

## Effects of COVID-19 Pandemic on Reported Lyme Disease, United States, 2020

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Surveys indicate US residents spent more time outdoors in 2020 than in 2019, but fewer tick bite–related emergency department visits and Lyme disease laboratory tests were reported. Despite ongoing exposure, Lyme disease case reporting for 2020 might be artificially reduced due to coronavirus disease–associated changes in healthcare-seeking behavior.

The coronavirus disease (COVID-19) pandemic has altered how humans interact with their environment and the healthcare system (1,2), and strained resources have limited the ability of state and local health departments to respond to reports of notifiable diseases (3). The Centers for Disease Control and Prevention (CDC) typically is notified of 30,000–40,000 Lyme disease cases annually (4), but the COVID-19 pandemic likely will affect the case counts. Most Lyme disease cases are acquired in spring and early summer (5); in 2020, these seasons coincided with the initial spread of COVID-19 and widespread stay-at-home orders. We explored 4 data sources to assess how the COVID-19 pandemic might have influenced tick bite risk and associated healthcare-seeking practices and affected reported Lyme disease cases for 2020.

The pathway for Lyme disease case reporting begins with environmental risk and culminates with case notification to CDC (Appendix Figure, <https://wwwnc.cdc.gov/EID/article/27/10/21-0903-App1.pdf>). Environmental risk is relatively stable in high-incidence areas and driven by ecologic factors unaffected by COVID-19 (6). The pandemic might have altered the frequency of outdoor activities and probability of encountering ticks, healthcare-seeking and provider services patterns, and case investigation and reporting. The data sources we used measure changes in time spent outdoors, information-seeking patterns

for tick removal, emergency department (ED) visits for tick bites, and laboratory testing for Lyme disease. This analysis was considered nonhuman subjects research by CDC.

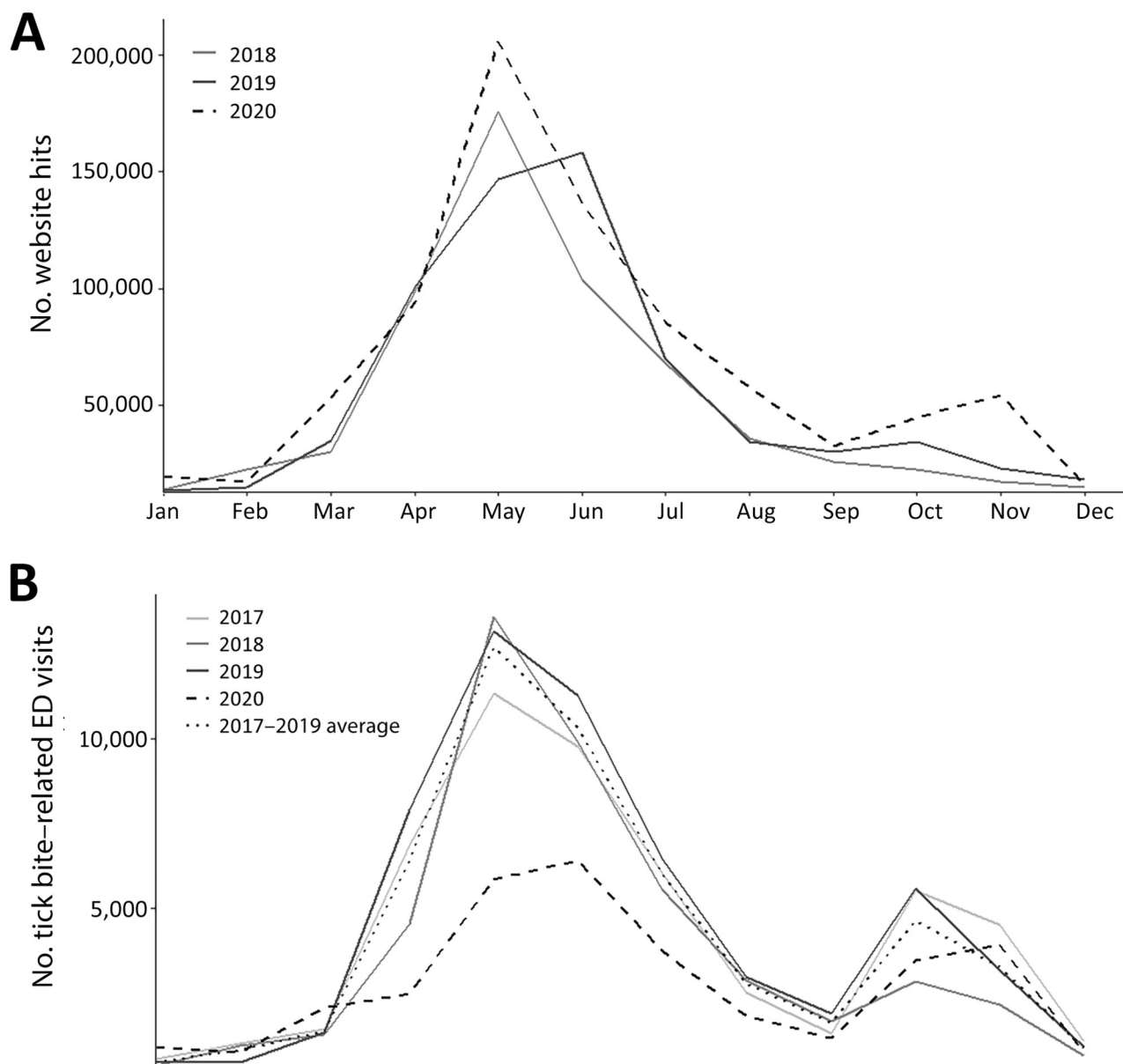
To assess potential behavior shifts that might have increased risk for tick encounters, we analyzed data from Porter Novelli's PN View 360+ consumer survey (7). Among 4,013 participants who responded to the survey distributed during July 31–August 9, 2020, approximately half (49.9%) reported that they had spent a lot more time or slightly more time outdoors by that point in 2020 compared with prior years. Only 20.9% of respondents reported spending less time outdoors in 2020.

To indirectly assess frequency of tick encounters in 2020 compared with prior years, we evaluated total monthly visits during 2018–2020 to a CDC website describing tick removal (8). Visits to this website typically increase during late spring and summer and again in October, when most bites from black-legged ticks (*Ixodes scapularis* and *Ixodes pacificus*) occur (5). We observed 818,167 website visits during 2020, ≈25% more than in 2019 (681,021) and 2018 (630,839) (Figure).

To assess patterns related to healthcare-seeking for tick encounters, we identified ED visits for tick bites by using the National Syndromic Surveillance Program (NSSP) BioSense platform (9). ED visits for tick bites decreased in 2020 from 2019 in both total number and rate per 100,000 ED visits (Figure). The largest relative decreases were observed in May. During 2017–2019, the average number of ED visits for tick bites during the month of May was 12,693, an average rate of 145/100,000 ED visits. During May 2020, only 5,845 ED visits for tick bites occurred, a rate of 89/100,000 ED visits.

We quantified cumulative counts and percent positivity of serologic tests for Lyme disease performed by an independent clinical laboratory. Lyme disease testing volume decreased from 2019 to 2020; 25.0% fewer tests were performed, and test positivity decreased slightly to <1% (Table).

During the first wave of the COVID-19 pandemic in 2020, the US population spent more time outdoors and visited a CDC website describing safe tick removal more frequently than during prior years. However, fewer persons sought care for tick bites, and substantially fewer laboratory tests for Lyme disease were ordered. These findings suggest that the risk of acquiring Lyme disease was similar or potentially higher in 2020 compared with risk during prior years, but fewer persons sought care, and fewer positive laboratory reports were referred for case investigation.



**Figure.** Comparison of visits to the Centers for Disease Control and Prevention (CDC) website on tick removal, 2018–2020, and to the ED for tick-bite related chief complaints, 2017–2020, United States. A) Website visits per month for [https://www.cdc.gov/ticks/removing\\_a\\_tick.html](https://www.cdc.gov/ticks/removing_a_tick.html). B) ED visits by month in which the chief health complaint was tick bite. Comparison of 2020 to the average of the previous 4 years is shown. ED, emergency department.

**Table.** Number and percent positive for Lyme disease tests performed by a large commercial laboratory and percent decrease in 2020 compared with 2019, United States\*

Testing tier	2019		2020		% Decrease in testing volume (95% CI)	Absolute difference in % positive (95% CI)
	Total tests	% Positive	Total tests	% Positive		
First tier†	925,939	9.6	691,453	9.2	25.3 (25.2–25.4)	0.3 (0.2–0.4)
Second tier‡	422,801	11.0	320,616	10.2	24.2 (24.1–24.3)	0.8 (0.6–0.9)
Total	1,348,740	10.0	1,012,069	9.5	25.0 (25.1–24.9)	0.5 (0.4–0.6)

\*Percent positive indicates the percentage of the total laboratory tests that were positive for each test tier and overall. The percent decrease in testing volume shows the percentage decrease in total tests performed by tier and overall for 2020 compared with 2019. Two-tier testing for Lyme disease is recommended, whereby specimens positive or equivocal on the first tier are subjected to the second tier. Additional details about testing tiers are available at <https://www.cdc.gov/lyme/diagnostictesting/index.html>.

†First-tier tests include enzyme immunoassays for IgM/IgG combined, IgM alone, and C6 antigen.

‡Second-tier tests include immunoblot for IgM or IgG.

Consequently, we anticipate that, once ultimately finalized, the official number of confirmed and probable Lyme disease cases in 2020 will be substantially lower than that for prior years.

One limitation of our study is that data sources we examined represent national trends and are indirect surrogates for Lyme disease risk and reporting, which vary geographically. Visits to a website describing tick removal might not correspond with finding an attached tick. Available data on laboratory testing represents 1 independent clinical laboratory; other commercial or academic laboratories might not have experienced a similar decrease in testing. Data sources associated with telehealth utilization and prescription claims could provide additional insights into the diagnosis and treatment for Lyme disease in 2020.

Already an issue in high-incidence states, the pandemic has highlighted the need for alternative Lyme disease surveillance strategies that rely less on human resources. An anticipated and potentially substantial decrease in reported Lyme disease in 2020 likely reflects the effects of the COVID-19 pandemic rather than a true change in Lyme disease incidence. Decreased reporting also could render 2020 inconsistent with long-term trends and changes in the epidemiology of the disease. Although nonpharmaceutical interventions for COVID-19 have mitigated the transmission of respiratory pathogens (10), these results suggest the behavioral and reporting changes seen for Lyme disease might extend to other nonrespiratory diseases.

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## Appendix

### Additional Methods

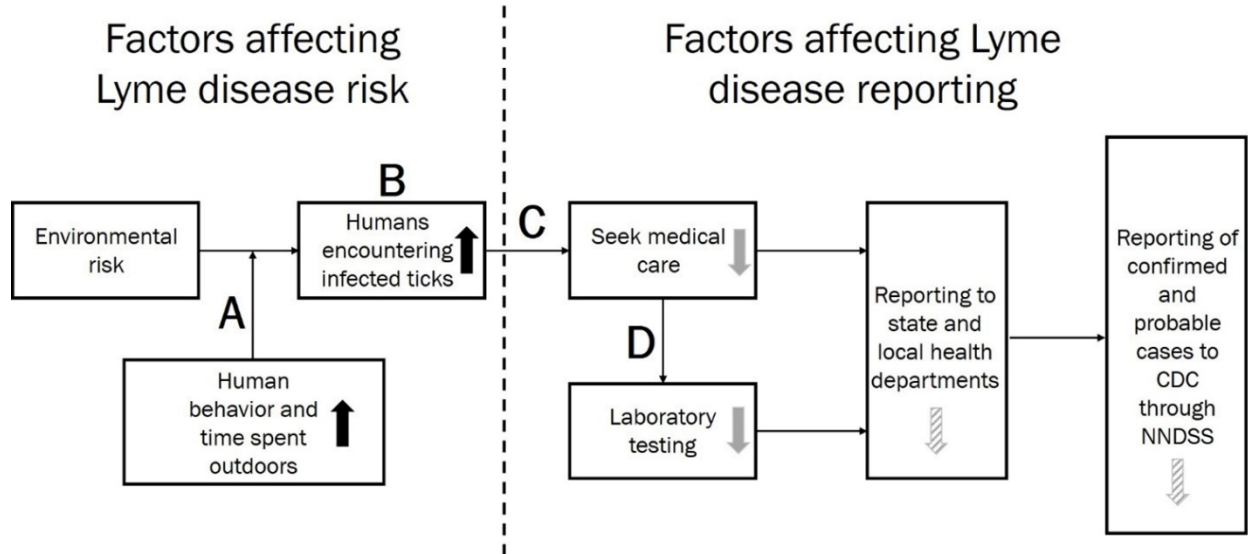
We used 4 data sources to evaluate the effects of the coronavirus disease (COVID-19) pandemic on Lyme disease reporting: Porter Novelli's PN View 360+ consumer survey (<https://styles.porternovelli.com/consumer-youthstyles>); the National Syndromic Surveillance Program (NSSP) BioSense platform (<https://www.cdc.gov/nssp/index.html>); data on Lyme disease testing performed at a large commercial laboratory; and visits to a the Centers for Disease Control and Prevention website describing safe tick removal ([https://www.cdc.gov/ticks/removing\\_a\\_tick.html](https://www.cdc.gov/ticks/removing_a_tick.html)). We provide methods for analysis of website visits in the manuscript.

We evaluated potential exposure to ticks in 2020 compared with prior years by examining responses to a question from the Porter Novelli's PN View 360+ consumer survey asking participants about the amount of time spent outdoors. This survey is a nationwide cross-sectional survey administered online to adults  $\geq 18$  years of age. Data are weighted by age, sex, region, race, and education to match current population estimates for the United States.

We evaluated tick bite-related visits to emergency departments (EDs) using the National Syndromic Surveillance Program (NSSP) BioSense platform. NSSP includes data from  $\approx 70\%$  of nonfederal EDs in the United States.

To determine trends in laboratory testing for Lyme disease, we analyzed data on serologic tests for Lyme disease performed by an independent clinical laboratory (Lab A) during February–December in 2019 and in 2020. Consistent reporting to this platform began in February 2019, so we excluded data from January 2020 to ensure comparability. We identified

tests by using Logical Observation Identifiers Names and Codes, LOINC version 2.70 (<https://loinc.org>), and data were sent from Lab A to NSSP every 10 minutes via HL7 messages.



**Appendix Figure.** Factors affecting Lyme disease risk and reporting during the coronavirus disease (COVID-19) pandemic, United States, 2020. The left side shows pathways for encountering infected ticks; the right side shows pathways for seeking medical care and reporting of possible Lyme disease cases to state and local health departments for investigation and reporting cases that meet the confirmed and probable case definition to the Centers for Disease Control and Prevention (CDC). Black arrows indicate increased activity due to the COVID-19 pandemic. Solid gray arrows indicate decreased activity due to the COVID-19 pandemic. Dashed gray arrows indicate predicted decreases for data are not currently available. Letters indicate data sources: A) Porter Novelli ConsumerStyles survey (<https://styles.porternovelli.com/consumer-youthstyles>); B) visits to Centers for Disease Control and Prevention website describing safe tick removal ([https://www.cdc.gov/ticks/removing\\_a\\_tick.html](https://www.cdc.gov/ticks/removing_a_tick.html)); C) the National Syndromic Surveillance Program (NSSP) BioSense platform (<https://www.cdc.gov/nssp/index.html>); D) reported Lyme disease testing performed by a large commercial laboratory. NNDSS, National Notifiable Diseases Surveillance System.