



# Epidemiology of Meningococcal Disease in the United States

**Amy Rubis, MPH**

Advisory Committee on Immunization Practices Meeting

June 28, 2024

# Agenda

- Overall epidemiology of meningococcal disease in the United States
- Recent notable epidemiology
  - Serogroup Y meningococcal disease cases
  - Outbreaks

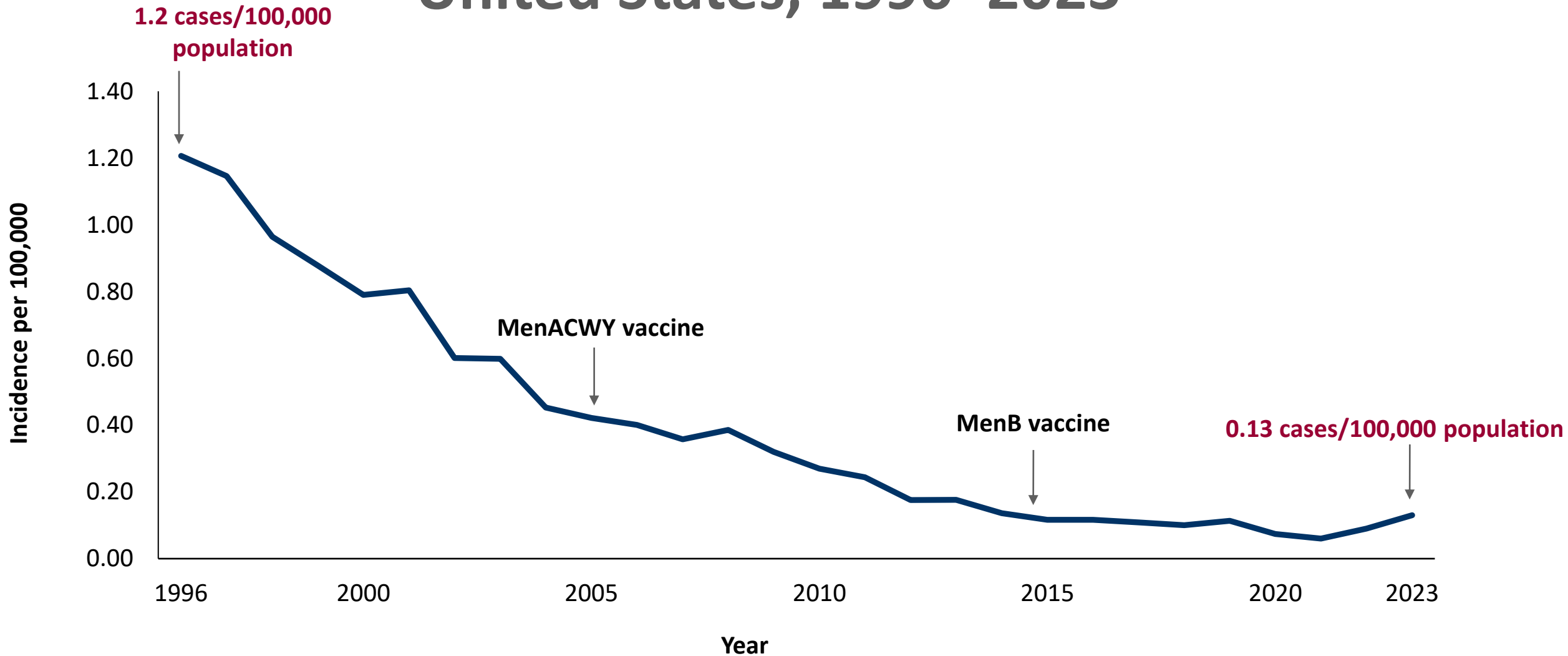
# Meningococcal Disease Surveillance

- Cases reported through National Notifiable Diseases Surveillance System (NNDSS)
- Additional serogroup, outcome, and clinical characteristics collected nationally through Enhanced Meningococcal Disease Surveillance (EMDS)
  - Isolates submitted for whole-genome sequencing

# Meningococcal Disease Surveillance Data, 2023

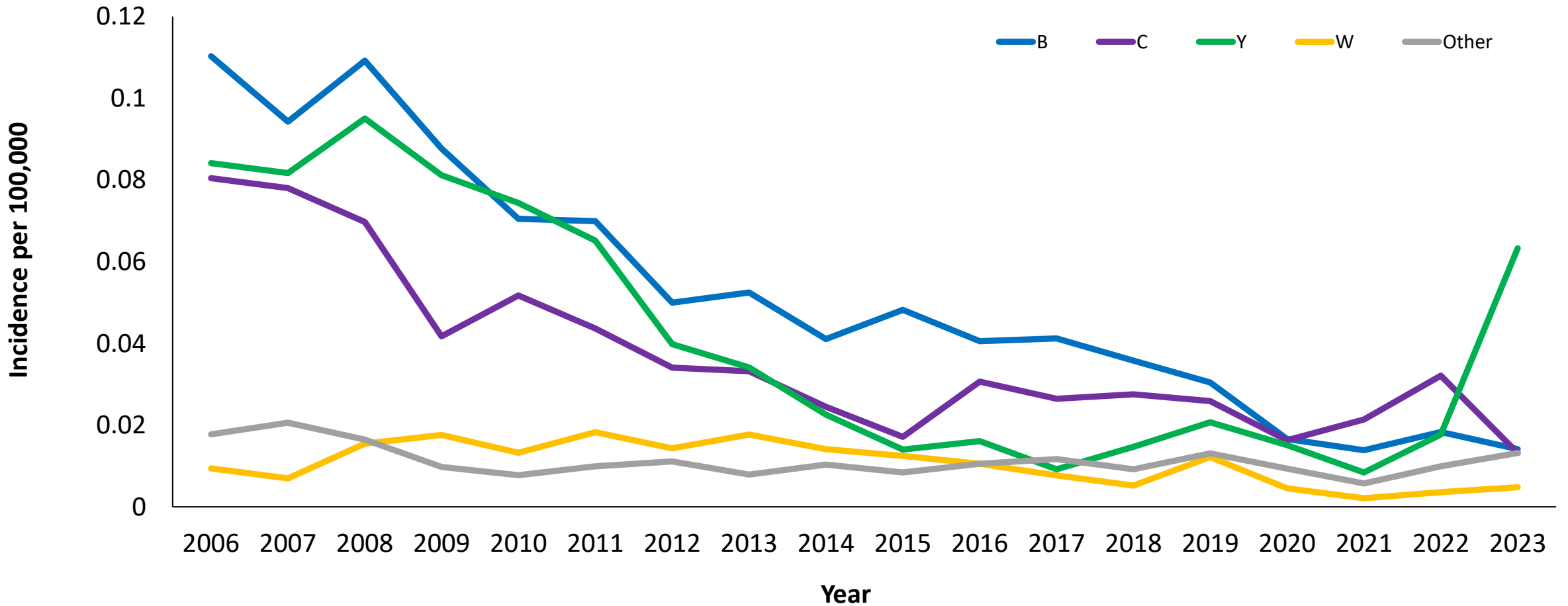
- 2023 data are still preliminary
  - Serogroup missing for 14% of cases
  - Clinical characteristics not yet complete
  - All available isolates not yet received and tested to confirm serogroup and antimicrobial susceptibility

# Meningococcal Disease Incidence – United States, 1996–2023\*



Abbreviations: MenACWY vaccine = quadrivalent (serogroups A, C, W, and Y) meningococcal conjugate vaccine; MenB vaccine = serogroup B meningococcal vaccine  
Source: 1996–2023 NNDSS Data. \*2023 NNDSS data are preliminary.

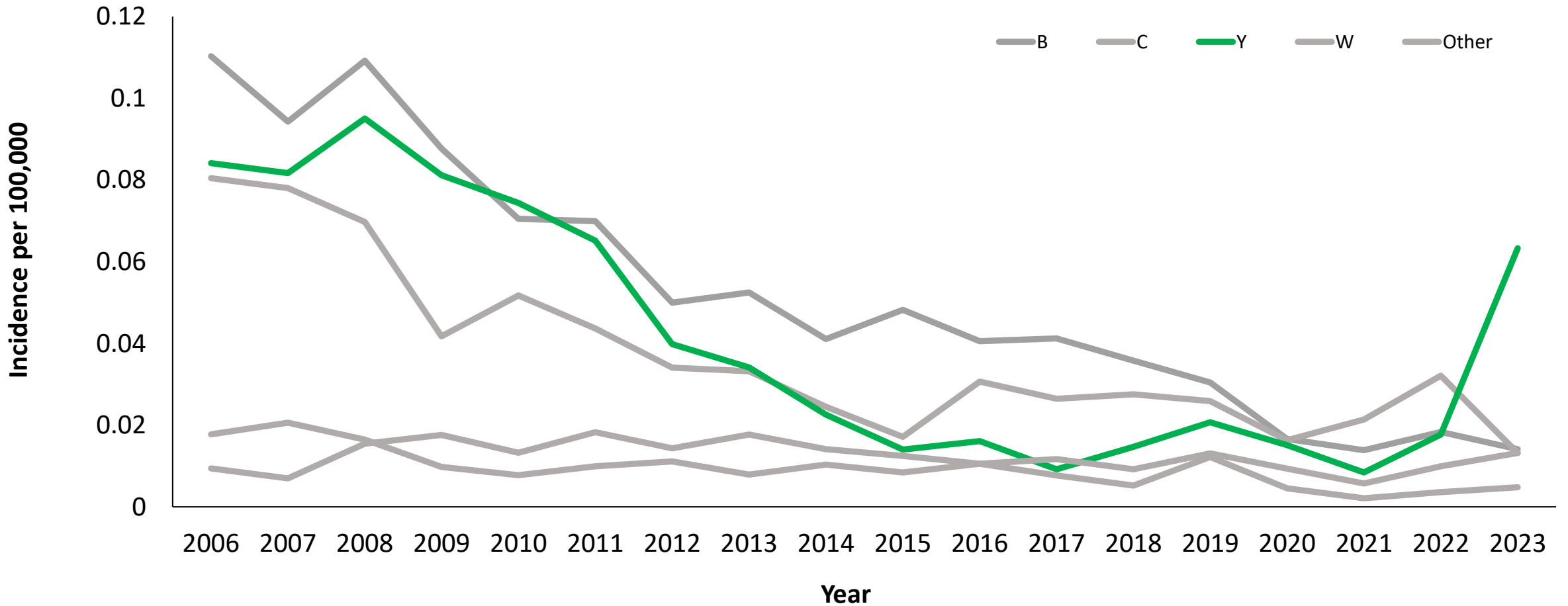
# Trends in Meningococcal Disease Incidence by Serogroup – United States, 2006–2023\*



Source: NNDSS data with additional serogroup data from Active Bacterial Core surveillance (ABCs) and state health departments

\*2023 data are preliminary

# Trends in Meningococcal Disease Incidence by Serogroup – United States, 2006–2023\*



Source: NNDSS data with additional serogroup data from Active Bacterial Core surveillance (ABCs) and state health departments

\*2023 data are preliminary

**Serogroup Y Sequence Type 1466**



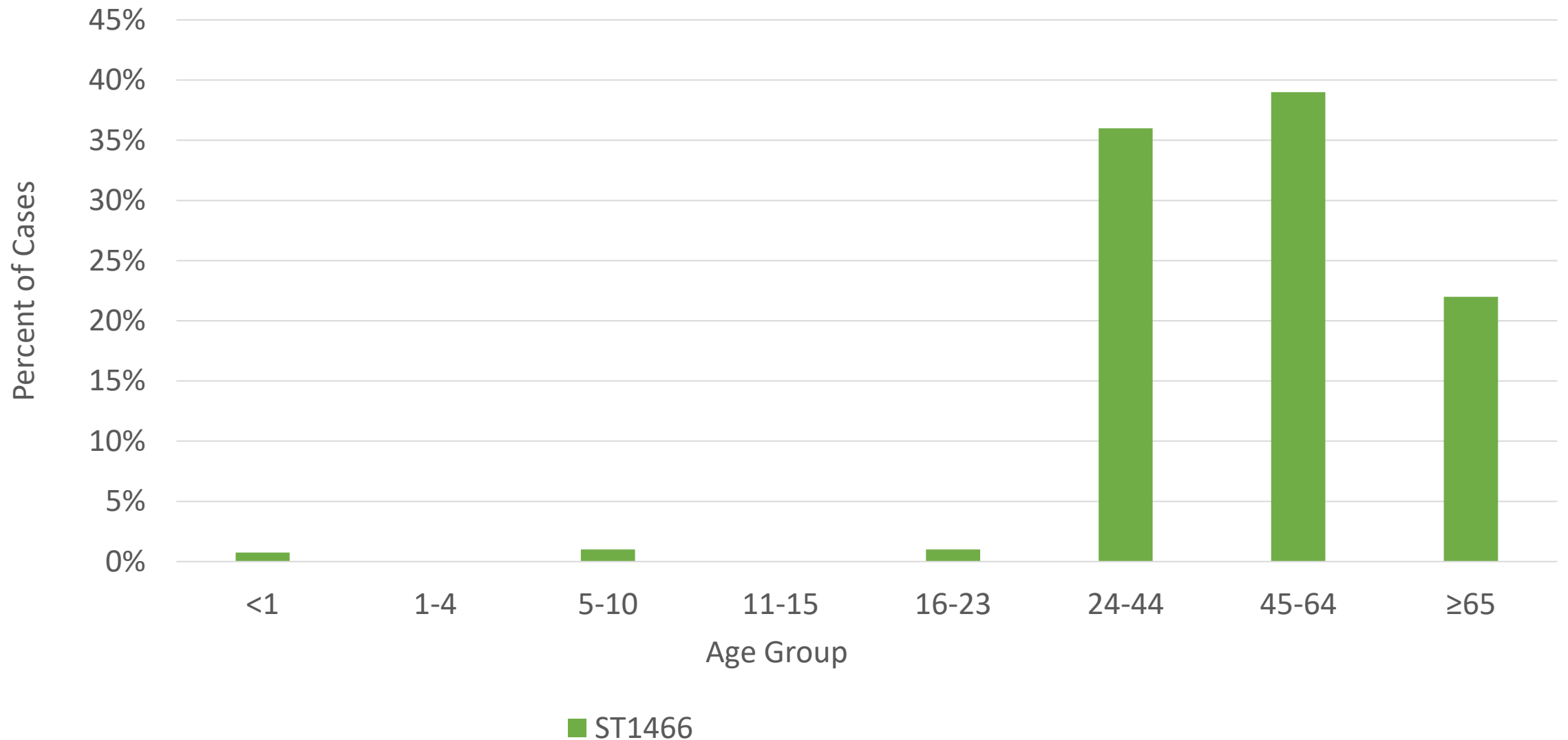
# Much of the increase is attributable to NmY ST-1466

- In many jurisdictions, the increases are primarily due to NmY sequence type (ST) 1466 (clonal complex CC174)
  - Susceptible to all treatment and prophylaxis antibiotics
- 31 cases of this strain detected in 2022; 122 so far in 2023
  - 2023 numbers are preliminary and incomplete

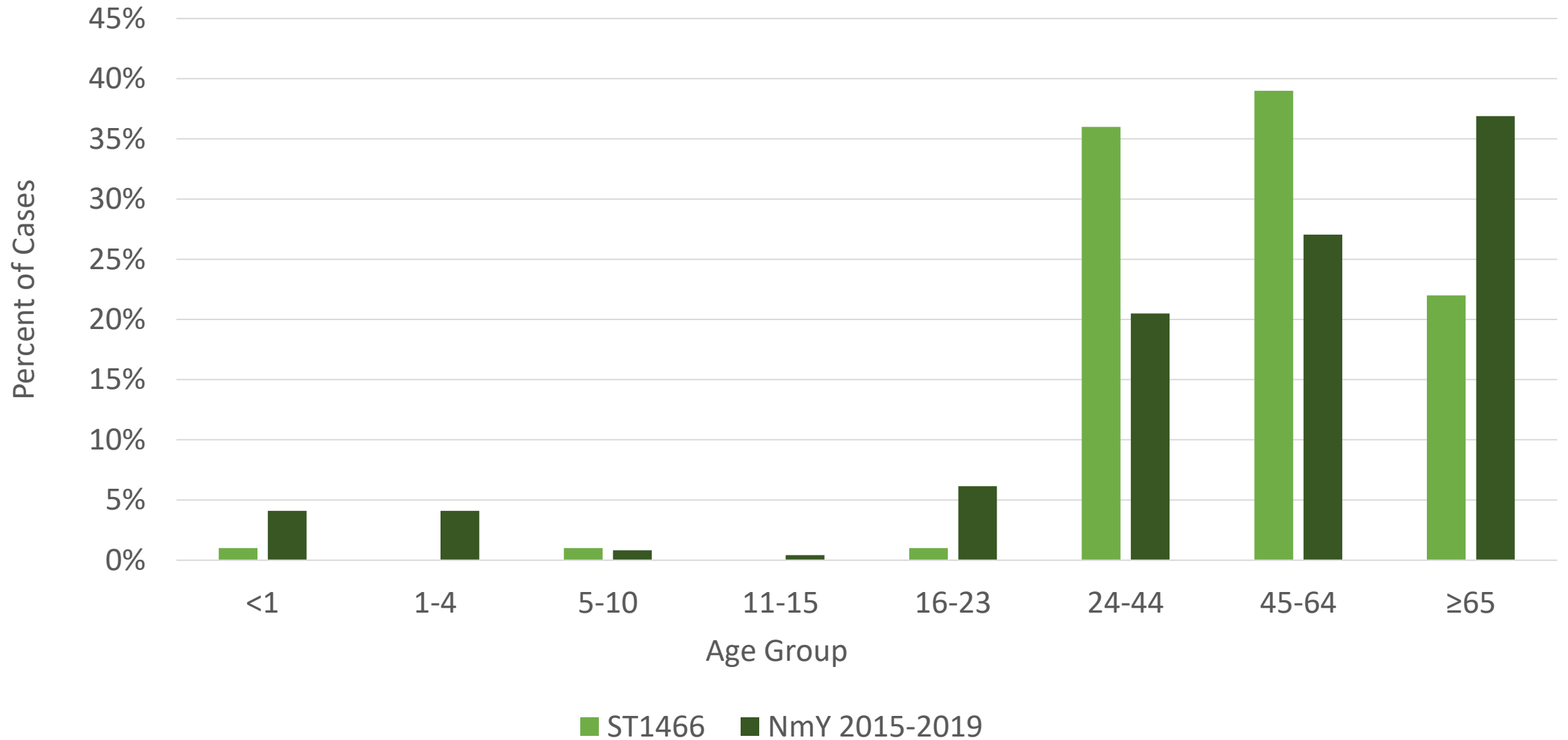
# Characteristics of ST-1466 Cases

- Of those with information available:
  - 64% (94/148) among Black or African American persons
  - 18% (27/153) in people with HIV
  - Majority had clinical presentations other than meningitis
    - 62% (76/122) presented with bacteremia
  - 4 cases in individuals who received MenACWY vaccine
    - Among 55% with known vaccine history
    - All were people with HIV
    - 3 received vaccine >7 years before onset
    - 1 received a single dose 3 years before onset

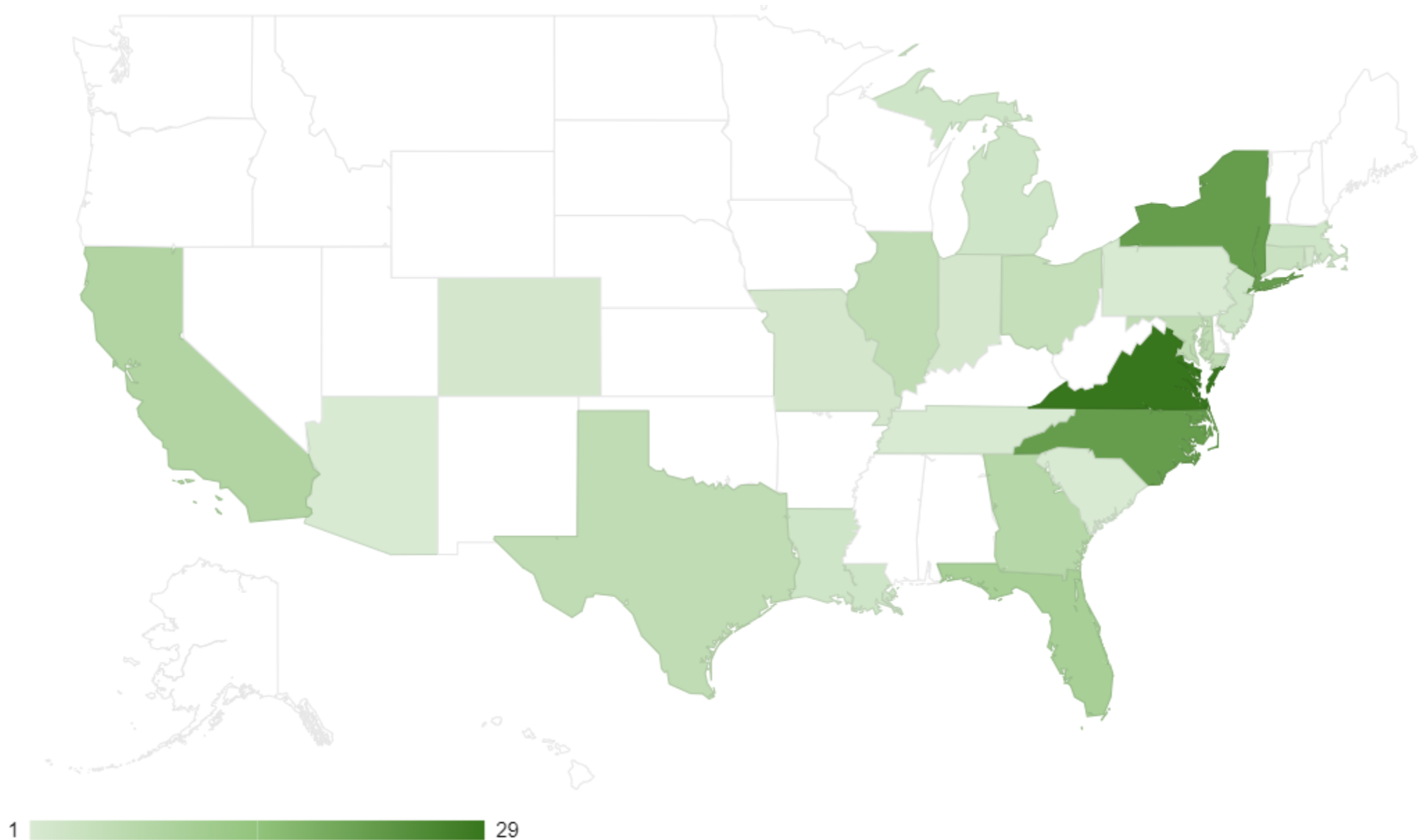
# Age distribution among NmY ST-1466 cases



# Age distribution among NmY ST-1466 cases



# NmY ST-1466 cases by state, 2022–2023



# Health Alert Network (HAN) Health Advisory

This is an official  
**CDC HEALTH ADVISORY**

Distributed via the CDC Health Alert Network  
March 28, 2024, 1:30 PM ET  
CDCHAN-00505

## Increase in Invasive Serogroup Y Meningococcal Disease in the United States

### Summary

The Centers for Disease Control and Prevention (CDC) is issuing this Health Alert Network (HAN) Health Advisory to alert healthcare providers to an increase in invasive meningococcal disease, mainly attributable to *Neisseria meningitidis* serogroup Y (Figure). In 2023, 422 cases were reported in the United States, the highest annual number of cases reported since 2014. As of March 25, 2024, 143 cases have been reported to CDC for the current calendar year, an increase of 62 cases over the 81 reported as of this date in 2023. A specific meningococcal strain, sequence type (ST) 1466, is responsible for most (101 of 148, 68%) serogroup Y cases with available sequence type data that were reported across the United States in 2023. Cases caused by this strain are disproportionately occurring in people ages 30–60 years (65%), Black or African American people (63%), and people with HIV (15%). In addition, most cases of invasive meningococcal disease caused by ST-1466 in 2023 had a clinical presentation other than meningitis: 64% presented with bacteremia, and at least 4% presented with septic arthritis. Of 94 patients with known outcomes, 17 (18%) died; this case-fatality rate is higher than the historical case-fatality rate of 11% reported for serogroup Y cases in 2017–2021. **Healthcare providers should 1) have a heightened suspicion for meningococcal disease, particularly among populations disproportionately affected by the current increase, 2) be aware that patients may present without symptoms typical of meningitis, and 3) ensure that all people recommended for meningococcal vaccination, including people with HIV, are up to date for meningococcal vaccines.**

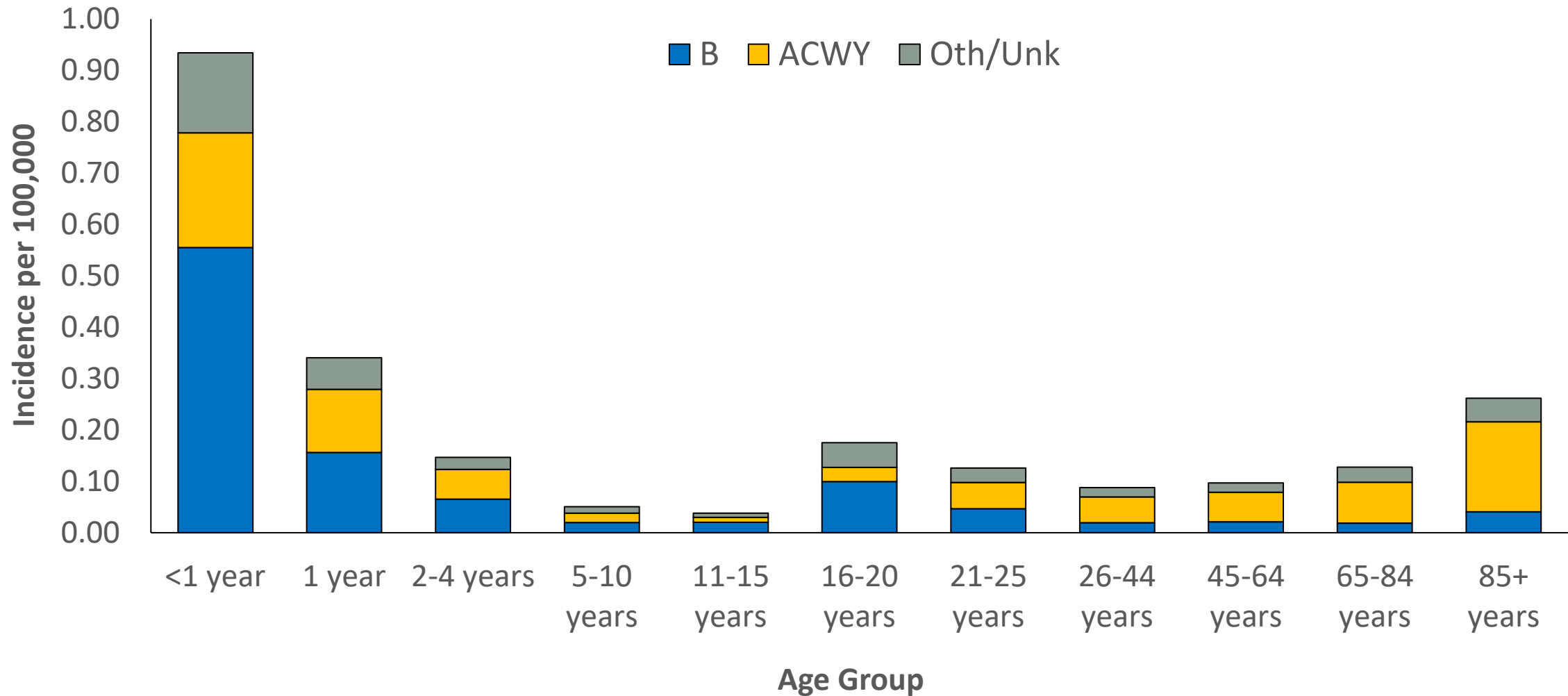
# 2024 Meningococcal Disease Cases

- As of June 11 2024, 251 cases reported for 2024
  - Increase from 164 in 2023
- Serogroup missing for 28% of 2024 cases
  - Of those with known serogroup, 103 (57%) are NmY

# Overall Meningococcal Disease Epidemiology

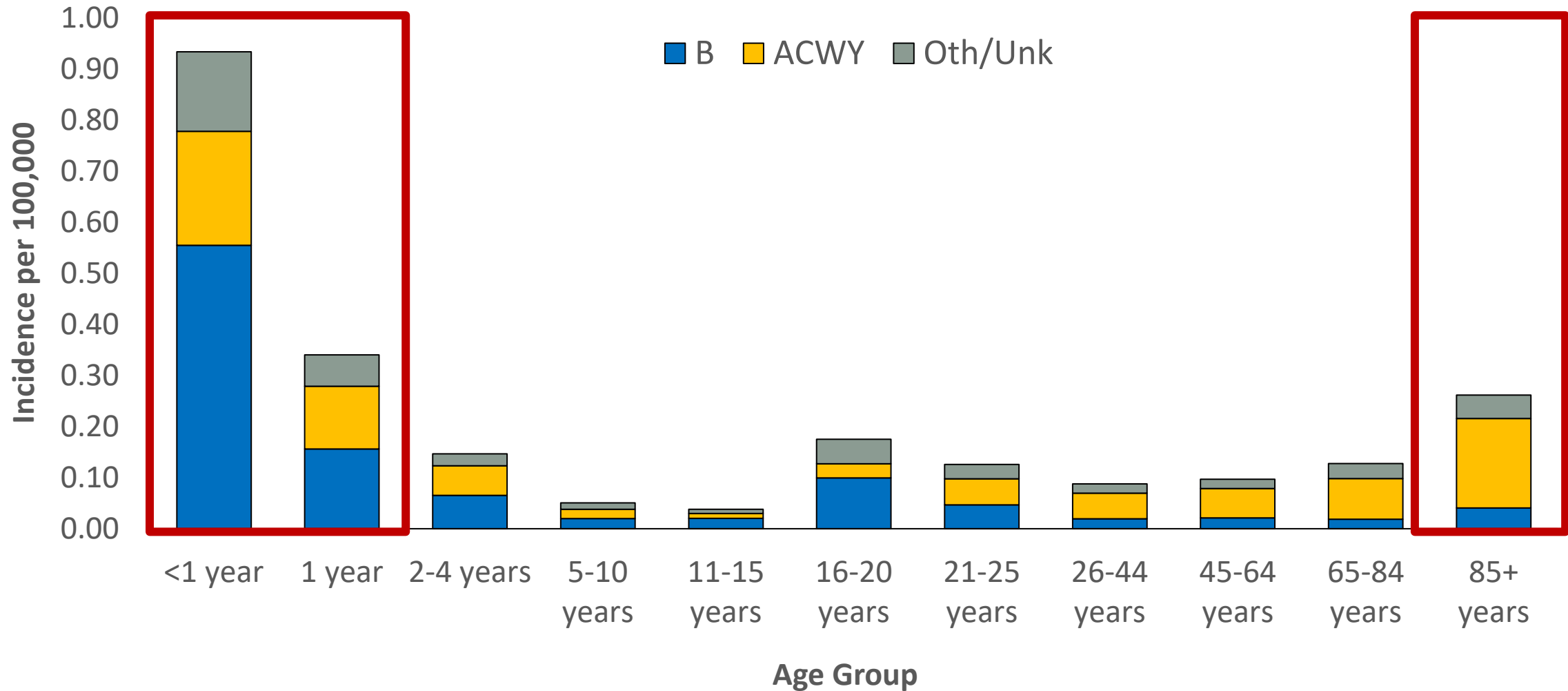


# Average Annual Meningococcal Disease Incidence by Age Group and Serogroup—United States, 2012–2021



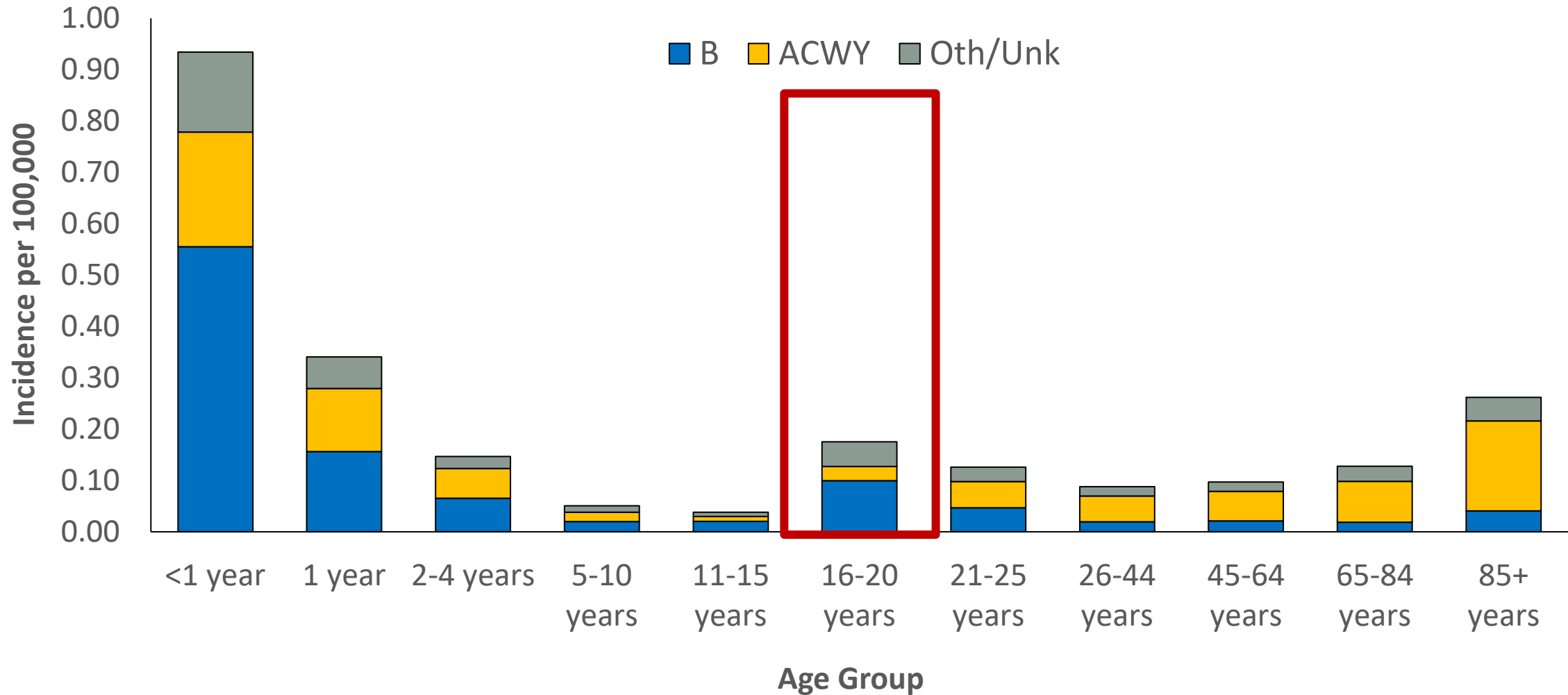
Source: NNDSS data with additional serogroup data from ABCs and state health departments

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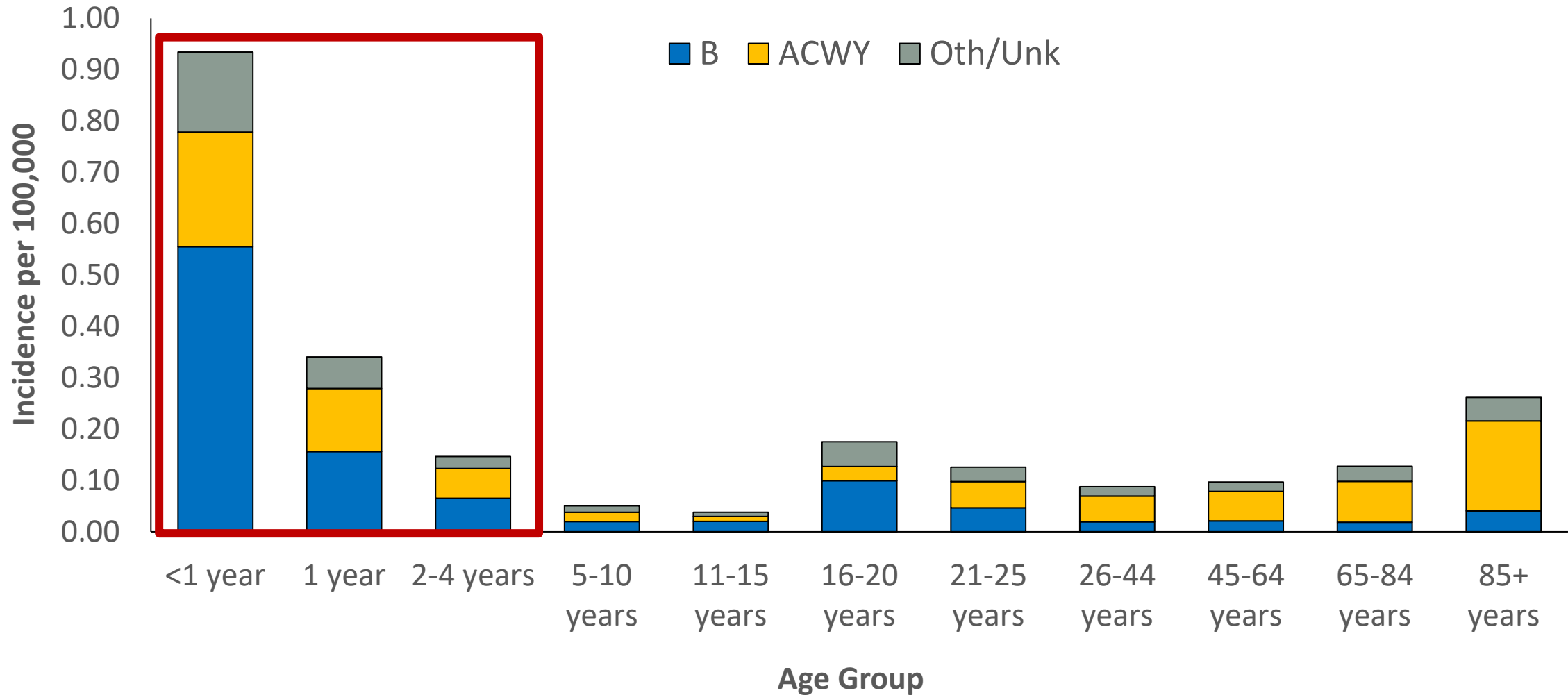
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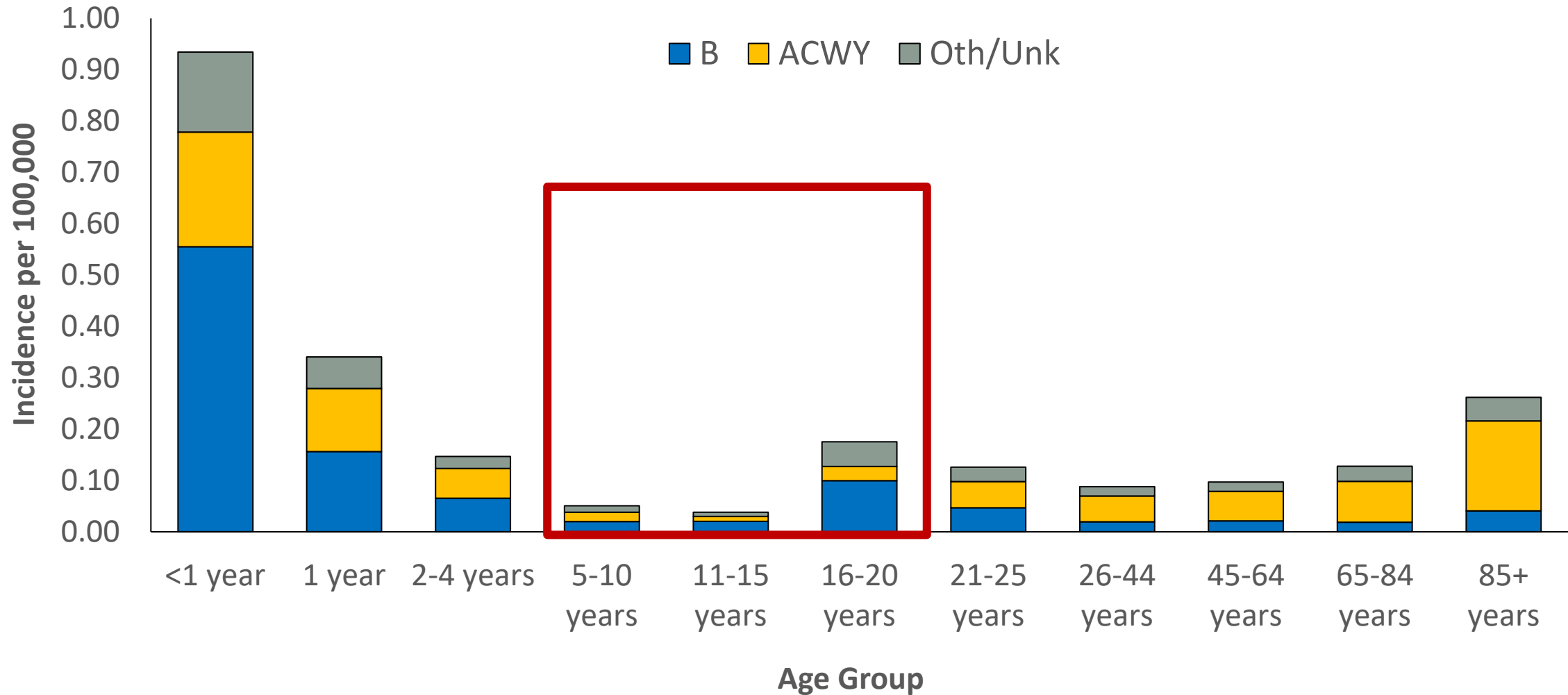
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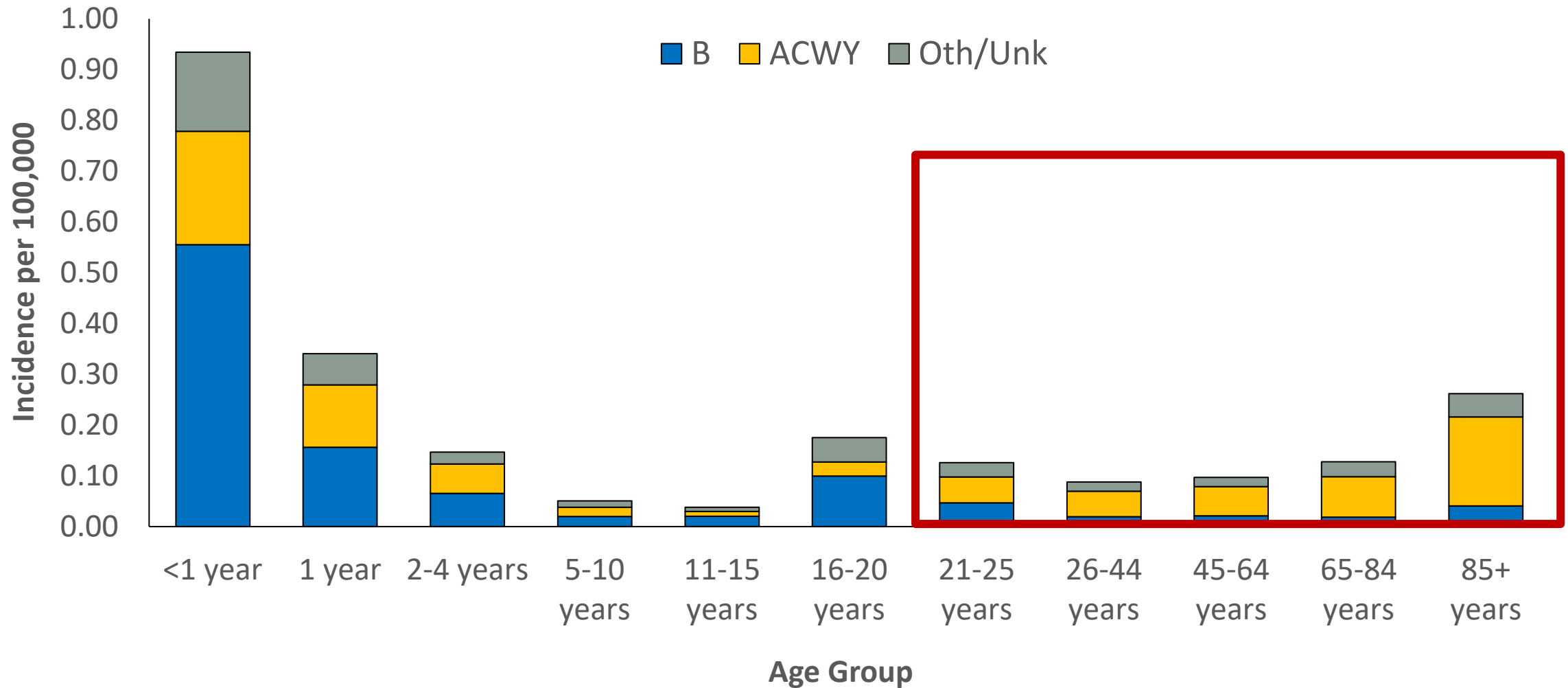
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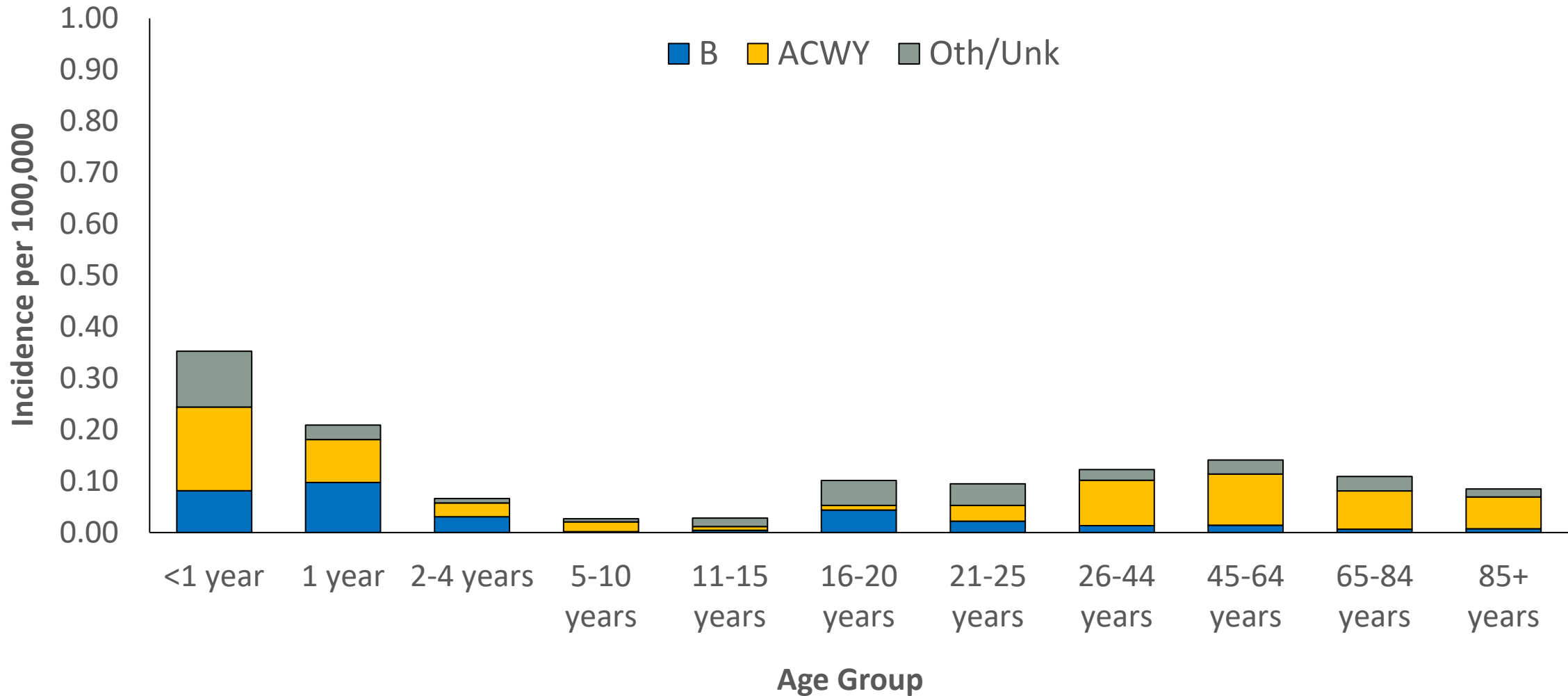
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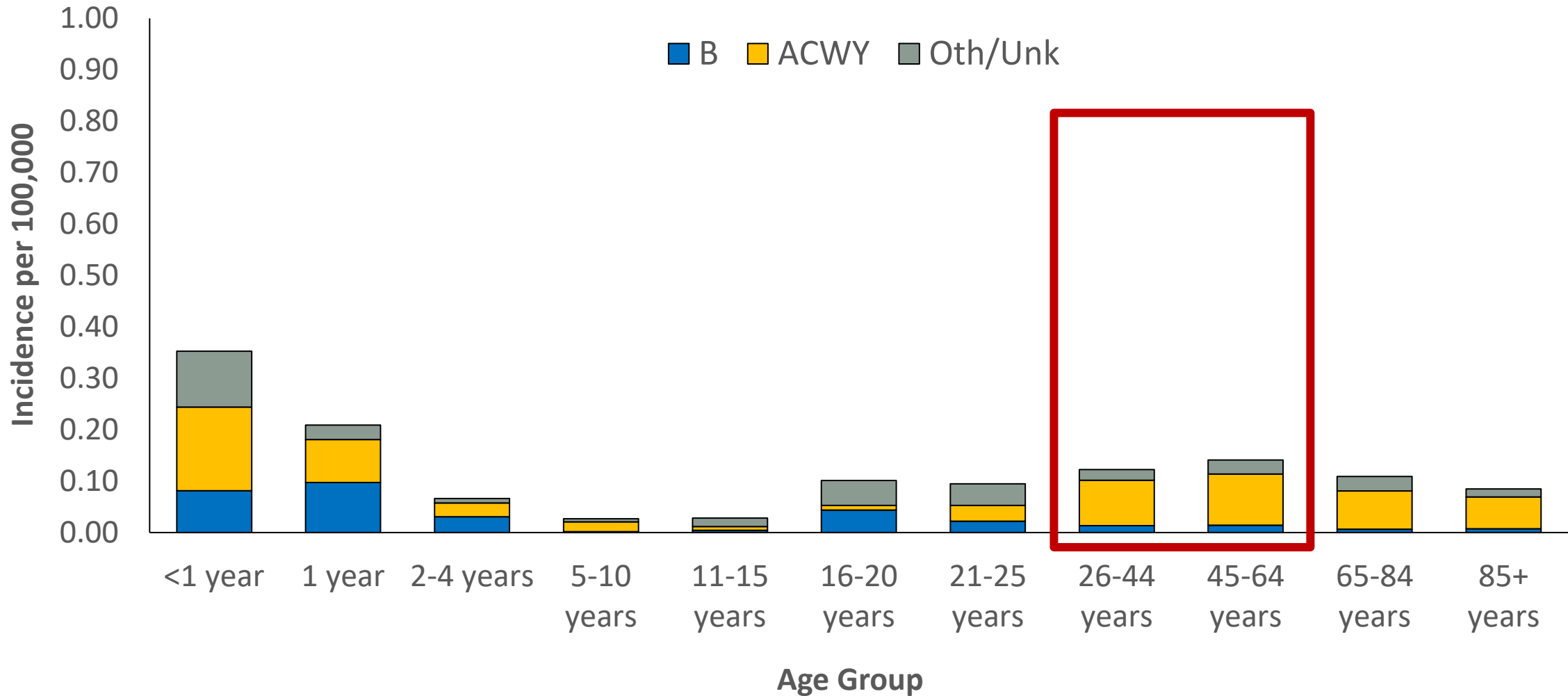
# Average Annual Meningococcal Disease Incidence by Age Group and Serogroup—United States, 2022–2023\*



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\*2023 NNDSS data are preliminary.

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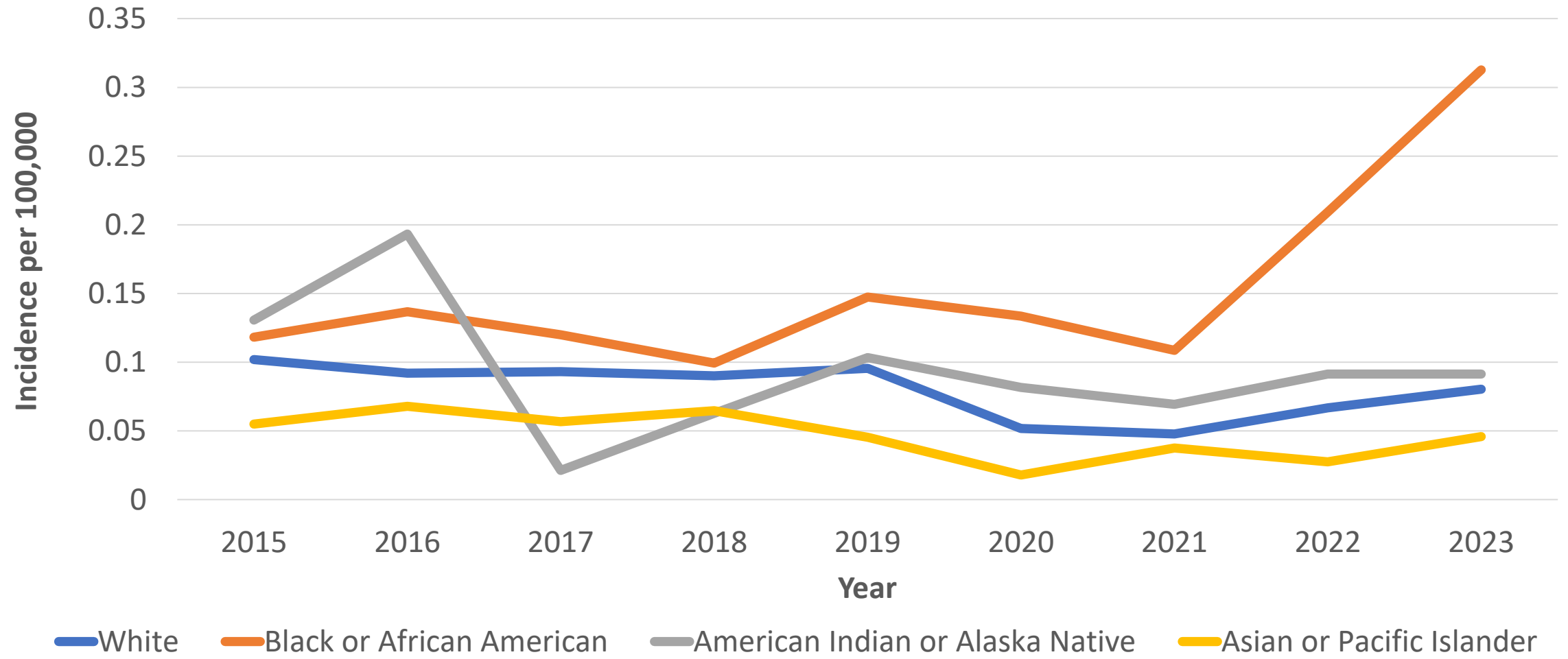


Source: NNDSS data with additional serogroup data from ABCs and state health departments

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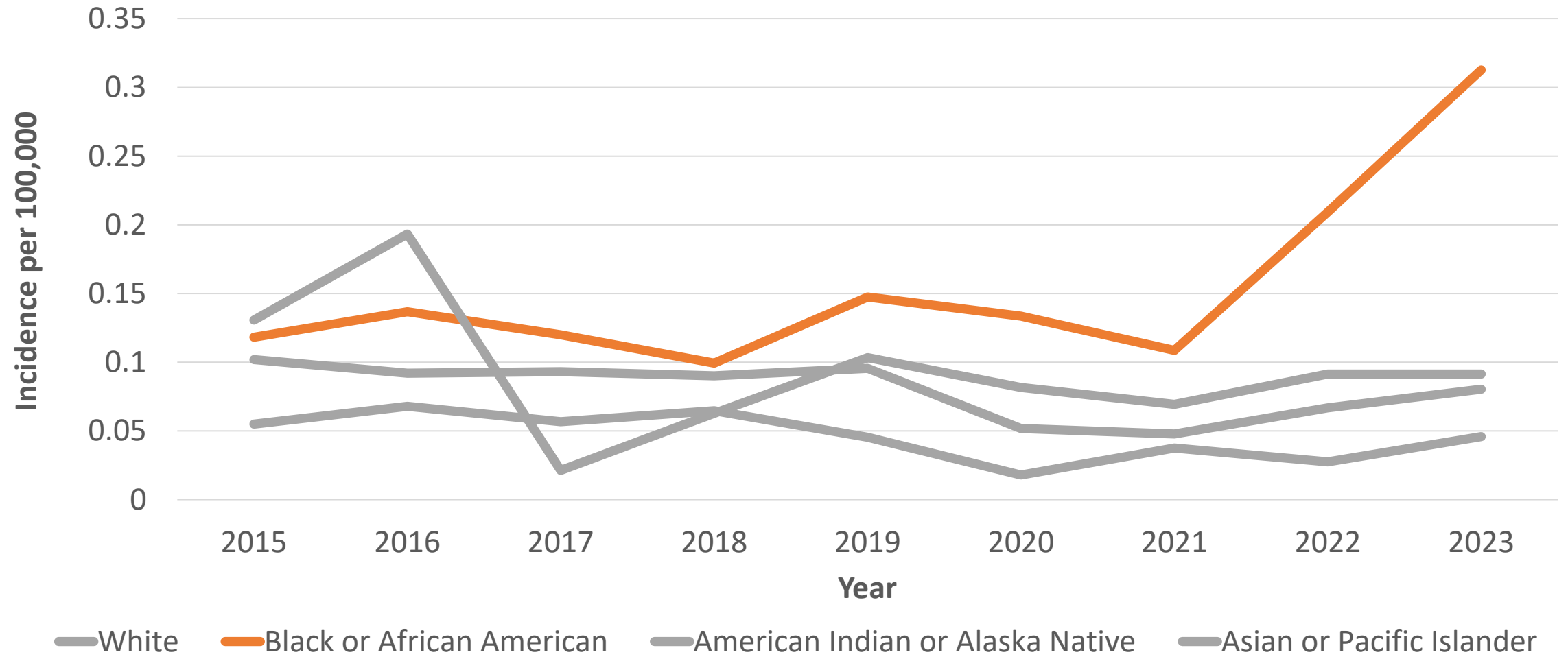


# Meningococcal Disease Incidence by Race—United States, 2015–2023\*



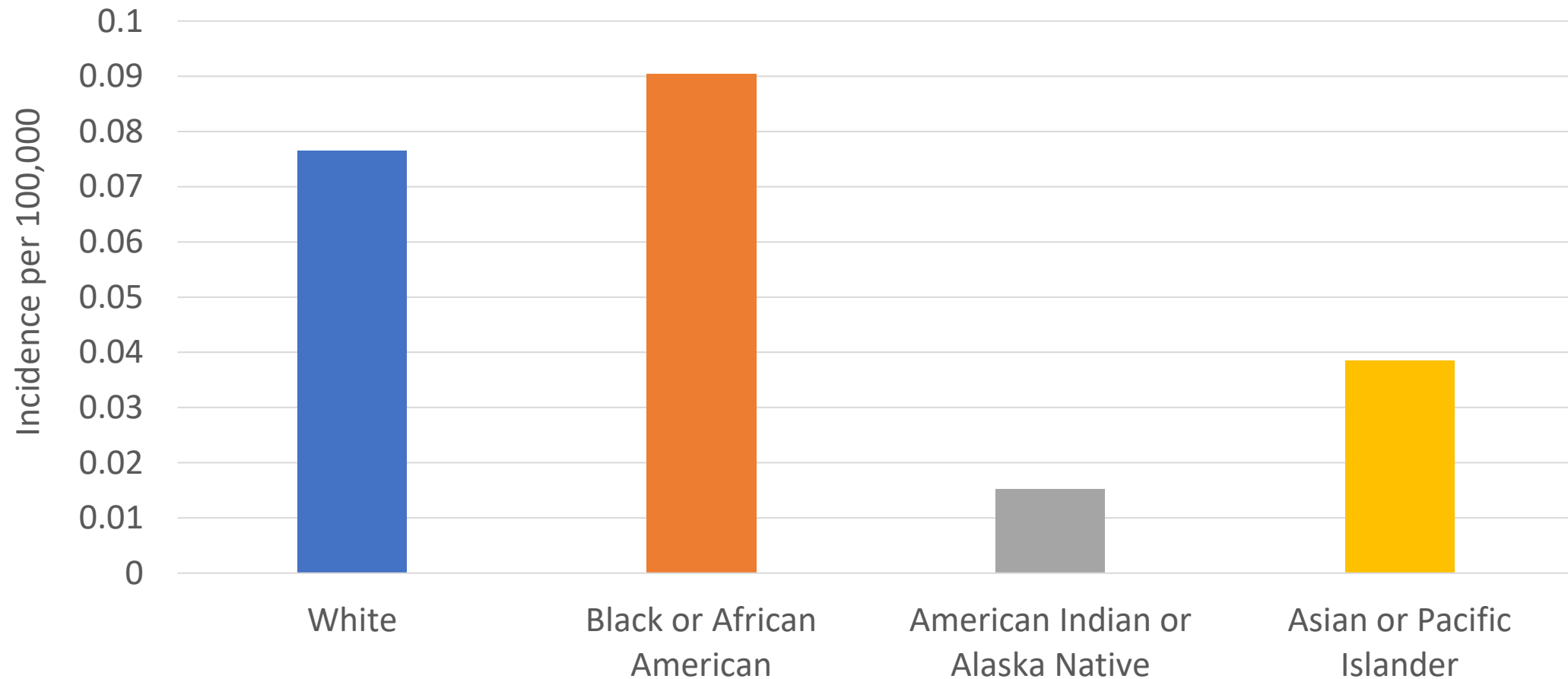
Source: NNDSS data with additional serogroup data from ABCs and state health departments. \*2023 NNDSS data are preliminary.  
Race is unknown for 5-12% of cases per year

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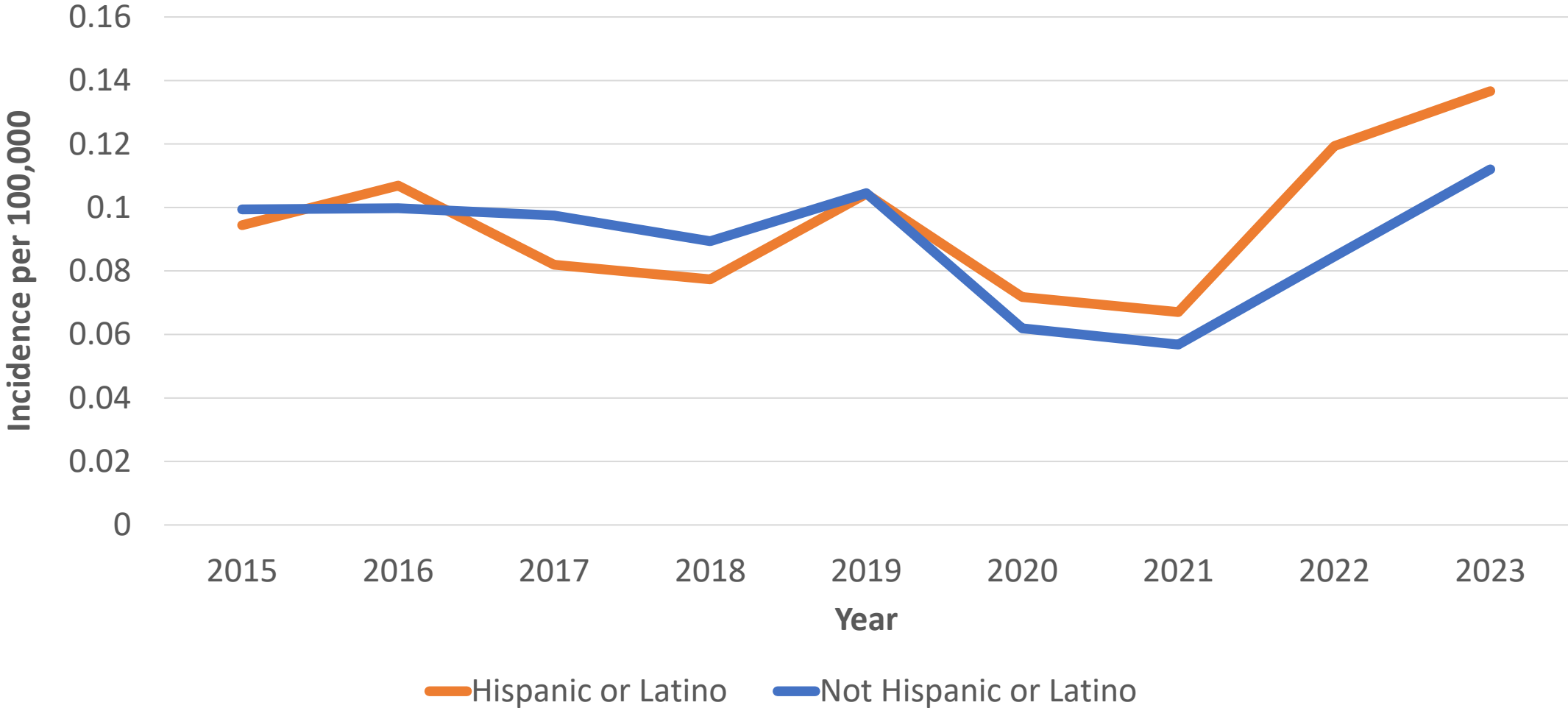
Source: NNDSS data with additional serogroup data from ABCs and state health departments. \*2023 NNDSS data are preliminary.  
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# Average Annual Meningococcal Disease Incidence by Race among 11–20 year olds—United States, 2015–2023\*



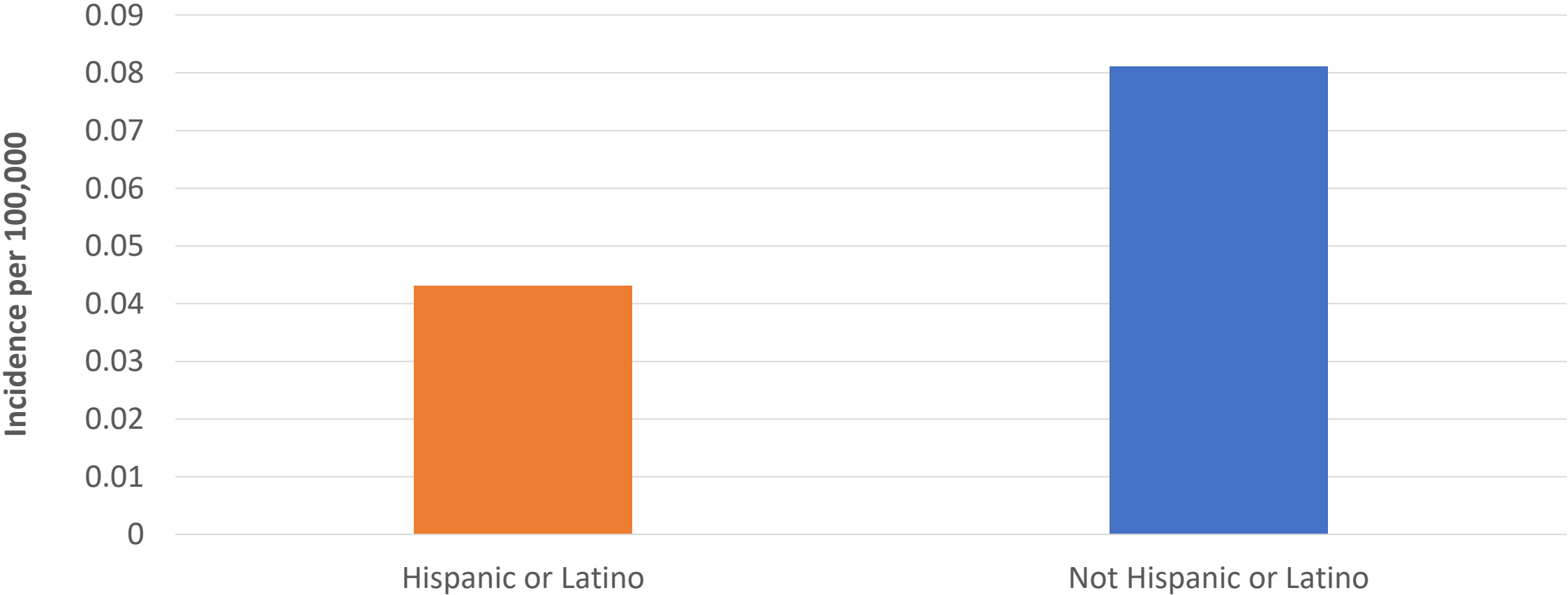
Source: NNDSS data with additional serogroup data from ABCs and state health departments. \*2023 NNDSS data are preliminary.  
Race is unknown for 6-15% of cases per year

# Meningococcal Disease Incidence by Ethnicity—United States, 2015–2023\*



Source: NNDSS data with additional serogroup data from ABCs and state health departments. \*2023 NNDSS data are preliminary. Ethnicity is unknown for 2-16% of cases per year

# Average Annual Meningococcal Disease Incidence by Ethnicity among 11–20 year olds—United States, 2015–2023\*



Source: NNDSS data with additional serogroup data from ABCs and state health departments. \*2023 NNDSS data are preliminary.  
Ethnicity is unknown for 3-27% of cases per year

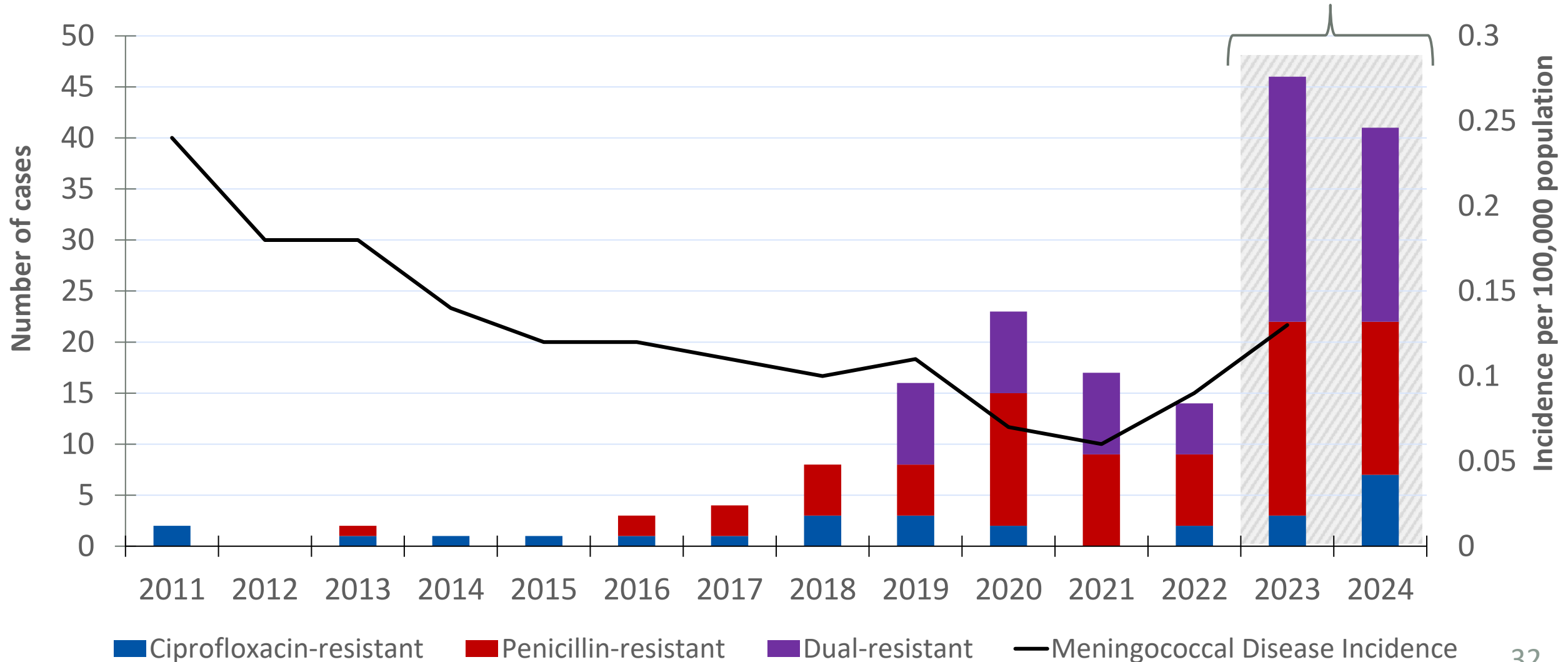
# Antibiotic-resistant *Neisseria meningitidis*

# Antibiotic-resistant *N. meningitidis*

- Penicillin-resistant and ciprofloxacin- and penicillin-resistant cases
  - ST-3587
  - Predominately among Hispanic or Latino individuals
- Ciprofloxacin-resistant only cases

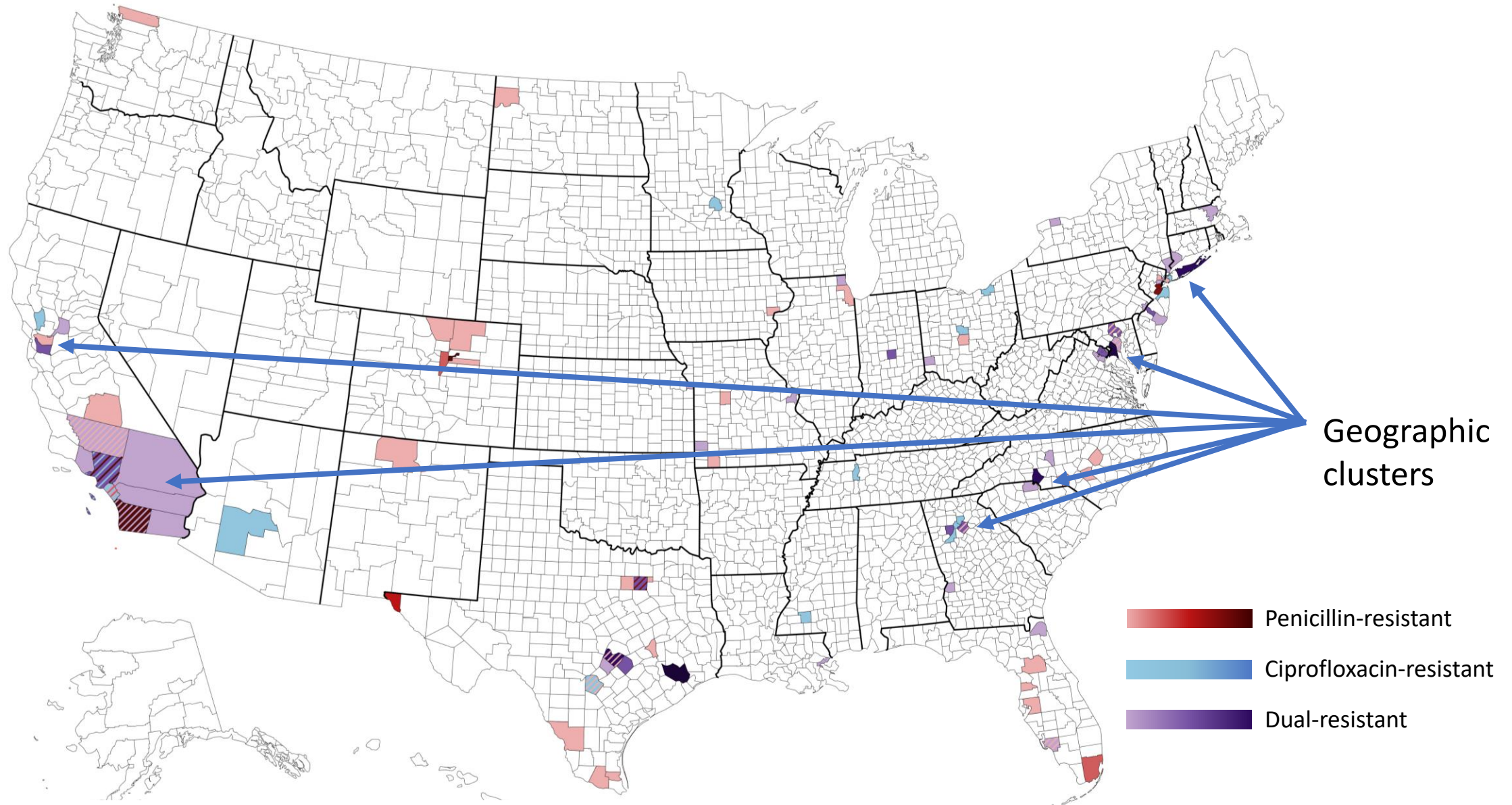
# *N. meningitidis* isolates with penicillin or ciprofloxacin resistance

Data are not final, and numbers may increase





# Resistant *N. meningitidis*, 2018–2024



Note: 3 dual-resistant cases missing county of residence/occurrence are excluded from the map

# Antibiotic-resistant *N. meningitidis*, 2018–2024

	Dual-resistant	Penicillin-resistant only	Ciprofloxacin-resistant only
<b>Total cases (2018-2024)</b>	72	73	20
<b>Median age (range)</b>	39 (0-97)	50 (0-89)	45 (3-84)
<b>% of cases among Hispanic individuals</b>	74% (53/72)	53% (39/73)	10% (2/20)
<b>% fatal</b>	7% (5/72)	6% (4/73)	0%

# Antibiotic-resistant *N. meningitidis*, 2018–2024

	Dual-resistant	Penicillin-resistant only	Ciprofloxacin-resistant only
All Serogroups	72	73	20
NmY or NG with NmY backbone	68/72	73/73	2/20
NmB	2/72	--	7/20
NmC or NG with NmC backbone	--	--	3/20
NmW	1/72		2/20
NmNG	--	--	6/20
Not Sequenced Yet	1/69	--	

# Travel history of antibiotic-resistant cases since 2018\*

	Dual-resistant	Penicillin-resistant only	Ciprofloxacin-resistant only
<b>Total</b>	72	73	20
<b>Travel History</b>	11/72	9/73	3/20
Domestic	6/11	3/9	
International	5/11	6/9	3/3
Mexico	2/5	6/6	--
Dominican Republic	1/5	--	--
Honduras	1/5		
Kingdom of Saudi Arabia	--	--	3/3

\*One additional dual-resistant case reported in an El Salvador resident and two beta-lactamase positive cases reported in Mexico residents who were in the United States at the time of onset

# Travel history of antibiotic-resistant cases since 2018\*

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<b>Travel History</b>	11/72	9/73	20
<b>Domestic</b>	6/11	3/9	
<b>International</b>	5/11	6/9	3
<b>Mexico</b>	2/5	6/6	--
<b>Dominican Republic</b>	1/5	--	--
<b>Honduras</b>	1/5		
<b>Kingdom of Saudi Arabia</b>	--	--	3

\*One additional dual-resistant case reported in an El Salvador resident and two beta-lactamase positive cases reported in Mexico residents who were in the United States at the time of onset



## Public Health Strategies for Antibiotic-resistant *Neisseria meningitidis*

### KEY POINTS

- CDC has detected penicillin- and ciprofloxacin-resistant serogroup Y meningococcal isolates in the United States.
- Using these antibiotics for invasive meningococcal disease in areas with resistance can increase suffering and death.
- Due to these concerns, CDC issued updated guidance related to treatment, prophylaxis, and surveillance.



Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™



### Morbidity and Mortality Weekly Report (*MMWR*)

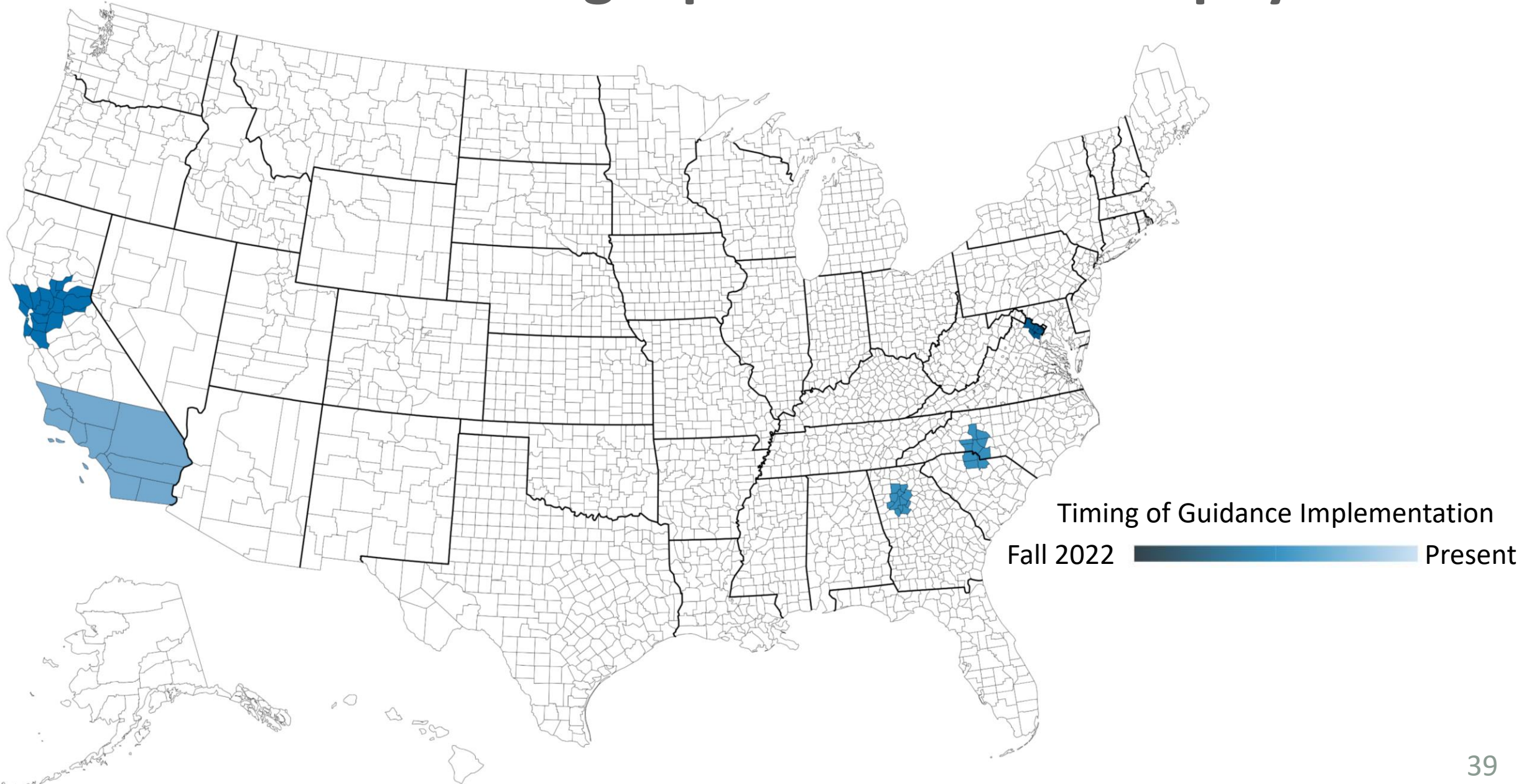
## Selection of Antibiotics as Prophylaxis for Close Contacts of Patients with Meningococcal Disease in Areas with Ciprofloxacin Resistance — United States, 2024

*Weekly* / February 8, 2024 / 73(5);99–103

[Print](#)

Isha Berry, PhD<sup>1,2</sup>; Amy B. Rubis, MPH<sup>1</sup>; Rebecca L. Howie, PhD<sup>1</sup>; Shalabh Sharma, MS<sup>1</sup>; Daya Marasini, PhD<sup>1</sup>; Henju Marjuki, PhD<sup>1</sup>; Samuel Crowe, PhD<sup>1</sup>; Lucy A. McNamara, PhD<sup>1</sup> ([VIEW AUTHOR AFFILIATIONS](#))

# Counties Not Using Ciprofloxacin for Prophylaxis



# Outbreaks



# Meningococcal Disease Outbreaks 2022-Present

Outbreak	Outbreak Period	Serogroup	Cases (deaths)
Florida MSM	December 2021 – February 2023	C	46 (9)
New York PEH	February 2022	C	3
Florida College	February – March 2022	B	3
Virginia Statewide	June 2022 – Present	Y	36 (8)*
Iowa Community	November 2022 – July 2023	W	12 (2)
Ohio Amish Community	December 2023 – January 2024	B	6 <sup>†</sup>
Colorado PEH	Jan 2024 – Present	Y	6*
Oklahoma Correctional Facility	March 2024 – May 2024	C	2 (1)
Kingdom of Saudi Arabia Travel	April 2024 – Present	W <sup>§</sup>	14*

Abbreviation: MSM, men who have sex with men; PEH, people experiencing homelessness

\*Ongoing

<sup>†</sup>5 additional suspect cases

<sup>§</sup>One additional serogroup C case and one additional nongroupable case

# Recent Meningococcal Disease Outbreaks

- Ongoing Statewide NmY ST-1466 Outbreak in Virginia
  - June 2022–present\*
  - 36 cases, 7 deaths (19% CFR)
  - 28/36 cases in Black or African American persons
  - Age range 16-82 years, median 47

# Recent Meningococcal Disease Outbreaks

- Amish community outbreak
  - 6 confirmed serogroup B cases
  - 5 additional suspected cases
  - Age range 1-10 years
- Response measures
  - Mass prophylaxis with ciprofloxacin
    - 83% coverage achieved but not all at once
    - One additional case occurred ~1 month after prophylaxis
  - Bexsero recommended for all community members aged 8 weeks and older
    - First time MenB vaccine has been recommended for people <10 years of age in the United States
    - Recommendation based on extensive safety data in infants in UK and elsewhere
    - **94% coverage achieved with first dose**
    - 56% coverage achieved with second dose

# Recent Meningococcal Disease Outbreaks

- People experiencing homelessness in Colorado\*
  - 6 serogroup Y cases
  - Age range 5 months-76 years
  - Penicillin-resistant ST-3587 strain
    - Not ciprofloxacin-resistant
    - Different population from the one primarily affected by the strain

# Recent Meningococcal Disease Outbreaks

- People with travel to the Kingdom of Saudi Arabia (KSA)\*
  - 14 total cases in 4 countries: United States (6), France (4), United Kingdom (3), Norway (1)
    - 10 cases in adults with travel history to KSA, 4 cases in children who were close contacts of travelers
  - 12 serogroup W, 1 serogroup C, 1 nongroupable
  - All travelers participated in Umrah
  - No travelers known to be vaccinated
  - 4 cases (2 NmW, 1 NmC, 1 NmNG) resistant to ciprofloxacin

# Cases of Meningococcal Disease Associated with Travel to Saudi Arabia for Umrah Pilgrimage – United States, United Kingdom, and France, 2024

Weekly / June 6, 2024 / 73(22);514–516

[Print](#)

On May 31, 2024, this report was posted online as an MMWR

Madhura S. Vachon, PhD<sup>1</sup>; Anne-Sophie Barret, MPH<sup>2</sup>; Jay MS<sup>5</sup>; Daya Marasini, PhD<sup>4</sup>; Basanta Wagle, PhD<sup>5</sup>; Page Kea Zipprich, PhD<sup>7</sup>; Franny Dorr, MPH<sup>8</sup>; Karen Kuguru, MPA<sup>9</sup>; S. Assiri, MD<sup>13</sup>; Noha H. Farag, MD, PhD<sup>14</sup>; Muhamed-Kheir T. Clark, PhD<sup>16</sup>; Ray Borrow, PhD<sup>3</sup>; Shamez N. Ladhani, PhD<sup>10</sup>  
[AFFILIATIONS](#))

## Meningococcal Disease Cases Linked to Travel to the Kingdom of Saudi Arabia (KSA): Ensure Pilgrims are Current on Meningococcal Vaccination

[Print](#)



Distributed via the CDC Health Alert Network  
May 20 2024, 10:30 AM ET  
CDCHAN-00508

- Recommend preferential use of alternative prophylaxis agents for cases associated with KSA travel

# Conclusions

- Incidence of meningococcal disease increased in 2023, primarily due to NmY ST-1466
  - ST-1466 primarily observed among those aged 30-60 years
- Ciprofloxacin resistance is increasing
  - Multiple jurisdictions have discontinued ciprofloxacin use
  - Increasing number of resistant isolates not serogroup Y

# Conclusions

- New strains emerging in the United States
  - Predominantly affecting racial minority groups leading to an increasing disparity in incidence among Black persons compared to other racial groups
- Large number of outbreaks since 2022
  - Affecting minorities or disadvantaged populations



# Thank you

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



**Backup slides**

**No confirmed instances of  
prophylaxis failure with  
ciprofloxacin reported to date...  
but concerning anecdotes**