



NEW YORK CITY DEPARTMENT OF
HEALTH AND MENTAL HYGIENE
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Commissioner

2023 Health Advisory #13: Tick-borne Disease Advisory

Please share with your colleagues in Internal and Family Medicine, Pediatrics, Infectious Disease, Infection Control, Laboratory Medicine, Hematology, Cardiology, Neurology, Rheumatology, Critical Care and Emergency Medicine.

- **Lyme disease is the most reported tick-borne disease (TBD) among New Yorkers, followed by babesiosis and anaplasmosis.**
- **Most New Yorkers acquire TBDs while outside of New York City. Locally-acquired cases of Lyme disease and babesiosis are reported from Staten Island, with sporadic cases of anaplasmosis and ehrlichiosis. A small number of locally-acquired cases of Lyme disease have been reported from the Bronx, with one case reported in 2022.**
- **Tick surveillance has identified the emergence of Gulf Coast ticks in Staten Island and continues to identify established populations of blacklegged and lone star ticks in Staten Island and the Bronx, all of which have tested positive for several TBD pathogens.**
- **Detailed guidance on how to identify, [diagnose](#) and treat TBDs is available from the [Centers for Disease Control and Prevention](#) (CDC) and from the Infectious Disease Society of America practice guidelines (IDSA) for [Lyme disease](#) and [babesiosis](#).**
- **[Free continuing education](#) on the assessment, evaluation, and clinical implications of Lyme disease and other TBDs is available online from CDC.**
- **Visit the Department of Health and Mental Hygiene's website for [Tick-borne Disease Diagnostic Reference: Poster for Providers](#) and more information about [ticks](#), [Lyme disease](#), [anaplasmosis](#), [babesiosis](#) and other TBDs.**

June 29, 2023

Dear Colleagues,

With the weather warming, be on the alert for patients with tick-borne diseases (TBDs) as people spend more time in tick habitats. This advisory presents key epidemiologic findings and updates on reportable TBDs and tick surveillance in New York City (NYC).

Recent travel to tick endemic areas (such as upstate New York, Long Island, other parts of the northeast, the mid-Atlantic region, and the upper Midwest) or residency in Staten Island should prompt consideration of TBDs in people with a compatible clinical presentation. A known history of a tick bite is not a prerequisite for consideration, as only a small proportion of patients with TBDs recall being bitten by a tick.

NYC TBD Epidemiology and 2022 Overview

- Lyme disease is the most reported TBD among New Yorkers, followed by anaplasmosis and babesiosis, which are all transmitted by the blacklegged tick (Figure 1, Tables 1, 2, 3, 3a).
- Cases of TBDs had been trending upward through 2021 with the highest number of reports among residents of Manhattan and Brooklyn.

- There were 2,018 Lyme disease cases (1,338 new diagnoses and 680 new positive results for cases from prior years) and this increase is due to a change in the case definition (see Table 5).
- There was a sharp decline in cases of anaplasmosis and babesiosis; this decline is under investigation to determine whether it reflects a true decrease, reporting errors, or pandemic-related travel anomalies. Most patients reported a history of travel outside NYC during the incubation period (e.g., upstate New York, Long Island, Massachusetts, Connecticut, Pennsylvania, New Jersey).
- Among Staten Island cases, 60% of Lyme disease cases and two babesiosis cases reported no history of travel during the incubation period, suggesting continued local transmission (Table 4a). From 2015-2018, Staten Island had the highest incidence rate of Lyme disease in NYC; since 2019, the incidence rate had been decreasing, until a rise in 2022 due to the change in case definition.
- Locally acquired cases of spotted fever group rickettsioses, including rickettsialpox and RMSF, while rare, have been reported in the past from all five boroughs.

Rare and emerging TBDs

- There has been only one report of Powassan virus disease, in a resident infected outside of NYC. The virus has been detected in a small number of blacklegged ticks in Staten Island and the Bronx.
- *Borrelia miyamotoi* has been detected in blacklegged ticks from Staten Island and the Bronx.
- *Rickettsia parkeri* has been detected in Gulf Coast ticks in Staten Island. However, there have been no reports of *R. parkeri* rickettsiosis among NYC residents.
- Heartland and Bourbon viruses have been detected in lone star ticks collected in parts of New York State but have not been detected among ticks collected in NYC or among NYC residents.

Considerations for TBDs

- TBD symptoms may be nonspecific and include fever, headache, myalgia and gastrointestinal manifestations. Rash is not associated with all TBDs and may not be an early indicator.
- Most New Yorkers with TBDs get infected when traveling or working outside of NYC.
- Diagnostic testing can help guide clinical management, but do not delay therapy if a TBD is suspected. Prompt treatment can prevent severe disease.
- Coinfection is uncommon but more likely associated with TBDs caused by blacklegged ticks.
- Ticks emerge when snow melts and stay active until temperatures fall below freezing.
- Ticks found crawling and unattached on skin are not considered a risk for TBD transmission.
- See Table 1 for a comprehensive summary of TBDs and tick surveillance data in NYC

Clinical and Testing Guidelines

See Table 2 for a summary of the preferred methods of diagnoses by TBD. Detailed guidance on how to identify, [diagnose](#) and treat TBDs is available in reference manuals for health care providers from the [NYC Department of Health and Mental Hygiene \(Health Department\)](#), the [Centers for Disease Control and Prevention](#) (CDC), and from the IDSA practice guidelines for [Lyme disease](#), and [babesiosis](#).

There is increased availability and indications to use the modified 2-tier testing algorithm (MTTT), which uses two enzyme immunoassays. Overall, the MTTT has a [higher sensitivity](#) in the early stages of infection and maintains similar specificity as the standard 2-tier testing algorithm (STTT) which uses an EIA followed by a Western blot assay.

Testing ticks for pathogens is generally not recommended as a tick may not have been attached long enough to transmit a pathogen detected in a tick, and conversely, even with a negative test result the patient might have unknowingly been bitten by a different tick. Advise patients to save the tick in a sealed bag or container for species identification and to determine the degree of tick engorgement, which can help determine eligibility for Lyme disease prophylaxis. Patients can kill an unattached live tick by putting it in rubbing alcohol.

Tick Removal and Lyme Disease Prophylaxis

Attached ticks should be removed promptly with fine-tipped tweezers, as demonstrated in the [NYS Department of Health \(NYSDOH\) tick removal tutorial](#). Advise patients to watch for symptoms including fever and rash. Guidelines support limited use of a single dose of doxycycline for adults and children as prophylaxis for Lyme disease when all of the following conditions are met:

- Patient was in a Lyme-endemic region
- Tick was attached for ≥ 36 hours, based on engorgement or history (See Figure 6 on page 20 of the IDSA [Lyme disease practice guidelines for visual reference](#))
- Prophylaxis can be started within 72 hours of tick removal
- Tick can be reliably identified as *Ixodes scapularis* (blacklegged tick or deer tick)
- Patient does not have any contraindications to receiving doxycycline

Reporting Cases

Laboratories report all positive results for Lyme disease, babesiosis, SFGR, ehrlichiosis, anaplasmosis, and Powassan virus to the NYC Health Department. Report suspected cases based on clinical suspicion for rickettsialpox. Cases of transfusion-associated TBDs must also be reported to the NYSDOH Blood and Tissue Resources Program at 518-485-5341 and your hospital's transfusion service. Report cases to the NYC Health Department via [Reporting Central](#) (preferred), mailing or faxing a [Universal Reporting Form](#), or calling the Provider Access Line at 866-692-3641.

Additional Resources

NYC Health Department

- [Zoonotic and Vector-borne Provider Information](#)
- [Tick-borne Disease Diagnostic Reference: Poster for Providers](#)
- [Ticks webpage](#), or call 311 or the Provider Access Line at 866-692-3641 to order free copies:
 - [NYC Tick ID and Removal Wallet Card](#) (also in [Spanish](#), [Russian](#), [Italian](#))
 - [Ticks taking over? Take back your yard](#) (also in [Spanish](#))
 - [All About Ticks: A Workbook for Kids and Their Parents](#) (also in [Spanish](#))

CDC and APHL (Association of Public Health Laboratories)

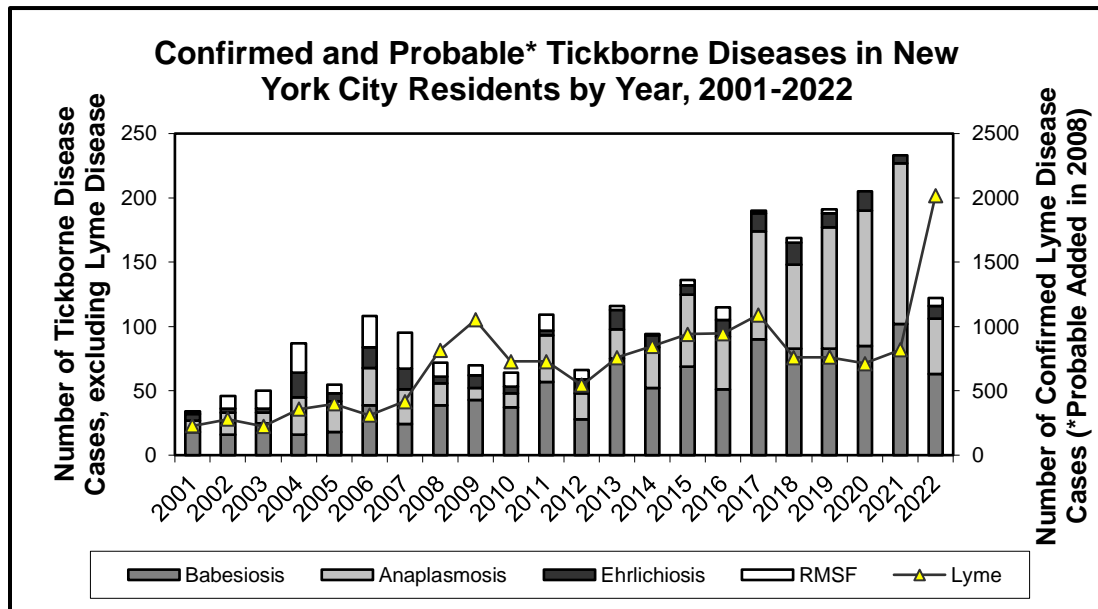
- [CDC Information about Ticks](#)
- [CDC Tickborne Disease Continuing Education](#)
- [CDC Clinical Practice Guidelines](#)
- [APHL Suggested Reporting Language, Interpretation and Guidance Regarding Lyme Disease Serologic Results](#)

| Table 1. Tickborne Disease and Tick Surveillance Data Summary Table | | | |
|--|--|---|---|
| Disease | Pathogen | Tick Vector | Tick Vector Presence in NYC |
| Lyme disease | <i>Borrelia burgdorferi</i> | Blacklegged tick (<i>Ixodes scapularis</i>) | Blacklegged tick is widely established in Staten Island, and focal areas of the Bronx, including Pelham Bay Park and Hunter Island. It is not known to be established in other areas of NYC. |
| Babesiosis | <i>Babesia microti</i> | | |
| Anaplasmosis | <i>Anaplasma phagocytophilum</i> | | |
| Powassan virus disease | Powassan or deer tick virus | Blacklegged tick and Groundhog tick (<i>Ixodes cookei</i>) | Groundhog tick not found in NYC. |
| Ehrlichiosis | <i>Ehrlichia chaffeensis</i> | Lone star tick (<i>Amblyomma americanum</i>) | Lone star tick found in Staten Island and northern Bronx. In 2022 the tick density in Staten Island decreased from 3.5 ticks/1000m ² in 2021 to 2.4 ticks/1000m ² , and remained the same in the Bronx, with 0.1 ticks/1000m ² in 2021 and 2022. |
| Bourbon and Heartland virus diseases | Bourbon virus (BRBV) and Heartland virus (HRTV)* | | |
| | | | Ticks with BRBV and HRTV only detected in Kansas, Oklahoma and Missouri, Long Island. |
| Spotted fever group rickettsioses* (SFGR) | Several <i>Rickettsia</i> species, primarily <i>R. rickettsii</i> and <i>R. parkeri</i> | American dog tick (<i>Dermacentor variabilis</i>) for <i>R. rickettsii</i> in NYC | American dog tick found in all boroughs. The tick density has been about 1.0 ticks/1000m ² in Staten Island and 2.0 ticks/1000m ² in the Bronx. |
| | | Gulf Coast tick (<i>Amblyomma maculatum</i>) for <i>R. parkeri</i> | |
| | | | The Gulf Coast tick was first detected in Staten Island in 2020 and is now considered established. |
| | Currently, there is no evidence this tick transmits TBD pathogens to humans in the US, but research is ongoing | Asian longhorned tick (<i>Haemaphysalis longicornis</i>) | This tick is widespread with increasing population densities in Staten Island and certain areas of the Bronx. In 2022, the tick density nearly doubled in Staten Island, reaching 42.4 ticks/1000m ² in comparison to 23.7 ticks/1000m ² in 2021, and in the Bronx, the density quadrupled in 2022 to 181 ticks/1000m ² compared to 41 ticks/1000m ² in 2021. |

**Rickettsia akari*, the causative agent of rickettsialpox, is transmitted by the mouse mite, not a tick. It is part of the SFGR and can cross react on serologic assays with other SFGR. Rickettsialpox often presents as an acute febrile illness often accompanied by headache, myalgia, and rash and an ulcerated, necrotic eschar at the site of tick or mite attachment. The eschar often appears before the onset of fever.

| Table 2. Tickborne diseases and preferred methods of diagnosis | |
|--|--|
| Disease | Preferred Methods of Diagnosis |
| Lyme disease | <ul style="list-style-type: none"> Erythema migrans (EM); rash that often presents before antibodies are detectable. Two-tier serological testing using a modified two-tier test (MTTT) or standardized two-tier test (STTT): Enzyme immunoassay (EIA) followed by an FDA-cleared second EIA for MTTT or a Western blot test for STTT. The overall interpretation is positive if the first test (EIA) is positive or equivocal; and for MTTT the second EIA is positive or equivocal, or for STTT the Western blot is positive. Overall, the MTTT has a higher sensitivity than the STTT in the early stages of infection and maintains similar specificity as the STTT. |
| Babesiosis | <ul style="list-style-type: none"> Polymerase chain reaction (PCR) on whole blood or blood smear. |
| Anaplasmosis and Ehrlichiosis | <ul style="list-style-type: none"> PCR on whole blood within the first week of illness Serology demonstrating a four-fold change in IgG by immunofluorescence assay (IFA) among acute and convalescent specimens |
| Spotted fever group rickettsioses (SFGR) | <ul style="list-style-type: none"> Serology demonstrating a four-fold change in IgG by IFA among acute and convalescent specimens PCR performed on whole blood is less sensitive than serology and a negative result does not rule out the diagnosis Antibodies to spotted fever group rickettsioses (SFGR) other than RMSF may reflect past exposures to a wide variety of SFGR species, including <i>R. akari</i> PCR of skin biopsy of rash is available at CDC for detection of rickettsial DNA |
| Powassan virus disease | <ul style="list-style-type: none"> Serum or cerebrospinal fluid: A positive IgM ELISA test should be confirmed by neutralized antibody testing (plaque-reduction neutralization test [PRNT]) of serum specimens at a state public health lab or CDC |
| Rare and emerging TBDs | <ul style="list-style-type: none"> Testing for rare or emerging TBDs, particularly viral diseases including Heartland and Bourbon viruses, may not be available at commercial labs. For diagnostic assistance, call 866-692-3641 <i>Borrelia miyamotoi</i> testing is available at several commercial diagnostic labs RMSF antibody tests often cross-react with <i>R. akari</i> and <i>R. parkeri</i> PCR of eschar swab and skin biopsy of rash available for detection of rickettsial DNA |

FIGURE 1. Tickborne Diseases in New York City Residents by Year of Diagnosis



*Probable added to Lyme disease case definition in 2008: Physician diagnosis with positive lab results and no erythema migrans or late manifestations

TABLES 3-8. Number of NYC Confirmed and Probable Tickborne Disease Cases by Borough and Year
 Minor variations in data presented here, and that presented elsewhere (including other publications of the NYC Department of Health and Mental Hygiene) may be due to several factors, including reporting delays, census data availability, corrections, and data-processing refinements (for example, the removal of duplicate reports).

Blacklegged Tick Associated Diseases:

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|-----------|
| Bronx | 0 | 1 | 2 | 0 | 1 | 4 | 2 | 5 | 1 | 11 | 4 |
| Brooklyn | 6 | 2 | 7 | 9 | 5 | 14 | 12 | 20 | 38 | 21 | 12 |
| Manhattan | 12 | 19 | 19 | 43 | 29 | 62 | 40 | 61 | 58 | 72 | 22 |
| Queens | 0 | 1 | 4 | 4 | 6 | 2 | 8 | 5 | 7 | 19 | 4 |
| Staten Island | 1 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 2 | 2 | 1 |
| Total | 19 | 23 | 32 | 56 | 41 | 84 | 65 | 93 | 106 | 125 | 43 |

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| Bronx | 1 | 12 | 7 | 4 | 5 | 12 | 10 | 7 | 2 | 11 | 6 |
| Brooklyn | 5 | 5 | 6 | 8 | 9 | 19 | 11 | 13 | 12 | 14 | 11 |
| Manhattan | 16 | 45 | 24 | 39 | 23 | 41 | 38 | 41 | 49 | 55 | 30 |
| Queens | 6 | 12 | 12 | 16 | 11 | 10 | 11 | 14 | 11 | 16 | 14 |
| Staten Island | 0 | 1 | 1 | 2 | 3 | 8 | 13 | 8 | 11 | 6 | 2 |
| Total | 28 | 75 | 50 | 69 | 51 | 90 | 83 | 83 | 85 | 102 | 63 |

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022* |
|---------------|------|------|------|------|------|------|------|------|------|------|-------|
| Bronx | 33 | 48 | 49 | 46 | 51 | 47 | 34 | 25 | 23 | 30 | 115 |
| Brooklyn | 125 | 253 | 285 | 335 | 322 | 384 | 283 | 284 | 285 | 339 | 773 |
| Manhattan | 264 | 313 | 338 | 327 | 322 | 385 | 267 | 290 | 242 | 278 | 779 |
| Queens | 89 | 107 | 104 | 116 | 128 | 150 | 87 | 112 | 114 | 111 | 223 |
| Staten Island | 34 | 41 | 76 | 121 | 123 | 124 | 87 | 53 | 48 | 55 | 128 |
| Total | 545 | 762 | 852 | 945 | 946 | 1090 | 758 | 764 | 712 | 813 | 2018 |

**The expected increase in Lyme disease is attributed to changes in a Centers for Disease Control and Prevention (CDC) case definition implemented in 2022. The new case definition counts anyone with a positive test result on an appropriate diagnostic assay; clinical criteria are no longer required. This change applies to states with a high incidence of Lyme disease, including New York. Despite this change, the NYC Health Department will continue to investigate a subset of patients to obtain clinical information, travel history and risk factors. This will help assess and characterize the risk of Lyme disease in areas of NYC where the blacklegged tick is found or may be emerging including Staten Island and areas of the Bronx.*

| | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | | 2021 | | 2022* | |
|--------------|------|-----|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | | | No travel | Travel | No travel | Travel | No travel | Travel | No travel | Travel | No travel | Travel | No travel | Travel |
| Bronx | 0 | 6 | 2 | 8 | 1 | 6 | 1 | 1 | 0 | 2 | 0 | 5 | 0 | 5 |
| Brooklyn | 3 | 79 | 0 | 101 | 1 | 47 | 1 | 62 | 3 | 37 | 1 | 56 | 3 | 21 |
| Queens | 3 | 24 | 3 | 31 | 0 | 11 | 4 | 25 | 2 | 18 | 4 | 19 | 0 | 2 |
| St. Island | 25 | 21 | 13 | 15 | 9 | 5 | 8 | 4 | 7 | 1 | 5 | 5 | 4 | 2 |
| Total | 31 | 130 | 18 | 155 | 11 | 69 | 14 | 92 | 12 | 58 | 10 | 85 | 7 | 30 |

**Residents of outer boroughs diagnosed with erythema migrans (EM) Apr. 1-Oct. 31 interviewed about travel during 3-30-day incubation period prior to EM onset. Manhattan residents excluded because previous study showed 97% traveled and borough has fewer potential blacklegged tick habitats.*

Lone Star Tick Associated Diseases:

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---------------|------|------|------|------|------|------|------|------|------|------|------|
| Bronx | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Brooklyn | 1 | 1 | 1 | 2 | 3 | 0 | 5 | 3 | 2 | 3 | 0 |
| Manhattan | 9 | 13 | 7 | 4 | 10 | 11 | 9 | 7 | 9 | 3 | 5 |
| Queens | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 2 | 1 | 0 | 5 |
| Staten Island | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 3 | 0 | 0 |
| Total | 11 | 15 | 9 | 7 | 14 | 14 | 17 | 12 | 15 | 6 | 10 |

American Dog Tick Associated Diseases:

| Table 7. Rocky Mountain spotted fever | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Bronx | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| Brooklyn | 3 | 0 | 1 | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 1 |
| Manhattan | 2 | 0 | 0 | 1 | 5 | 1 | 3 | 1 | 0 | 0 | 4 |
| Queens | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Staten Island | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 7 | 0 | 1 | 4 | 10 | 2 | 4 | 2 | 0 | 0 | 6 |

Other Diseases:

| Table 8. Rickettsialpox | | | | | | | | | | | |
|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Bronx | 3 | 9 | 4 | 5 | 5 | 3 | 3 | 0 | 0 | 0 | 0 |
| Brooklyn | 4 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| Manhattan | 4 | 5 | 1 | 4 | 1 | 5 | 2 | 0 | 0 | 2 | 1 |
| Queens | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| Staten Island | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 13 | 15 | 5 | 11 | 8 | 9 | 7 | 1 | 0 | 3 | 1 |

Tick Surveillance and Testing Data:

| Table 9. Density of Blacklegged Ticks/1000m² in Staten Island and the Bronx, 2018-2022 | | | | | |
|--|------|------|------|------|------|
| | 2018 | 2019 | 2020 | 2021 | 2022 |
| Staten Island | 5.7 | 1.5 | 2.1 | 4.0 | 4.2 |
| The Bronx | 22.9 | 6.1 | 2.9 | 4.2 | 7.5 |

| Table 10. Percent of Blacklegged Ticks Collected in Staten Island and the Bronx Testing Positive for TBD Pathogens, 2022 | | |
|---|-----------|---------------|
| | The Bronx | Staten Island |
| <i>Borrelia burgdorferi</i> | 65.0% | 29.0% |
| <i>Anaplasma phagocytophilum</i> | 7.2% | 4.1% |
| <i>Babesia microti</i> | 1.3% | 4.7% |
| <i>Borrelia miyamotoi</i> | 2.0% | 1.6% |