Invasive Meningococcal Disease in Maricopa County Arizona 2000-2006

Natalia Wilson, MD, MPH

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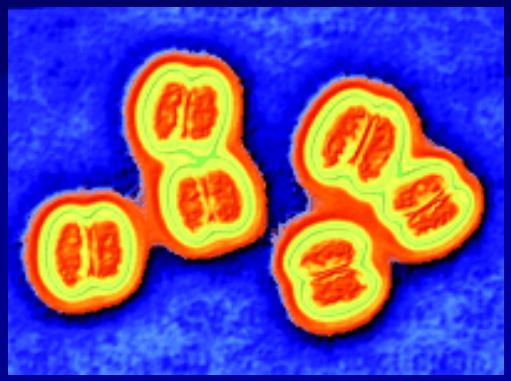
Overview of Disease

What is *Neisseria Meningitidis*?



- Gram negative diplococcus
- At least 13 known serogroups
- Most common A,B,C,Y, W-135
- Humans the only host

Photo: CMAJ Dec 6, 2005; 173(12). Available from http://www.cmaj.ca/cgi/content/full/173/12/1442
Baltimore, RS. Recent trends in meningococcal epidemiology and current vaccine recommendations. *Curr Opin Pediatr* 18:58-63.
CDC Division of Bacterial and Mycotic Diseases *Meningococcal Disease.* Available from http://www.cdc.gov/ncidod/DBMD/diseaseinfo/meningococcal_t.htm

Transmission

- Contact with large aerosol droplets
- Contact with respiratory tract secretions
  1. kissing
  2. sharing drinks, cigarettes
  3. mouth-to-mouth resuscitation
  4. intubation

Kimmel, SR. Prevention of Meningococcal Disease. *American Family Physician* 2005:72(10):2049-2056

High Risk Groups

- College freshmen living in dorms
- Military recruits
- Microbiologists routinely exposed to *N.meningitidis*
- Those with terminal complement component deficiencies
- Those with functional/anatomic asplenia
- Travelers to hyperendemic or epidemic area

Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* 2005;54(RR-7):1-21

Clinical Syndromes

Clinical syndromes include

1. Septicemia
2. Meningitis
3. Bacteremia
4. Pneumonia
5. Other includes septic arthritis, conjunctivitis, pericarditis

Baltimore, RS. Recent trends in meningococcal epidemiology and current vaccine recommendations. *Curr Opin Pediatr* 18:58-63

Epidemiology in the US

Background Epidemiology

- In US approximately 1400-2800 cases/yr
- Rate = 0.5-1.1/100,000 population
- CFR=10-14%
- Morbidity in survivors 11-19%

Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* 2005;54(RR-7):1-21

Gardner, P. Prevention of Meningococcal Disease. *N Engl J Med* 2006;355(14):1466-73

Seasonality

- Majority of cases in winter and early spring

Centers for Disease Control and Prevention. *Epidemiology & Prevention of Vaccine-Preventable Disease.* Atkinson W, Hamborsky J. Wolfe S, eds. 9th ed. Washington DC: Public Health Foundation, 2005.

Pichichero, ME. The new meningococcal conjugate vaccine. *Postgraduate Medicine* 2006;119(1). Available from http://postgradmed.com/issues/2006/06/047/

Sharip,A, et.al. Population-Based Analysis of Meningococcal Disease Mortality in the United States 1990-2002. *Pediatr Infect Dis J* 2006;25:191-194.

Distribution by Serogroup

- B, C, Y each cause about 1/3rd of cases
- In infants ≥ 50% caused by B
- In ≥ 11 years of age, 75% caused by C,Y,W-135
- In elderly, Y higher
- Cases caused by A rare in US

Baltimore, RS. Recent trends in meningococcal epidemiology and current vaccine recommendations. *Curr Opin Pediatr* 18:58-63.

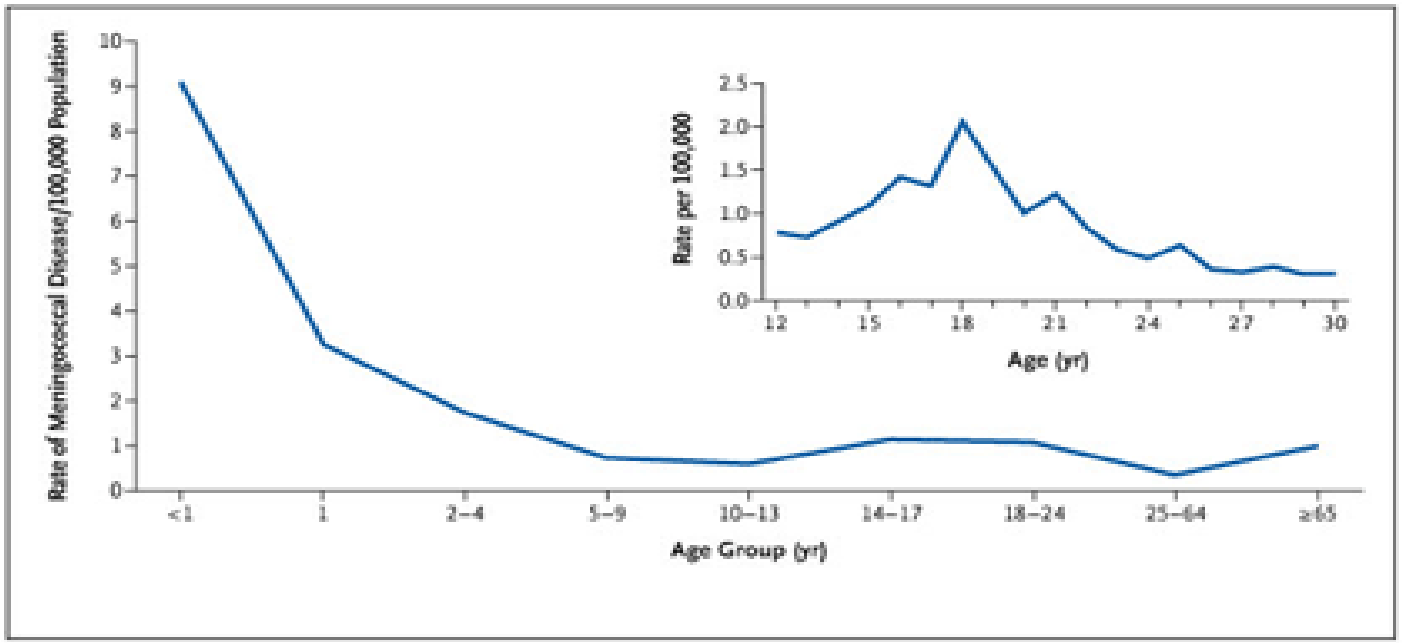
Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005;54(RR-7).

Gardner, P. Prevention of Meningococcal Disease. *N Engl J Med* 2006; 355(14):1466-73

Distribution by Age

- Rate of Meningococcal Disease by age - US, 1991-2002

  Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005;54(No.RR-7)



Distribution by Race/Ethnicity

- Blacks at higher risk

Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005;54(RR-7).

Distribution by Gender

- Males account for 51-55%

Gondim, FAA. *Meningococcal Meningitis*. Available from http://www.emedicine.com/neuro/topic210.htm

O'Brien, JA, Caro JJ, Getsios, D. Managing Meningococcal Disease in the United States: Hospital Case Characteristics and Costs by Age. *Value In Health* 2006;9(4):236-243

Distribution by Syndrome

- Meningitis* more common than bacteremia alone

*Meningitis=meningitis with or without meningococcemia

Centers for Disease Control and Prevention. 2006. *Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network Neisseria meningitidis, 2000-2005-provisional.* Available from http://www.cdc.gov/ncidod/dbmd/abcs/survreports

Kaplan, SL, et.al. Multicenter Surveillance of Invasive Meningococcal Infections in Children. *Pediatrics* 2006;118(4):e979-e984.

O'Brien, JA, Caro JJ, Getsios, D. Managing Meningococcal Disease in the United States: Hospital Case Characteristics and Costs by Age. *Value In Health* 2006;9(4):236-243

Surveillance

Surveillance in US

- Nationally by National Electronic Telecommunications System for Surveillance (NETSS) and CDC's Emerging Infection Program's Active Bacterial Core surveillance (ABCs)
- State and county levels

Centers for Disease Control & Prevention (2006). *Meningococcal Disease.* Available from http://www.cdc.gov/ncidod/DBMD/diseaseinfo/meningococcal_t.htm

Reporting Requirements in Arizona

- Health care providers
  - submit communicable disease report within 24 hours for a case or suspect case
- Laboratories
  - submit a report within 24 hours after a positive test result to AZ Department of Health Services
  - isolates must be sent to AZ State Lab

Arizona Department of Health Services (2006). Division of Public Health Services Office of Infectious Disease Services. *Communicable Disease Reporting*. Available from http://www.azdhs.gov/phs/oids/rptllist.htm

Prevention

- Vaccination
- Prophylaxis

Vaccination

- 2 vaccines
  - Meningococcal polysaccharide vaccine (MPSV4 or Menomune)
  - Meningococcal conjugate vaccine (MCV4 or Menactra)
- Antigens to A,C,Y,W-135
- No B coverage

Gardner, P. Prevention of Meningococcal Disease. *N Engl J Med* 2006; 355(14):1466-73

Meningococcal Polysaccharide Vaccine

- Licensed in 1981 for age ≥ 2 years
- Limitations
  - Short duration of protection
  - Booster may lead to diminished antibody response
  - Does not prevent carrier state
  - Does not elicit herd immunity

Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005;54(RR-7).

Gardner, P. Prevention of Meningococcal Disease. *N Engl J Med* 2006; 355(14):1466-73

Meningococcal Conjugate Vaccine

- Licensed in 2005 for ages 11-55
- Advantages
  - Longer-term protection
  - Booster leads to rise in antibodies
- Assumed advantages
  - Reduction of carrier state
  - Herd immunity
- Limitation
  - Not approved for younger ages

Gardner, P. Prevention of Meningococcal Disease. *N Engl J Med* 2006; 355(14):1466-73
Pichichero, ME. The new meningococcal conjugate vaccine. *Postgraduate Medicine* 2006;119(1). Available from http://postgradmed.com/isues/2006/06/047/

Current Recommendations for Vaccination (revised Aug 2007)

- ACIP of CDC recommends routine immunizations with conjugate vaccine for
  - All 11-18 year olds
  - 19-55 year olds at ↑risk for IMD

CDC. Revised Recommendations of the Advisory Committee on Immunization Practices to Vaccinate All Persons Aged 11--19 Years with Meningococcal Conjugate Vaccine. MMWR Weekly. 2007;56(31):794-95

Prophylaxis

- Close contacts to receive prophylaxis
- School mates and co-workers typically not included
- Ideal within 24°

Centers for Disease Prevention and Control. Prevention and Control of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2005;54(RR-7).

Gardner, P. Prevention of Meningococcal Disease. *N Engl J Med* 2006; 355(14):1466-73

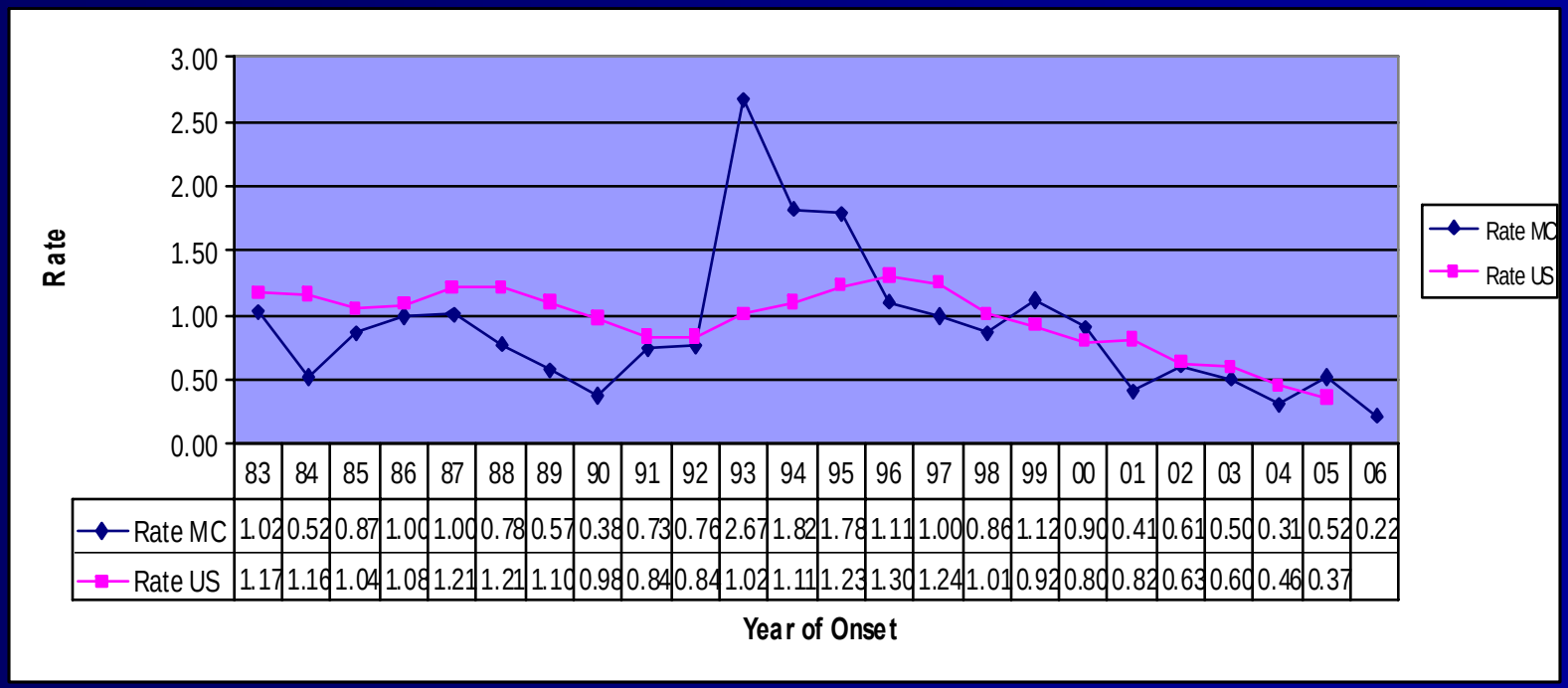
Epidemiologic Trends in Maricopa County Arizona 2000-2006

Table 1: Invasive Meningococcal Disease in Maricopa County 2000-2006*

	Year							
	2000	2001	2002	2003	2004	2005	2006	Total
# of Cases	28	13	20	17	11	19	5	113
Incidence Rate	0.90	0.41	0.61	0.50	0.31	0.52	0.22¤	
# of Deaths	3	0	5	1	0	1	2	12
Case Fatality Rate	11%	0%	25%	6%	0%	5%	40%	11%

Year 2006 through 6/30/2006
Rates per 100,000 population US Census estimates
¤Annualized as of 6/30/2006

Figure 1: Invasive Meningococcal Disease in the US and Maricopa County, Incidence Rates by Year, 1983-2006*



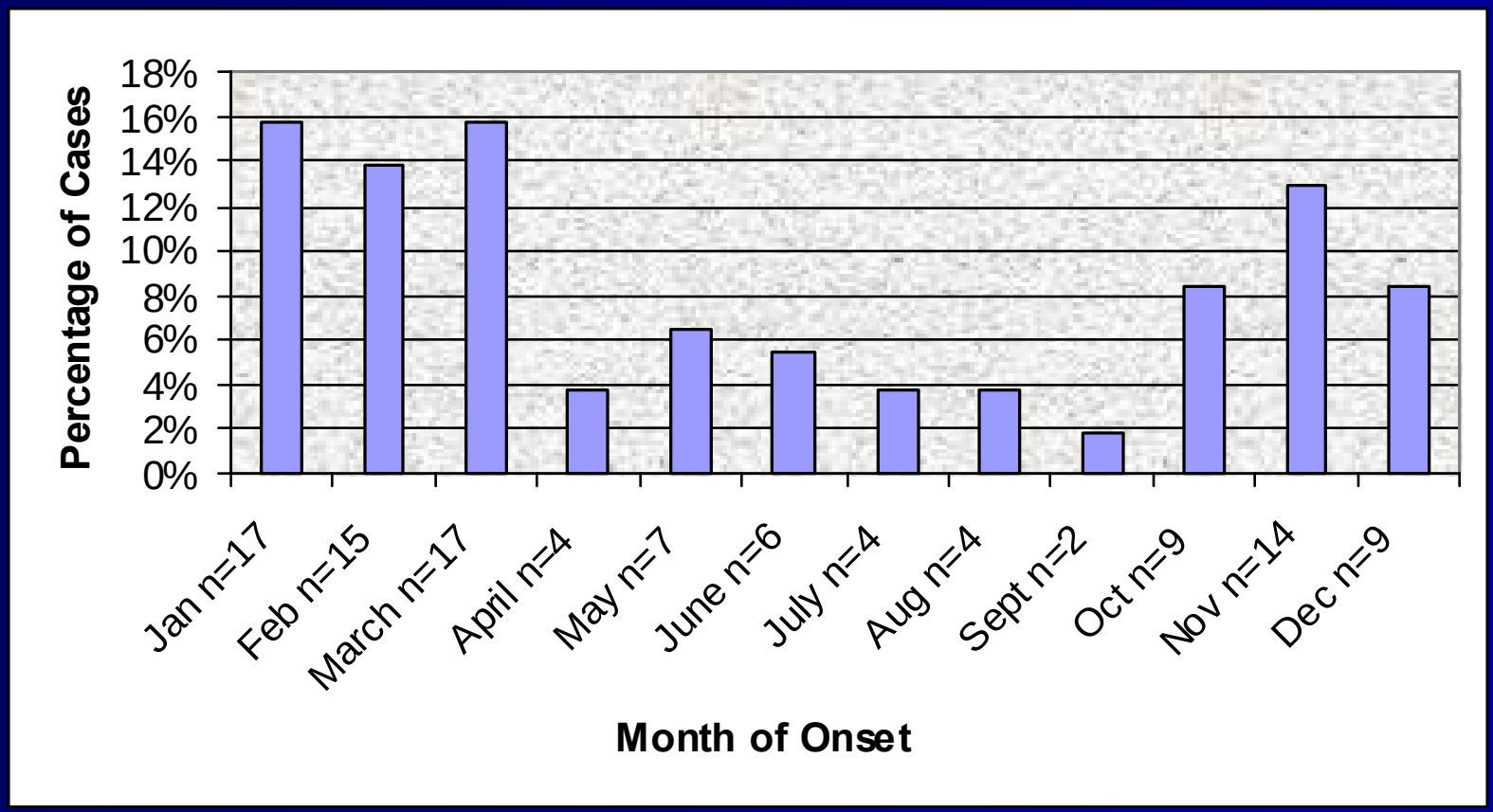
	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Rate MC	1.02	0.52	0.87	1.00	1.00	0.78	0.57	0.38	0.73	0.76	2.67	1.82	1.78	1.11	1.00	0.86	1.12	0.90	0.41	0.61	0.50	0.31	0.52	0.22
Rate US	1.17	1.16	1.04	1.08	1.21	1.21	1.10	0.98	0.84	0.84	1.02	1.11	1.23	1.30	1.24	1.01	0.92	0.80	0.82	0.63	0.60	0.46	0.37	

*Year 2006 annualized as of 6/30/2006

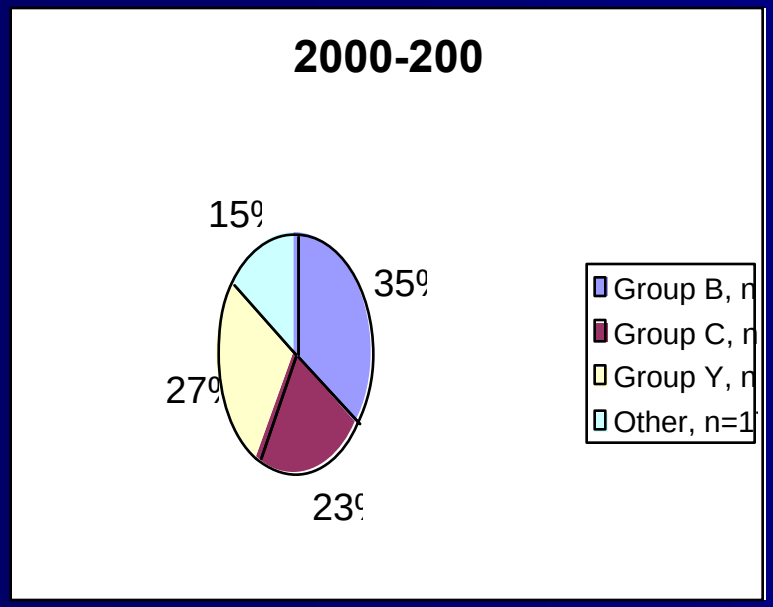
Rates per 100,000 population US Census estimates

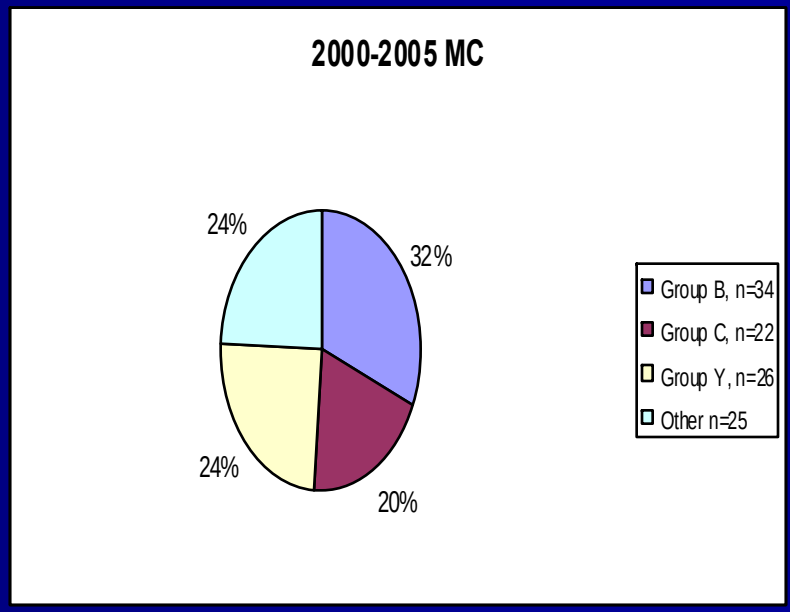
Raw numbers for US rate calculation obtained from CDC. Summary of Notifiable Diseases, US, 2000-2004. *MMWR* 2000;49(53); *MMWR* 2001;50(53);*MMWR* 2002;51(53);*MMWR* 2003;52(54);*MMWR* 2004;53(53)2004 & CDC. Notifiable Diseases/Deaths in Selected Cities Weekly Information. *MMWR* 2006;54(52);1320-1330.

Figure 2: Invasive Meningococcal Disease in Maricopa County, Percentage Distribution by Month of Onset, 2000-2005



Figures 3a & 3b: Invasive Meningococcal Disease in the US and Maricopa County, Percentage Distribution by Serogroup, 2000-2005



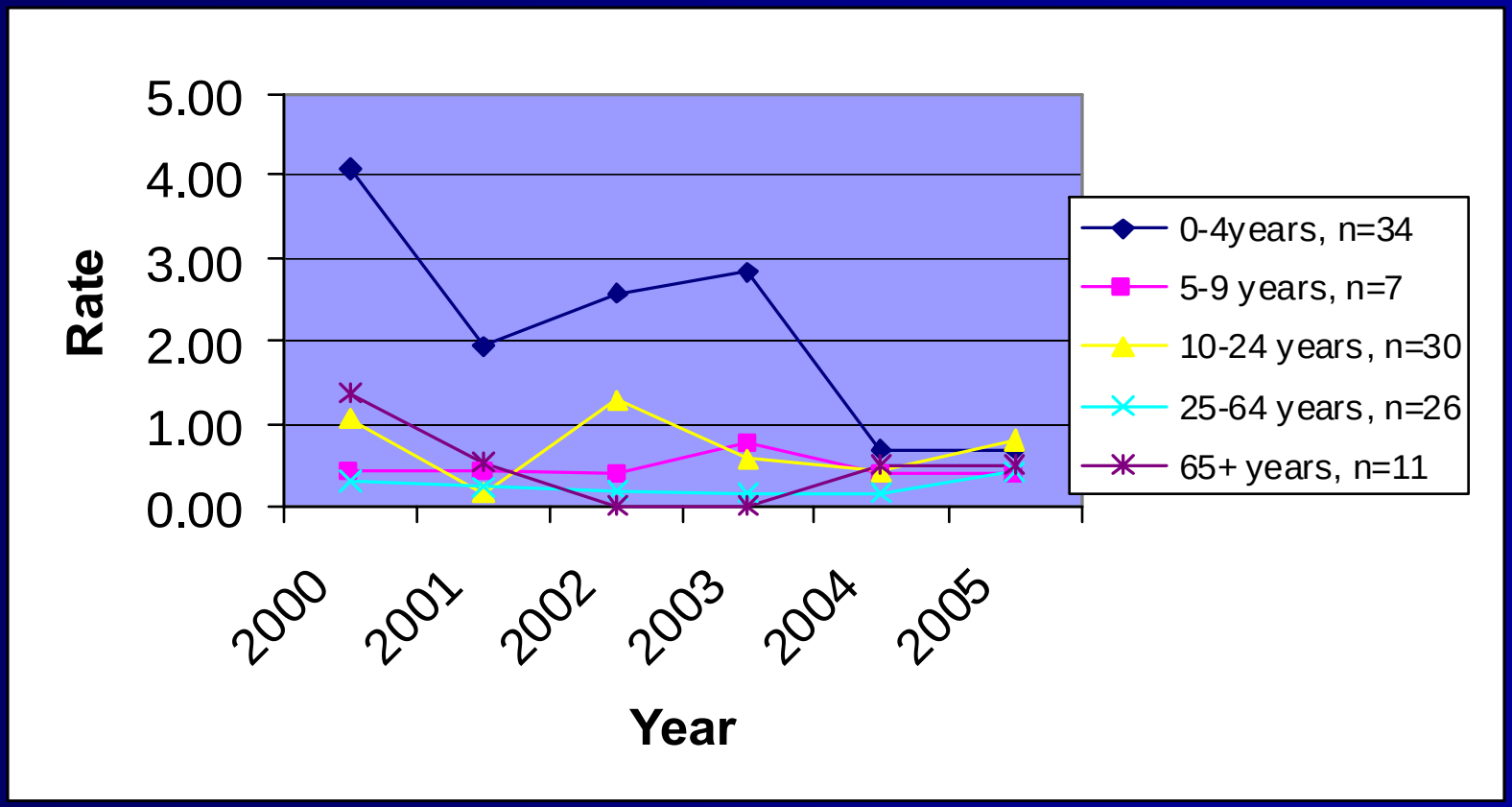


US data per Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network *Neisseria meningitidis,* 2000-2005, excluding Oregon

Unknowns diistributed among knowns

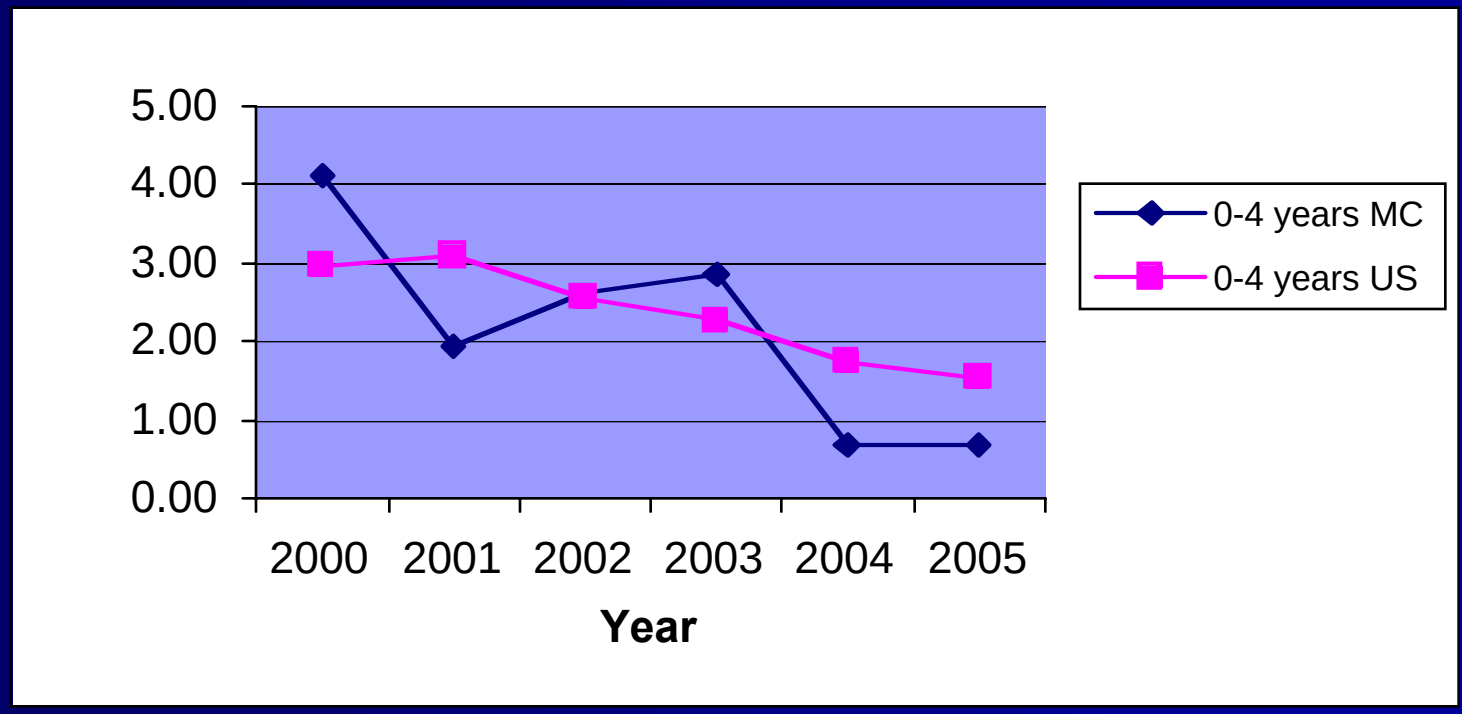
Other=Serogroup W-135 & Not Groupables

Figure 4: Invasive Meningococcal Disease in Maricopa County, Incidence Rates by Age Group and Year



Rates per 100,000 US Census population estimates

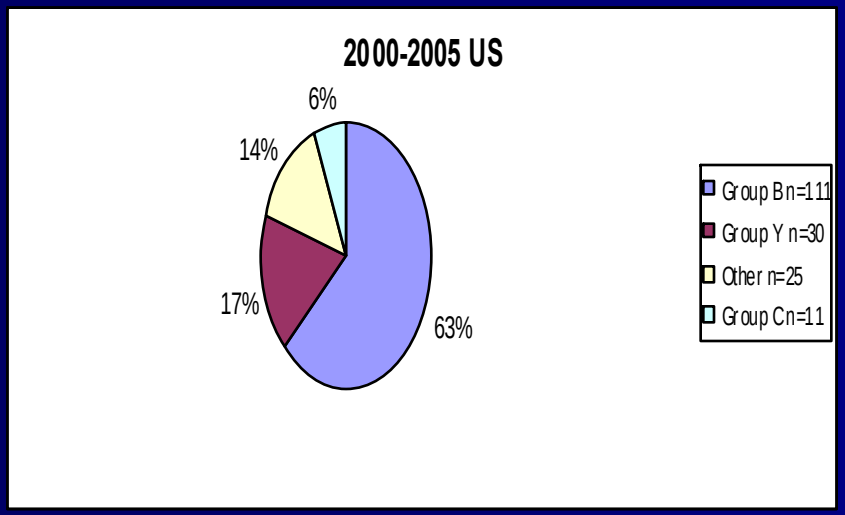
Figure 5: Invasive Meningococcal Disease in US and Maricopa County, Incidence Rates for Age 0-4 by Year

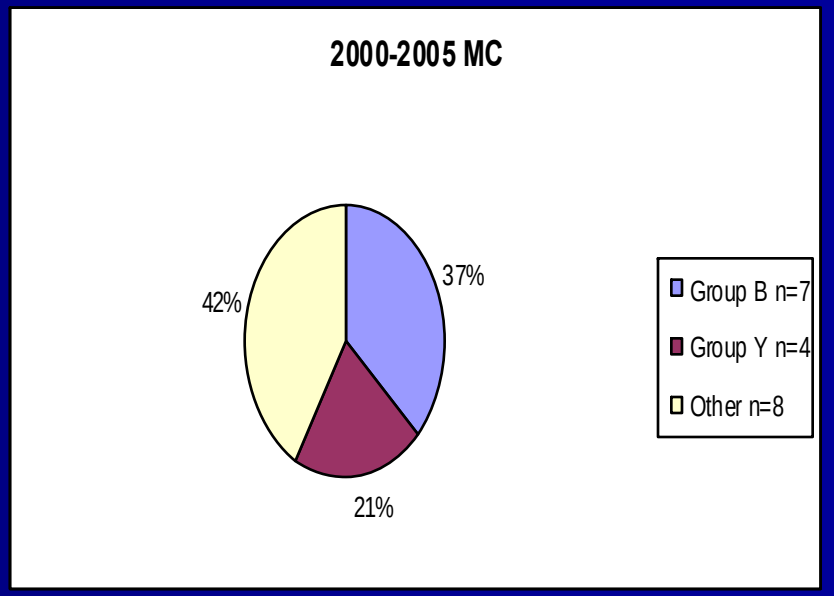


Rates per 100,000 US Census population estimates.

Raw numbers for US rate calculation obtained from CDC. Summary of Notifiable Diseases, US, 2000-2004. *MMWR* 2000;49(53); *MMWR* 2001;50(53); *MMWR* 2002;51(53); *MMWR* 2003;52(54); *MMWR* 2004;53(53) 2004; *MMWR* 2005;54(53)

Figure 6a & 6b: Invasive Meningococcal Disease in the US & Maricopa County, Percentage Distribution for Age < 1 year by Serogroup for Years 2000-2005





US data per Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network *Neisseria meningitidis,* 2000-2005-*provisional*

Unknowns distributed among knowns

Other=W-135 & Not Groupables

Figure 7: Invasive Meningococcal Disease in Maricopa County, Distribution of Cases for Age < 1 year by Serogroup and Year

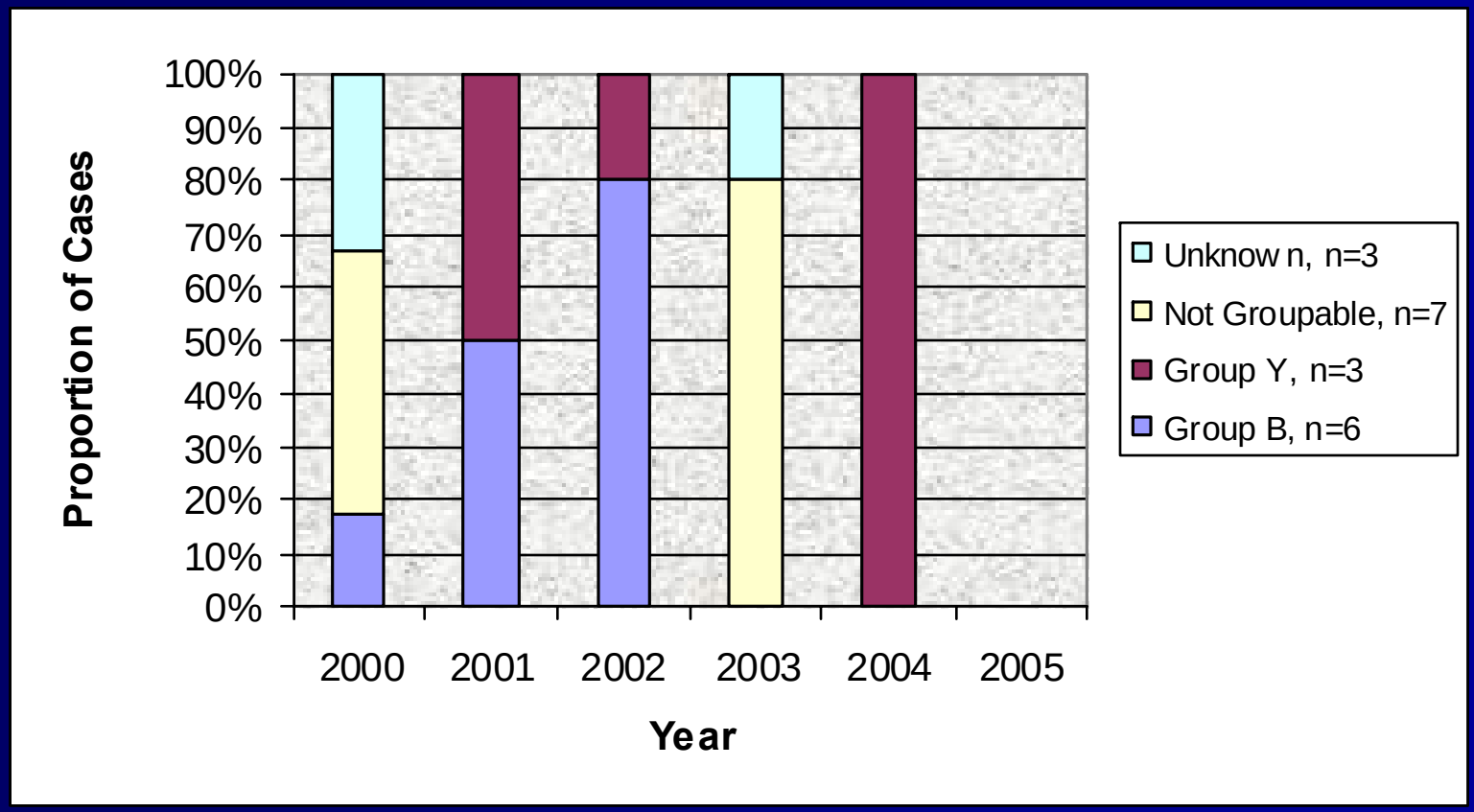


Figure 8: Invasive Meningococcal Disease in Maricopa County, Distribution of Cases by Age & Serogroup for Years 2000-2005

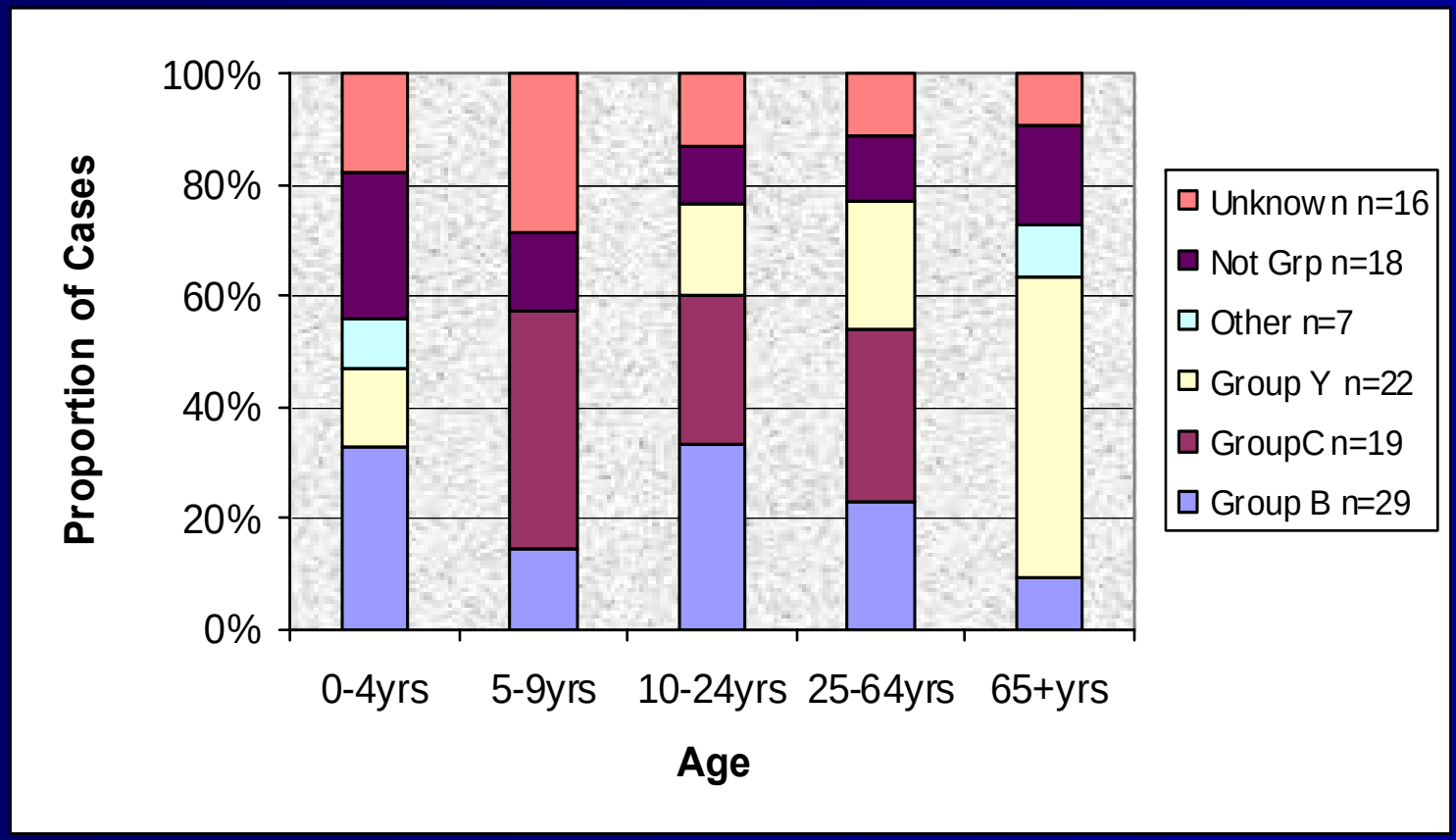
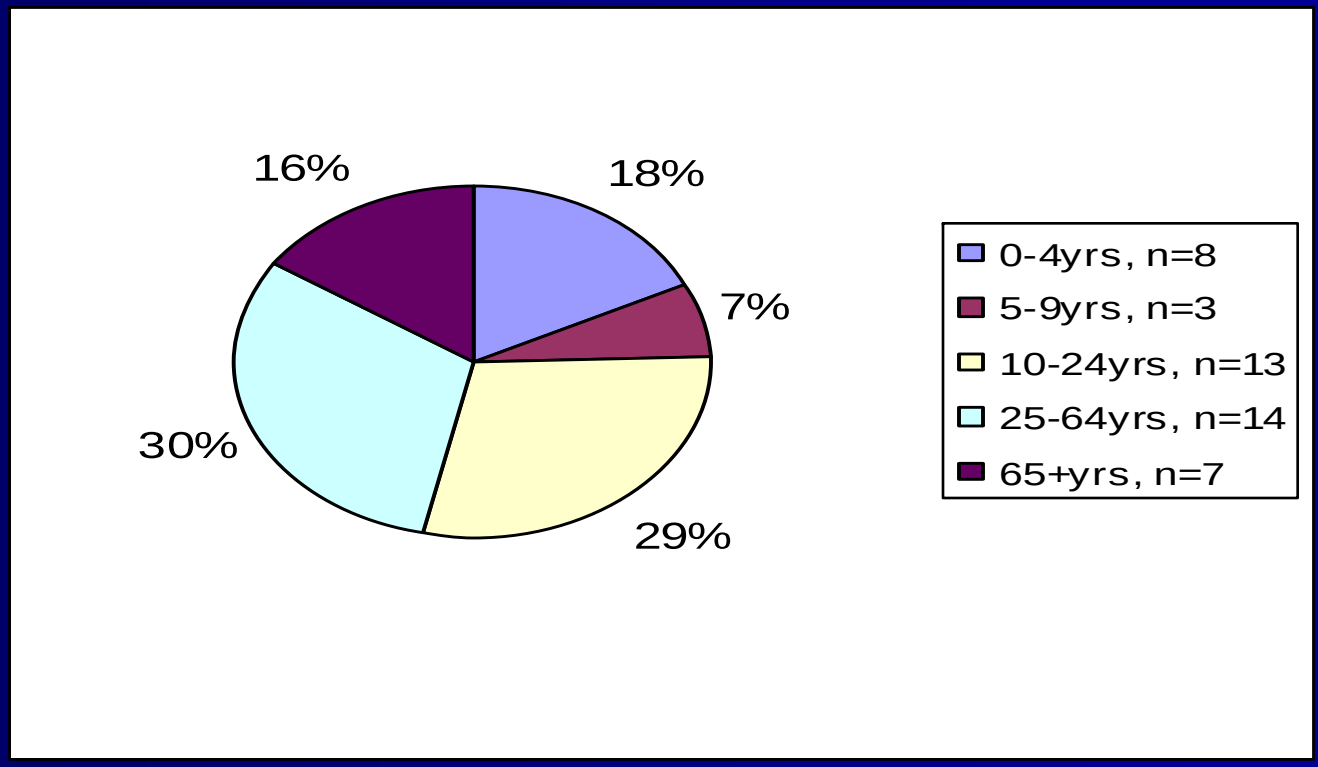
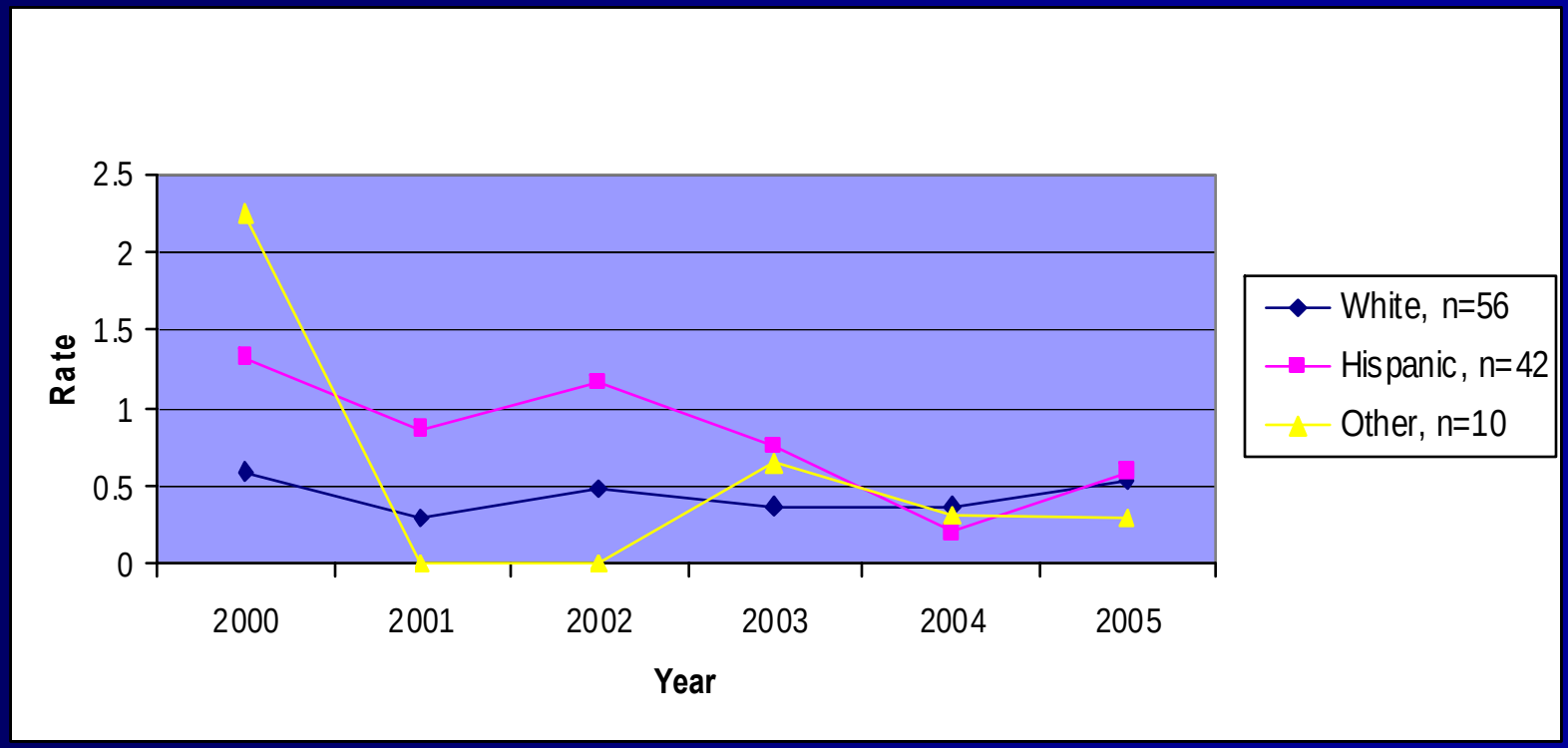


Figure 9: Vaccine-Preventable* Invasive Meningococcal Disease in Maricopa County by Age Group for Years 2000-2005



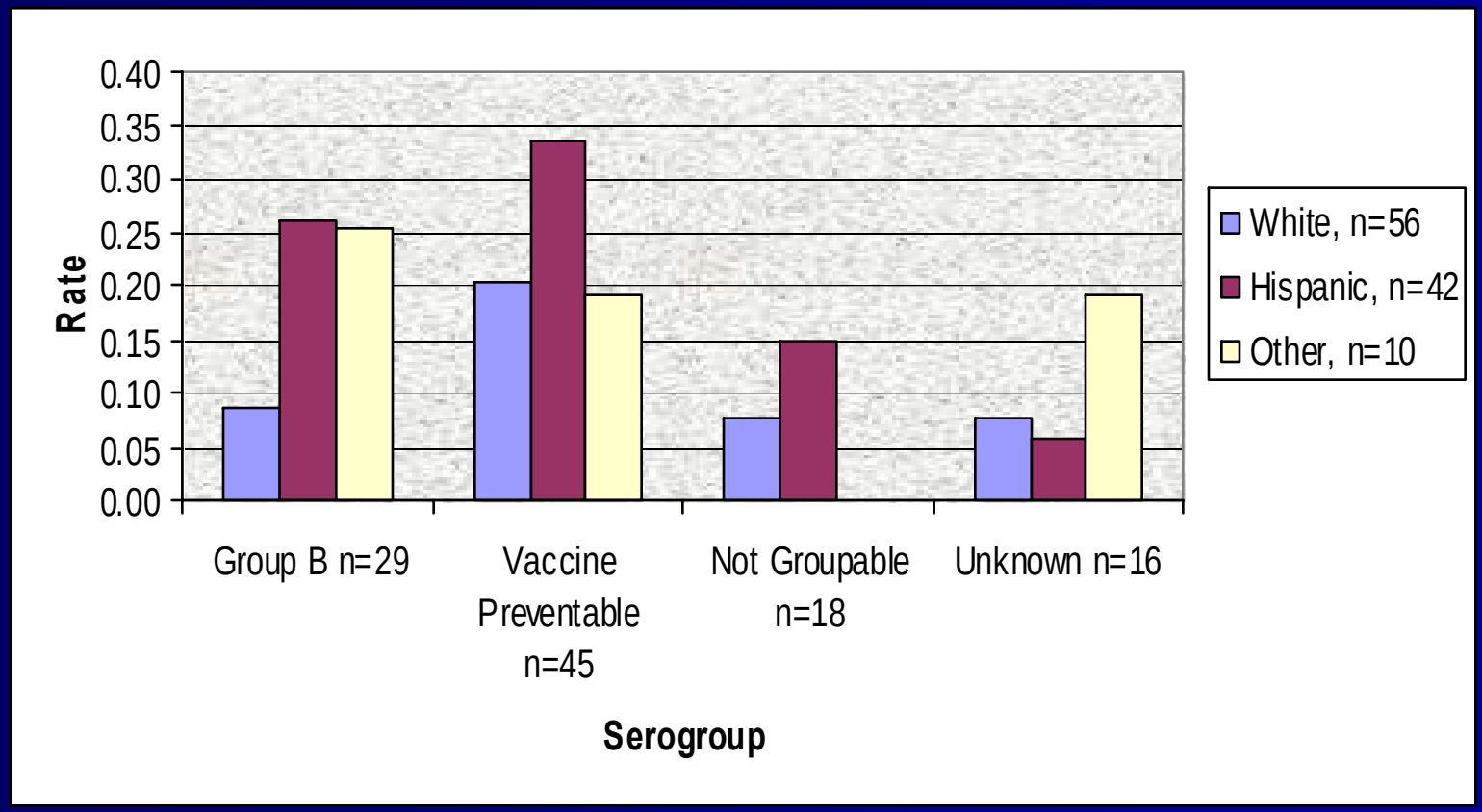
*Vaccine Preventable=A,C,Y,W-135

Figure 10: Invasive Meningococcal Disease in Maricopa County, Incidence Rates by Race/Ethnicity and Year



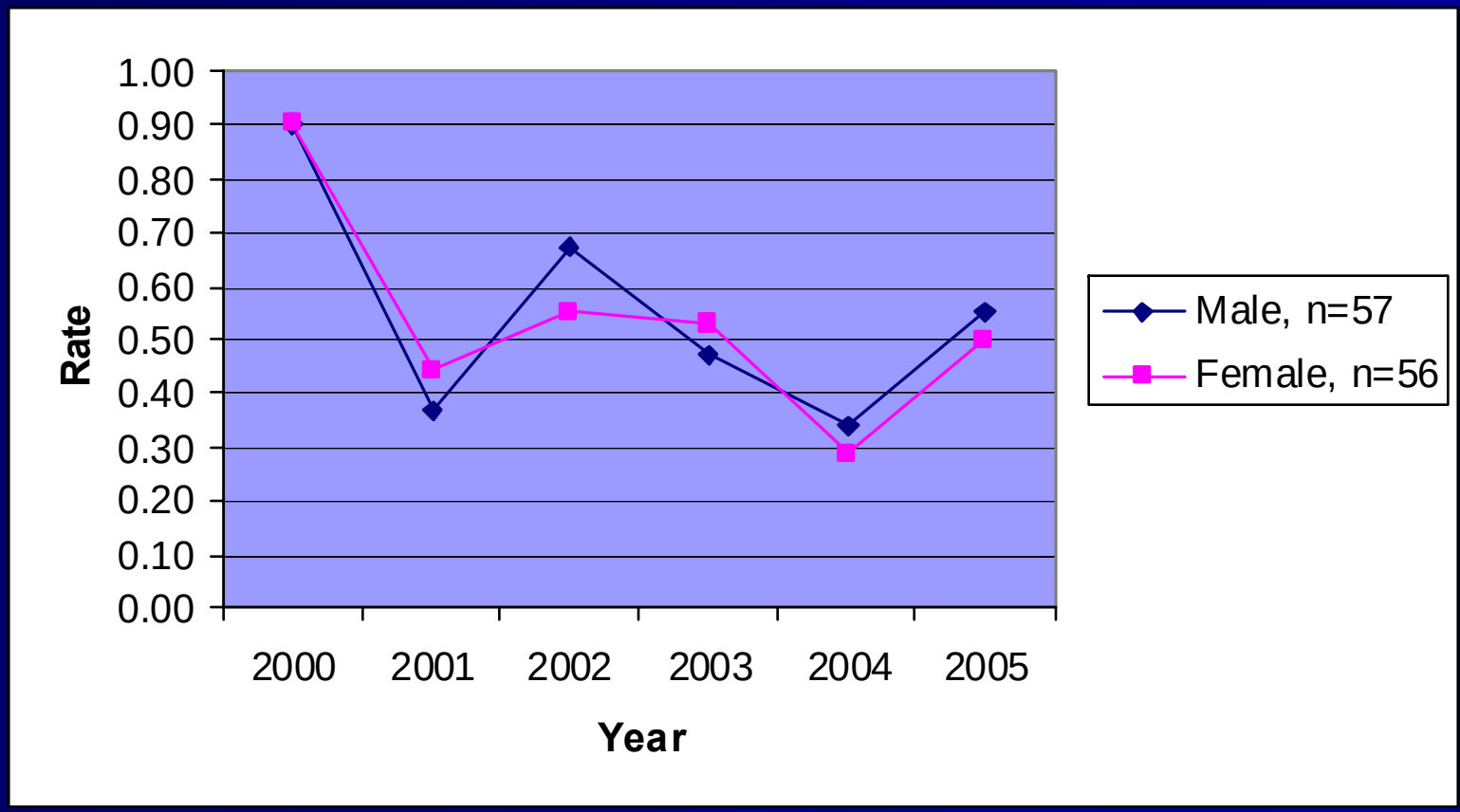
Rates per 100,000 US Census population estimates
Other includes Black, American Indian/Alaskan Native, Asian/Pacific Islander

Figure 11: Invasive Meningococcal Disease in Maricopa County, Rates by Race/Ethnicity and Serogroup for Years 2000-2005



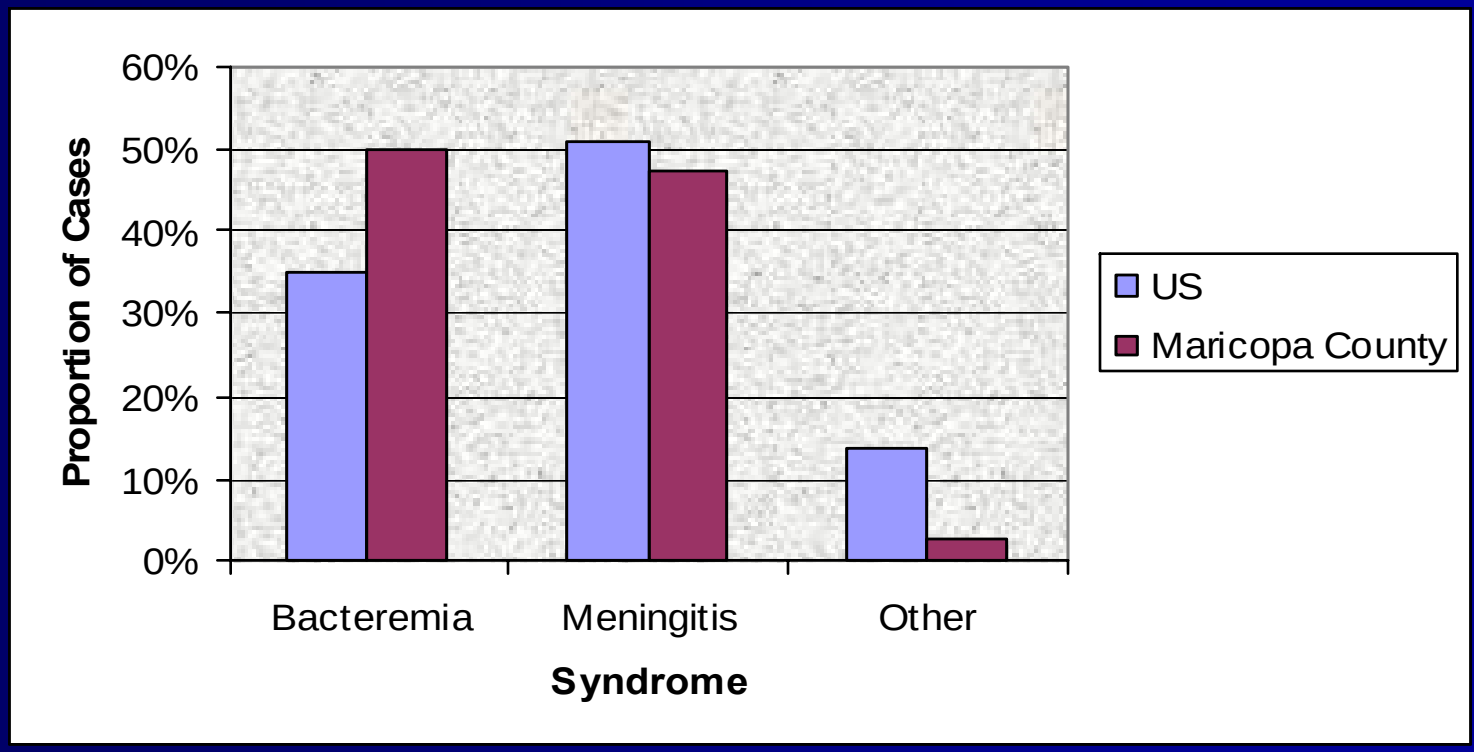
Rates per 100,000 US population estimates
Other includes Black, Native American/Alaskan Native, Asian/Pacific Islander

Figure 12: Invasive Meningococcal Disease in Maricopa County, Incidence Rates by Gender and Year



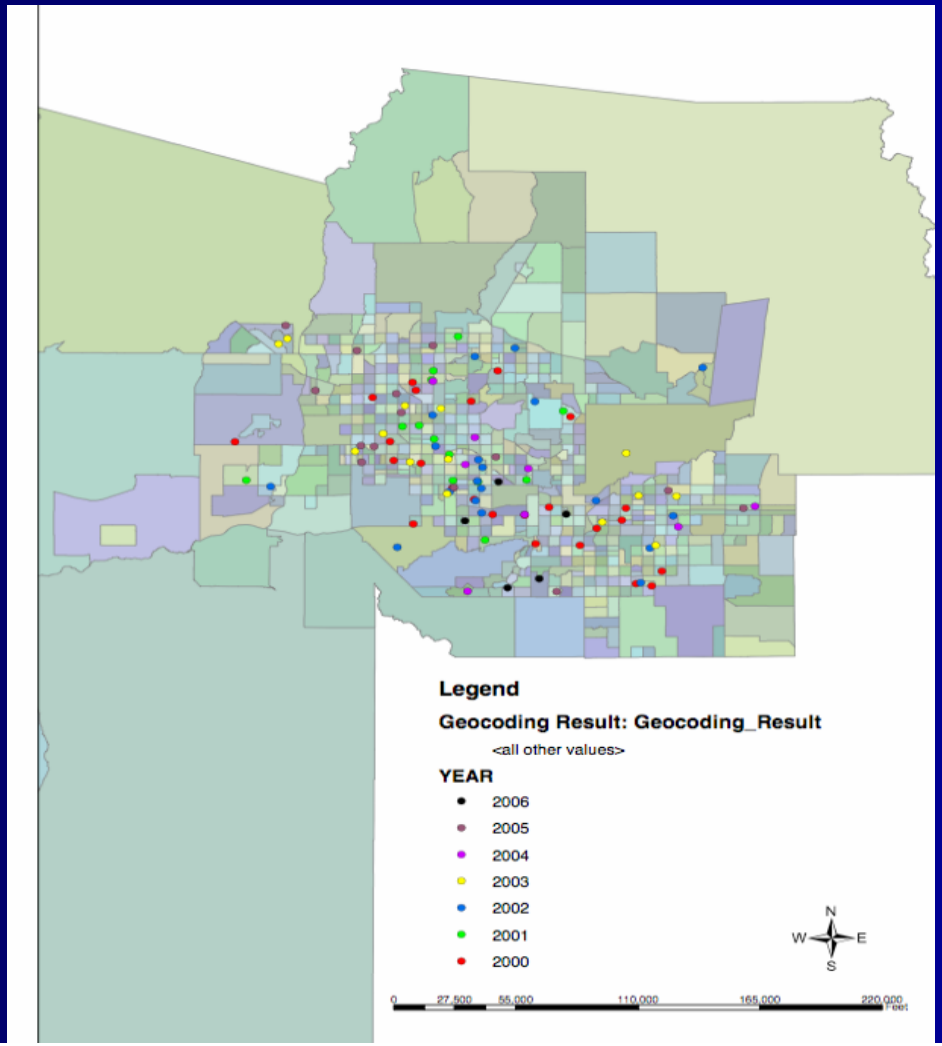
Rates per 100,000 US Census population estimates

Figure 13: Invasive Meningococcal Disease in the US and Maricopa County, Distribution of Cases by Syndrome for Years 2000-2005



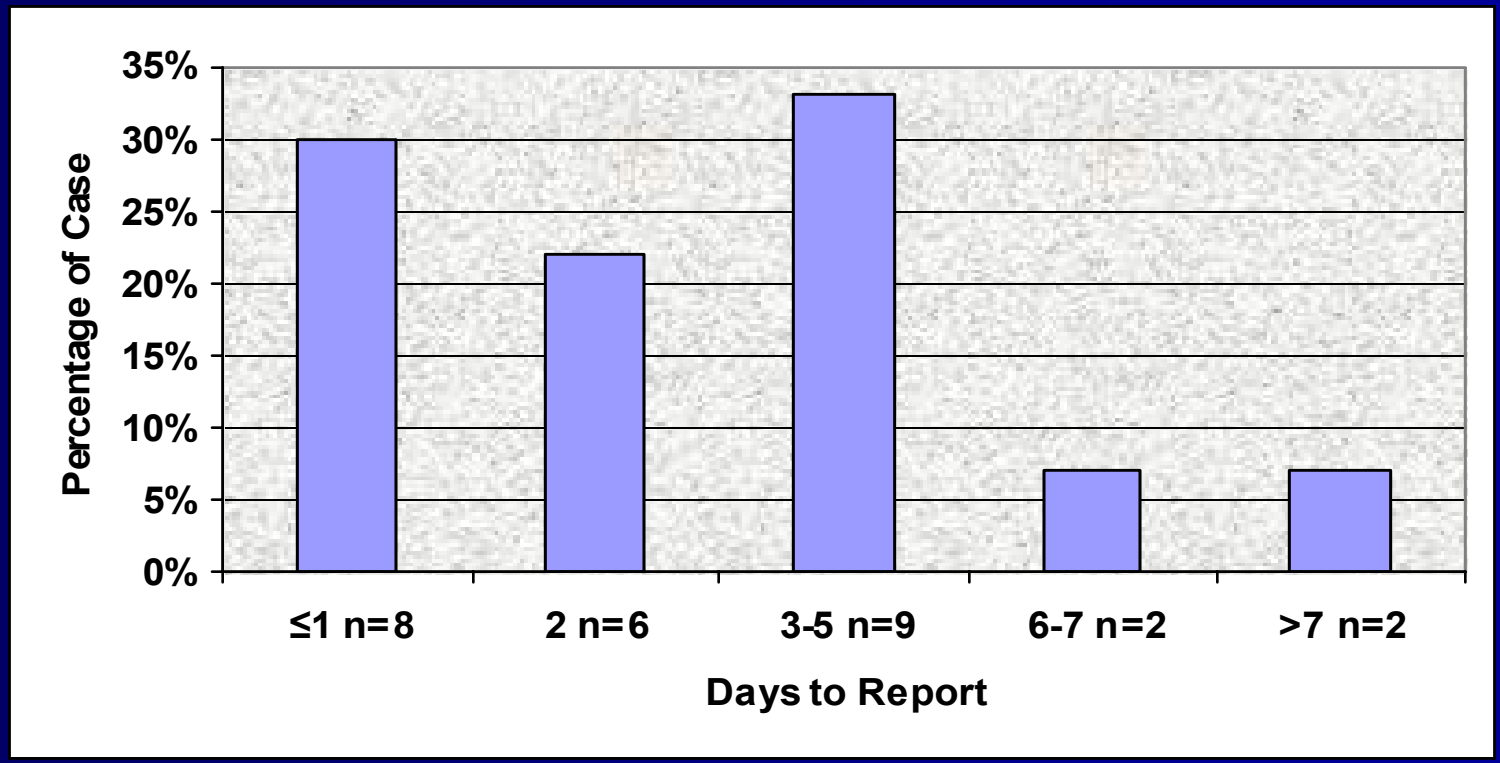
US data per Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network *Neisseria meningitidis,* 2000-2005
Meningitis=meningitis +/-meningococcemia

Map 1: Invasive Meningococcal Disease in Maricopa County, Geocoded by Census Tracts for Years 2000-2006



Reporting & Investigation

Figure 14: Distribution of Cases* by Reporting Time to Maricopa County Department of Public Health, 1/1/2005-6/30/2006



Case=confirmed & probable, Maricopa County or out of state

Conclusions

- This study provides baseline epidemiologic trends of Invasive Meningococcal Disease in Maricopa County (MC)
- Trends of particular interest
  - Lower proportion of Serogroup B cases
  - Higher proportion of Not Groupable cases
  - Declining rate in 0-4 year old population
  - Higher proportion of Bacteremia alone cases
  - Sizeable proportion of Vaccine-Preventable disease

Conclusions

- Subsequent studies can
  - re-evaluate these apparent trends
  - assess the effect of routine meningococcal vaccination in MC
- Timeliness of reporting to Maricopa County Department of Public Health warrants further study