Effectiveness of pneumococcal vaccination in children in the United States

Edwin J. Asturias MD
Associate Professor of Pediatrics and Pediatric Infectious Diseases
Director for Latin America
Pneumococcal disease in the pre-vaccine era

Acute meningitis ~30-40%
CA-Pneumonia ~20%
Acute otitis media ~30%
Evolution of US ACIP pneumococcal vaccine recommendations

- Single dose of PPSV23 at 65 years
- PCV7 for routine use in children
- 1997
- 2000

PPSV23: 23-valent pneumococcal polysaccharide vaccine
PCV13: 13-valent pneumococcal conjugate vaccine

Slide shared by L. Harrison
PCV-7 Direct Effect of Vaccination: Invasive Pneumococcal Disease Among Children < 5 Years, 1998/99–2007 in the US

Cases/100,000 population

Serotype group
- PCV7 type
- Non-PCV7 type
- 19A

*100% reduction in PCV7 serotypes, 2007 vs baseline

Changes in the incidence of invasive pneumococcal disease (IPD) among children <5 years old from 1998-2015 in the United States

https://www.cdc.gov/abcs/reports-findings/survreports/spneu-types.html

https://www.cdc.gov/abcs/reports-findings/survreports/spneu-types.html
Invasive Pneumococcal Disease Among Adults ≥ 65 Years, 1998/99–2007


*92% reduction in PCV7 serotypes, 2007 vs baseline
Incidence (1994–2013) of macrolide-resistant invasive pneumococcal disease in metropolitan Atlanta, GA, USA
Mean Annual Incidence of Pneumococcal Meningitis in the US According to Serotype Group and Time Period 1998-2005

Hsu HE. N Engl J Med 2009; 360:244-256
Evolution of US ACIP pneumococcal vaccine recommendations

- Single dose of PPSV23 at 65 years
- PCV13 for routine use in children (2010-2012)
- PCV13 for immunocompromised adults aged ≥19 years (2015-2018)

**PPSV23**: 23-valent pneumococcal polysaccharide vaccine

**PCV13**: 13-valent pneumococcal conjugate vaccine
Changes in the incidence of invasive pneumococcal disease (IPD) among children <5 years old from 1998-2015 in the United States

https://www.cdc.gov/abcs/reports-findings/survreports/spneu-types.html

*Courtesy of T. Pilishvilli. CDC Active Bacterial Core Surveillance*
Annual hospitalization rates of all Spn pneumonia, complicated pneumonia and serotype-specific per 100000 in the US

Clinical Infectious Diseases, 2017; 64 (12):1699–1704, https://doi.org/10.1093/cid/cix115
Annual office visits for OM among children < 5 years of age in the US 1997-2014

Differences in OM visit rates per 100 children

Reduction in OM visit rates after introduction of PCV13 and PCV7 was most marked among children <2 years

Impact of PCV vaccines on mortality from acute bacterial meningitis

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Incidence of IPD breakthrough infections in the US according to PCV schedule 2010-2016

- Before booster:
  - <12 months: 7.79 cases per 100,000 person years
  - 12-35 months: 2.34 cases per 100,000 person years

- After booster:
  - 12-23 months: 0.57 cases per 100,000 person years
  - 24-59 months: 0.47 cases per 100,000 person years

Courtesy of T. Pilishvilli. CDC Active Bacterial Core Surveillance
Invasive pneumococcal disease in children <5 years according to serotypes 2007-2017 (* most important ST)

 Courtesy of T. Pilishvilli. CDC Active Bacterial Core Surveillance

Streptococcus pneumoniae

Cases and Deaths per 100,000 Population by Age Group

Cases

Deaths

Age (years)

< 1

1

2-4

5-17

18-34

35-49

50-64

≥ 65

Evolution of US ACIP pneumococcal vaccine recommendations

- **1997**: PCV7 for routine use in children
- **2000**: Single dose of PPSV23 at 65 years
- **2010**: PCV13 for routine use in children
- **2012**: PCV13 for immunocompromised adults aged ≥19 years
- **2014**: PCV13 added to PPSV23 for adults ≥65
- **2015**: PCV13→PPSV23 interval changed for adults ≥65
- **2018**: PCV13 in adults ≥65 to be re-assessed

**PPSV23**: 23-valent pneumococcal polysaccharide vaccine

**PCV13**: 13-valent pneumococcal conjugate vaccine

Slide shared by L. Harrison
Incidence of invasive pneumococcal disease (IPD) among adults 65 years or older 1998-2015 in the United States.

*PPSV23 serotypes: 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, and 33F
*PCV13 serotype: 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F

https://www.cdc.gov/abcs/reports-findings/survreports/spneu-types.html
Trends in pneumococcal colonization by serotype from 2001 to 2014 for PCV-7 and PCV-13 serotypes.
Incidence of IPD in adults ≥ 65 years in US, 2007-2017 by PCV13 serotypes

Courtesy of T. Pilishvilli. CDC Active Bacterial Core Surveillance
Summary

• The impact of PCV vaccines in the US has had a dramatic direct and indirect effect on the incidence of disease.

• While other countries have introduced fewer-dose schedules (2+1 and 1+1) the incidence of breakthrough disease is still a problem in the US.

• Continuation of the > 65 year-old schedule is being evaluated and will depend on the development of new vaccines.