

BACKGROUND

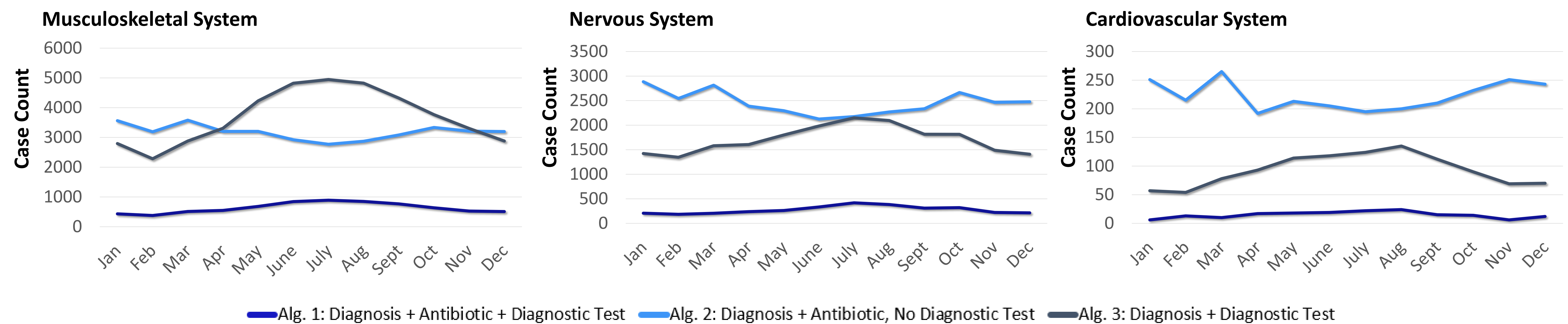
- Lyme disease (LD) is the fifth most commonly reported notifiable disease in the US, but the true disease burden remains unknown due to inconsistent reporting.
- We previously validated a claims-based algorithm requiring a LD diagnosis code and a LD-indicated antibiotic via medical record review and estimated a PPV of 93.8%.¹ Claims data, from health insurance companies, capture medically attended care billed to the company.
- The current work explores additional claims-based algorithms to identify cases of LD-associated conditions without LD-specific diagnosis codes.

METHODS

- We developed algorithms using the following:
 - Diagnosis codes** reflecting musculoskeletal, nervous system, and cardiovascular manifestations not specific to LD.
 - At least 7 days' supply of one of the following **antibiotics**: doxycycline, amoxicillin, penicillin G, cefotaxime, cefuroxime axetil, or azithromycin – or evidence of ceftriaxone injections.
 - Diagnostic tests** were assessed via Current Procedural Terminology (CPT) codes for antibody detection tests and nucleic acid amplification tests.
- For each manifestation, we assessed 3 algorithms. All elements were required to occur within 90 days of one another.
 - Algorithm 1: Diagnosis code + antibiotic + diagnostic test**
 - Algorithm 2: Diagnosis code + antibiotic, with no diagnostic test**
 - Algorithm 3: Diagnosis code + diagnostic test, regardless of antibiotic**
- We applied all algorithms to claims from Massachusetts residents, where LD is endemic, from July 2000 – June 2019.

RESULTS

Figure 1. Seasonality assessment: frequency of LD-associated conditions identified by claims-based algorithms by calendar month, July 2000 – June 2019.



RESULTS

- We identified 144,058 individuals who met ≥ 1 algorithm, among whom 10% had a LD-specific diagnosis code within +/-90 days.
- The algorithms identified the greatest patient count for musculoskeletal manifestations, followed by neurologic manifestations, then cardiovascular.
- The most common **diagnoses** identifying cases were:
 - Musculoskeletal System:** joint pain
 - Neurologic System:** radiculopathy, Bell's palsy
 - Cardiovascular System:** atrioventricular block, myocarditis or pericarditis
- Antibiotic treatment:**
 - Among patients identified by algorithms requiring an antibiotic, patients with a diagnostic test (**algorithm 1**) were more likely than those without a diagnostic test (**algorithm 2**) to receive doxycycline (43% vs 18%); most other patients received amoxicillin.
 - Algorithm 3** had a low prevalence of treatment (16%).
- Seasonality:**
 - Algorithm 1** and **algorithm 3**, both requiring a diagnostic test, reflected LD seasonality in the northeastern US, with higher burden in summer.
 - Algorithm 2**, which did not require a diagnostic test, had an inverse seasonal pattern.

Table 1. Descriptive characteristics of cases identified by claims-based algorithms for LD manifestations.

	Musculoskeletal System			Nervous System			Cardiovascular System		
	Alg. 1 n (%)	Alg. 2 n (%)	Alg. 3 n (%)	Alg. 1 n (%)	Alg. 2 n (%)	Alg. 3 n (%)	Alg. 1 n (%)	Alg. 2 n (%)	Alg. 3 n (%)
Total count	7,585	38,136	44,353	3,296	29,437	20,508	176	2,672	1,114
Demographics									
Female sex	4,539 (59.8)	23,543 (61.7)	27,414 (61.8)	1,927 (58.5)	18,246 (62)	12,257 (59.8)	77 (43.8)	1,047 (39.2)	453 (40.7)
Age ≥ 18	5,862 (77.3)	32,647 (85.6)	37,647 (84.9)	3,003 (91.1)	28,761 (97.7)	19,700 (96.1)	145 (82.4)	2,476 (92.7)	996 (89.4)
Antibiotics									
Doxycycline	3,168 (41.8)	6,740 (17.7)	2,845 (6.4)	1,478 (44.8)	5,376 (18.3)	1,382 (6.7)	89 (50.6)	502 (18.8)	84 (7.5)
Amoxicillin	4,398 (58)	30,820 (80.8)	4,201 (9.5)	1,841 (55.9)	23,521 (79.9)	1,809 (8.8)	88 (50.0)	2,102 (78.7)	91 (8.2)
Care setting of diagnosis code									
Outpatient	7,137 (94.1)	35,298 (92.6)	42,380 (95.6)	2,883 (87.5)	28,394 (96.5)	18,731 (91.3)	143 (81.3)	2,213 (82.8)	missing
Emergency Department	448 (5.9)	2,838 (7.4)	1,973 (4.4)	413 (12.5)	1,043 (3.5)	1,777 (8.7)	33 (18.8)	459 (17.2)	missing
LD codes in +/-90 days of non-Lyme diagnosis date									
LD diagnosis	1,865 (24.6)	697 (1.8)	4,055 (9.1)	827 (25.1)	367 (1.2)	1,964 (9.6)	57 (32.4)	38 (1.4)	139 (12.5)
Rash diagnosis	835 (11)	1,307 (3.4)	3,175 (7.2)	353 (10.7)	920 (3.1)	1,281 (6.2)	21 (11.9)	83 (3.1)	81 (7.3)

DISCUSSION & CONCLUSIONS

- This analysis identified potential LD cases with musculoskeletal, nervous system, and cardiovascular symptoms, who did not have LD-specific diagnosis codes. These patients would not be identified by claims-based algorithms relying on LD diagnoses.
- The algorithm requiring a diagnosis code for a LD manifestation, antibiotic treatment, and LD diagnostic test identified patients whose characteristics were consistent with those of LD cases. We will validate this algorithm via medical record review.
- In the US, where the accuracy of LD surveillance varies by geography, validated claims-based algorithms can supplement the traditional LD surveillance system for a more accurate picture of the national burden of LD.