

NCIOM

Vector Borne Disease

Megan Davies, MD
Medical Epidemiologist
Communicable Disease Branch
Epidemiology Section
North Carolina Division of Public Health

What Are Vector Borne Diseases?

- A disease that is transmitted to humans or other animals by an insect or other arthropod is called a *vector-borne disease*. Vectors of human disease in NC are typically mosquitoes or ticks.

Vector Borne Diseases of Concern in NC are:

- Bacterial Diseases
 - Lyme Disease
- Rickettsial Diseases
 - Rocky Mountain Spotted Fever
 - Ehrlichiosis
- Viral Diseases
 - West Nile Encephalitis
 - LaCrosse Encephalitis
 - Eastern Equine Encephalitis
- Unknown Cause
 - STARI

LD Background

- Caused by the spirochete *Borrelia burgdorferi*
- Transmitted by tick bite
- *Ixodes scapularis* (black legged tick) is vector tick with complex ecology dependent on geographical region of US
- Controversial transmission, diagnosis and treatment: confounded by STARI

Lyme Disease, NC, 1987-2007

Case Details; n=1430

- Gender

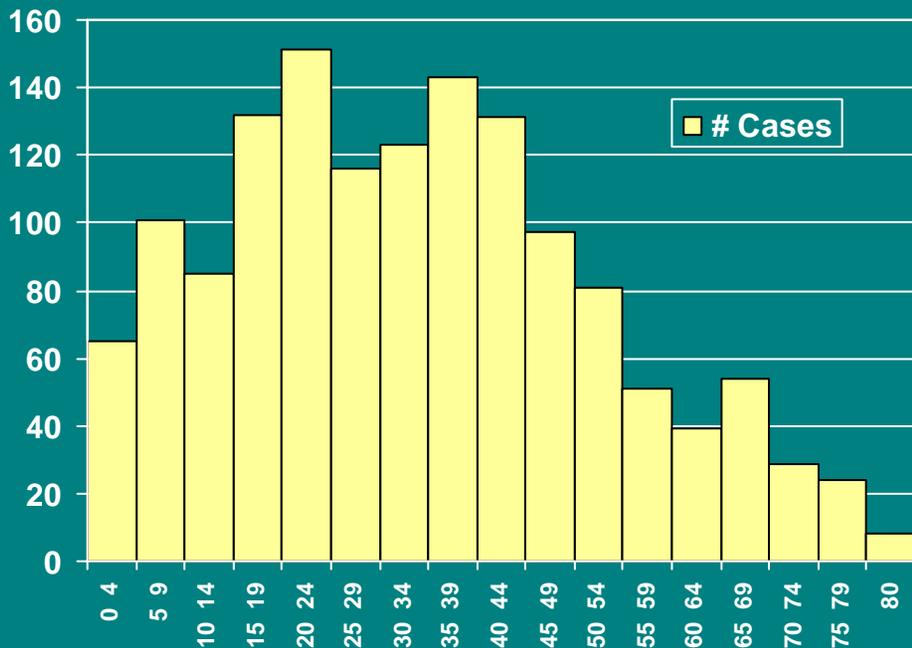
– Female	719	(50%)
– Male	711	(50%)

- Race

– Asian	11	(<1%)
– Black	126	(9%)
– Nat. Am.	5	(<1%)
– White	1210	(85%)
– Unk	78	(6%)

- Ethnicity

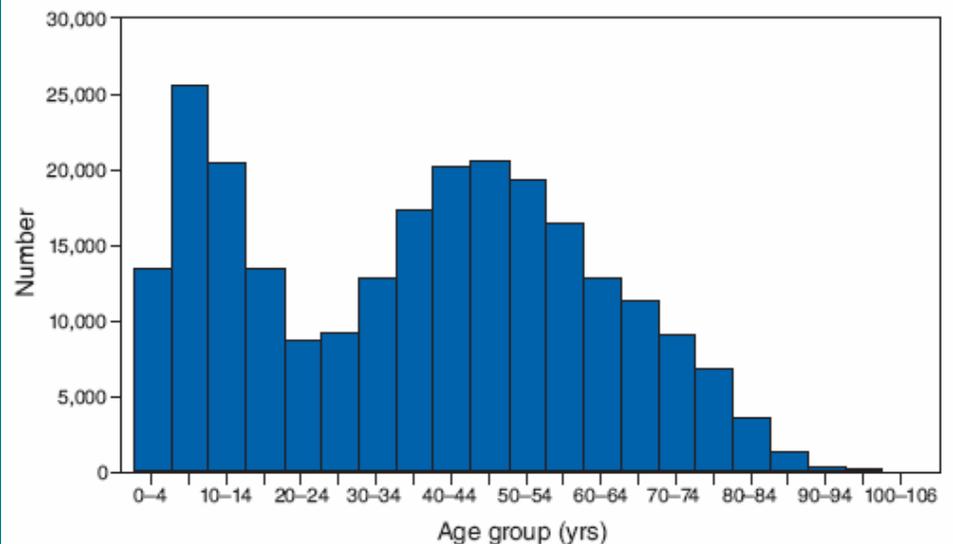
– Hisp	37	(3%)
– N Hisp	1142	(80%)
– Unk	251	(17%)



Number of Reported Lyme Disease Cases by Age Group, NC, 1987-2007; n=1430

**Surveillance for Lyme Disease --
- United States, 1992--2006
Surveillance Summaries
October 3, 2008 / 57(SS10);1-9**

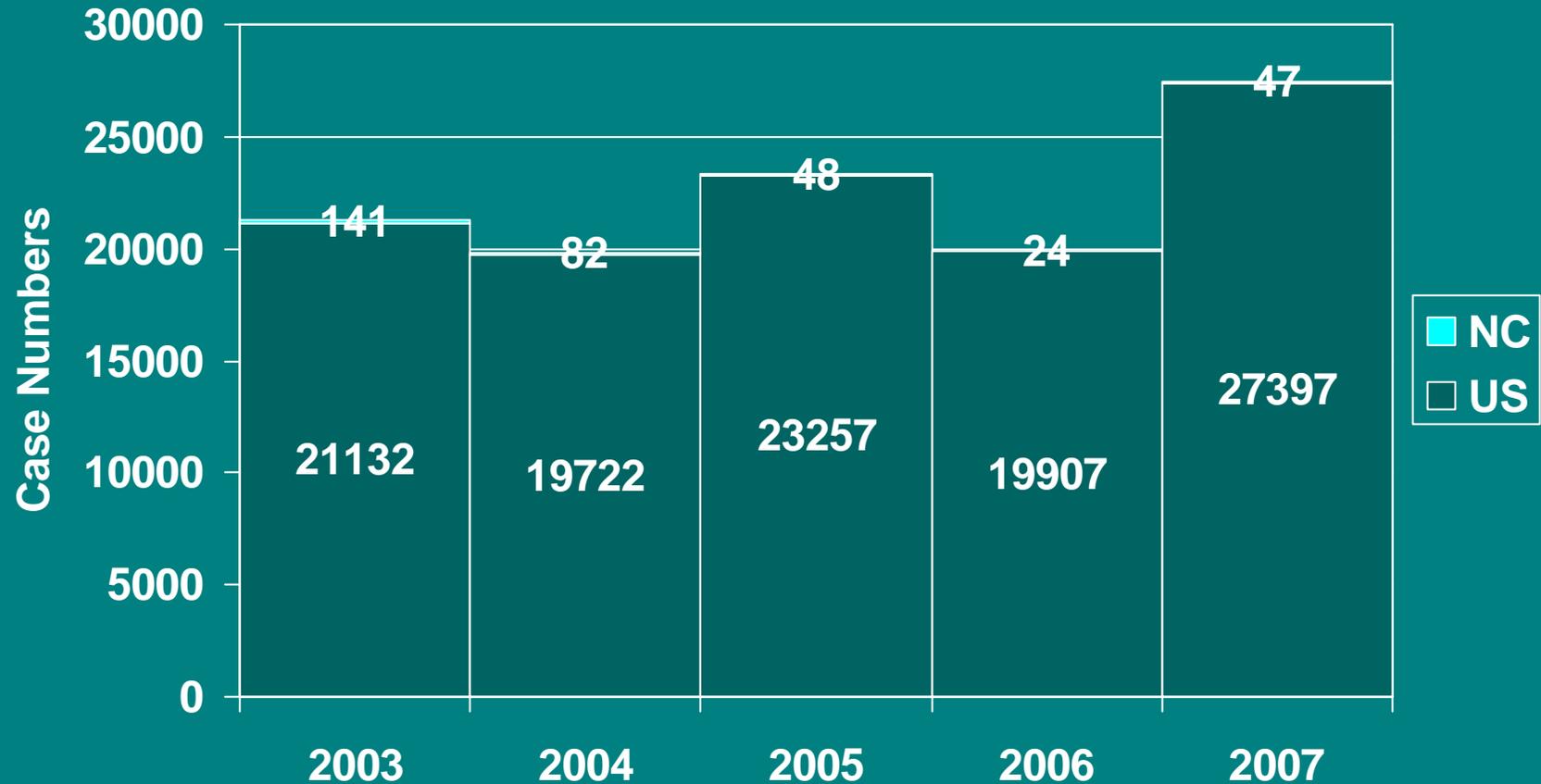
FIGURE 3. Number* of reported Lyme disease cases, by age group — United States, 1992–2006



* N = 241,931.

Surveillance for Lyme Disease --- United States, 1992--2006

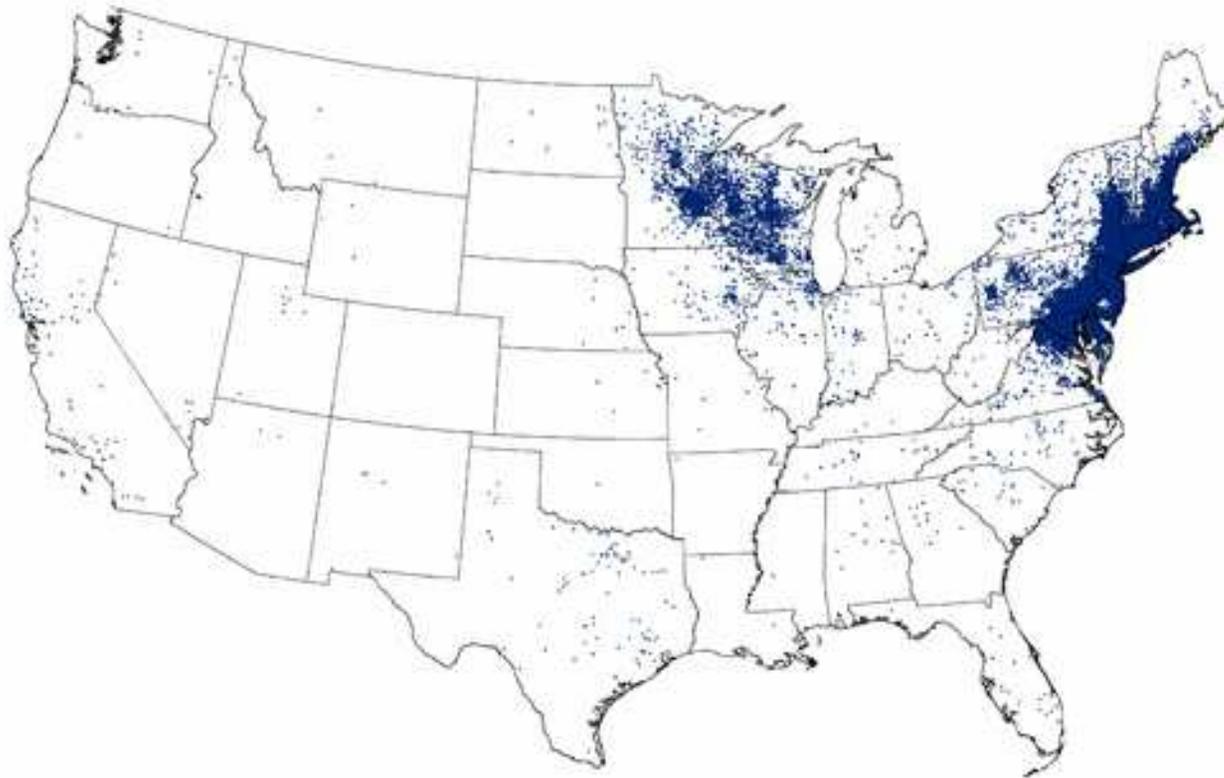
Surveillance Summaries October 3, 2008 / 57(SS10);1-9



2007 US data: http://www.cdc.gov/ncidod/dvbid/lyme/ld_UpClimbLymeDis.htm

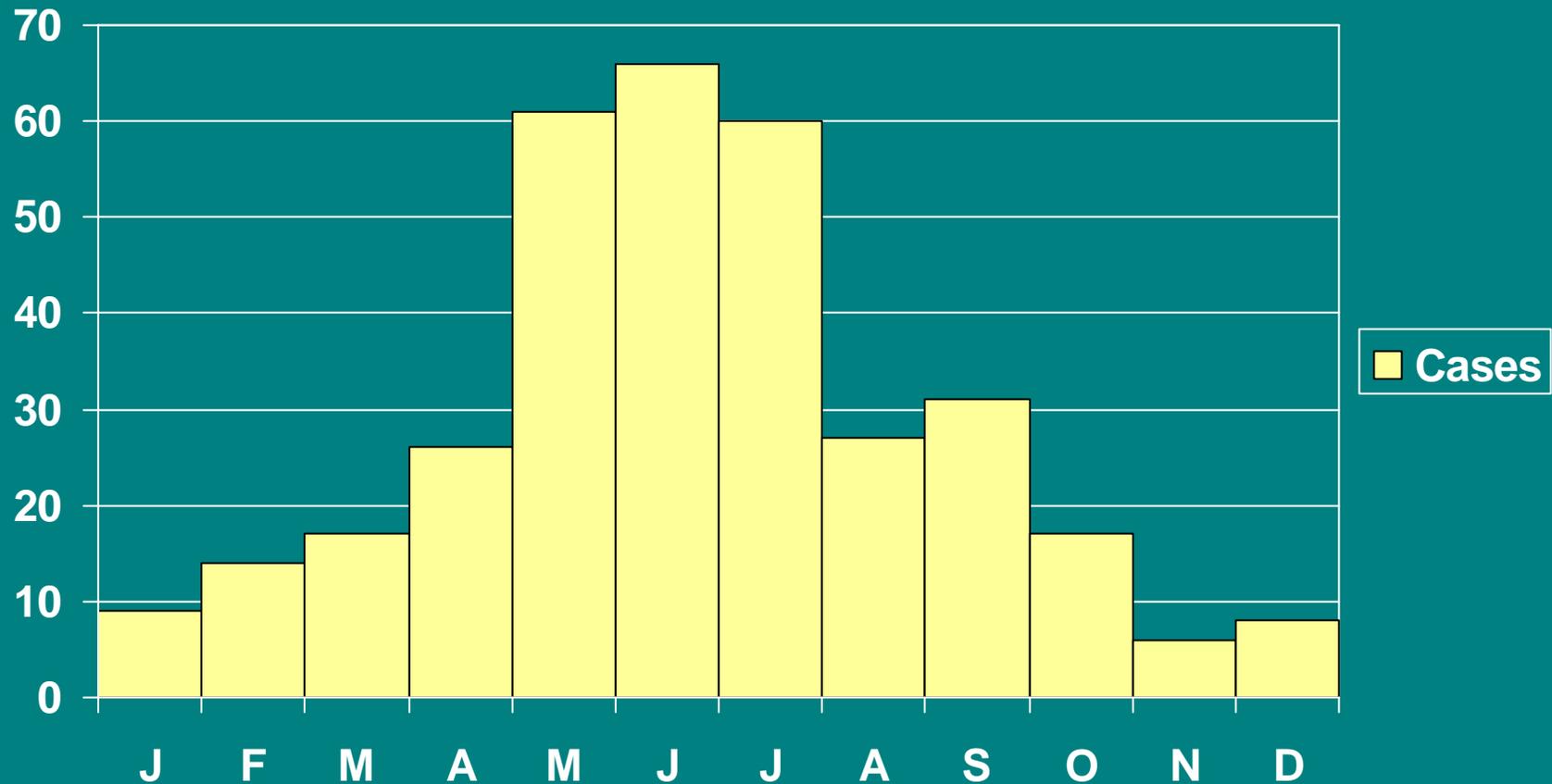
http://www.cdc.gov/ncidod/dvbid/lyme/ld_Incidence.htm

Reported Cases of Lyme Disease -- United States, 2007



1 dot placed randomly within county of residence for each reported case

Number of Reported Lyme Disease Cases by Month of Illness Onset, NC, 2003-2007; n=342



RMSF Background

- Caused by *Rickettsia rickettsii*
- *D. variabilis* (dog tick) is the tick vector
- Ecology is well established in NC
- Most common vector-borne disease in NC
- Mortality in US cited as 3-5% with treatment
- NC mortality is less than 1%
 - In NC RMSF cases are less likely to be hospitalized or develop complications relative to US RMSF cases
 - Due to high degree of awareness among clinicians or infection with less pathogenic SFGR

RMSF, NC, 1987-2007

Case Details; n=5196

- Gender

– Female	2268	(43%)
– Male	2907	(56%)
– Unk	21	(<1%)

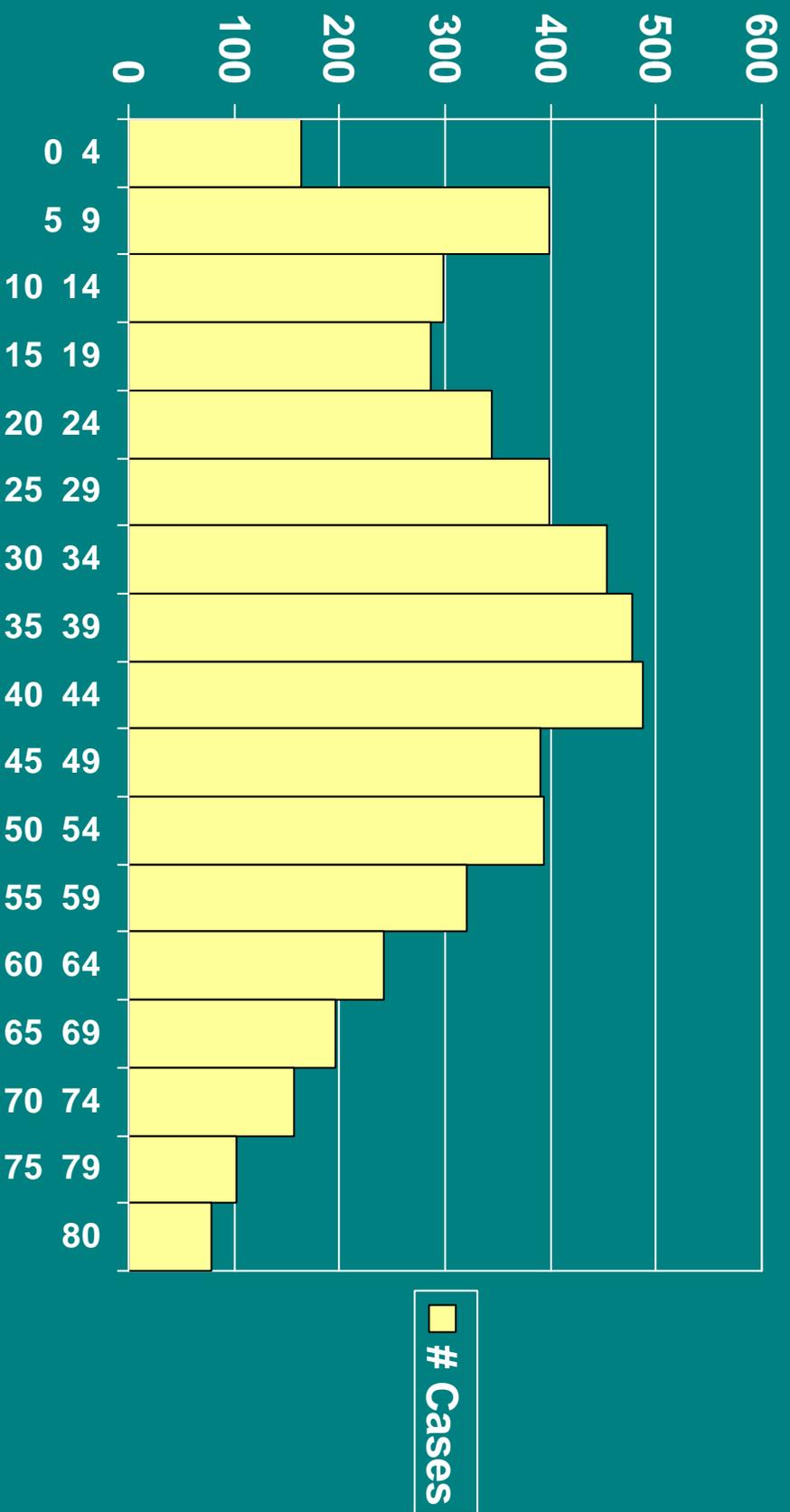
- Race

– Asian	32	(<1%)
– Black	653	(13%)
– Nat. Am.	58	(1%)
– White	4225	(81%)
– Unk	228	(4%)

- Ethnicity

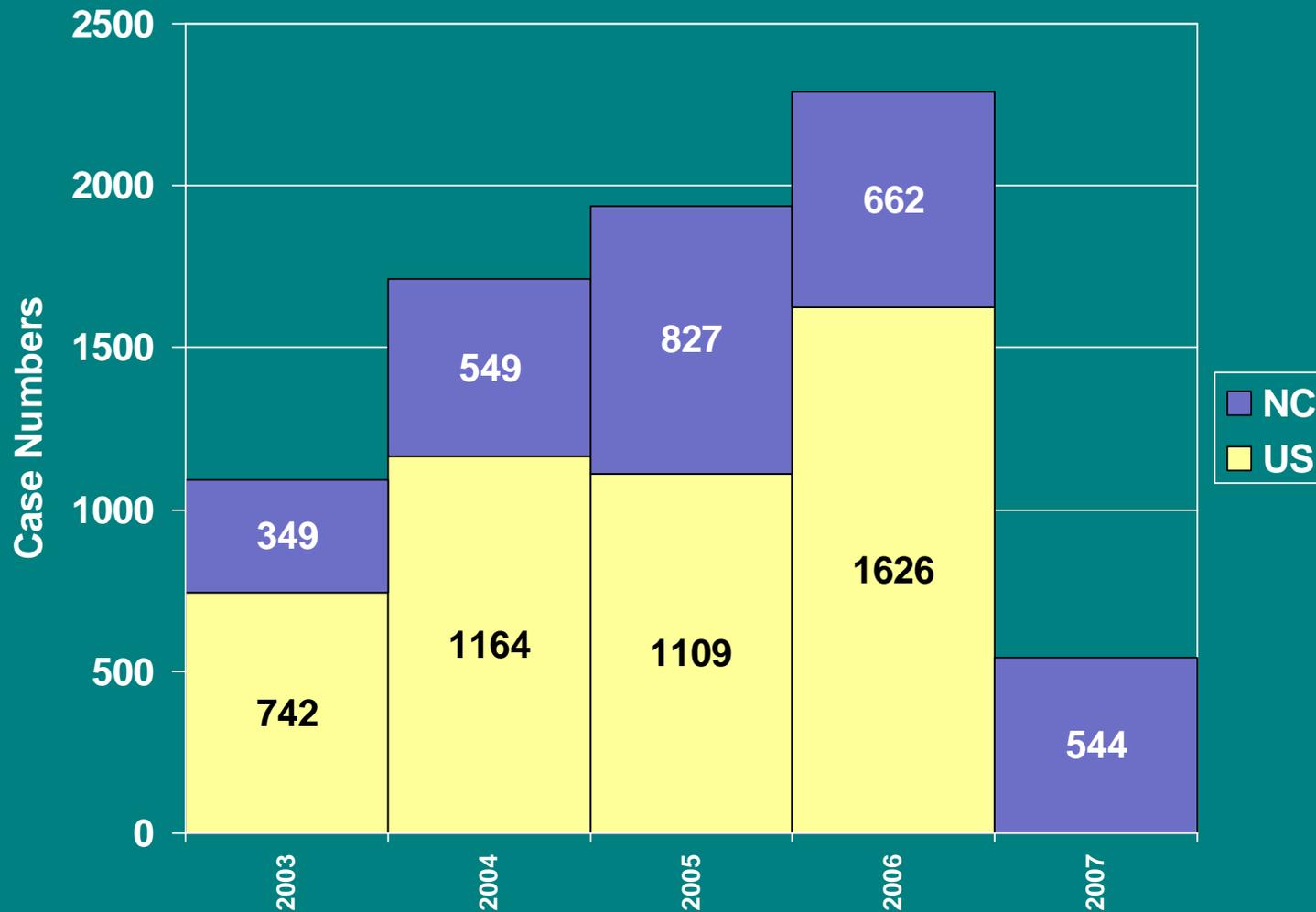
– Hisp	136	(3%)
– N Hisp	4419	(85%)
– Unk	641	(12%)

Number of Reported RMSF Cases by Age Group, NC, 1987-2007; n=5196

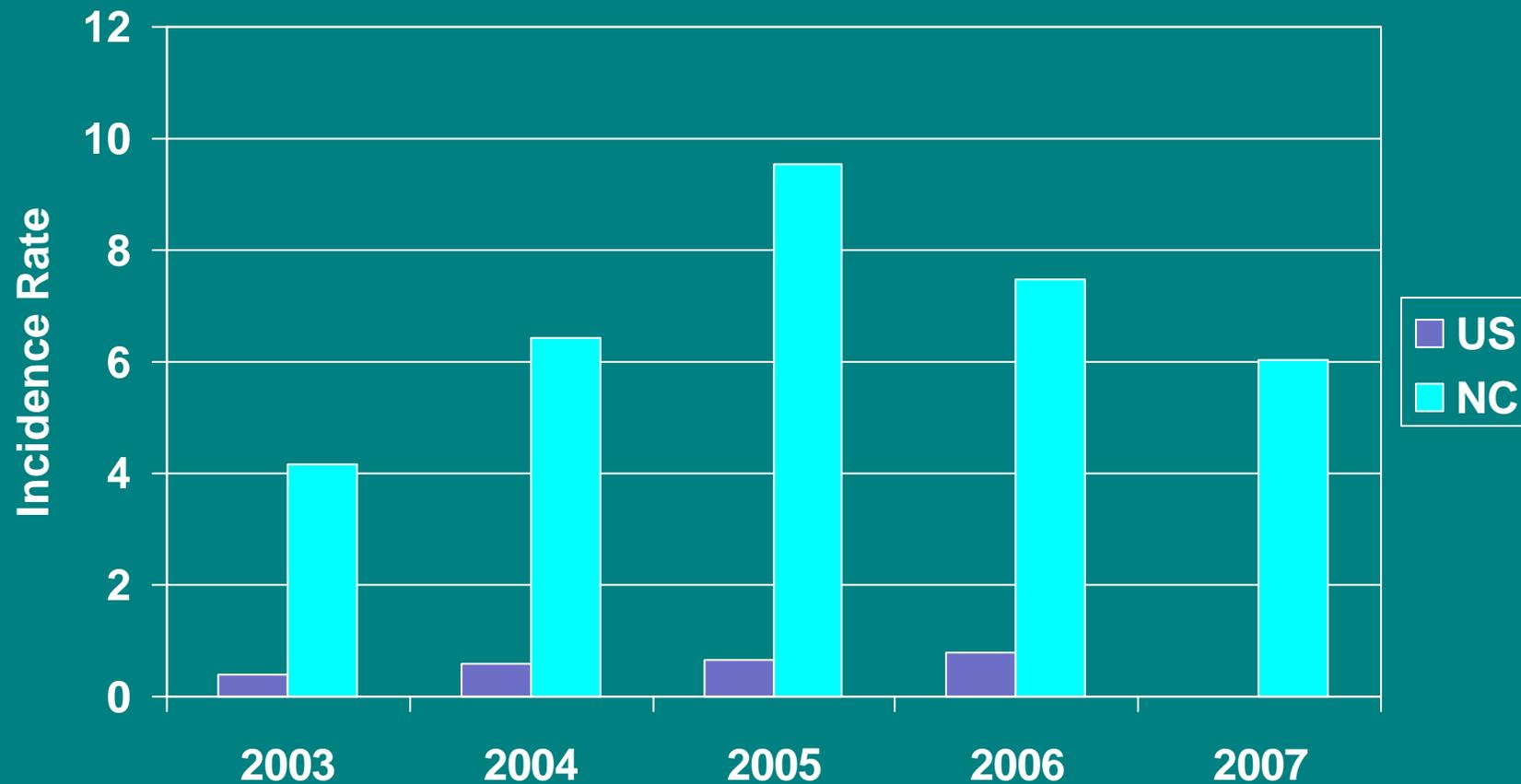


Summary of Notifiable Diseases --- United States, 2006

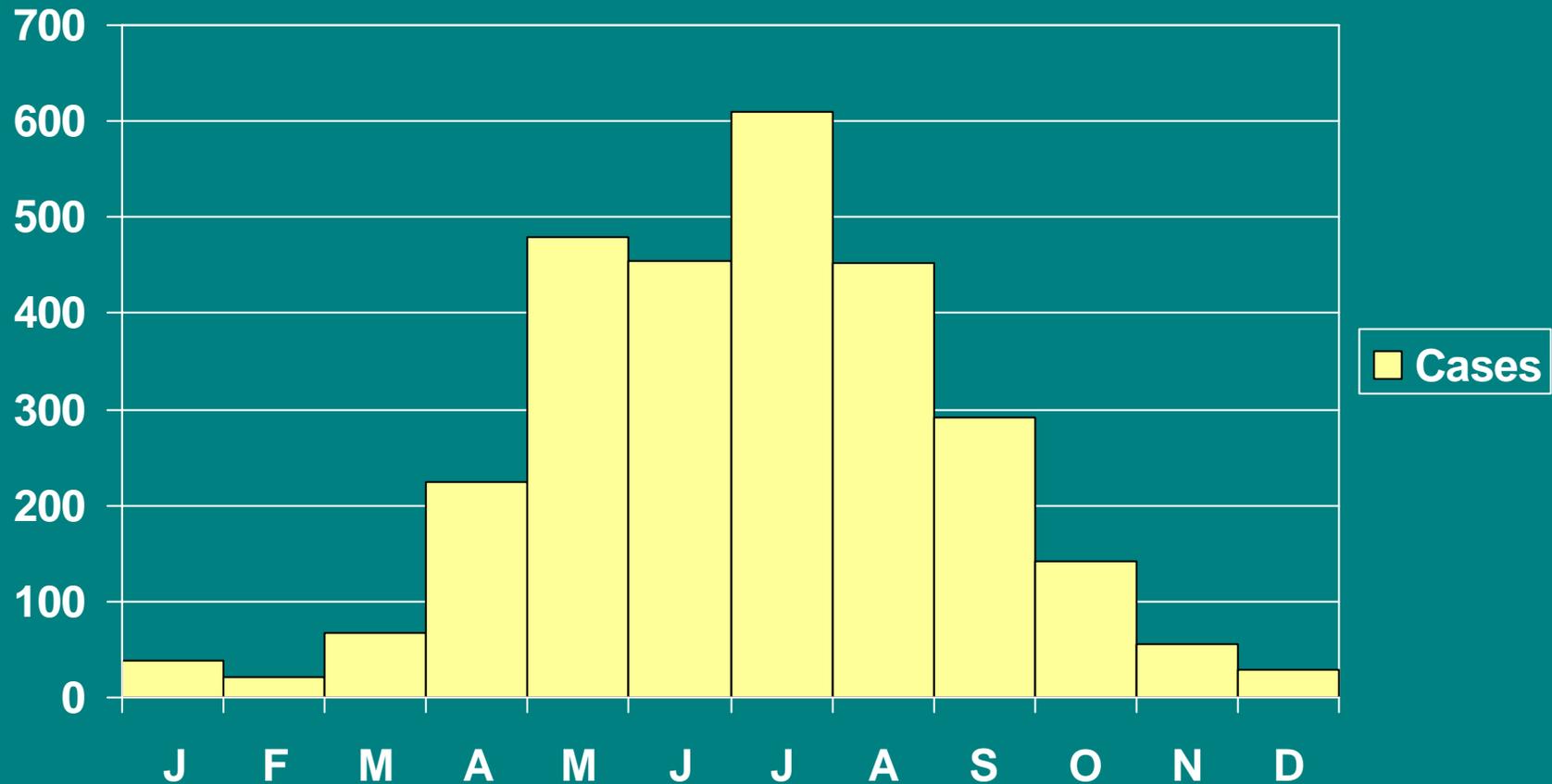
March 21, 2008 / 55(53);1-94



RMSF Incidence Rate per 100,000 population



Number of Reported RMSF Cases by Month of Illness Onset, NC, 2003-2007; n=2931



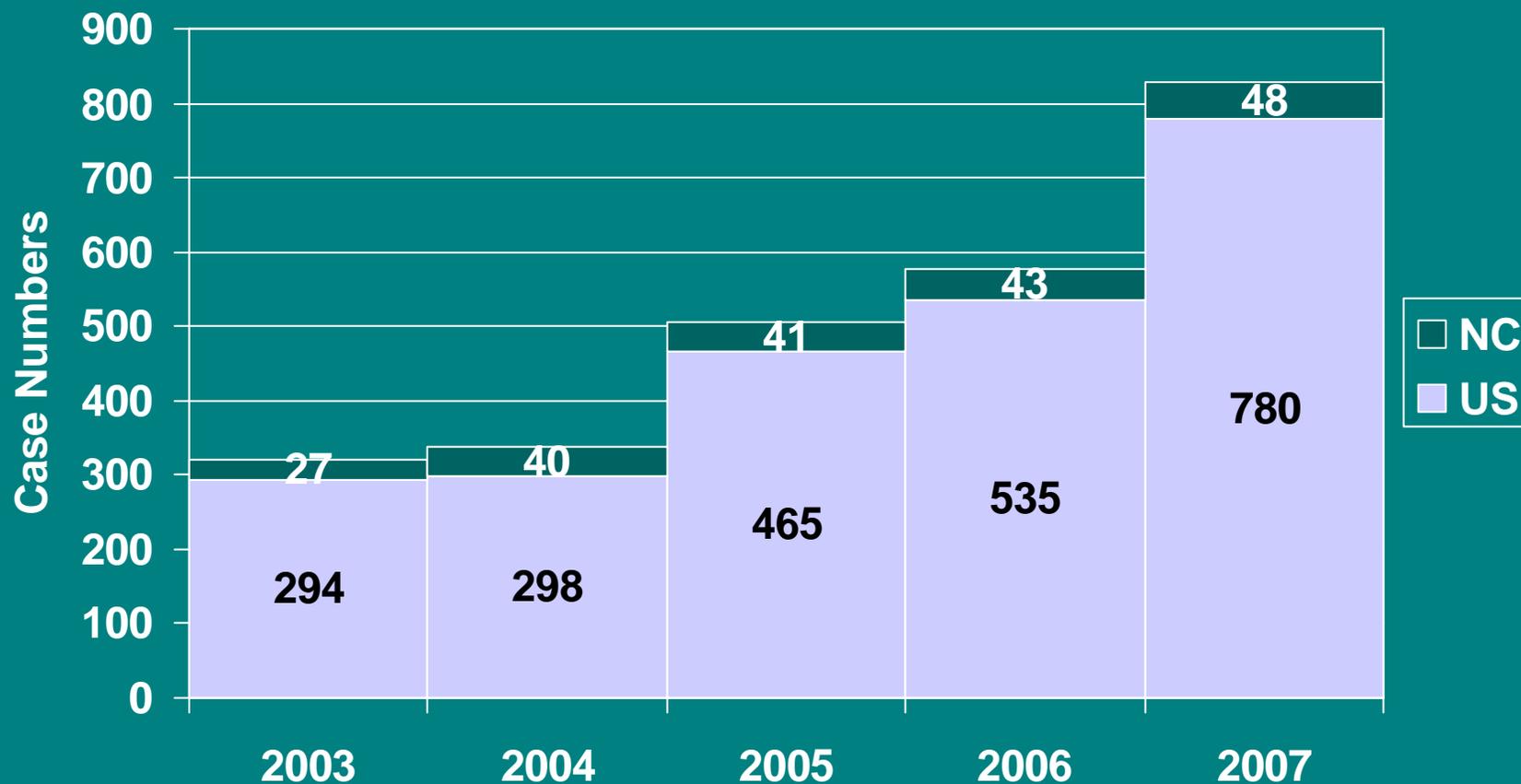
HME Background

Paddock CD, Childs JE. *Ehrlichia chaffeensis*: a prototypical emerging pathogen. Clin Microbiol Rev 2003; 16:37–64.

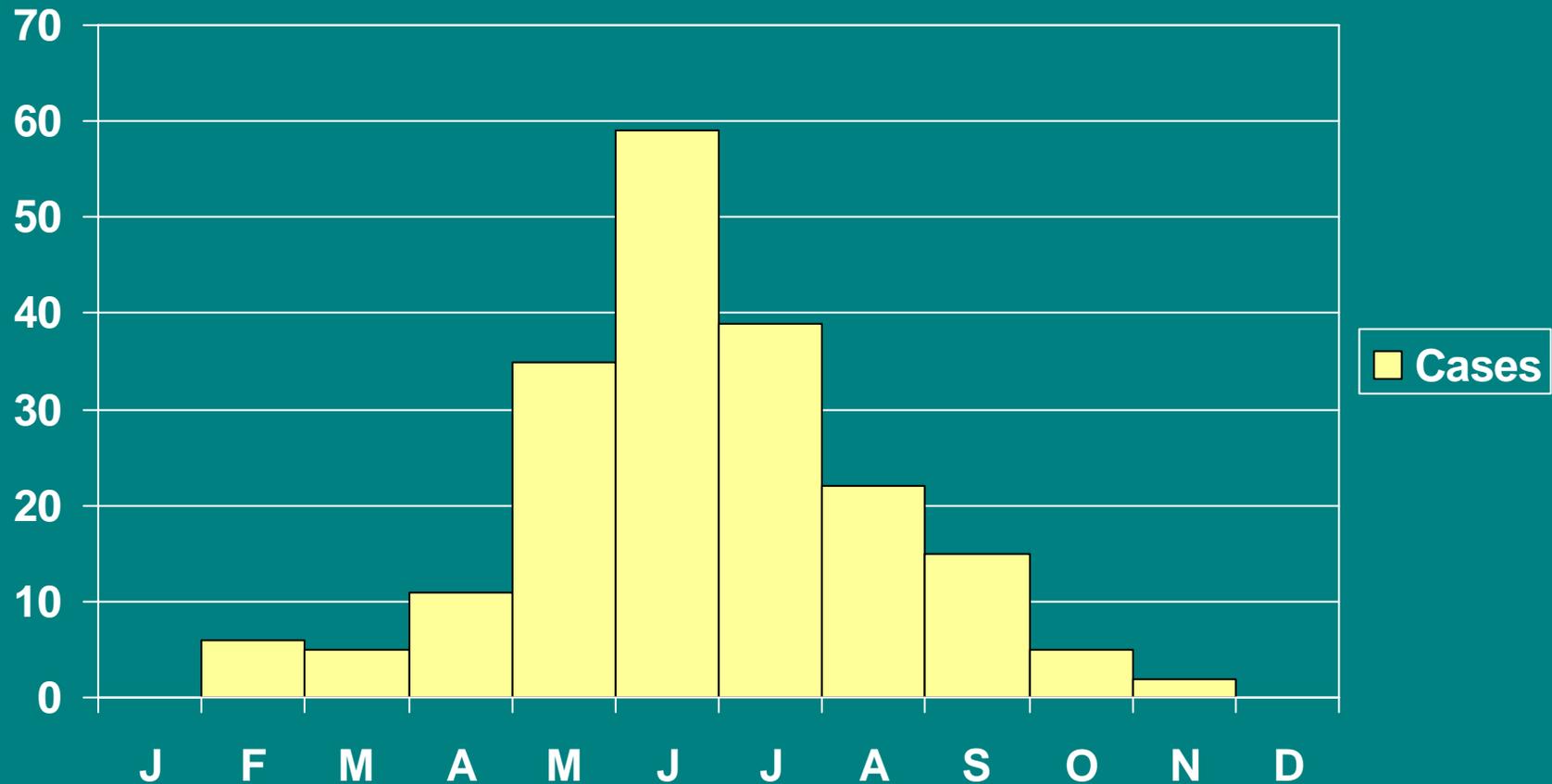
- Caused by *Ehrlichia chaffeensis*.
- *Amblyomma americanum* (the lone star tick) is the primary vector.



Human Monocytic Ehrlichiosis



Number of Reported HME Cases by Month of Illness Onset, NC, 2003-2007; n=199

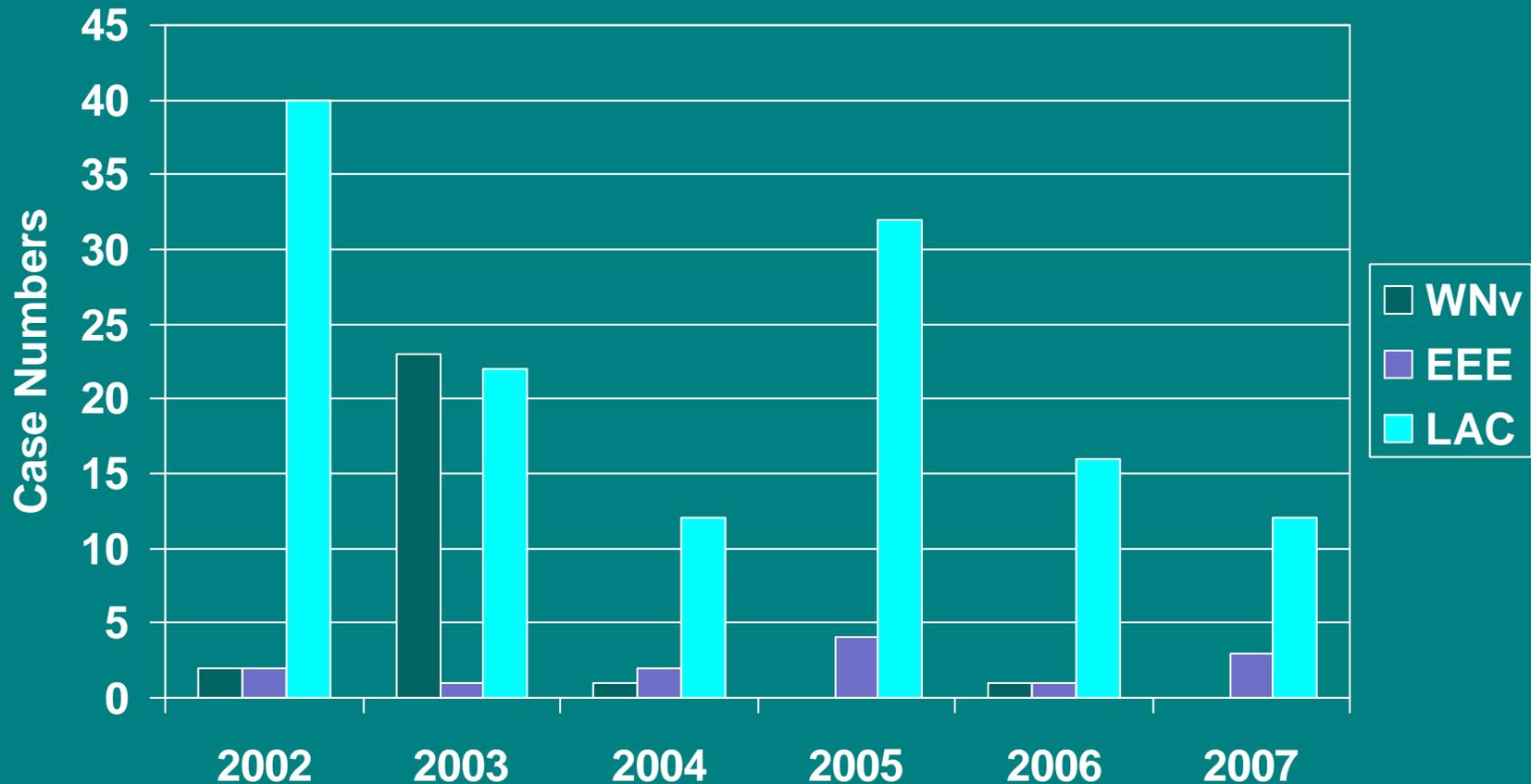


Mosquito Borne Diseases

- Mosquitoes can serve as vectors in the transmission of disease pathogens (notably viruses) between animals.
- The viruses that mosquitoes can carry are referred to as arboviruses (**ar**thropod **bo**rne **viruses**).
- Mosquitoes acquire virus from reservoir hosts (typically small mammals or birds) when the female takes a blood meal and then may transfer that virus to another animal at a later feeding.

Human Arboviral Cases, NC, 2002-2007

<http://www.deh.enr.state.nc.us/phpm/Data-Maps.htm>



What is being done to Mitigate Morbidity and Mortality of VBD?

- Vector Borne Disease Task Force
 - Meets quarterly to coordinate prevention, control, research, outreach and education
 - Members include
 - Advocacy groups
 - Citizens
 - Universities (UNC, NCSU)
 - State Agencies (DPH, DENR, WRC, NCDA)

What is being done to Mitigate Morbidity and Mortality of VBD?

- Outreach to Clinicians
 - Emphasize guideline based early treatment
 - IDSA and MMWR
 - Emphasize timely and appropriate diagnostics
- Outreach to general public
 - Press releases, posters, websites
 - Emphasize PPE and habitat modification
 - Proper tick removal, note date of bite
 - Seek medical attention if needed

Recommendation # 1

- Expand outreach campaign to the public about prevention of Vector-borne diseases in general and Tick-borne diseases specifically

Recommendation # 2

- Expand outreach to health care providers
 - Emphasize appropriate and timely treatment in accordance with guidelines
 - IDSA, AAN, MMWR
 - Emphasize appropriate diagnostics for surveillance
 - NOT at the expense of timely treatment

Recommendation # 3

- Differentiate STARI from LD
 - Expand UNC/CDC study ongoing in NC to learn more about STARI
- Better understanding of Spotted Fever Group Rickettsia
 - Other agents cross react with RMSF serology
 - Collaborate with CDC to develop reagents specific to each unique (potential) pathogen