



Current Epidemiology of Pediatric Pneumococcal Disease, United States

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Advisory Committee on Immunization Practices

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Pneumococcal carriage is precursor to pneumococcal disease

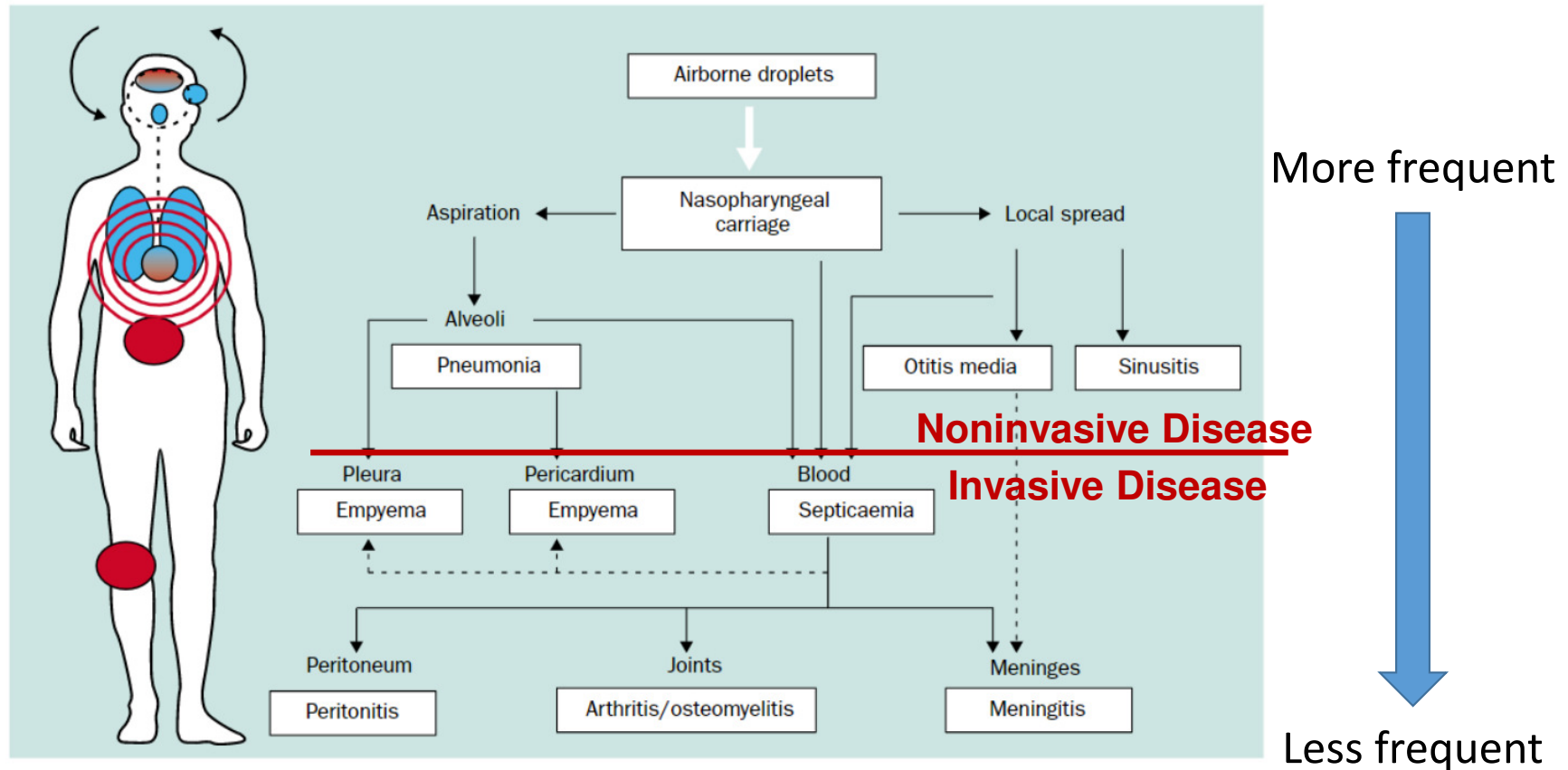


Figure 1. Pathogenic route for *S. pneumoniae* infection. Redrawn from reference 2. Organs infected through the airborne and haematogenic routes are depicted in blue and red, respectively.

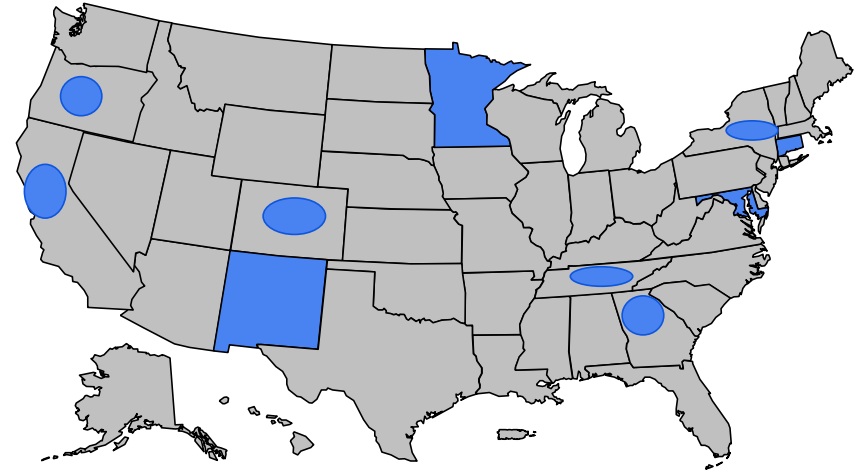
Outline

- Invasive Pneumococcal Disease (IPD) in children
 - Impact of Pneumococcal Conjugate Vaccines (PCVs) on IPD incidence and serotype distribution
 - IPD incidence caused by serotypes in PCV15 and PCV20
 - Changes in IPD incidence and serotype distribution post-COVID19
- Acute Otitis Media (AOM)
 - Impact of PCV13
 - Incidence Estimates
- Pneumonia in children
 - Impact of PCV13 on all-cause and pneumococcal pneumonia
 - Incidence Estimates

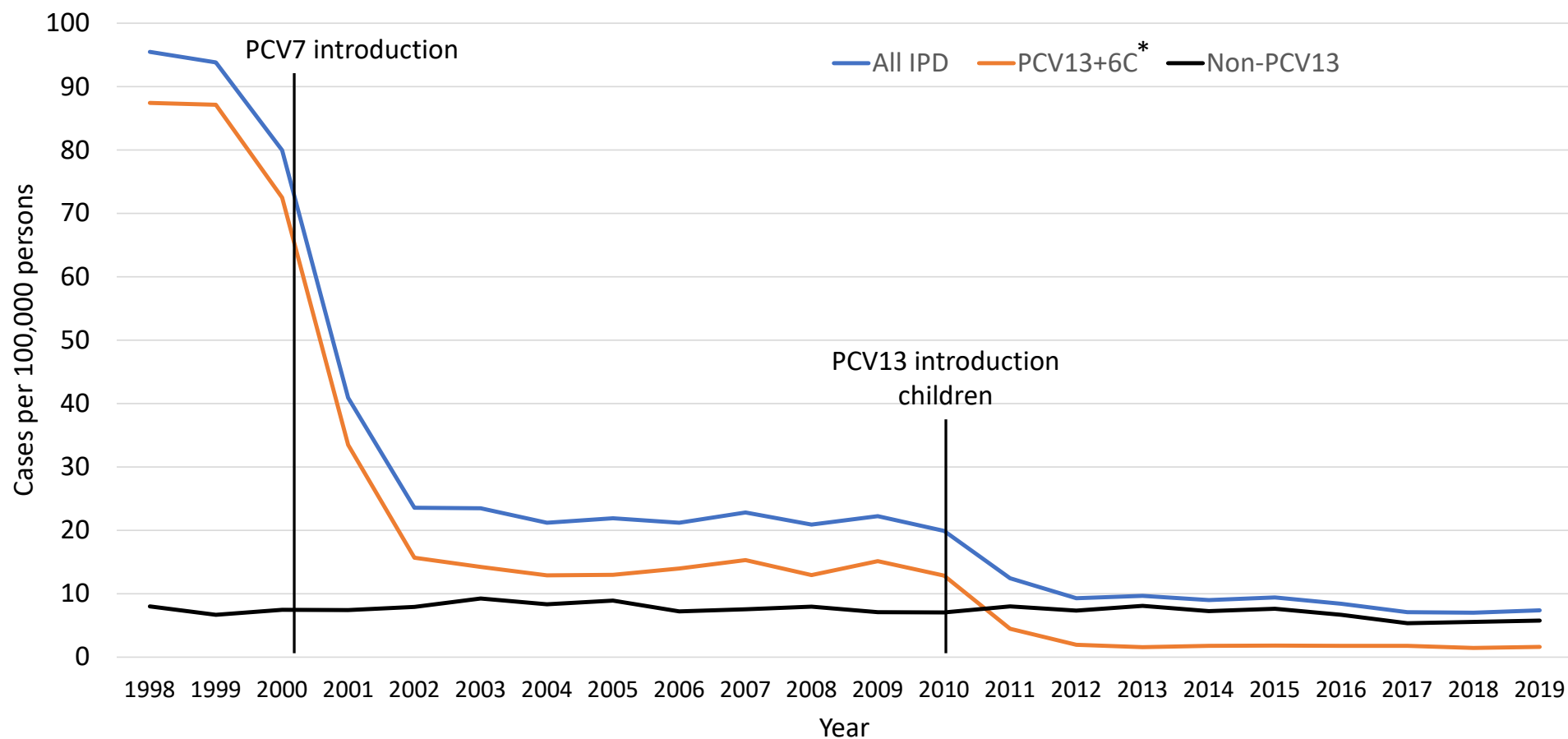
Impact of PCVs on Invasive Pneumococcal Disease (IPD) Incidence and Serotype Distribution among Children in the U.S.

Methods

- **Active Bacterial Core surveillance (ABCs):**
 - Active laboratory and population-based surveillance, 10 sites
 - Pneumococcus isolation from sterile site
- Isolates serotyped by whole genome sequencing, Quellung, or PCR at reference labs and grouped for analysis by vaccine type
- US Census Bureau race-bridged post-census population estimates used as denominators
- Overall and serotype-specific IPD incidence rates (cases per 100,000 people)

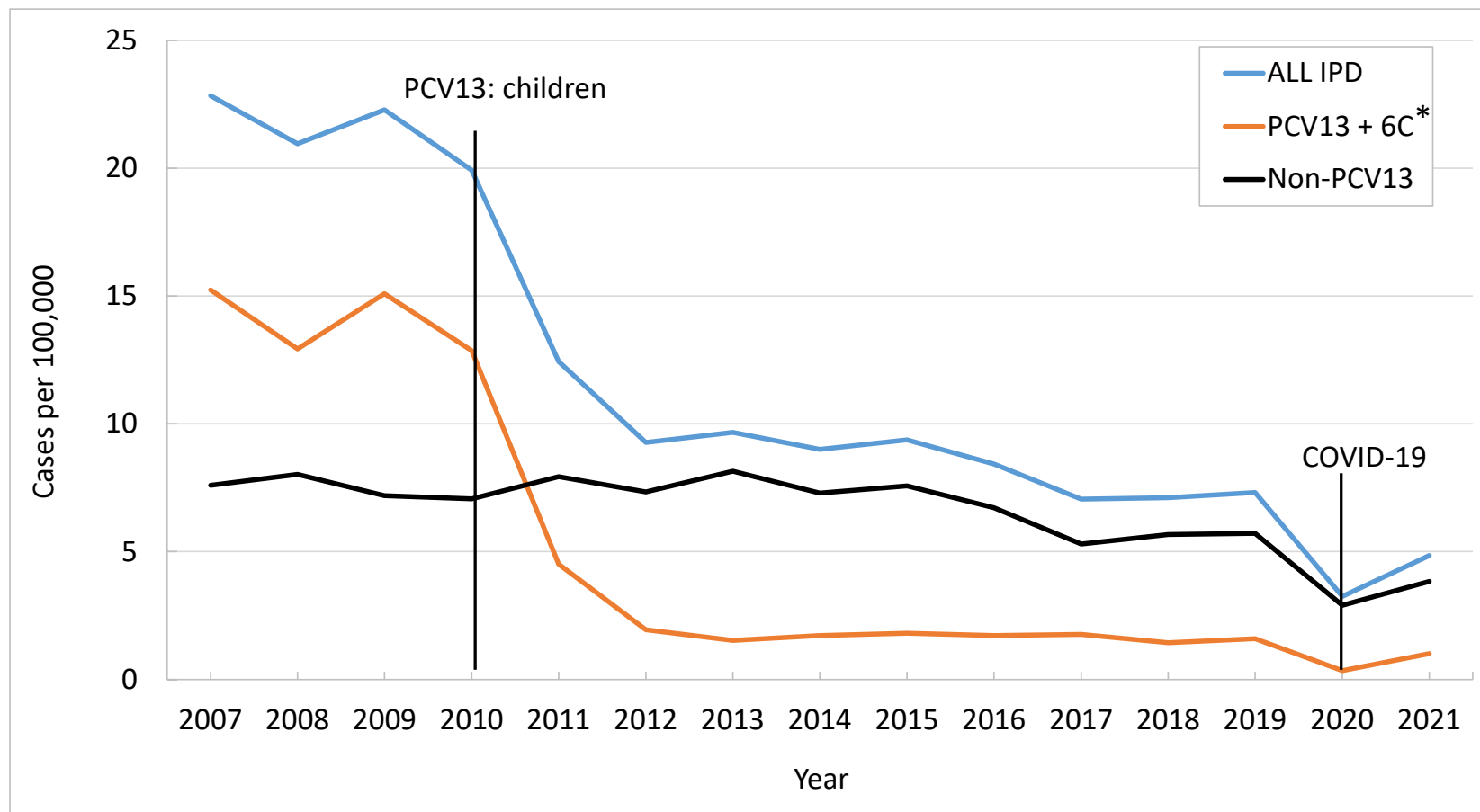


Incidence rates of invasive pneumococcal disease (IPD) among children < 5 years old, 1998–2019



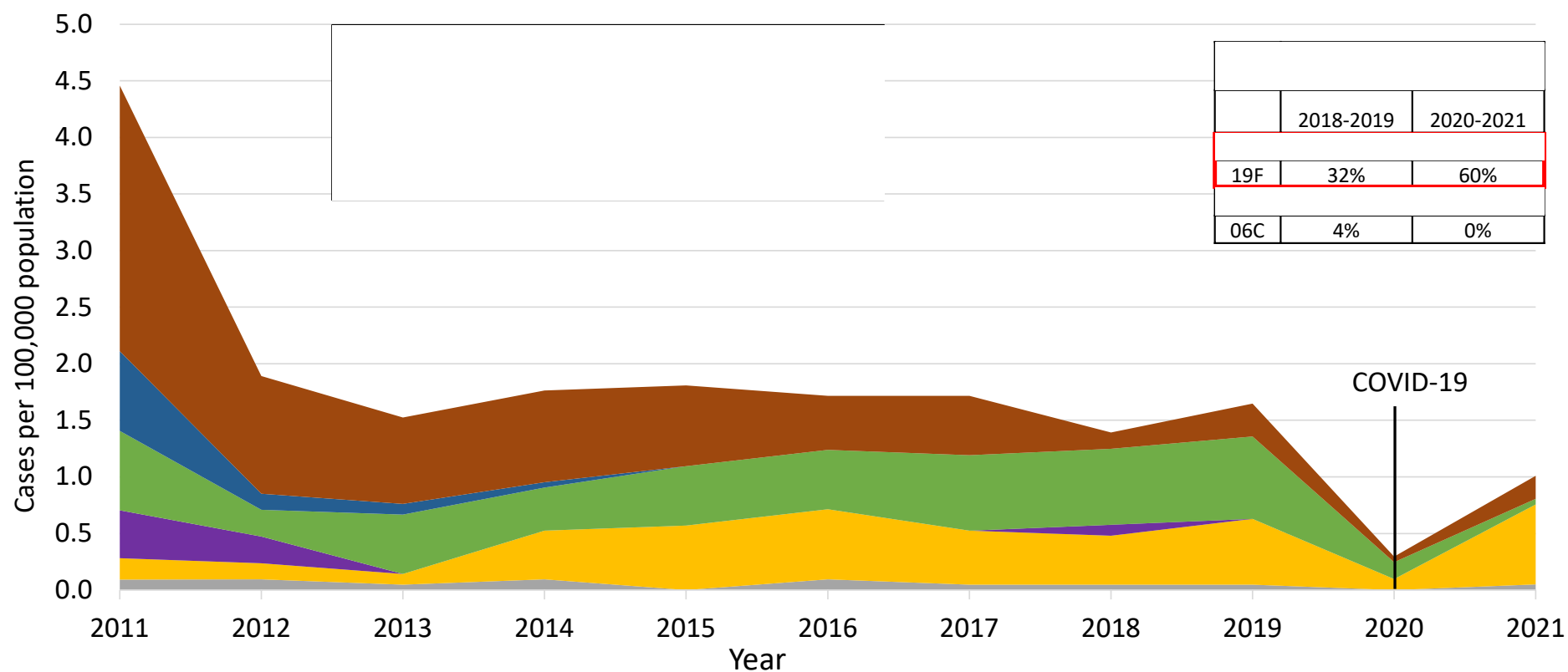
*Serotype 6C was grouped with PCV13 serotypes due to cross protection from 6A antigen in the vaccine

Incidence rates of invasive pneumococcal disease (IPD) among children < 5 years old, 2007 – 2021



*Serotype 6C was grouped with PCV13 serotypes due to cross protection from 6A antigen in the vaccine

Incidence rates of IPD among children < 5 years old, 2011 – 2021, by PCV13+6C* serotypes



*Serotype 6C was grouped with PCV13 serotypes due to cross protection from 6A antigen in the vaccine

Current Pediatric Pneumococcal Disease Incidence Caused by Serotypes in PCV15 and PCV20

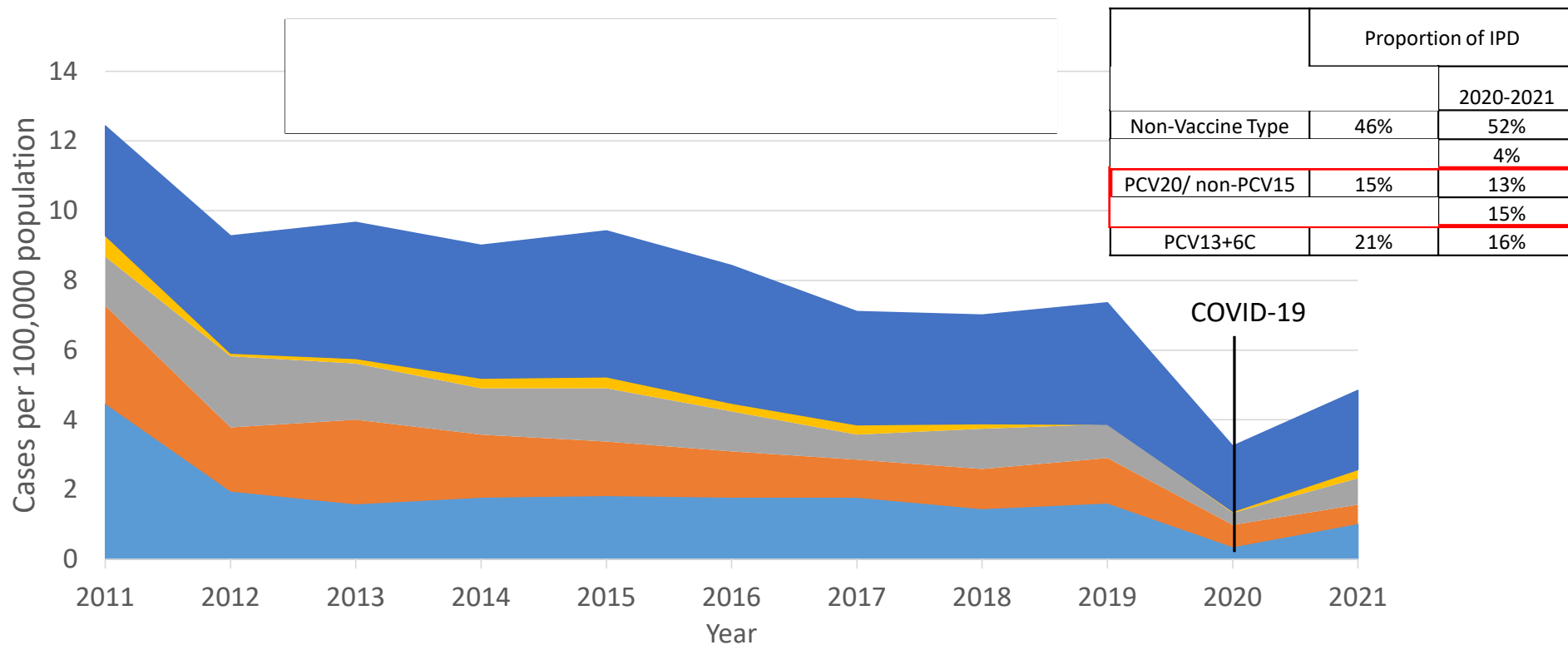
Serotypes contained in current and new pneumococcal vaccines

	1	3	4	5	6A	6B	7F	9V	14	18C	19A	19F	23F	22F	33F	8	10A	11A	12F	15B	2	9N	17F	20
PCV13																								
PCV15																								
PCV20																								
PPSV23																								

For analysis purposes:

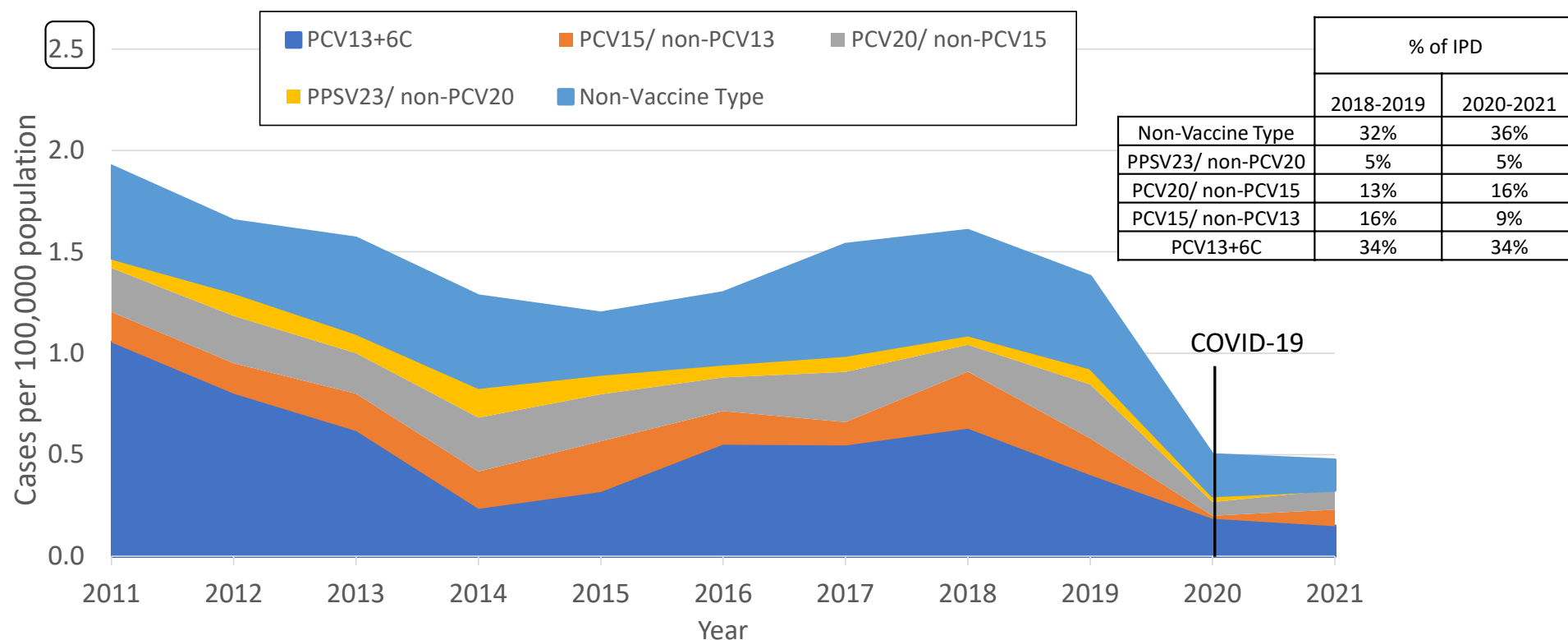
- **PCV13+6C:** includes serotype **6C** with PCV13 types due to cross protection from 6A antigen
- **PCV15 non-PCV13:** includes serotypes **22F** and **33F**
- **PCV20 non-PCV15:** includes serotypes **8, 10A, 11A, 12F, and 15B**
- **PPSV23 non-PCV20:** includes serotypes **2, 9N, 17F, and 20**

Incidence rates of IPD among children <5 years old, 2011 – 2021, by vaccine type



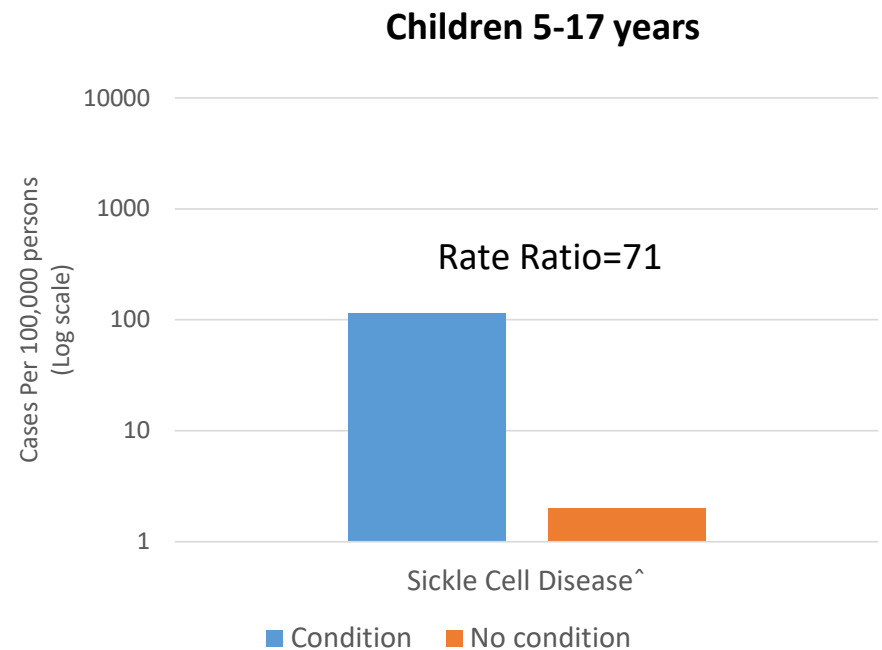
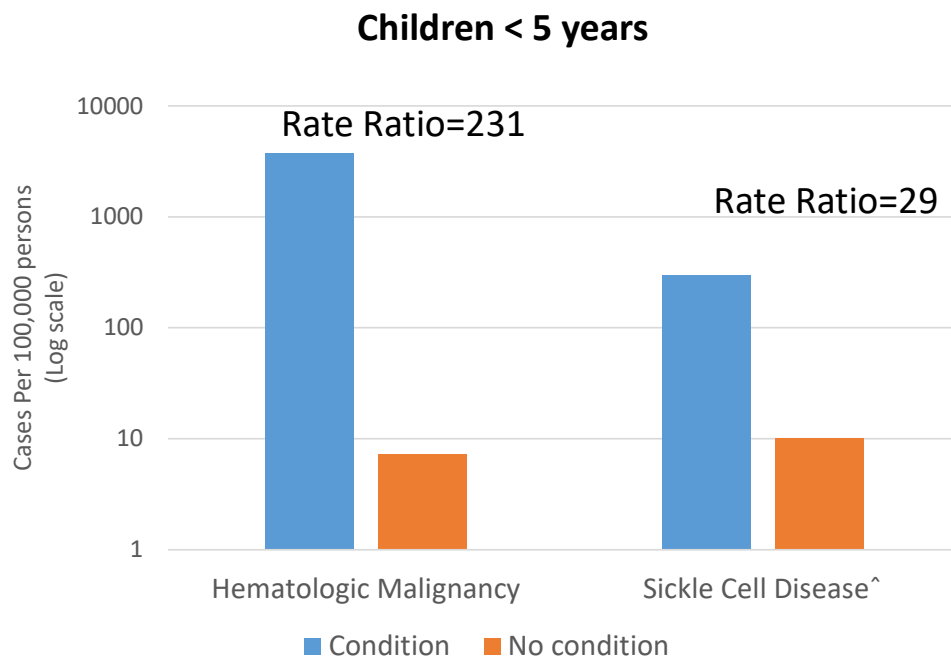
PCV15 non-PCV13 serotypes: 22F, 33F
 PCV20 non-PCV15 serotypes: 8, 10A, 11A, 12F, 15B
 PPSV23 non-PCV20 serotype: 2, 9N, 17F, 20

Incidence rates of IPD among children 5 -18 years old, 2011 – 2021, by vaccine type



PCV15 non-PCV13 serotypes: 22F, 33F
 PCV20 non-PCV15 serotypes: 8, 10A, 11A, 12F, 15B
 PPSV23 non-PCV20 serotype: 2, 9N, 17F, 20

IPD incidence among children with immunocompromising conditions, 2015-2019*



CDC unpublished data, IPD cases identified from ABCs

*Hematologic Malignancy Data only available from 2015-2018 for children age <5 years

^ IPD rates for those with and without sickle cell disease are among African American children

Acute Otitis Media (AOM) in Children

PCV13 impact on acute otitis media in children

- AOM is a major cause of childhood morbidity^{1,2,3}
 - Pneumococcus is a common bacterial cause of AOM
 - *S. pneumoniae* accounted for an estimated **24%**⁴
- AOM incidence decreased after PCV13 introduction
 - 11%-14% decrease, depending on age group and study years^{1,2}

¹ Tong et al. *BMC* 2018

² King et al. *ASHE* 2021

³ Casey et al *Clin Pediatr* 2014;

⁴ Kaur et al. *EJCMID* 2022

Incidence of acute otitis media among children

	AOM visits per 100,000 Person Years		
	2014 ¹	2014-2018 ²	2016-2018 ³
<1	43,180	--	--
1 year	47,860	--	--
<2 years	--	76,880	49,050
2-4 years	29,980	41,030	31,970
5-17 years	9,060	9,180	5,680

**AOM incidence highest
among children age <5 years**

¹ Tong et al. *BMC* 2018

² Hu et al. *BMC* 2022

³ Unpublished analysis courtesy of Laura King, UC Berkeley

Pneumonia in Children

Evidence of PCV13 impact on pneumonia in children

- Reduction in incidence of all-cause and pneumococcal pneumonia among in children following PCV13 introduction^{1,2,3}
 - **17-35%** reduction in all cause-pneumonia¹
 - **40%** and **51%** reduction in inpatient pneumococcal pneumonia among ages <1 and 5-17 years, respectively; no reductions in ages 2-4 years²

¹Tong et al. *BMC* 2018

² Simonsen et al. *Lancet* 2014

³King et al. *ASHE* 2021

Pneumonia incidence among children

Age (years)	All-cause pneumonia (frequency per 100,000 person years) ¹ , 2014	All-cause inpatient pneumonia (cases per 100,000 population) ² , 2018–19
< 1	2,250	680
1	3,990	480
2–4	3,390	290
5–17	1,280	87

¹ Tong et al. BMC 2018

² National Inpatient Sample, 2018-2019

Conclusions

- Use of PCVs (PCV7, PCV13) significantly decreased the incidence of pneumococcal disease in U.S. children
- Risk of disease remains higher in children with immunocompromising conditions compared to children without
- In 2018–2019, the proportion of IPD caused by vaccine serotypes was:
 - PCV20, non-PCV13: ~30% of IPD
 - PCV15, non-PCV13: ~15% of IPD

Questions

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 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.

