Clinical Management and Outcomes of Lyme Disease in Wisconsin

D O'Leary, E Belongia, K Orloski, P Chyou, C Gale, M Finkel, E Hayes

United States Centers for Disease Control and Prevention, Fort Collins, CO

Marshfield Medical Research Foundation

Marshfield, WI

Mayo-Midelfort Clinic,

Eau Claire, WI

Background

- **Lyme disease (LD)**
  - **Caused by spirochete *Borrelia burgdorferi***
  - **Transmitted in US by *Ixodes scapularis* and *I. pacificus* ticks**
  - **Nationally-notifiable**

- **Wisconsin 7th highest LD incidence in US from 1992-1998**
  - **(9.5 cases/100,000)**

- **Little is known regarding LD management practices and outcomes in the midwestern United States**

Objectives

- **Describe LD serologic testing and treatment in WI**

- **Identify temporal changes in clinical management of LD**

- **Assess clinical outcomes**

Marshfield and / Mayo-Midelfort Clinic Network

- **Marshfield Clinic**
    - **450 physician multispecialty practice**
    - **regional centers in 31 central and northwest WI communities**
    - **fee-for-service and capitated care**

- **Mayo-Midelfort Clinic**
    - **multispecialty practice with >140 physicians**
    - **main campus in Eau Claire with regional centers in surrounding counties**

- **Representative of most ambulatory practice settings in WI**

Methods: Case Ascertainment

- **Clinical databases are linked between all outlying clinics and main clinic**

- **Databases include ICD-9 diagnoses on all patients**

- **Computerized search of diagnosis files between 1992-1998**

- **ICD-9 codes consistent with LD (088.81, 695.9, 066.9)**

- **Abstraction of corresponding medical charts**

Medical Record Abstraction for LD-Related Illness

- **Patient demographics**

- **Signs and symptoms**

- **Diagnostic testing**

- **Treatment**

- **Clinical outcomes**

National LD Surveillance Case Definition

- **Clinical criteria**
  - **Erythema migrans, or**
  - **At least one late manifestation and laboratory confirmation of infection**

- **Laboratory criteria for diagnosis**
  - **Isolation of *Borrelia burgdorferi* from clinical specimen, or**
  - **Demonstration of diagnostic levels of IgM or IgG antibodies to the spirochete in serum or CSF, or**
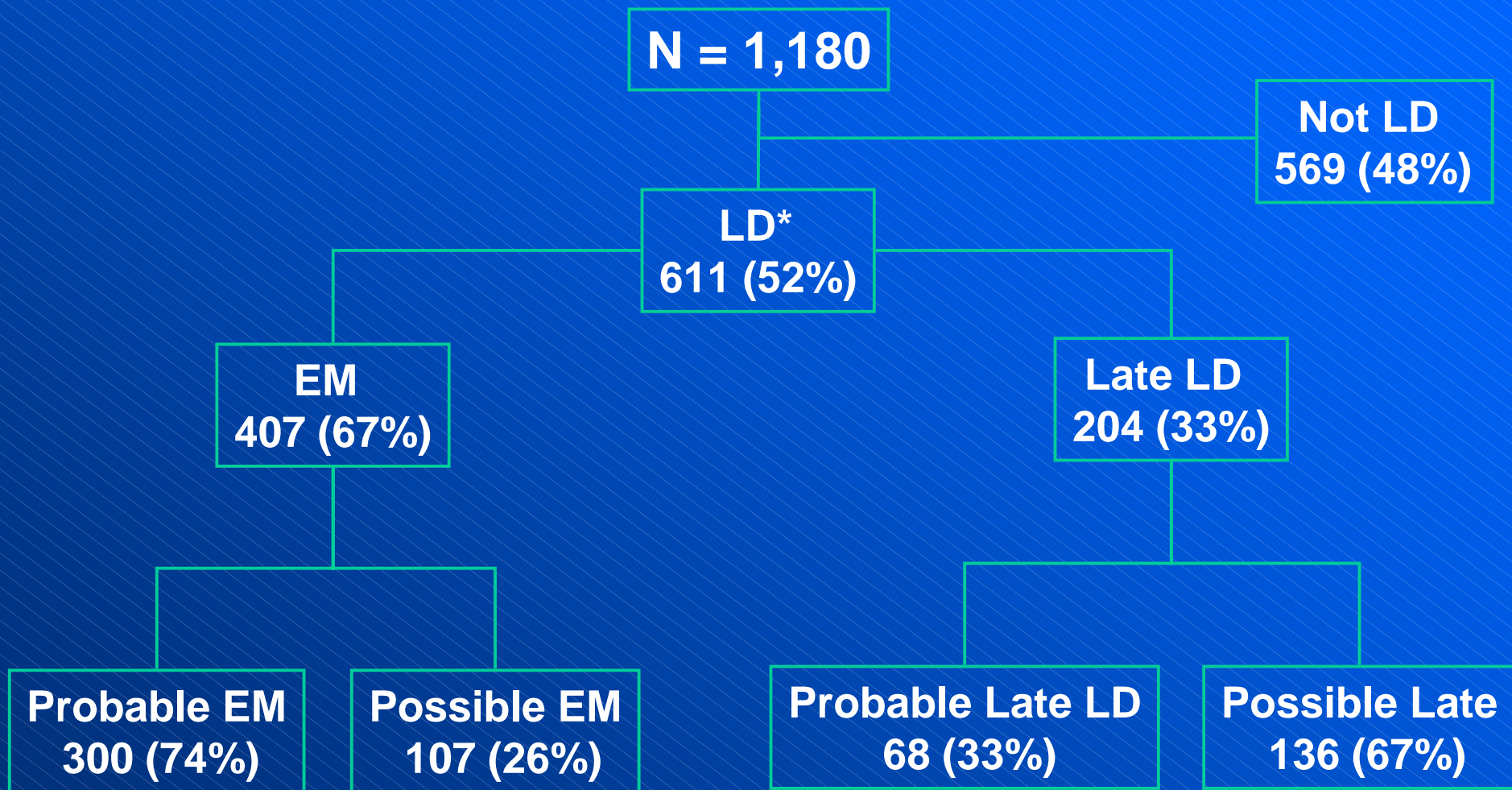 - **A significant change in antibody levels in paired acute and convalescent serum samples**

LD Case Classification

- **Probable (EM or Late LD)**
  - **Met national surveillance case definition for EM or late LD**

- **Possible (EM or Late LD)**
  - **EM documented but size $\leq$ 5cm or unspecified**
  - **Positive LD serologic test with recurrent arthralgias or neurologic manifestations not meeting the probable case definition**

- **Not LD**
  - **Illness meeting neither of above criteria**

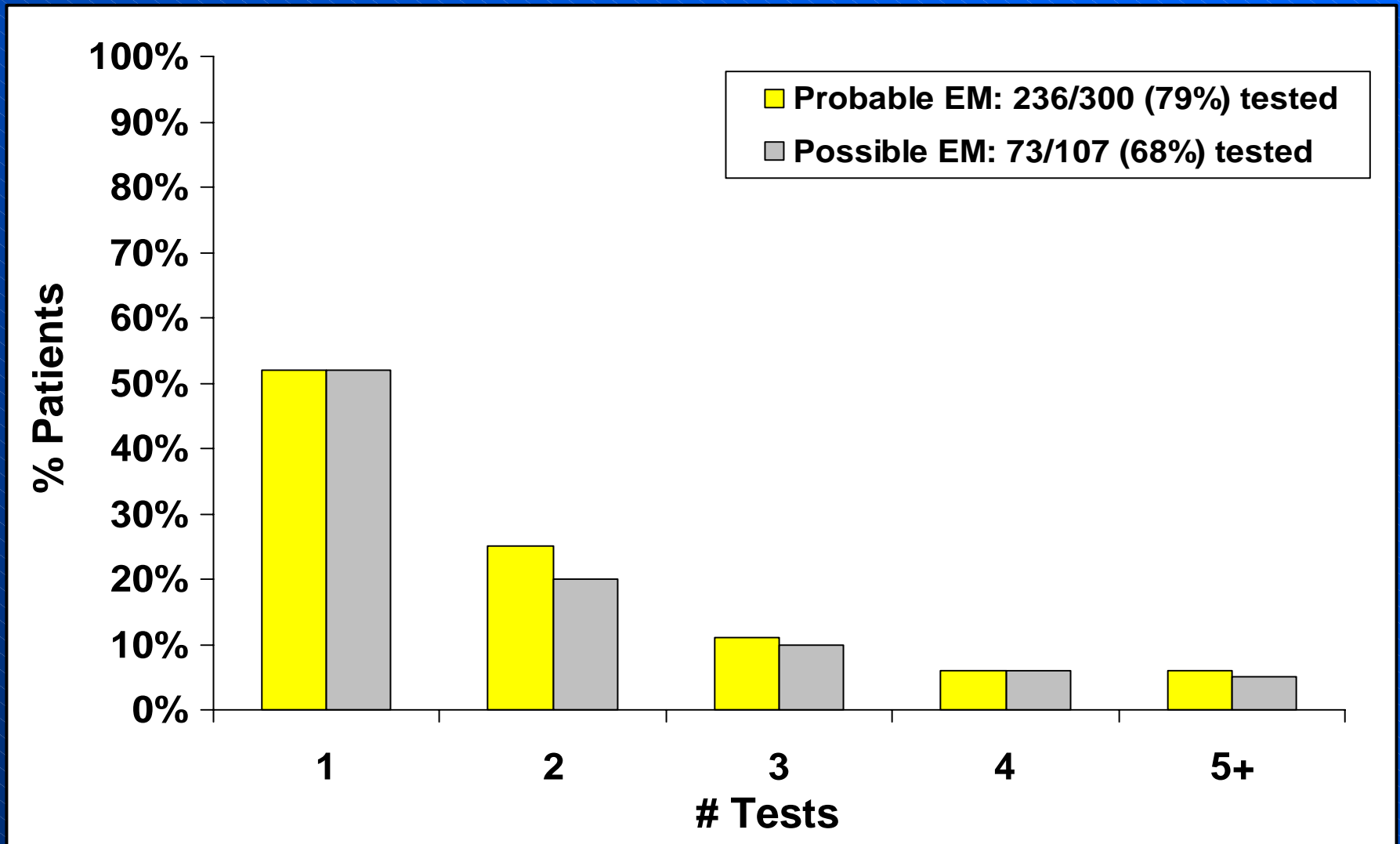# Outcome Classification

- **Medical record reviewed up to three years after initial visit to ascertain clinical outcome**

  - **'complete resolution'**
    - No mention of LD at last clinic visit

  - **'persistent LD symptoms'**
    - LD mentioned at last clinic visit

  - **'insufficient information'**
    - No follow-up after initial clinic visit

Results: Patient Classification

N = 1,180

Not LD
569 (48%)

LD*
611 (52%)

EM
407 (67%)

Late LD
204 (33%)

Probable EM
300 (74%)

Possible EM
107 (26%)

Probable Late LD
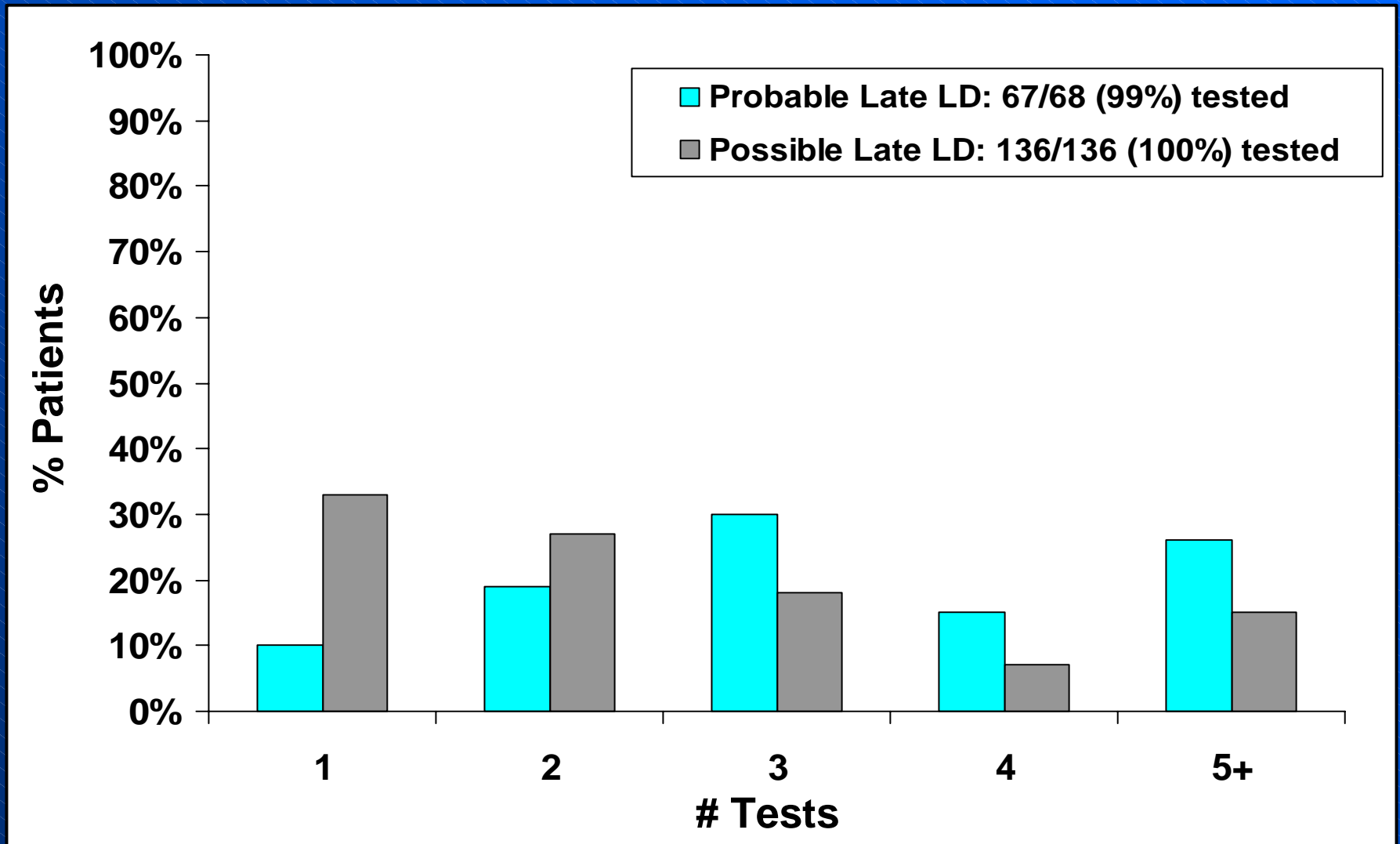68 (33%)

Possible Late
136 (67%)

*All LD patients: 56% male; median age = 37

Frequency of Serologic Testing Among Patients With EM

# Frequency of Serologic Testing Among Patients With Late LD

Proportion of Patients with ≥4 Serologic Tests

Patient classification	Year of diagnosis		p
	1992-95	1996-98	
Probable EM	12%	13%	0.9
Probable Late LD	52%	34%	0.04
Not LD	9%	22%	<0.01

Antimicrobial Use

- **The most frequently prescribed antimicrobials for initial therapy**
  - **Doxycycline**
  - **Amoxicillin**
  - **Ceftriaxone**

- **Patients without LD**
  - **94% received antimicrobials**
  - **29% received multiple courses**

- **No temporal changes in proportion of patients receiving multiple courses of antimicrobials**
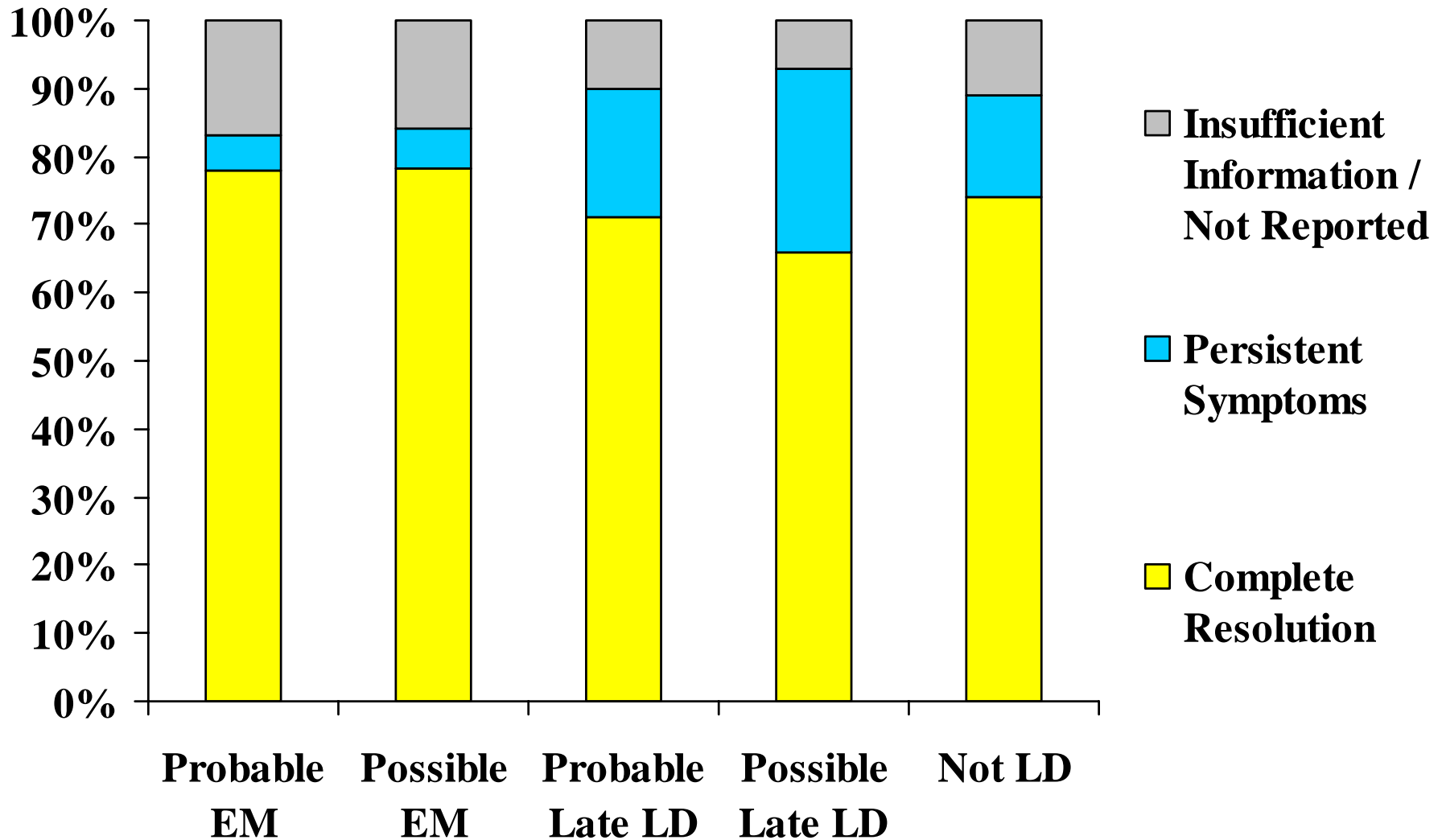
Limitations

- **Study based on medical record abstraction**

  - **Visits possibly missed due to patients seeking care in other systems**

  - **Inconsistent documentation of signs and symptoms in medical records**

  - **Variation in scheduled patient follow-up**

  - **Temporal changes in accepted testing methods**

Conclusions

- **Serologic testing was common among patients with EM**
  - **empiric therapy recommended (*Ann Int Med 1997; 127, 1106-1108*)**

- **There was a temporal increase in patients without LD who had $\geq$4 serologic tests**
  - **Decreasing number of tests for patients with late LD**

- **Recommended drugs are used for LD therapy *(Clin Inf Dis 2000; 31, Supp. 1, S1-S14)***
  - **but they are often given to patients without LD**

- **The majority of patients have complete resolution of LD symptoms**

Conclusions

- **Serologic testing was common among patients with EM**
  - empiric therapy recommended (*Ann Int Med 1997; 127, 1106-1108*)

- **There was a temporal increase in patients without LD who had $\geq$4 serologic tests**
  - Decreasing number of tests for patients with late LD

- **Recommended drugs are used for LD therapy** *(Clin Inf Dis 2000; 31, Supp. 1, S1-S14)*
  - but they are often given to patients without LD

- **The majority of patients have complete resolution of LD symptoms**

Acknowledgements

- **Marshfield Clinic**
  - **Catherine Grimm**
  - **Nita Herr**
  - **Deborah Hilgemann**
  - **Deborah Kempf**
  - **Donna Wittman**
  - **Sonia Weigel**
  - **Lorelle Ziegelbauer**

- **Mayo-Midelfort Clinic**
  - **Londa Dahnke**
  - **Peggy Munden**
  - **Robert Noyce, MD**

Patient Demographic Characteristics

	Not LD	EM	Late LD
Age (median)	41 years	36 years	41 years
% Male	51%	56%	60%

Multiple-course (≥2) Antimicrobial Therapy: Temporal Analysis

| Patient classification	Year of diagnosis		p
	1992-95	1996-98	
Probable EM	19%	13%	0.16
All EM	21%	14%	0.10
Probable Late LD	63%	57%	0.65
All Late LD	53%	56%	0.55
Not LD	28%	31%	0.51

Late manifestations of LD

- **Musculoskeletal System: Recurrent, brief attacks of objective joint swelling in or a few joints.**
- **Nervous System: Lymphocytic meningitis, cranial neuritis (especially facial palsy), radiculoneuropathy or, rarely encephalomyelitis alone or in combination**
- **Cardiovascular System: Acute onset, high grade (2nd or 3rd degree) atrioventricular defects that resolve in days or weeks and are sometmes associated with myocarditis**
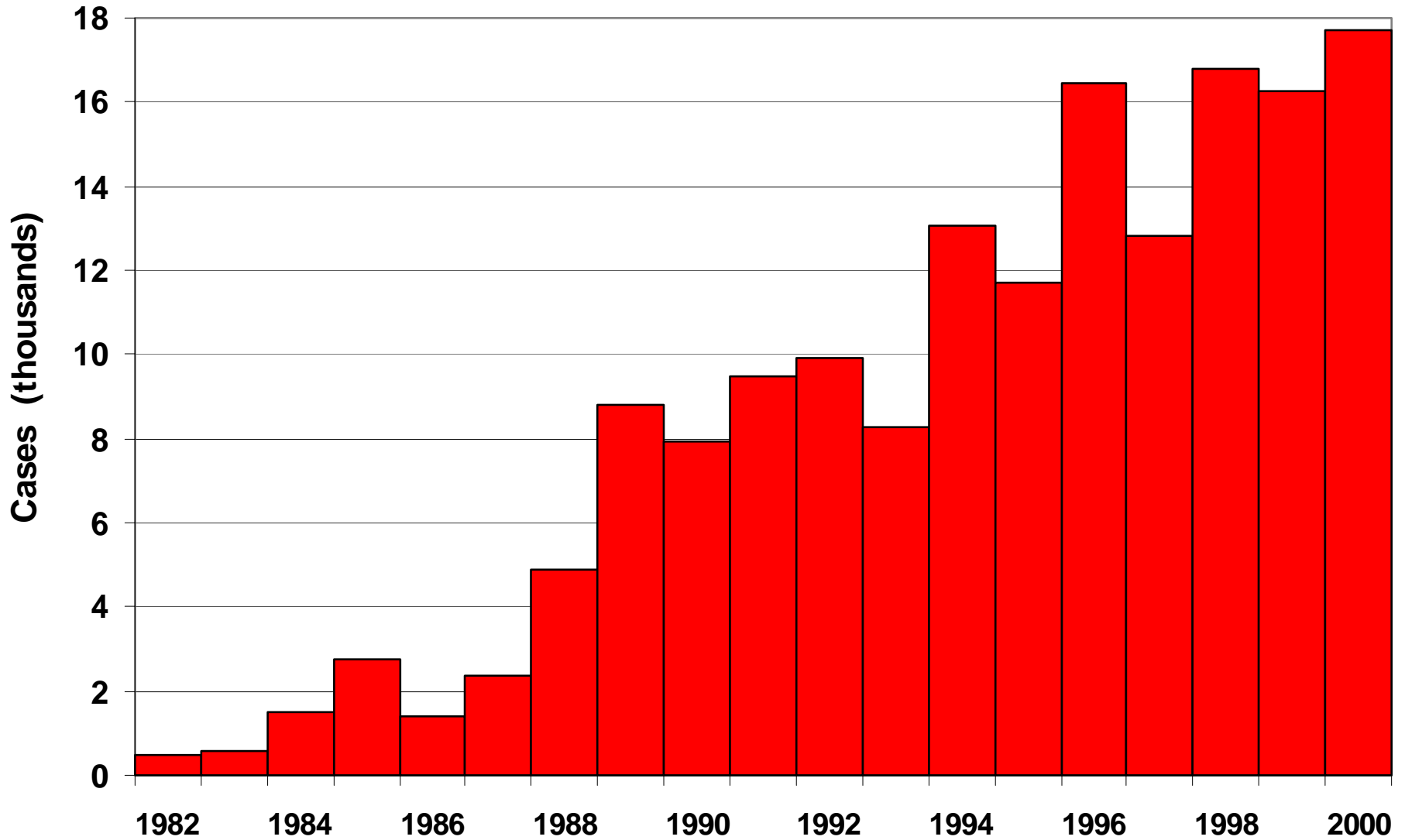
Comparision of Results With Other Studies

- **Published studies from other endemic settings**
  - **MC Reid et.al., 1998: New England**
  - **AC Steere et.al., 1983, 1993: New England**
  - **LH Sigal et.al., 1990: Mid-Atlantic**
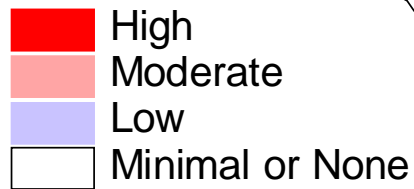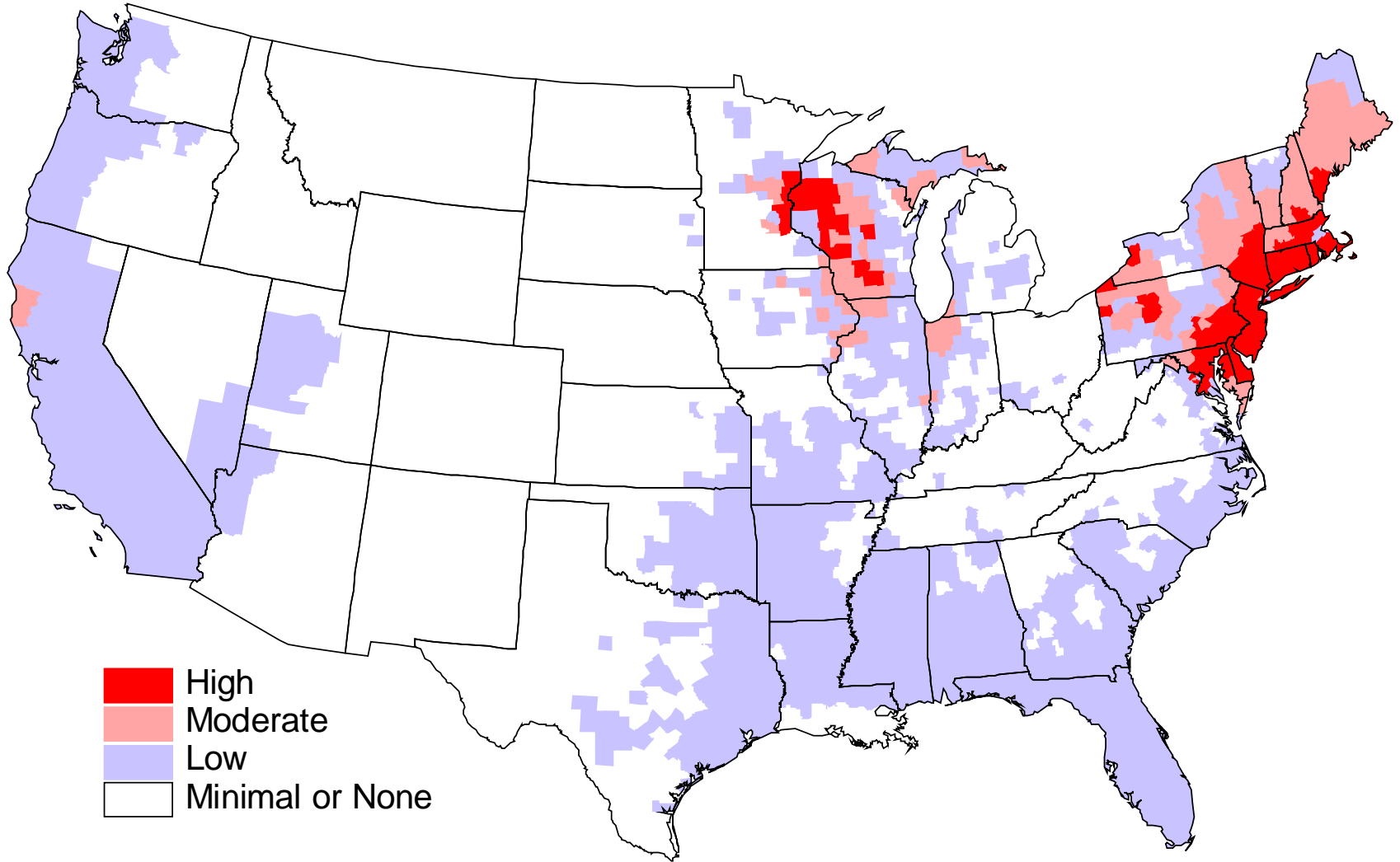
Reported Cases of Lyme Disease - United States, 1982-2000
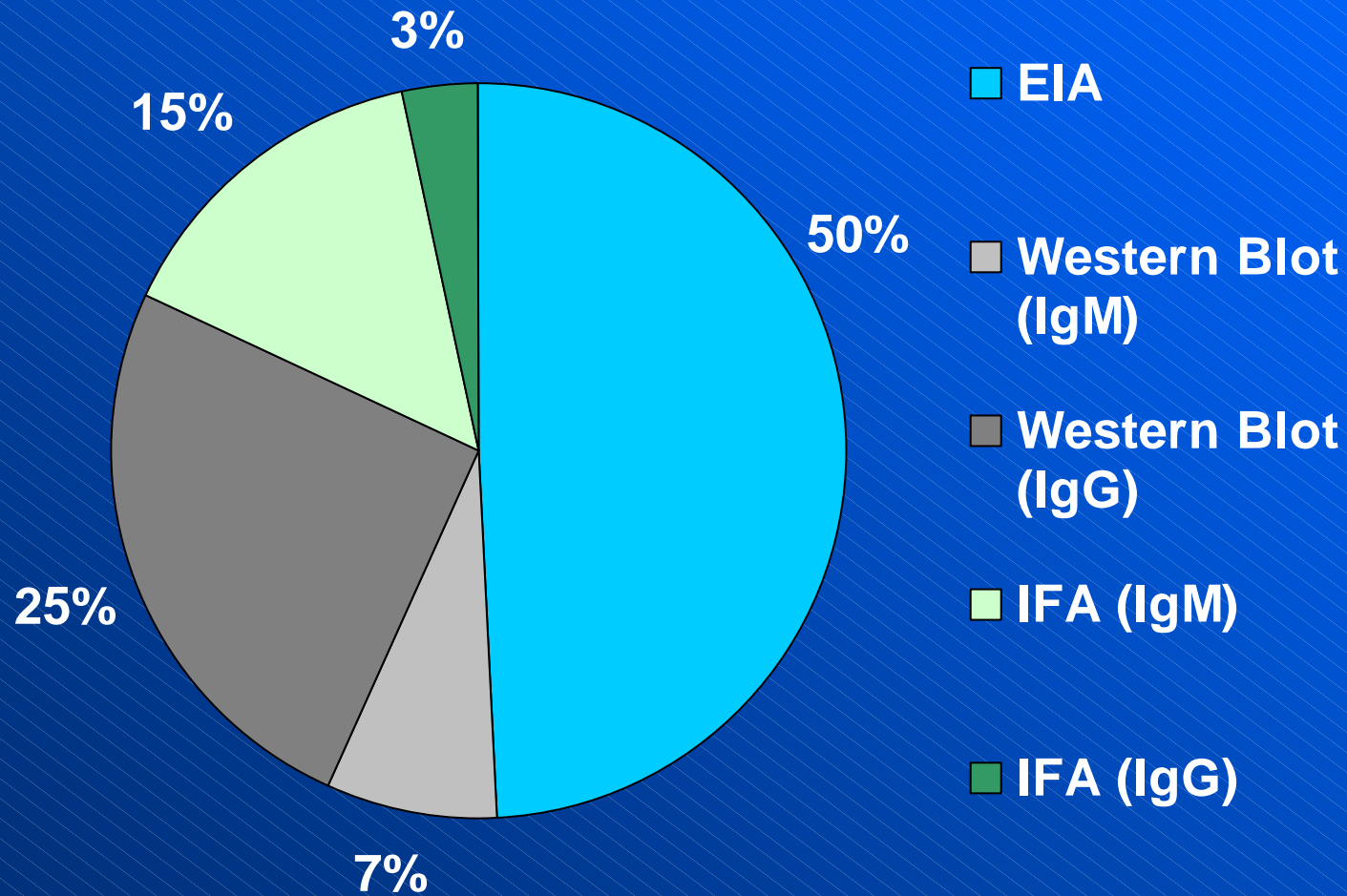
Demographic Characteristics of Patients with EM

	Probable EM	Possible EM	All EM
Age (median)	36 years	41 years	38 years
% Male	56%	59%	57%

Demographic Characteristics of Patients with Late LD

	Probable Late LD	Possible Late LD	All Late LD
Age (median)	41 years	37 years	37 years
% Male	40%	52%	48%

Serologic Tests Performed for Patients With Late LD
(n = 404 tests)

Proportion of Patients Receiving Any Antimicrobial Therapy

Patient Classification	Proportion
All EM (n=407)	99%
All Late LD (n=204)	99%
Not LD (n=569)	94%