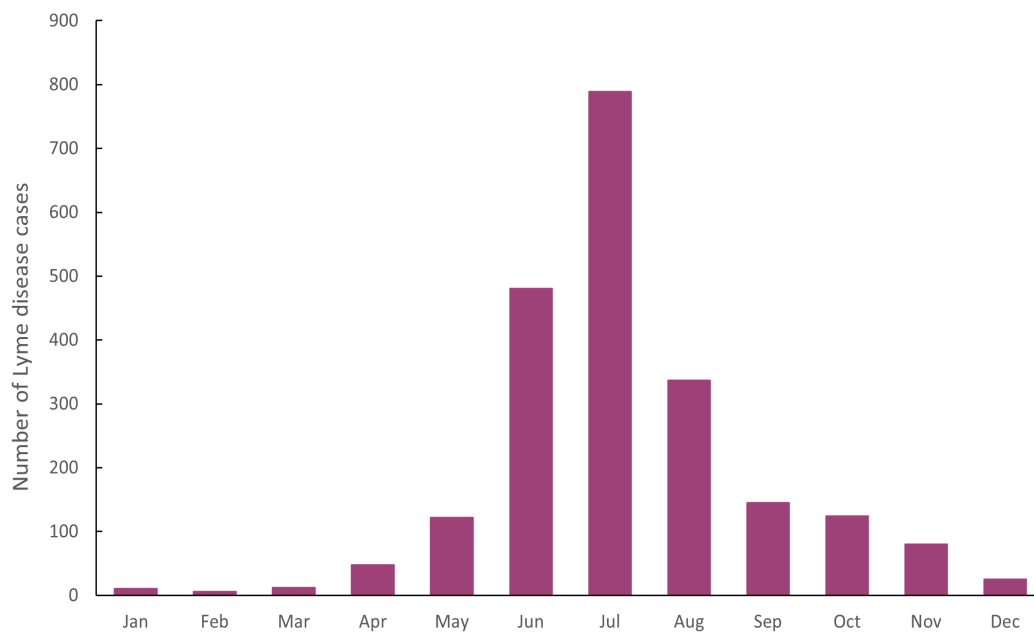


Figure 5. Month of reported illness onset of Lyme disease cases acquired in Canada, 2021





➤ DISCUSSION

In 2021, nine provinces reported 3,147 cases of Lyme disease to PHAC, representing a year-over-year increase of 94.6% compared to the previous year, and the largest ever annual number of cases reported in the country. Factors contributing to this trend include greater human exposure to at-risk areas and to risk of infection. Climate change may increase the risk of human exposure by contributing to the expansion of habitat suitable for blacklegged ticks in eastern Canada (4, 5), landscape changes, greater activity and range of ticks and their hosts (6), as well as by leading to an increase in outdoor human activity due to the longer and warmer seasons.

Other factors include more frequent detection and reporting due to enhanced surveillance and greater awareness among clinicians and the public. As in 2020, factors related to the COVID-19 pandemic may also have influenced the risk of acquiring Lyme disease, for example, by affecting healthcare-seeking behaviours and access to health services during the height of public health measures during the pandemic (7) or the amount of time Canadians spent outdoors.

Factors that may explain the variation in the proportion of cases classified as confirmed or probable between provinces include the difference in effort and investigation procedures for cases reported by clinicians, according to the evolution of the endemicity of the disease in the respective jurisdiction.

Children aged 5–14 years and adults aged 55–79 years were the age groups with higher risk of acquiring Lyme disease, and, for nearly all age groups, incidence was higher in males. These age groups are likely at greater risk of Lyme disease infection due to behavioural differences that increase their exposure to ticks. For example, there may be greater tendency to engage in outdoor activities such as gardening or greater awareness of risk and precautions during those activities in some age groups over others.

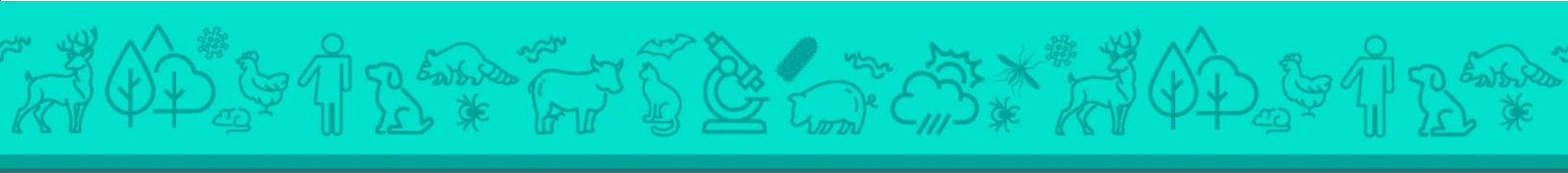
These observed age and sex variations in risk are similar to findings from previous years in Canada and in the US (3, 8, 9, 10). It remains important to target these at-risk groups to promote the adoption of preventative measures and reduce their risk of Lyme disease.

Illness onset was reported in every month throughout the year, with the majority of cases reported to have occurred between May and November. As observed in previous years in Canada and in the USA, more illness onset was reported in summer months, peaking in July (3, 8, 10). This corresponds to the season in which ticks, and, specifically, nymphal ticks that are harder to spot, are most actively seeking hosts and when Canadians are more likely to participate in outdoor activities (11). As a result, Canadians should be aware of the risk of tick bites during such activities as gardening, camping, hiking and outdoor excursions.

As in previous years, a large proportion of reported cases acquired infection in locations in southern and southeastern Ontario, southern Québec and in Nova Scotia, where the main vector of Lyme disease, the blacklegged tick is established. In British Columbia, Lyme disease incidence remained low and stable, in part due to lower prevalence of the pathogen among western blacklegged ticks (12). Outside of Canada, there continues to be a risk of Lyme disease infection for travellers visiting endemic regions in the USA and Europe.

➤ PUBLIC HEALTH CONCLUSIONS

Lyme disease continues to be the most frequently reported vector-borne disease in Canada. The overall trend of reported Lyme disease cases in Canada has been moving upwards since 2009. It is estimated that the number of reported Lyme disease cases will continue to increase in the future (13). This trend will be influenced by several factors including the local abundance of infected tick populations, including in urban areas, and the continued range expansion of tick populations in Canada with expected warmer temperatures.



The key findings of this report highlight the importance of sustained human and vector surveillance, as well as preventative strategies, especially enhancing public awareness about ways to protecting oneself from tick bites, to minimize the burden of Lyme disease in Canada.

➤ **ACKNOWLEDGEMENTS**

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