

Centers for Disease Control and Prevention
National Center for Immunization and Respiratory Diseases



Current Epidemiology of Pneumococcal Disease among Adults, United States

February 2024, ACIP Meeting

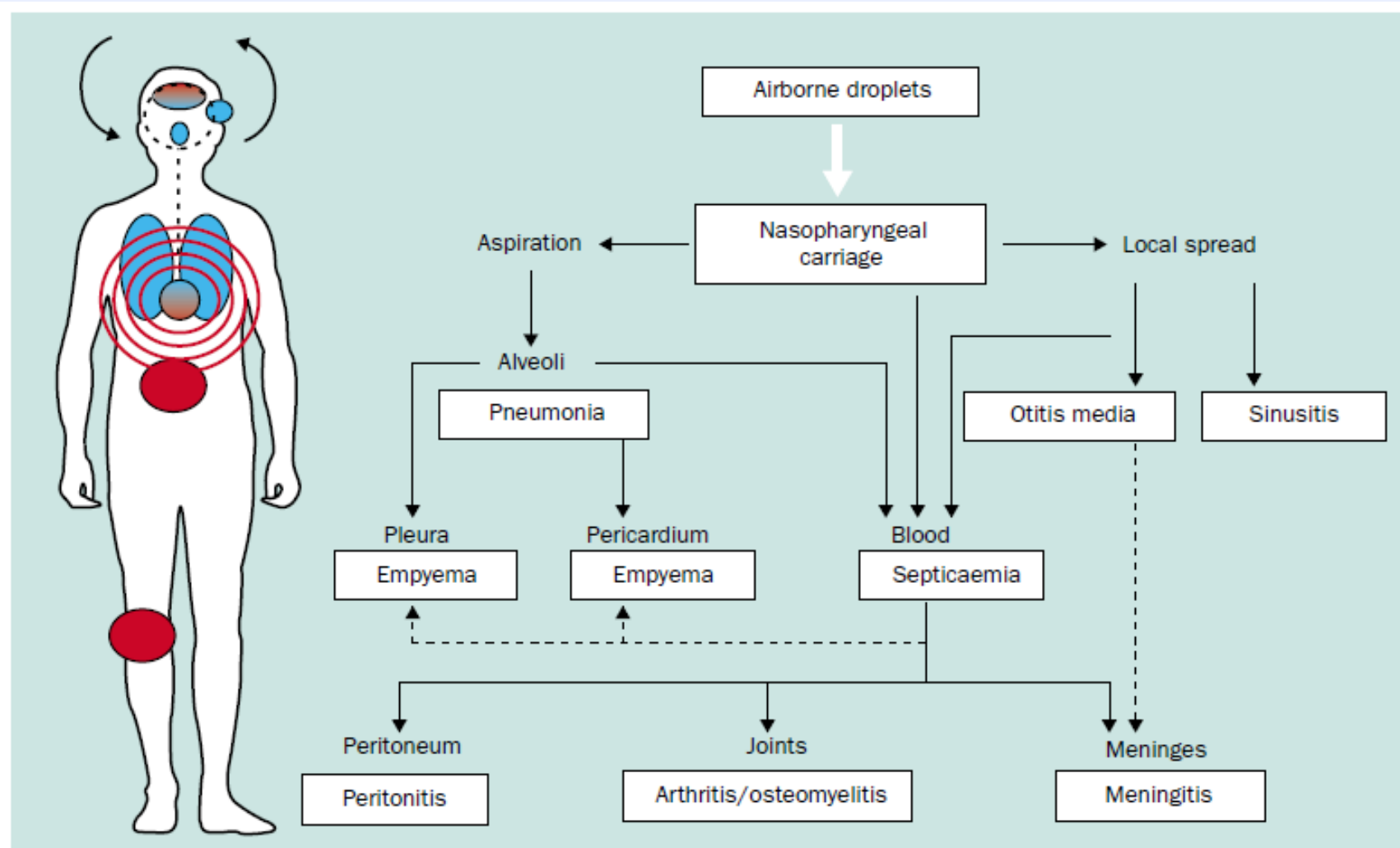
February 29, 2024
Ryan Gierke, MPH

Outline

- Background on pneumococcal disease
- Pneumococcal vaccine coverage in adults
- Pneumonia incidence estimates in adults
- Invasive pneumococcal disease (IPD)
 - Impact of COVID-19
 - Incidence by vaccine type
 - Serotype distribution



Pneumococcal carriage is precursor to pneumococcal disease



More frequent

Less frequent

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.

Bogaert, Lancet Infect Dis 2004;4:144-54

Pneumococcal carriage is precursor to pneumococcal disease

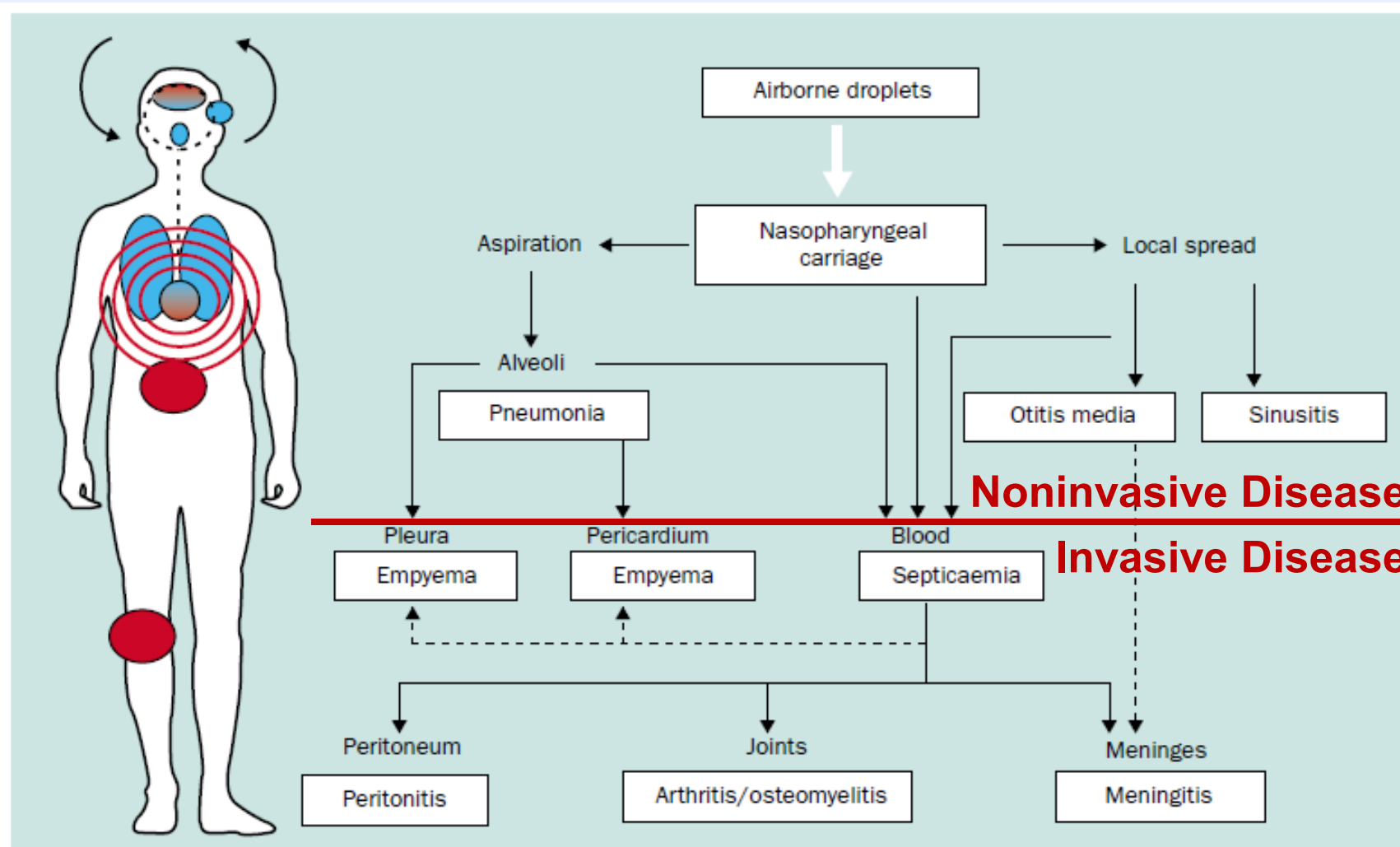


Figure 1. Pathogenic route for *S. pneumoniae* infection. Redrawn from reference 2. Organs infected through the airborne and haematogenic routes are depicted in blue and red, respectively.

Bogaert, Lancet Infect Dis 2004;4:144-54

PCV15 and PCV20 coverage among Medicare Part A/B beneficiaries aged ≥ 65 years¹, Oct 1, 2021 – Dec 31, 2023

- PCV20 coverage: **12%**
 - Ranged from **9%** (adults aged ≥ 85 years) to **25%** (adults aged 65 years)
- PCV15 coverage: **0.2%**
 - Less than **1%** across all ages



1. Based on age at the end of 2022

Unpublished data courtesy of CDC ISD. Based on CMS data from January 17, 2024.

Estimated proportion of adults who ever received any pneumococcal vaccination, National Health Interview Survey, 2021

Age group	%	(95% CI)
Overall (≥ 65 years)	65.8	(64.4-67.2)
Overall (19–64 years <i>with risk-based indication</i>)	22.2	(21.0-23.5)
White	23.3	(21.7-24.9)
Black	22.6	(19.2-26.4)
Hispanic	19.0	(15.9-22.6)*
Asian	16.9	(12.0-23.2)*
Other	22.7	(16.3-30.7)

* $p < 0.05$ for comparisons with white as the reference

<https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/pubs-resources/vaccination-coverage-adults-2021.html#summary>

Estimated incidence of pneumococcal disease in adults aged ≥ 65 years

Disease	Estimated incidence (per 100,000 population)
All-cause hospitalized pneumonia ¹	847–3,365
Hospitalized noninvasive pneumococcal pneumonia ²	105
Invasive pneumococcal disease (IPD) ³	24

Case fatality ratio from IPD: 14%³

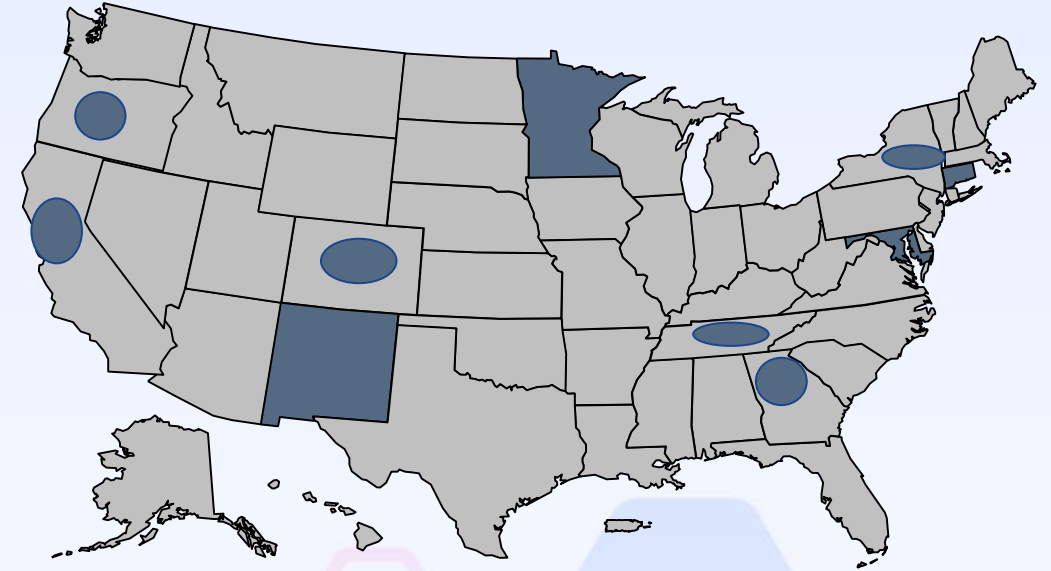
1. McLaughlin et al. Vaccine 2020 (limited to studies that collected data during or after 2010)
2. Gierke et al. IDweek 2020. CDC's Surveillance for NonInvasive Pneumococcal Pneumonia (SNiPP), 2017
3. CDC ABCs, 2018–2019

IPD Incidence and Serotype Distribution Among Adults in the United States

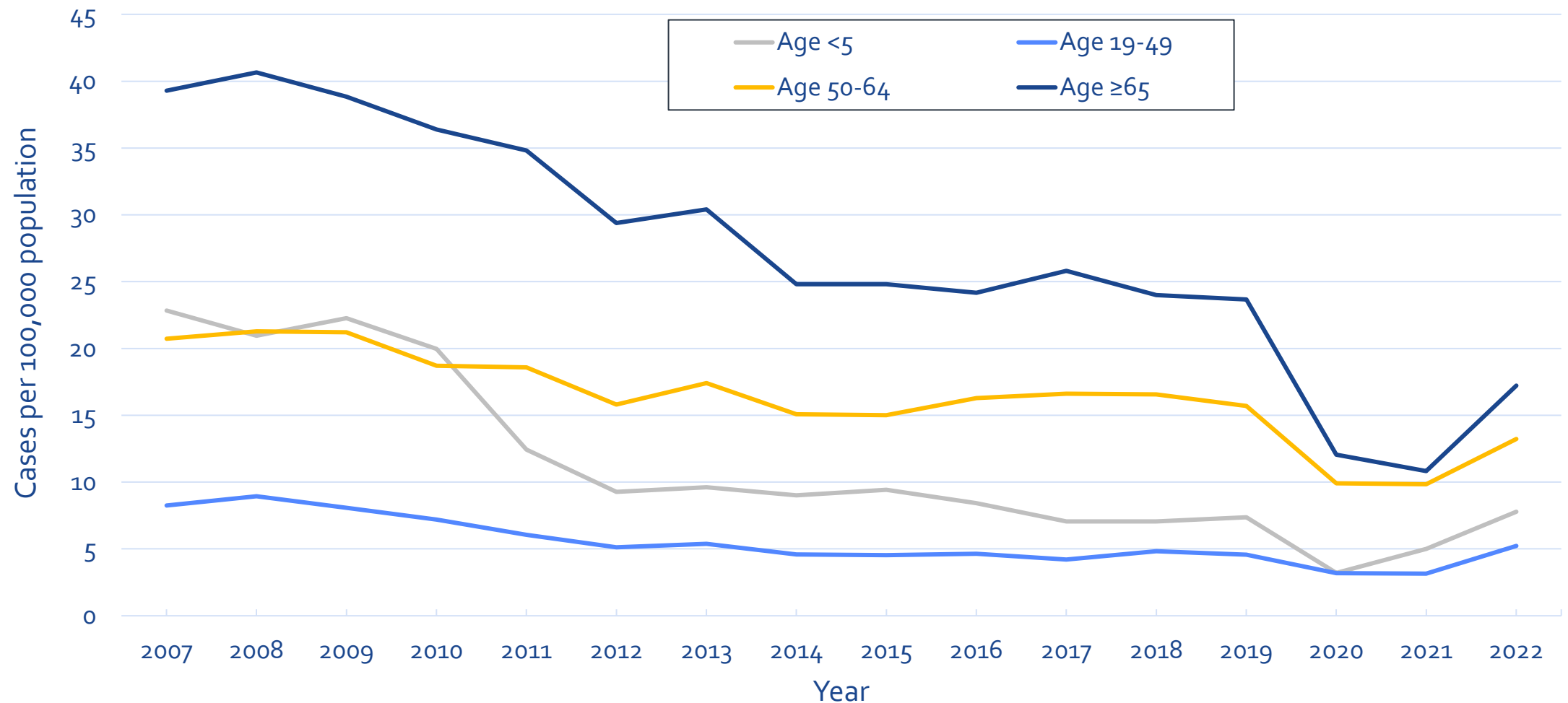


Methods

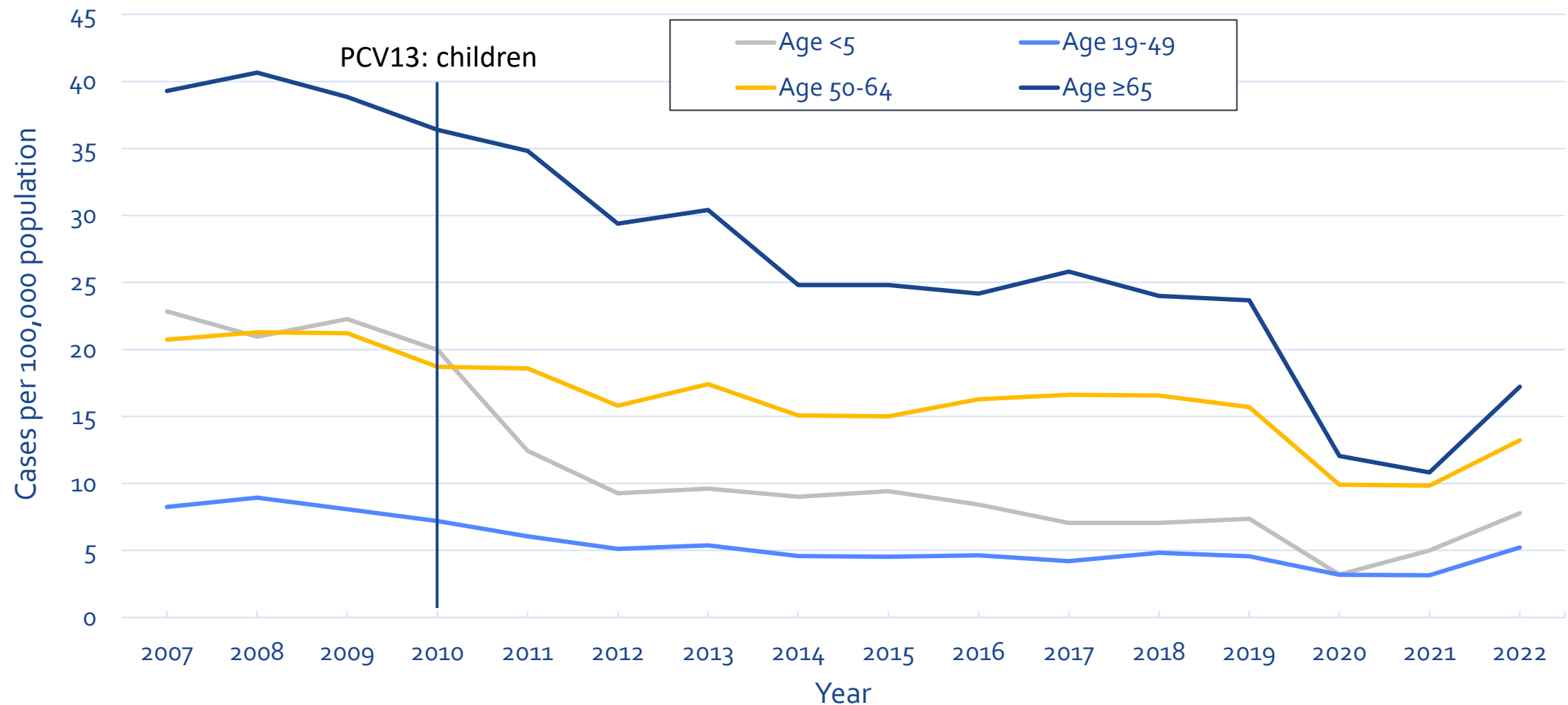
- **Active Bacterial Core surveillance (ABCs):**
 - Active laboratory and population-based surveillance, 10 sites
 - Pneumococcus isolation from sterile site
- Isolates serotyped by whole-genome sequencing, Quellung, or PCR at reference labs and grouped for analysis by vaccine type
- US Census Bureau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



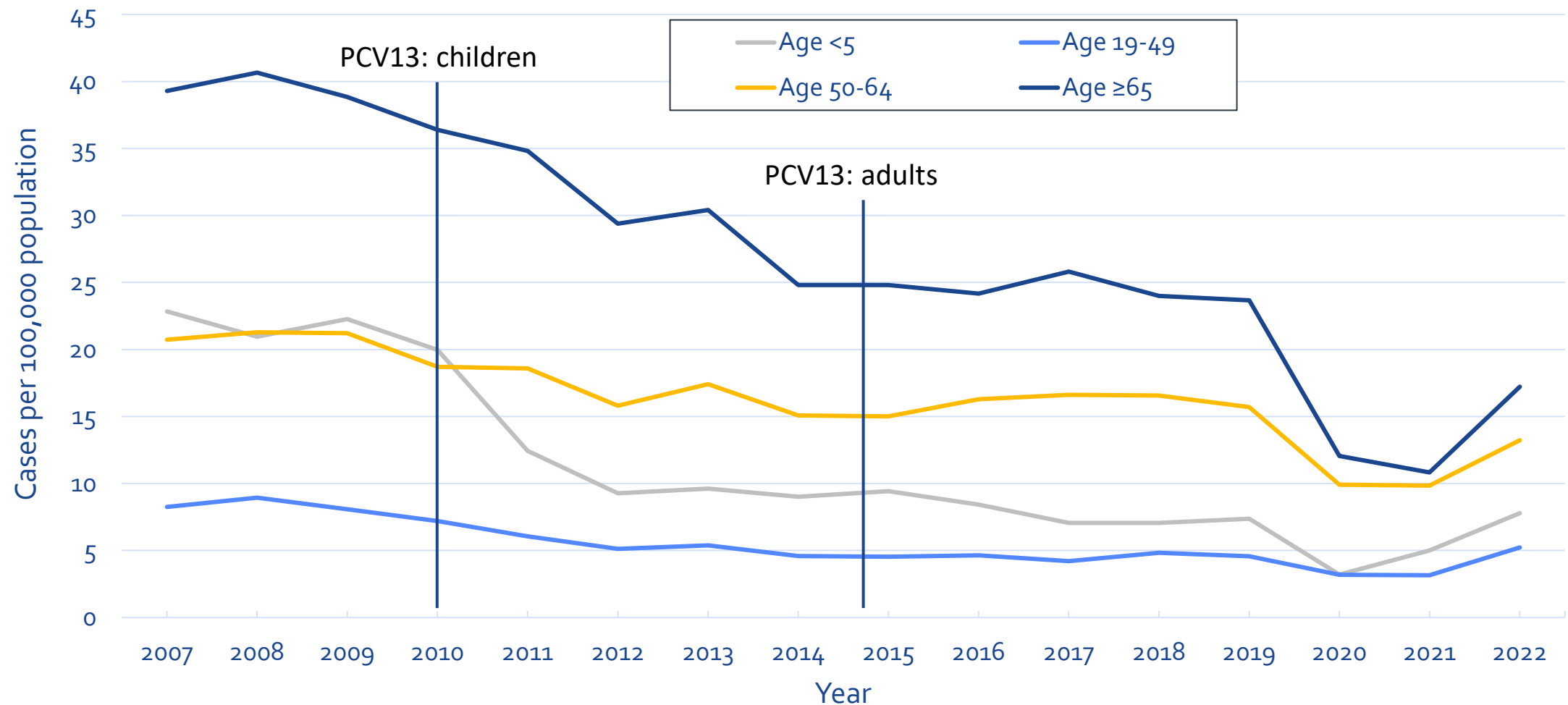
IPD incidence rates, by age group, 2007 – 2022



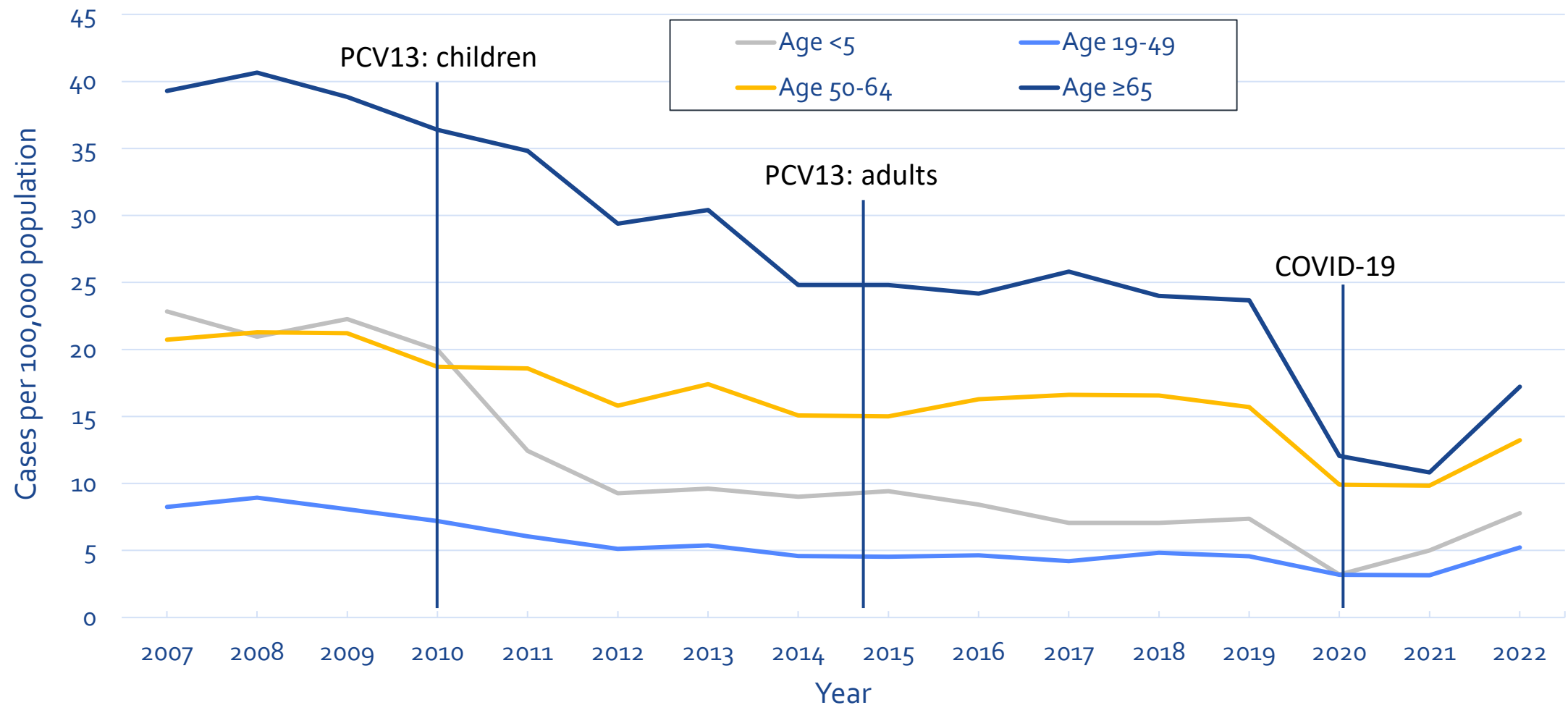
IPD incidence rates, by age group, 2007 – 2022



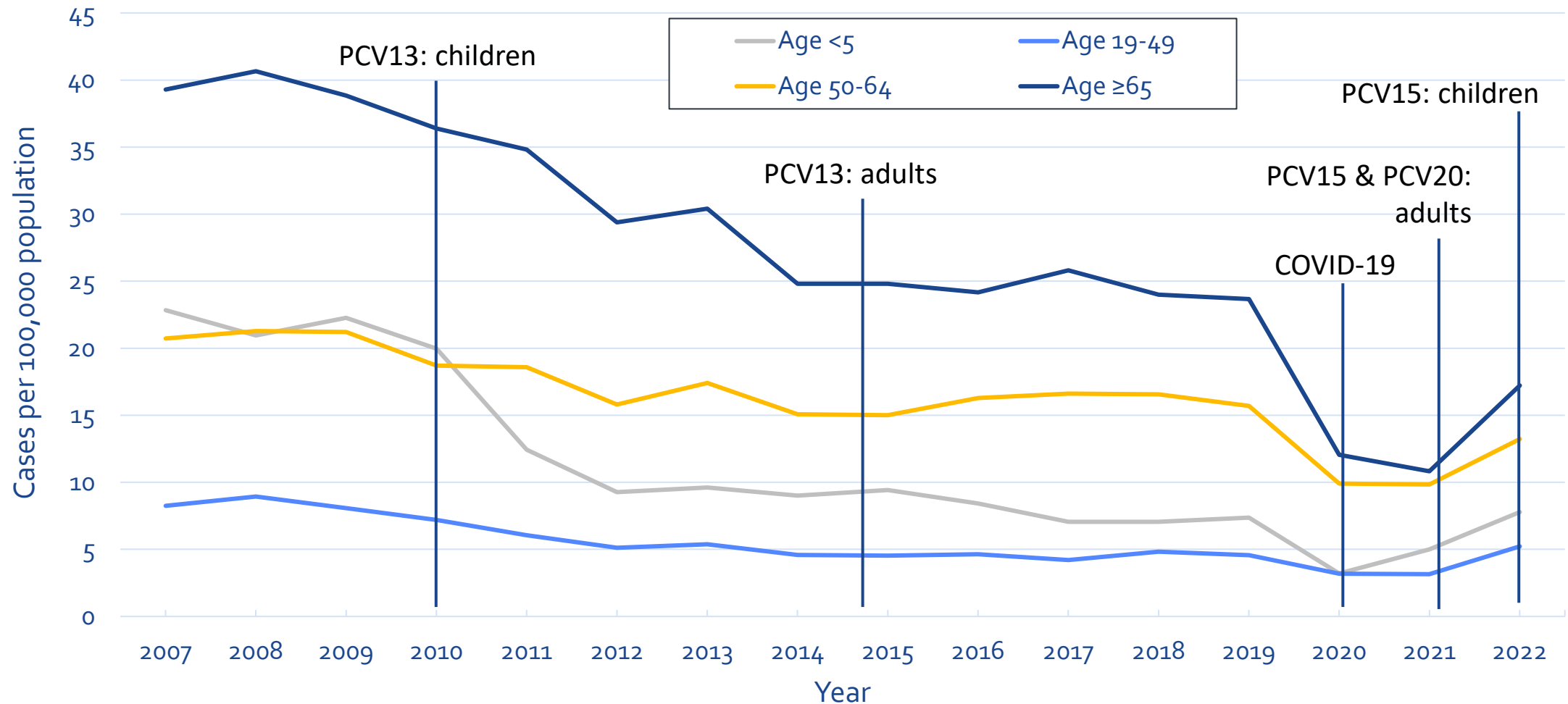
IPD incidence rates, by age group, 2007 – 2022



IPD incidence rates, by age group, 2007 – 2022



IPD incidence rates, by age group, 2007 – 2022



Proportion of adult IPD cases, with a risk-based indication, 2018 – 2021

- Among adult IPD cases, **82% – 87%** had at least one risk-based indication for pneumococcal vaccination
 - Age 19-49 years: **82%**
 - Age 50-64 years: **87%**
 - Age ≥ 65 years: **87%**



Serotypes contained in current and new pneumococcal vaccines

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B			
PCV15																																			
PCV20																																			
PPSV23																																			
PCV21																																			

Serotypes contained in PCV20 and PCV21

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B		
PCV20	Blue	Grey	Blue	Blue	Grey	Blue	Grey	Blue	Blue	Blue	Grey	Blue	Blue	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Blue	White	White	White	White	White	White	White	White	White	White	White	White	White
PCV21	White	Grey	White	White	Grey	White	Grey	White	White	White	Grey	White	White	Grey	Grey	Grey	Grey	Grey	Grey	Grey	White	White	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow



Serotypes contained in PCV20 and PCV21

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B	
PCV20																																	
PCV21																																	

For analysis purposes:

- **PCV20 non-PCV21:** includes serotypes **1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B**

Serotypes contained in PCV20 and PCV21

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B		
PCV20																																		
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For analysis purposes:

- **PCV20 non-PCV21:** includes serotypes **1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B**
- **PCV20 and PCV21:** includes serotypes **3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C**

Serotypes contained in PCV20 and PCV21

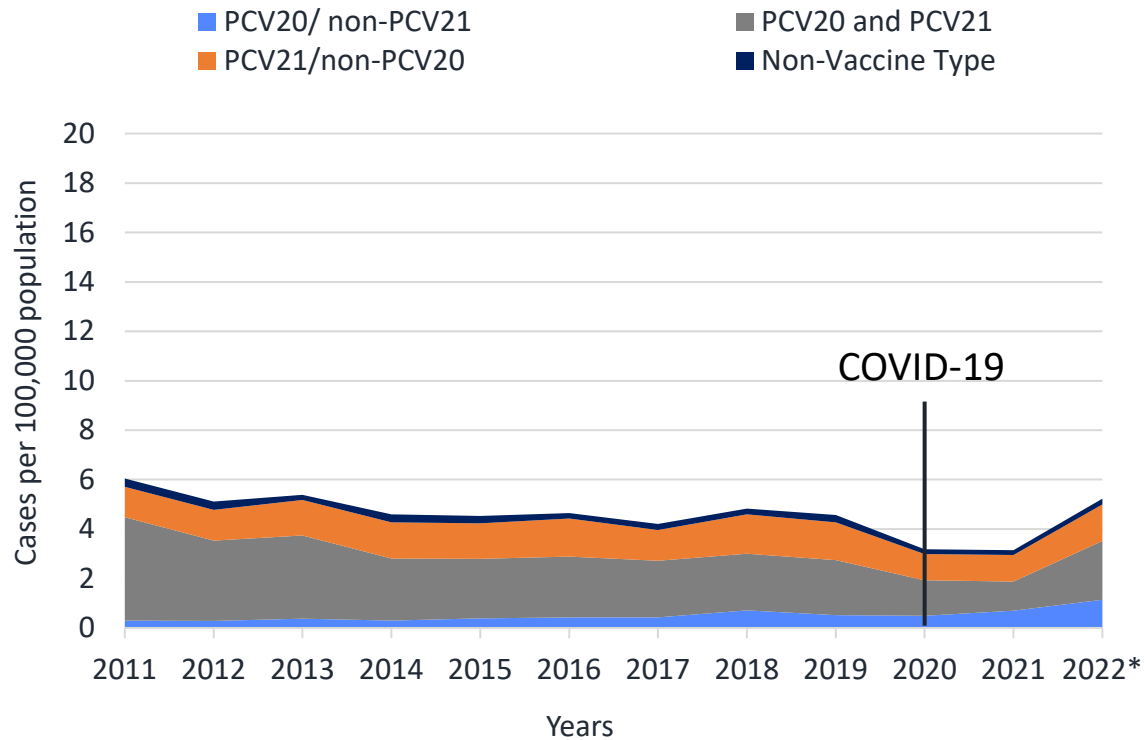
	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B	
PCV20	Blue	Grey	Blue	Blue	Grey	Blue	Grey	Blue	Blue	Blue	Grey	Blue	Blue	Grey	Grey	Grey	Grey	Grey	Grey	Blue	White	White	White	White	White	White	White	White	White	White	White	White	White
PCV21	White	Grey	White	White	Grey	White	Grey	White	White	White	Grey	White	White	Grey	Grey	Grey	Grey	Grey	Grey	White	White	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

For analysis purposes:

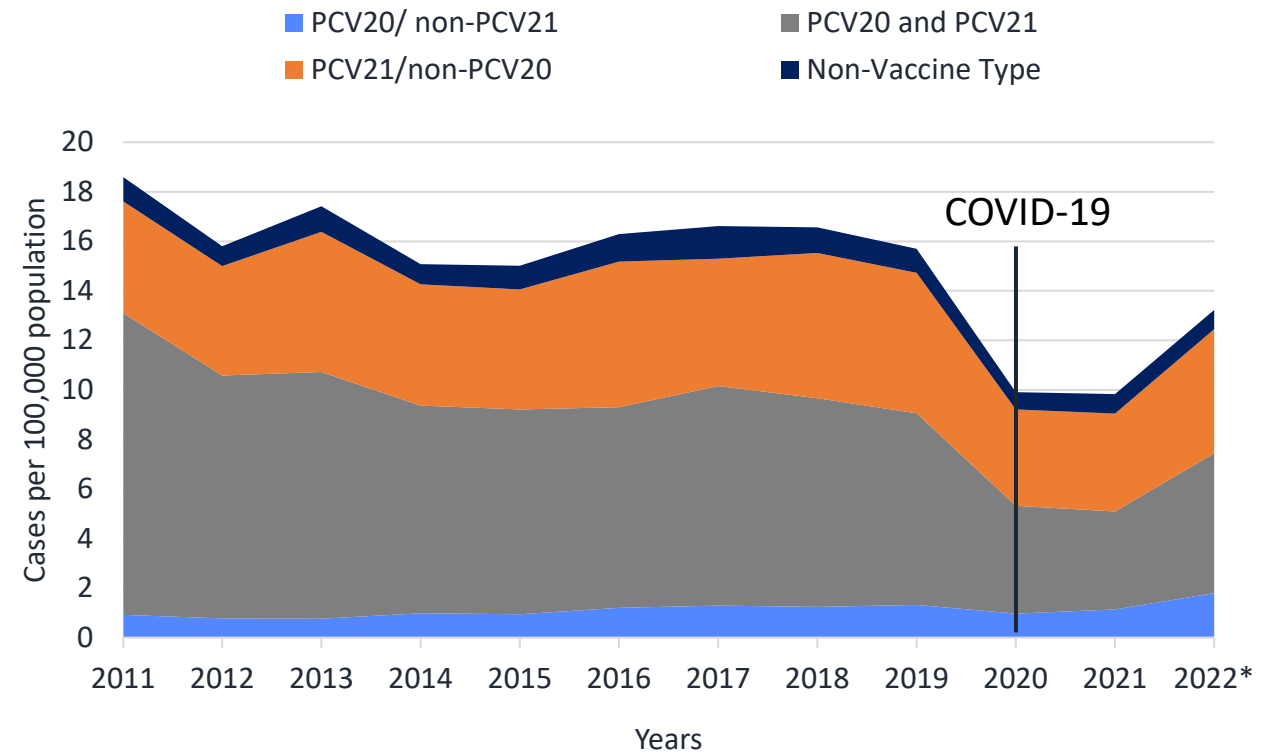
- **PCV20 non-PCV21:** includes serotypes **1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B**
- **PCV20 and PCV21:** includes serotypes **3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C**
- **PCV21 non-PCV20:** includes serotypes **9N, 17F, 20, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35B**

IPD incidence rates among adults 19-64 years old, by vaccine type, 2011 – 2022

19-49 years old



50-64 years old

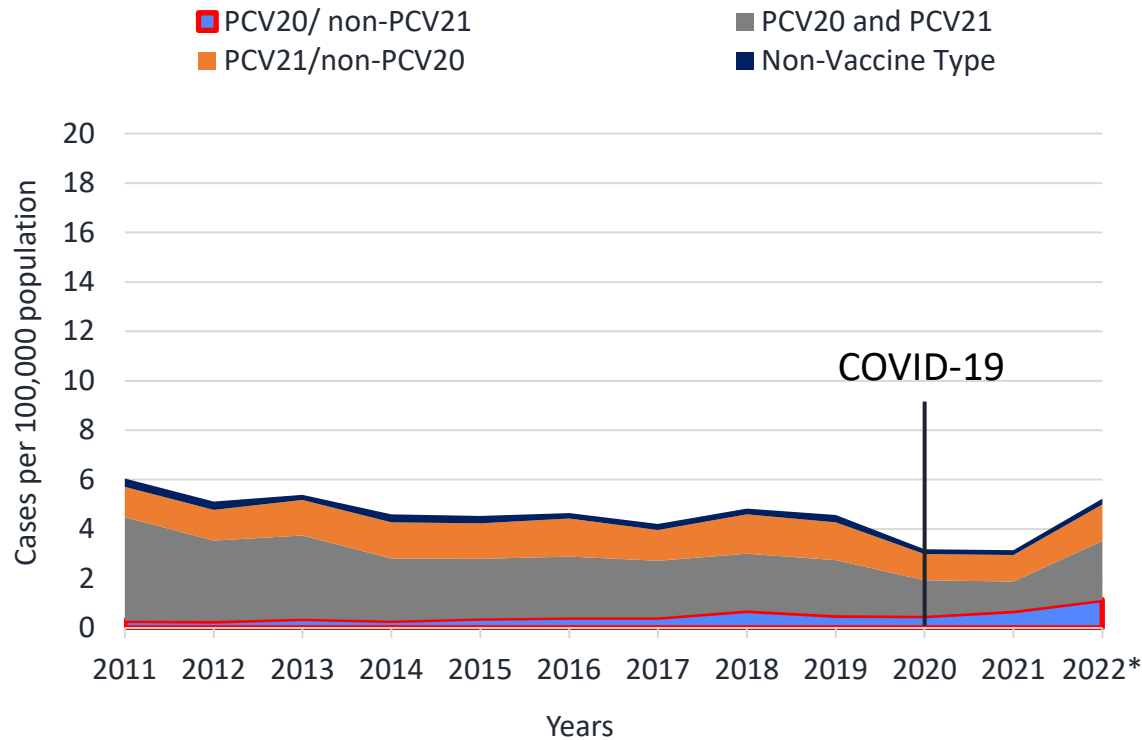


PCV20/ non-PCV21 serotype: 1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B
 PCV20/ in-PCV21 serotypes: 3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C
 PCV21/ non-PCV20 serotypes: 9N, 17F, 20, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35B

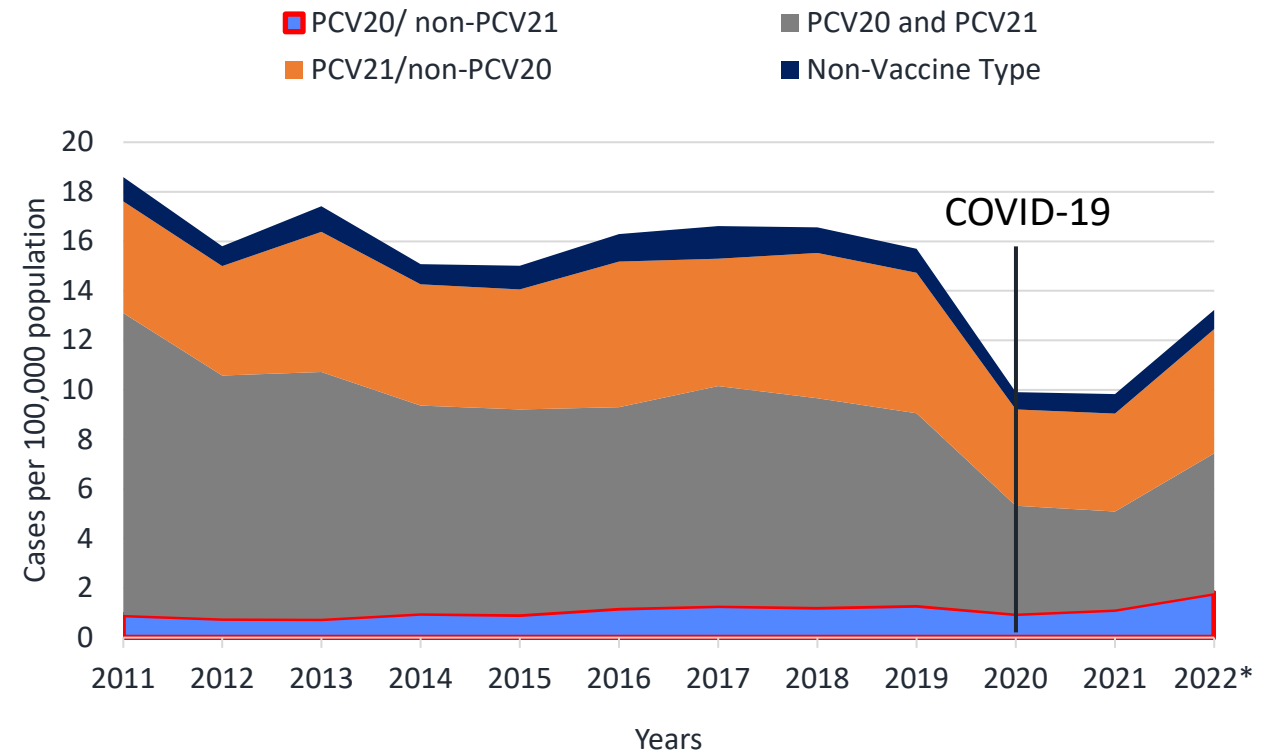
*2022 estimates are not finalized

IPD incidence rates among adults 19-64 years old, by vaccine type, 2011 – 2022

19-49 years old



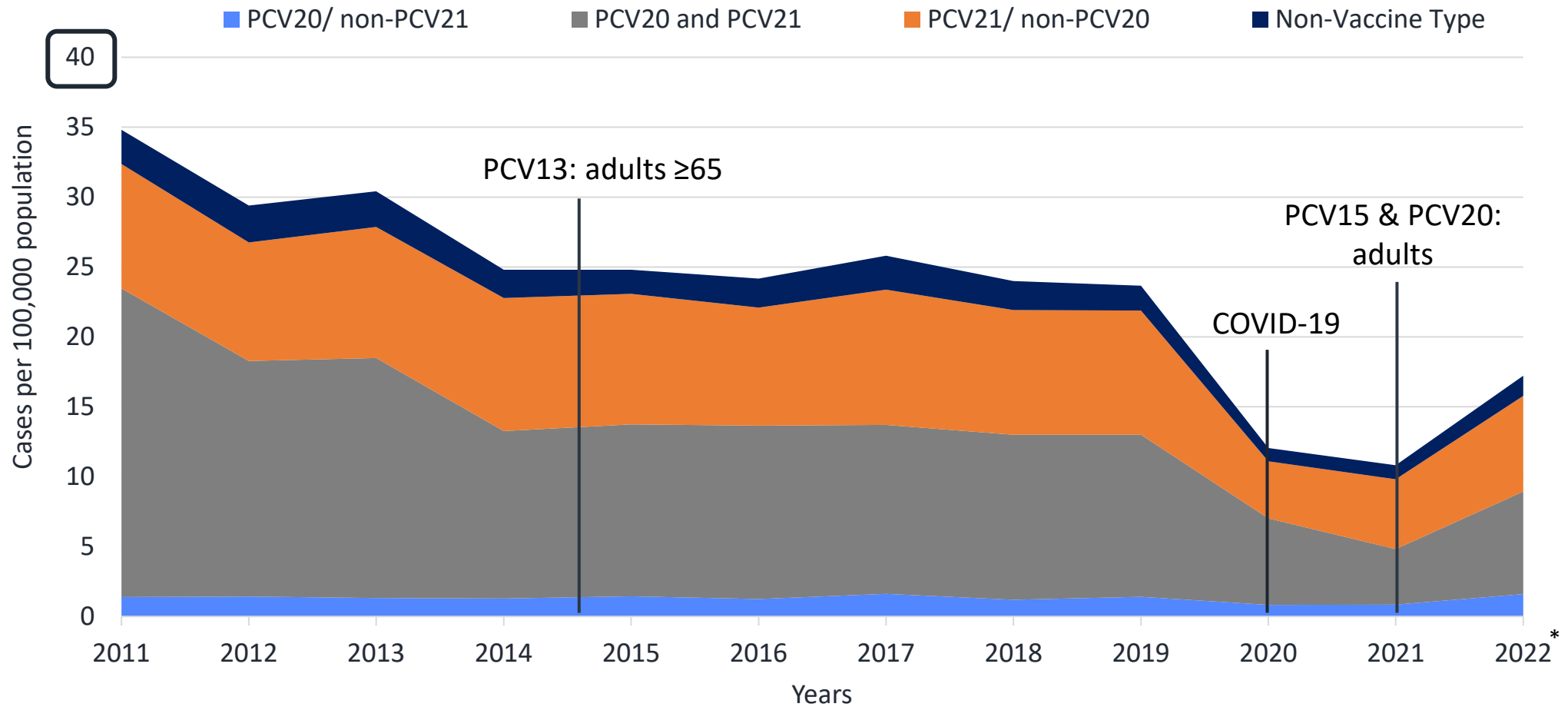
50-64 years old



PCV20/ non-PCV21 serotype: 1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B
 PCV20/ in-PCV21 serotypes: 3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C
 PCV21/ non-PCV20 serotypes: 9N, 17F, 20, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35B

*2022 estimates are not finalized

IPD incidence rates among adults ≥65 years old, by vaccine type, 2011 – 2022

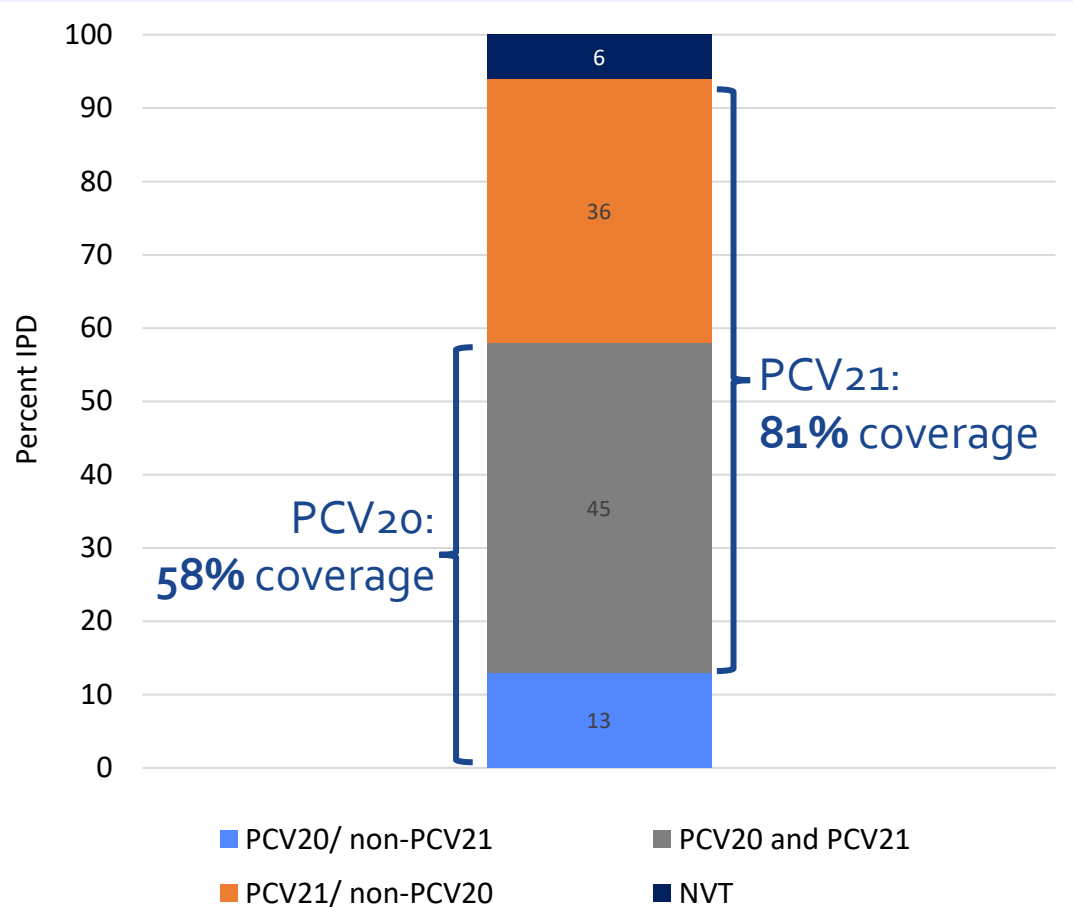


PCV20/ non-PCV21 serotype: 1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B
 PCV20/ in-PCV21 serotypes: 3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C
 PCV21/ non-PCV20 serotypes: 9N, 17F, 20, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35B

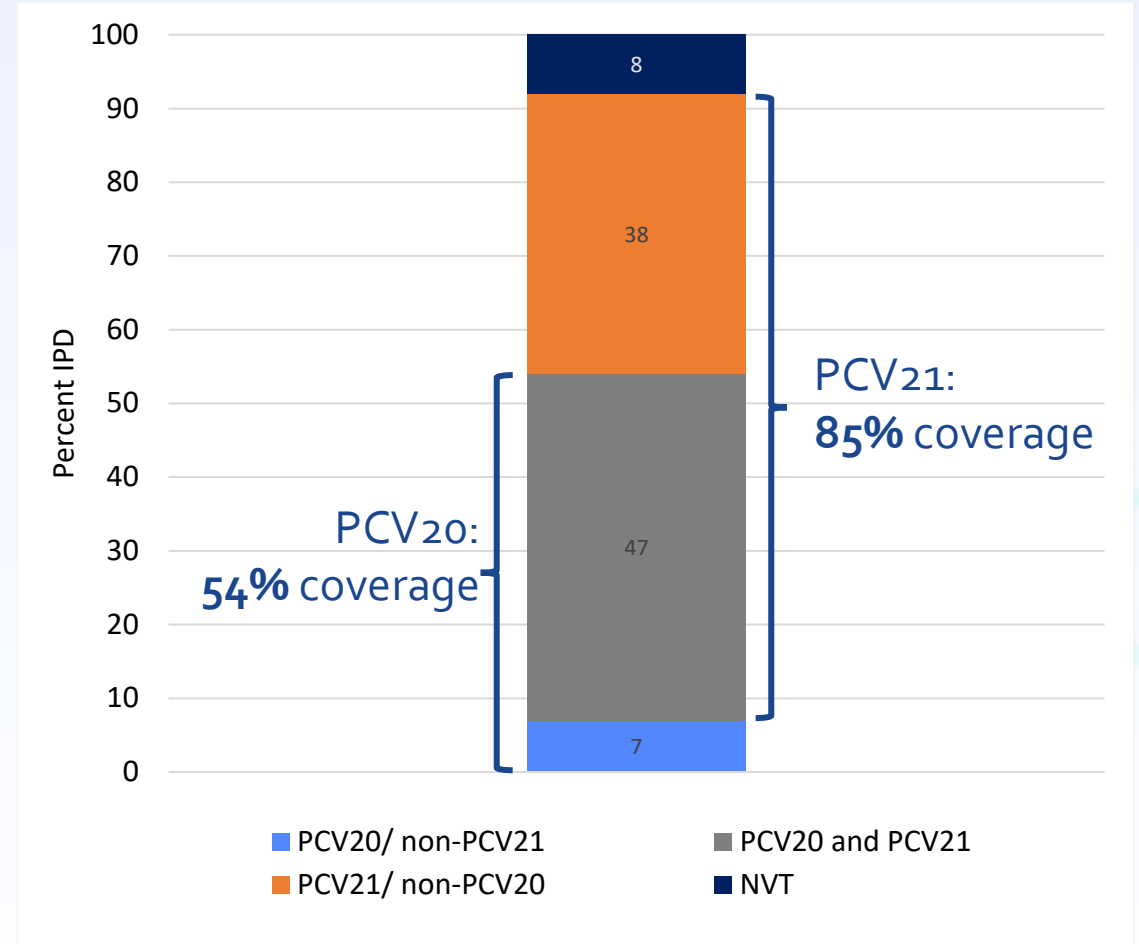
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Proportion of IPD by vaccine-type among adults with a pneumococcal vaccine indication, 2018 – 2022

19-64 years old (with a risk-based indication)



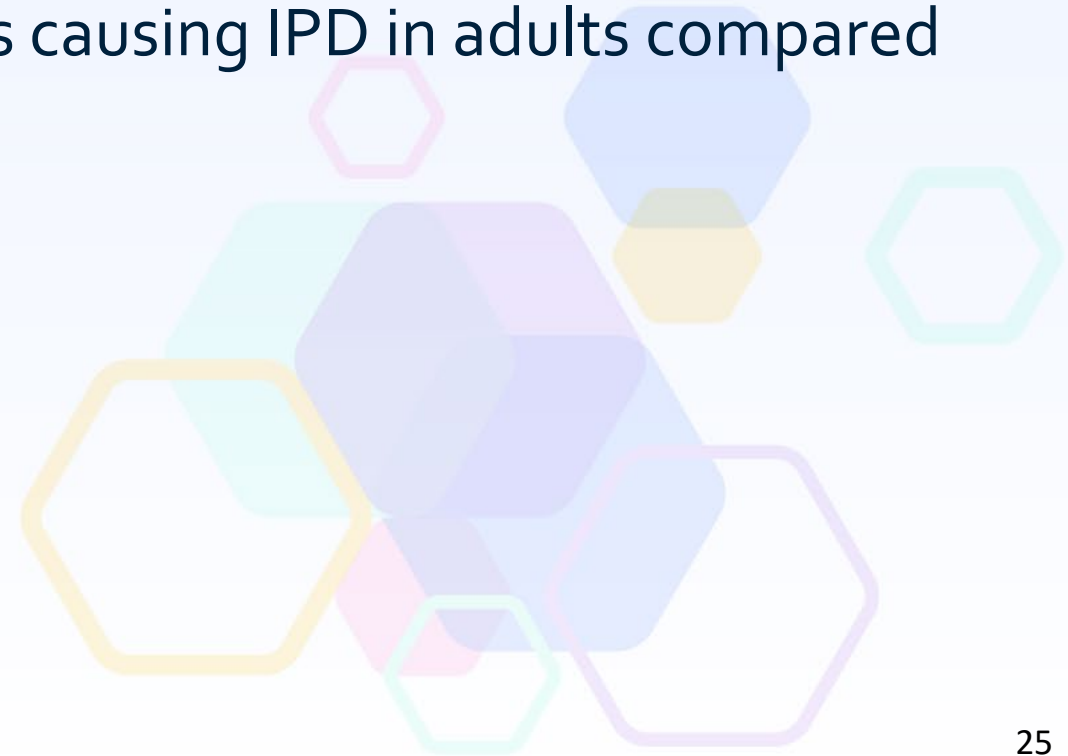
≥65 years old



PCV20/ non-PCV21 serotype: 1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B
 PCV20/ in-PCV21 serotypes: 3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C
 PCV21/ non-PCV20 serotypes: 9N, 17F, 20, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35B

Conclusion

- During the COVID-19 pandemic, rates of IPD declined but are now returning to pre-pandemic levels
- >80% of adult IPD cases have a risk-based indication for vaccination
- PCV21 has greater coverage of the serotypes causing IPD in adults compared to PCV20
 - PCV20 covers 54–58% of adult IPD
 - PCV21 covers 81–84% of adult IPD



Questions

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

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Supplemental slides



Serotypes contained in current and new pneumococcal vaccines

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B		
PCV15																																		
PCV20																																		
PPSV23																																		
PCV21																																		

For analysis purposes:

- **PCV15+6C** includes serotype **6C** with PCV15 types due to cross protection from 6A antigen

Serotypes contained in current and new pneumococcal vaccines

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B			
PCV ₁₅																																			
PCV ₂₀																																			
PPSV ₂₃																																			
PCV ₂₁																																			

For analysis purposes:

- **PCV15+6C** includes serotype **6C** with PCV₁₅ types due to cross protection from 6A antigen
- **PCV20/ non-PCV15:** includes serotypes **8, 10A, 11A, 12F, and 15B**

Serotypes contained in current and new pneumococcal vaccines

	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B		
PCV ₁₅	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	White	White	White	White	White	White	White	White	White	White	White	White	White	White	White	White	White	White	White
PCV ₂₀	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Grey	Grey	Grey	Grey	Grey	White	White	White	White	White	White	White	White	White	White	White	White	White	White
PPSV ₂₃	Blue	Blue	Blue	Blue	White	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Grey	Grey	Grey	Grey	Grey	Yellow	Yellow	Yellow	Yellow	White	White	White	White	White	White	White	White	White	White
PCV ₂₁	White	Blue	White	White	Blue	White	Blue	White	White	Blue	White	White	Blue	Blue	Grey	Grey	Grey	Grey	White	White	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	

For analysis purposes:

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

Serotypes contained in current and new pneumococcal vaccines

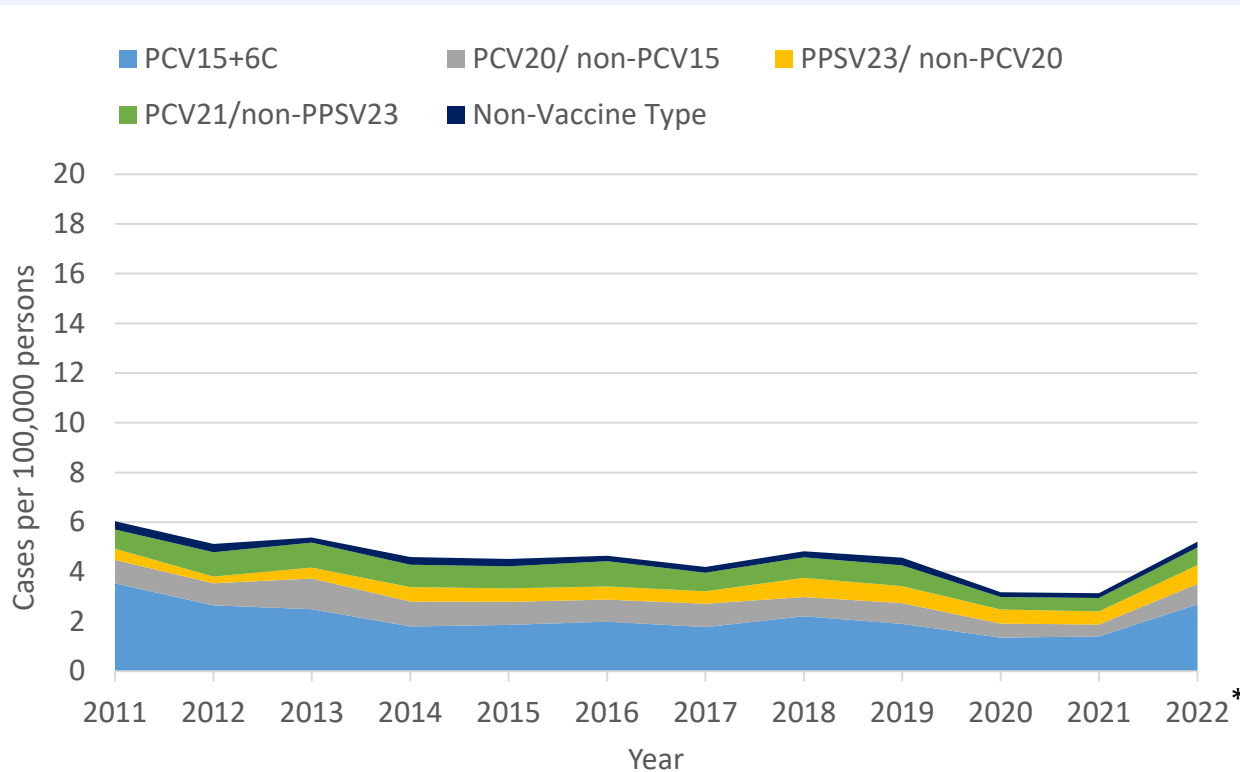
	1	3	4	5	6 A	6 B	7 F	9 V	1 4	1 8 C	1 9 A	1 9 F	2 3 F	2 2 F	3 3 F	8	1 0 A	1 1 A	1 2 F	1 5 B	2	9 N	1 7 F	2 0	1 5 A	1 5 C	1 6 F	2 3 A	2 3 B	2 4 F	3 1	3 5 B			
PCV ₁₅	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																				
PCV ₂₀	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PPSV ₂₃	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PCV ₂₁		■			■		■				■			■	■		■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■

For analysis purposes:

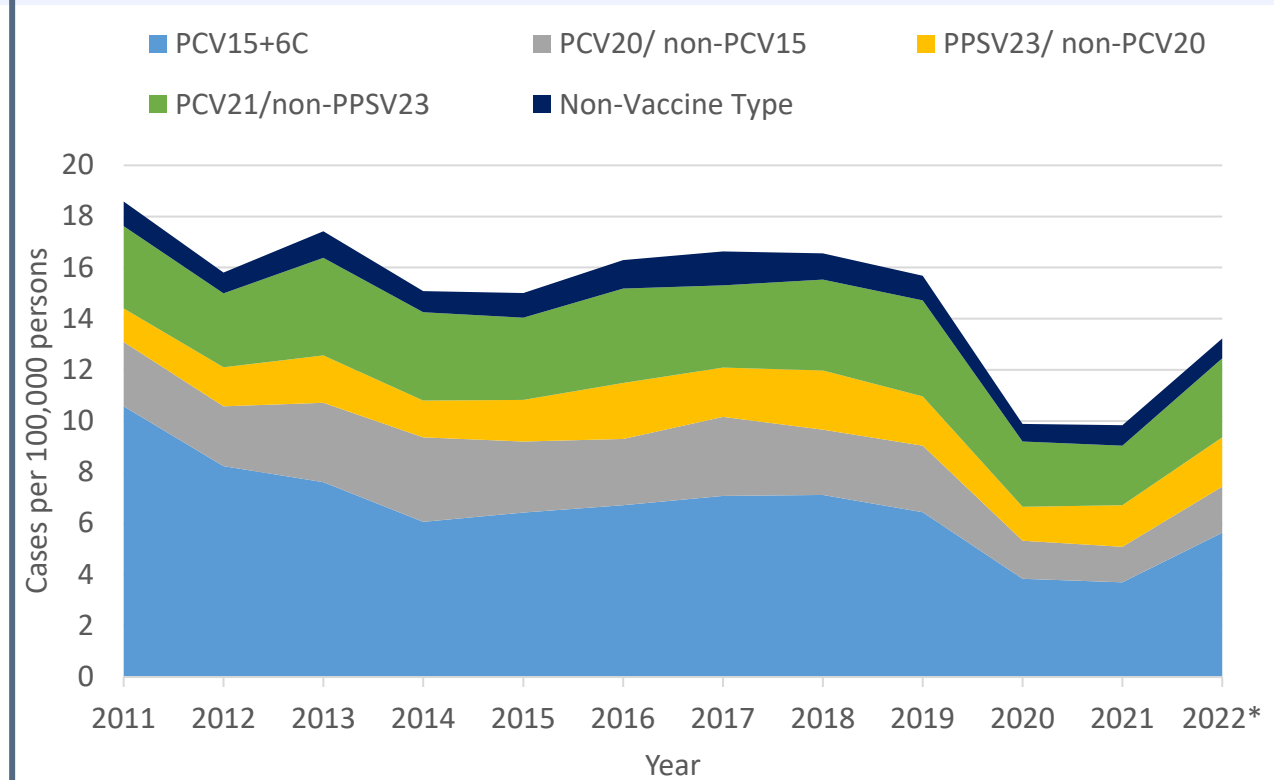
- **PCV15+6C** includes serotype **6C** with PCV15 types due to cross protection from 6A antigen
- **PCV20 non-PCV15:** includes serotypes **8, 10A, 11A, 12F, and 15B**
- **PPSV23 non-PCV20:** includes serotypes **2, 9N, 17F, and 20**
- **PCV21 non-PPSV23:** includes serotypes **15A, 15C, 16F, 23A, 23B, 24F, 31, 35B**

IPD incidence rates among adults 19-64 years old, by vaccine type, 2011 – 2022

19-49 years old



50-64 years old



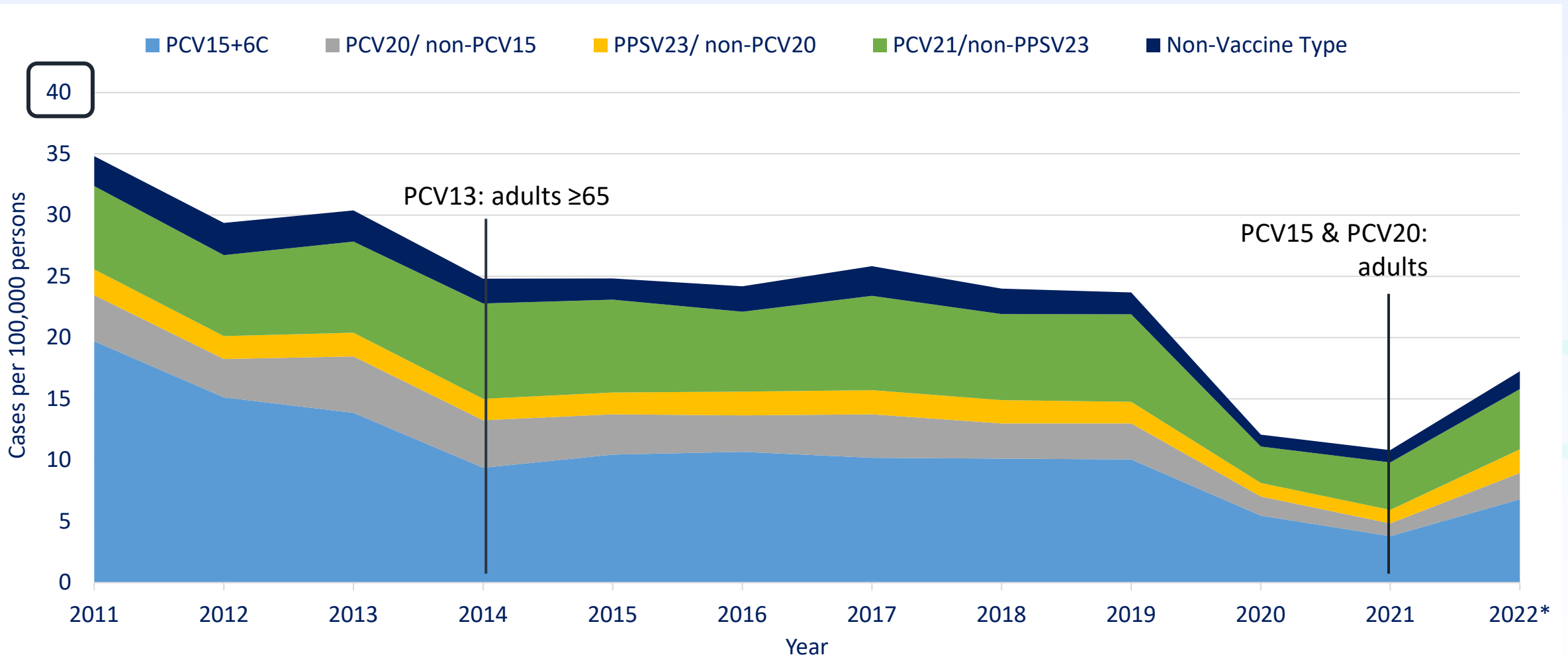
PCV20 non-PCV15 serotypes: 8, 10A, 11A, 12F, 15B

PPSV23 non-PCV20 serotypes: 2, 9N, 17F, 20

PCV21 non-PPSV23 serotypes: 15A, 15C, 16F, 23A, 23B, 24F, 31, 35

*2022 estimates are not finalized

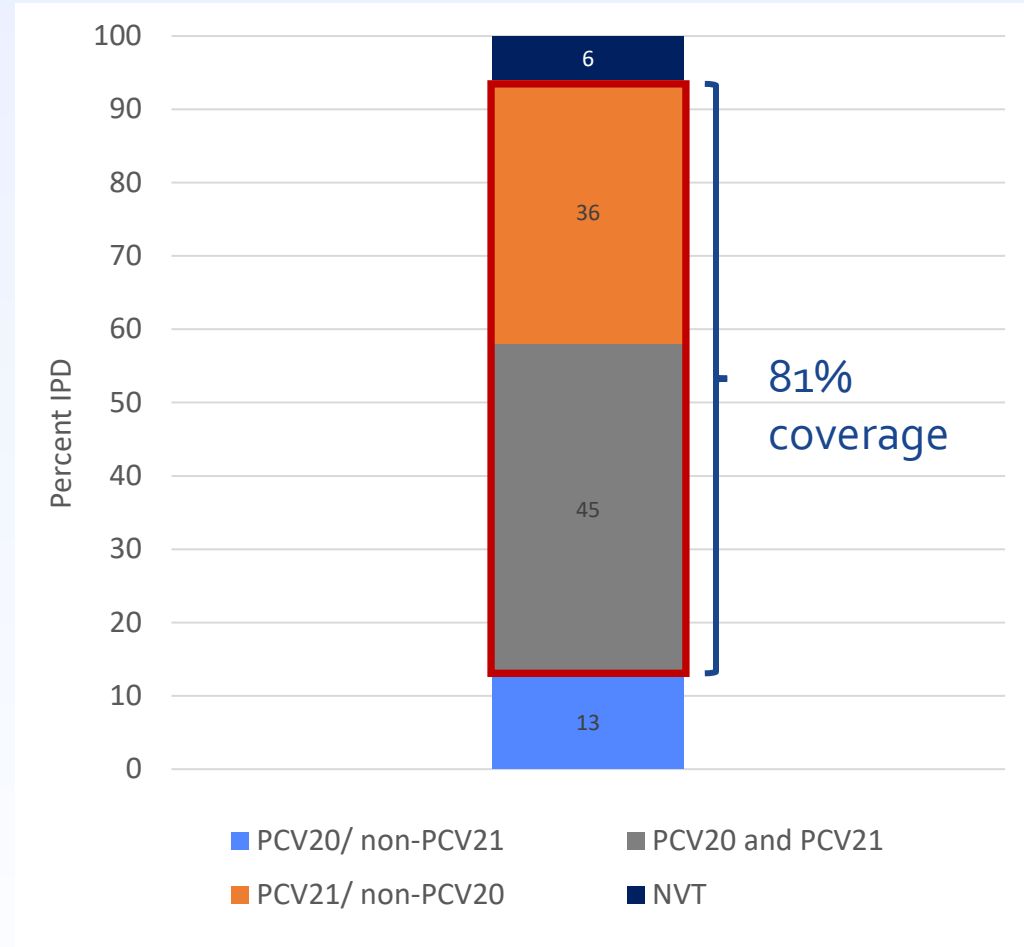
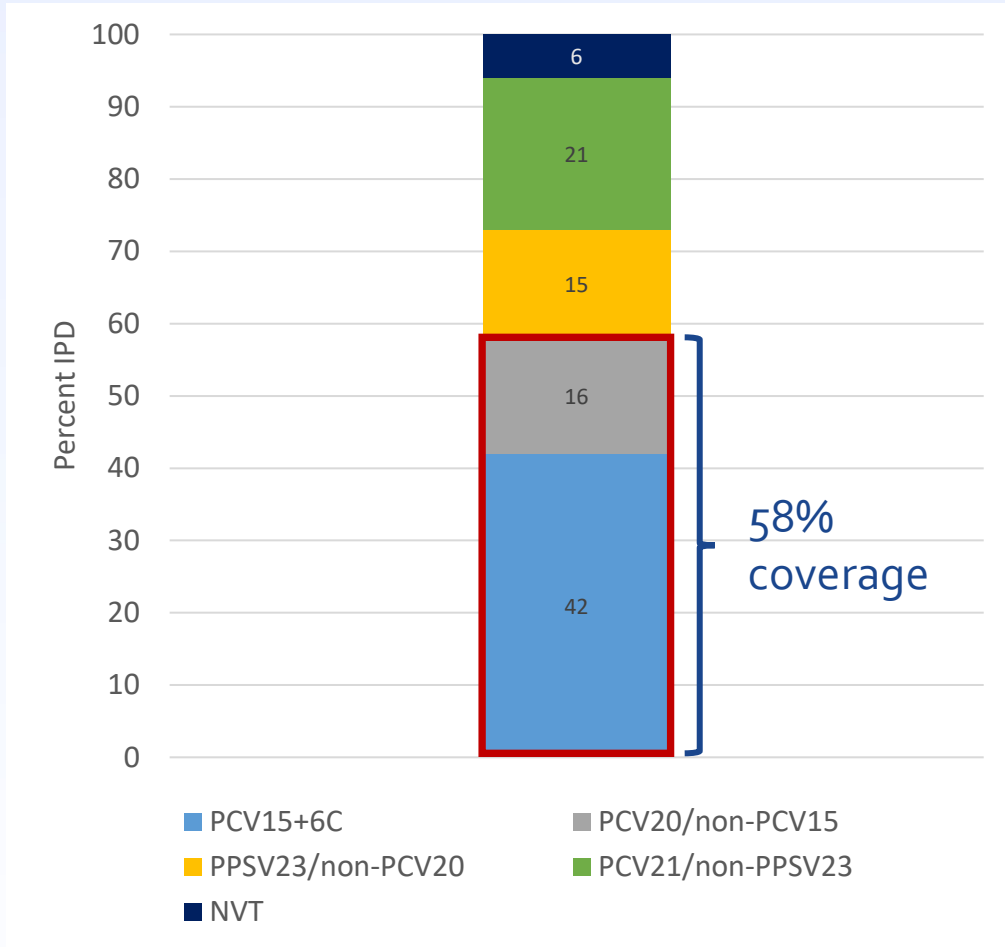
IPD incidence rates among adults ≥65 years old, by vaccine type, 2011 – 2022



PCV20 non-PCV15 serotypes: 8, 10A, 11A, 12F, 15B
 PPSV23 non-PCV20 serotypes: 2, 9N, 17F, 20
 PCV21 non-PPSV23 serotypes: 15A, 15C, 16F, 23A, 23B, 24F, 31, 35

*2022 estimates are not finalized

Proportion of IPD by vaccine-type among adults aged 19-64 years, with a risk-based indication, 2018-2022



PCV20/ non-PCV15 serotypes: 8, 10A, 11A, 12F, 15B

PPSV23/ non-PCV20 serotypes: 9N, 17F, 20

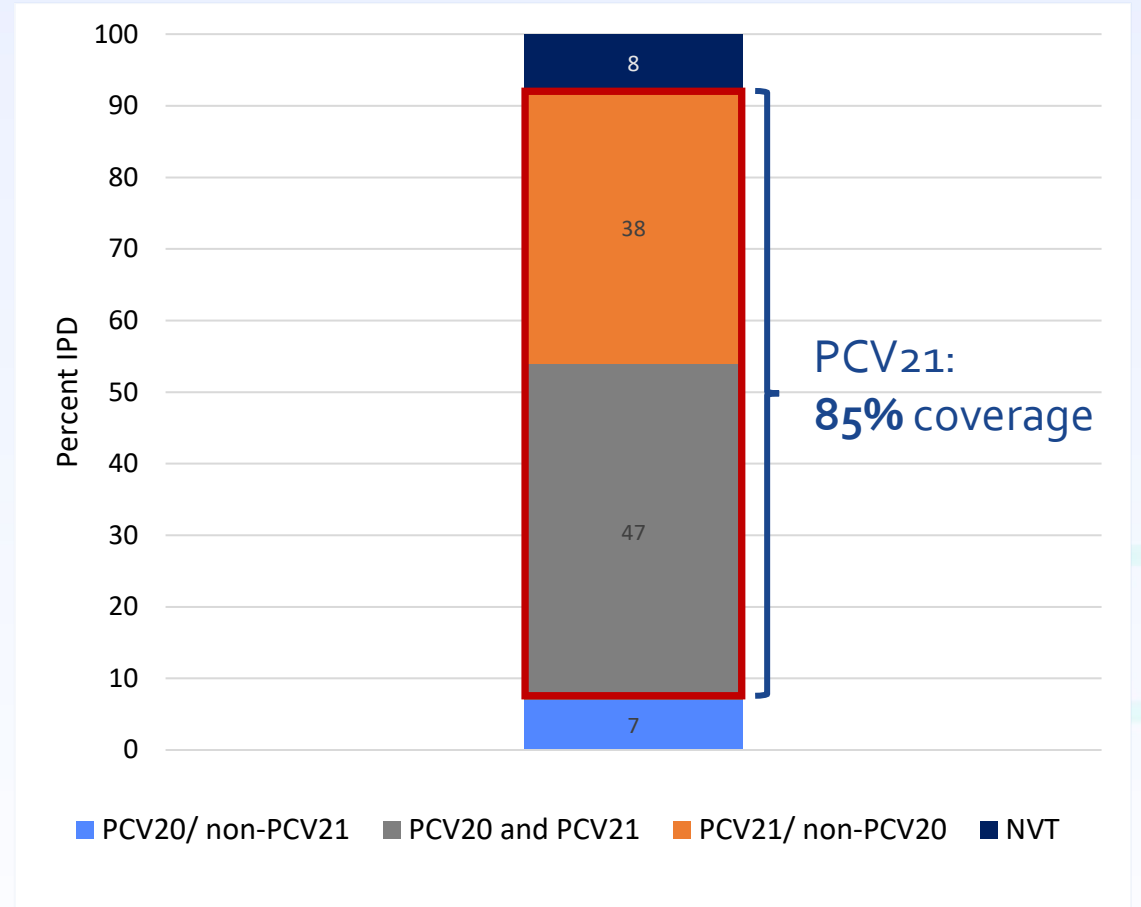
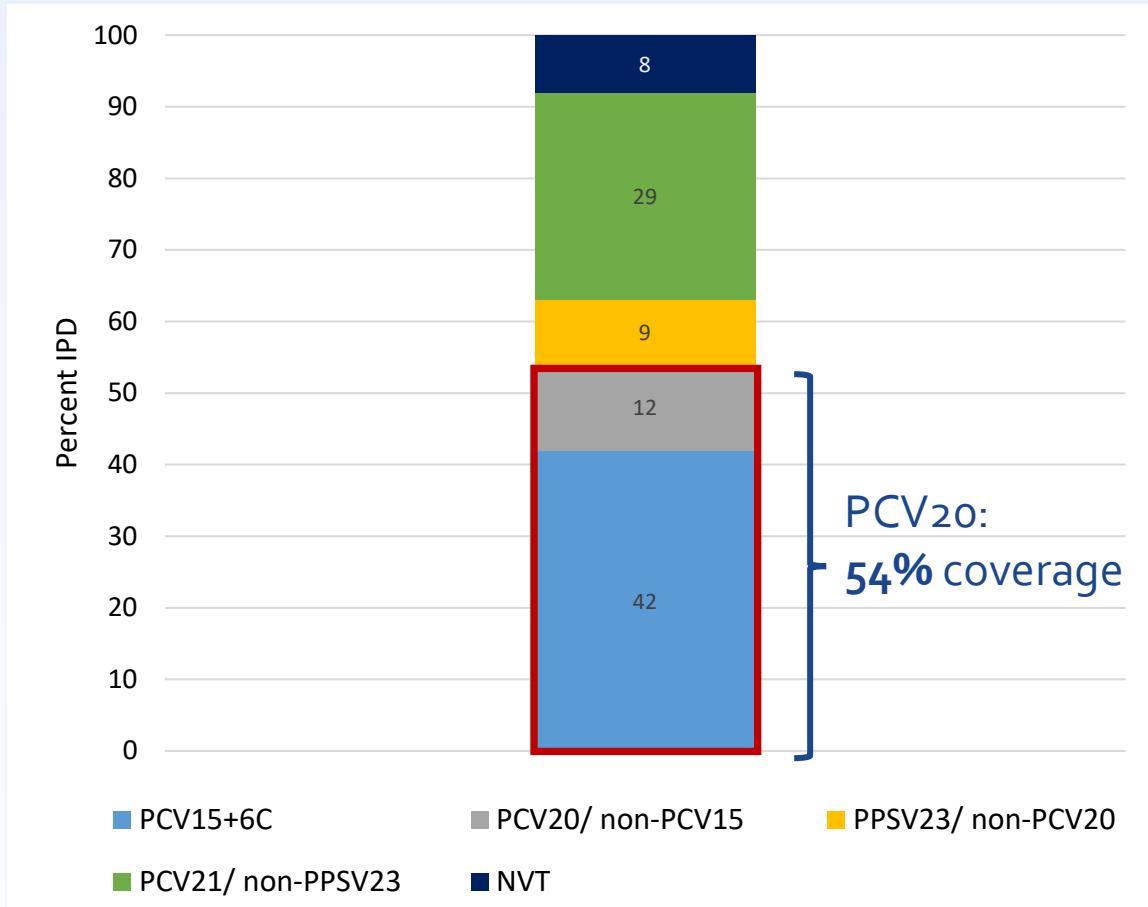
PCV21/ non-PPSV23 serotypes: 15A, 15C, 16F, 23A, 23B, 24F, 31, 35

PCV20/ non-PCV21 serotype: 1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B

PCV20/ in-PCV21 serotypes: 3, 6A, 7F, 19A, 22F, 33F, 8, 10A, 11A, 12F, +6C

PCV21/ non-PCV20 serotypes: 9N, 17F, 20, 15A, 15C, 16F, 23A, 23B, 24F, 31, 35

Proportion of IPD by vaccine-type among adults age ≥65 years, 2018-2022



PCV20/ non-PCV15 serotypes: 8, 10A, 11A, 12F, 15B
 PPSV23/ non-PCV20 serotypes: 2, 9N, 17F, 20
 PCV21/ non-PPSV23 serotypes: 15A, 15C, 16F, 23A, 23B, 24F, 31, 35

PCV20/ non-PCV21 serotype: 1, 4, 5, 6B, 9V, 14, 18C, 19F, 23F, 15B
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