

# Recent Trends in Incidence and Demographics of Pediatric Meningococcal Disease in the United States

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## BACKGROUND

- An estimated 1,400 to 3,000 people in the United States (US) develop meningococcal disease (MD) each year (O'Brien et al., 2006)
- While most cases of MD are sporadic, outbreaks do occur, especially in young children and persons living in close quarters (e.g., first-year college students), making the disease a significant public health concern
- Even when treated with antibiotics, 10% to 15% of individuals who develop MD die, while 10% to 20% of survivors suffer serious, potentially debilitating complications such as hearing loss, brain damage, seizure, and stroke
- MD is always life threatening and requires immediate hospitalization
- Limited data are available on incidence and demographic trends in MD since the 2005 introduction of the meningococcal conjugate vaccine

## OBJECTIVE

- To estimate annual incidence and demographic characteristics of MD in the US pediatric population from 2000 to 2009

## METHODS

### Study Design

- Retrospective database analysis

### Data Source

- Discharge data from the 2000, 2003, 2006, and 2009 Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID)
  - Is the largest all-payer pediatric (aged ≤ 20 years) inpatient care database in the US
  - Includes many clinical and nonclinical variables for each inpatient stay, including patient demographics, diagnosis codes, length of stay, total charges, admission and discharge status, payer, and hospital-specific characteristics
  - Uses sampling weights to generate nationally representative estimates

### Inclusion Criteria

- Inpatient discharges containing a diagnosis code (primary or nonprimary) for MD (ICD-9-CM codes in the range of 036.xx)
- Aged ≤ 20 years

### Study Measures and Analytical Methods

- Weighted estimates of the annual number of pediatric hospitalizations related to MD
- Annual MD incidence per 100,000 children (adjusted to 2010 US population) estimated using KID sampling weights and year-specific pediatric population denominators from US census data
- Characteristics of MD-related hospitalizations
- Descriptive analyses using SAS® (Version 9.3) statistical software

## RESULTS

### Incidence

- Total cases of MD (inpatient admissions) in the US decreased by 63% from 2000 to 2009 (Table 1):
  - 1,684 in 2000 (1.9 per 100,000 US pediatric population)
  - 1,100 in 2003 (1.2 per 100,000 US pediatric population)
  - 749 in 2006 (0.8 per 100,000 US pediatric population)
  - 587 in 2009 (0.65 per 100,000 US pediatric population)
- By age (Figure 1):
  - < 1 year: Incidence was highest, by far, in infants but decreased by 50% from 2000 to 2009 (7.6 per 100,000 to 3.8 per 100,000)
  - 1-4 years: Incidence decreased 70% from 2000 to 2009 (2.7 per 100,000 to 0.8 per 100,000)
  - 5-10 years: Incidence decreased 75% from 2000 to 2009 (1.2 per 100,000 to 0.3 per 100,000); similar incidence and trends were seen for age groups 11-18 years and 19-20 years
- By sex (Figure 2):
  - Incidence decreased in males and females from 2000 to 2009 (males: 2.2 to 0.8 per 100,000; females: 1.9 to 0.5 per 100,000)
  - Incidence was generally higher in males than females, and this disparity widened over the study period (16% higher incidence in 2000; 51% higher in 2009)
- By race/ethnicity (Figure 3):
  - Incidence decreased from 2000 to 2009 for all racial groups, with the exception of Native American patients, who went from having the lowest MD incidence (0.2 per 100,000) of all groups in 2000 to the highest (0.7 per 100,000) in 2009

### Demographics (Table 1)

- Pediatric patients with MD were predominantly male, with male representation increasing from 55% to 61% of cases from 2000 to 2009
- Racial composition of pediatric MD shifted during this period, with representation declining among white patients (from 56% to 45% of cases) and increasing among black patients (from 8% to 11% of cases)
- Insurance coverage shifted substantially during this period, with Medicaid increasing from 35% of cases in 2000 to nearly 50% of cases in 2009
- Geographic distribution remained fairly constant, with highest representation from the South (~30% of cases) and West (~30% of cases)

Table 1. Characteristics of Inpatient Admissions for MD in the US in 2000-2009

	2000		2003		2006		2009	
	Weighted n	%	Weighted n	%	Weighted n	%	Weighted n	%
<b>Total</b>	1,684	100.00	1,100	100.00	749	100.00	587	100.00
<b>Sex</b>								
Male	924	54.85	625	56.80	426	56.83	356	60.69
Female	760	45.15	449	40.83	313	41.86	224	38.12
Unknown/missing	–	–	26	2.37	10	1.31	7	1.19
<b>Age in years</b>								
< 1	290	17.20	251	22.76	195	26.10	153	26.00
1-4	416	24.70	301	27.35	178	23.76	120	20.47
5-10	284	16.87	167	15.17	102	13.58	77	13.17
11-18	529	31.43	272	24.75	199	26.62	161	27.42
19-20	161	9.57	98	8.94	71	9.52	70	11.98
Unknown/missing	4	0.22	11	1.04	3	0.42	6	0.95
<b>Race/ethnicity</b>								
White	944	56.08	501	45.50	309	41.24	263	44.79
Black	131	7.81	96	8.72	63	8.38	66	11.29
Hispanic	193	11.46	120	10.87	112	14.90	67	11.43
Asian/Pacific Islander	22	1.33	12	1.13	15	2.02	11	1.82
Native American	2	0.13	3	0.28	4	0.58	7	1.16
Other	59	3.50	34	3.08	38	5.05	37	6.35
Unknown/missing	332	19.69	335	30.42	208	27.83	136	23.16
<b>Geographic region</b>								
Northeast	280	16.63	154	14.03	128	17.12	68	11.52
Midwest	396	23.50	257	23.36	142	18.99	150	25.55
South	496	29.43	354	32.14	231	30.88	194	32.98
West	513	30.44	335	30.47	247	33.01	175	29.95
<b>Primary payer</b>								
Medicare	5	0.28	2	0.14	2	0.27	–	–
Medicaid	586	34.79	475	43.14	337	44.96	289	49.28
Private insurance	905	53.75	511	46.41	331	44.18	231	39.33
Self-pay	118.0	7.00	66.0	6.00	40.0	5.38	37.0	6.30
No charge	10.0	0.58	2.0	0.16	4.0	0.50	4.0	0.76
Other	53	3.12	44	3.95	34	4.49	25	4.33
Unknown/missing	8	0.48	2	0.19	2	0.22	–	–
<b>Admission source</b>								
Emergency department	782	46.46	573	52.05	394	52.65	84	14.30
Another hospital	314	18.67	200	18.18	159	21.22	28	4.70
Other health facility, including long-term care	51	3.02	18	1.67	24	3.23	10	1.79
Court/law enforcement	–	–	2	0.14	–	–	–	–
Routine, including births and other sources	462	27.42	302	27.45	170	22.71	47	8.08
Unknown/missing	75	4.43	6	0.51	1	0.19	418	71.13

Figure 1. Incidence of MD in the US in 2000-2009, by Age

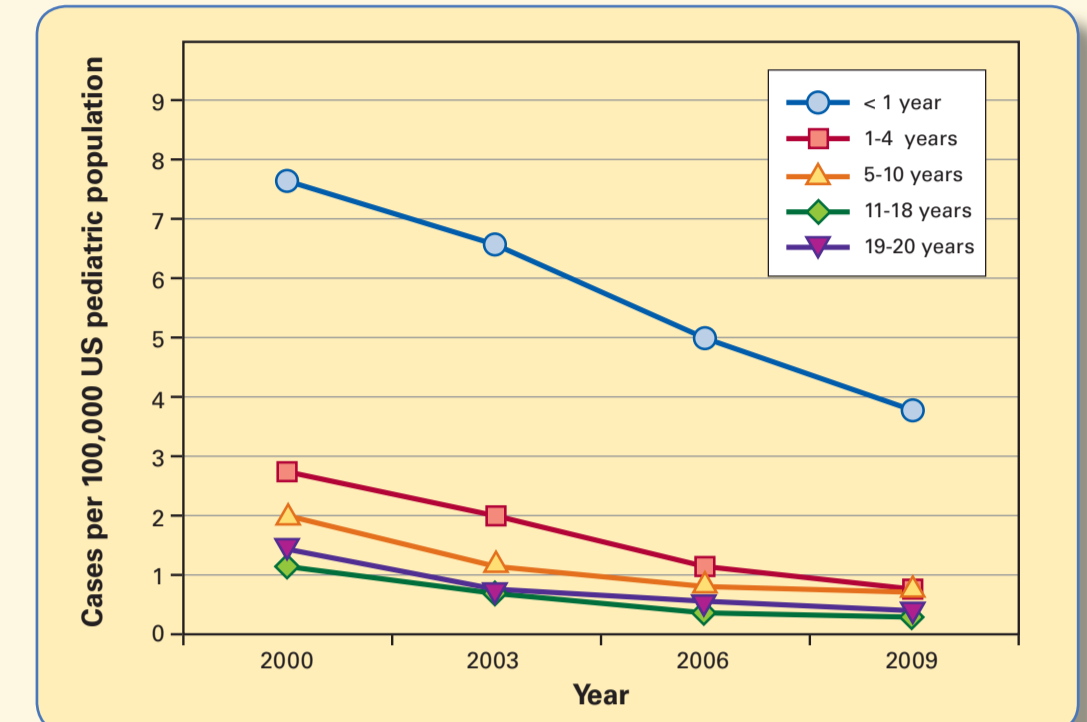


Figure 2. Incidence of MD in the US in 2000-2009, by Sex

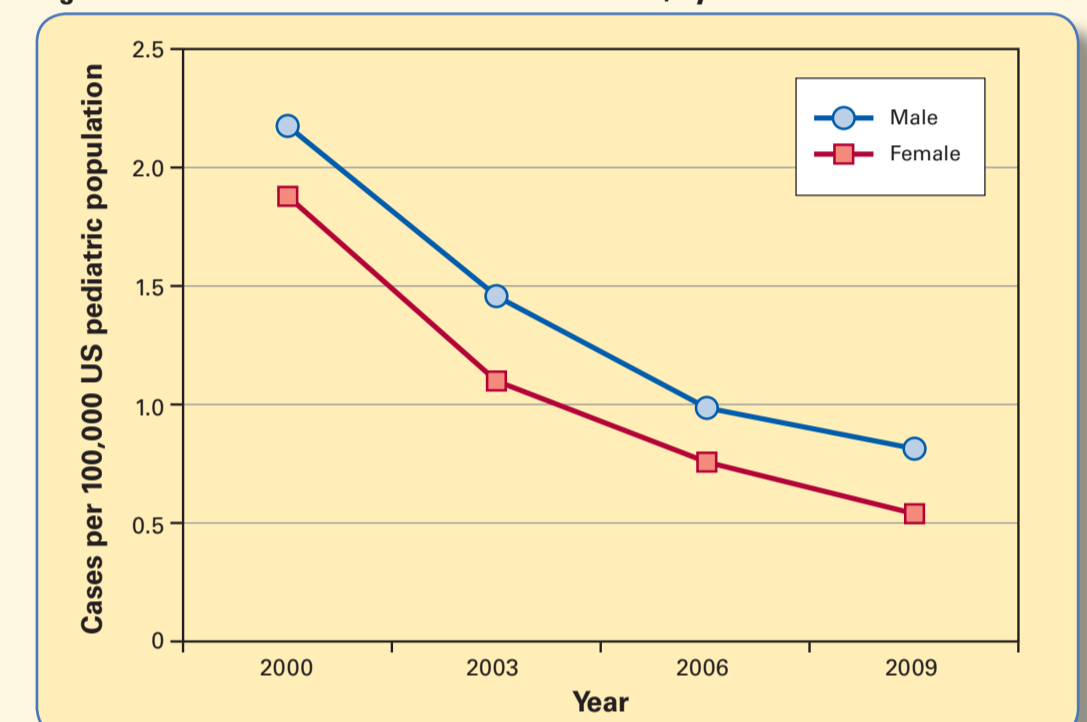
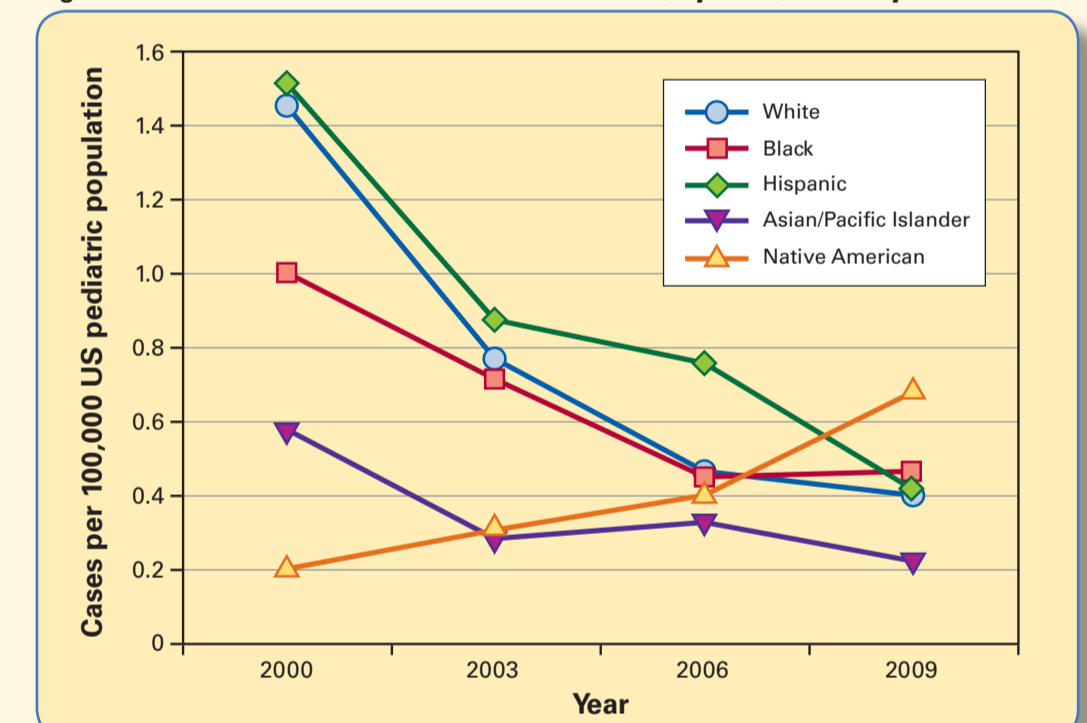


Figure 3. Incidence of MD in the US in 2000-2009, by Race/Ethnicity



## LIMITATIONS

- Patient discharges were identified based on diagnosis codes that, if recorded inaccurately, may cause misidentification of MD
- Because unique patient identifiers were not provided, we were unable to follow patients who moved from facility to facility; results may be biased somewhat if the experiences of patients who transferred from facility to facility differed from those who remained in the analytic sample

## CONCLUSIONS

- Pediatric MD incidence declined during the 2000s, possibly due to the 2005 introduction of the meningococcal conjugate vaccine
- However, MD incidence remained substantially higher in infants than other age groups, and there appeared to be a demographic shift in cases away from female and white patients
- Future studies are warranted to investigate possible reasons for the increase in pediatric MD incidence among Native American patients, the only racial group evaluated in this study that experienced an increase in incidence from 2000 to 2009

## REFERENCE

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):236-242.

## CONTACT INFORMATION

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