



# Update on Immunization Practices ***For Younger & Older Adults***

Supported by an educational  
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CENTER FOR  
Independent Healthcare Education

**VMC**  
Vemco MedEd

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Education and Vemco MedEd

# Activity Description

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## Target Audience

This activity is designed as a comprehensive approach to address the practice needs of primary care providers, including primary care physicians, doctors of osteopathy, physician assistants, nurse practitioners, and allied healthcare professionals, who are at the forefront of caring for adult patients eligible for immunizations and/or at risk for vaccine-preventable diseases.

## Learning Objectives

At the conclusion of the educational activity, the learner should be able to:

- Evaluate the latest clinical research on the impact of HPV vaccination in the prevention of various types of cancer in men and women
- Identify strategies to adhere to ACIP HPV vaccination recommendations and overcome barriers by both healthcare providers and patients to vaccinate younger adults
- Describe the clinical consequences of pneumococcal disease and its associated complications among older adults
- State the latest ACIP recommendations for pneumococcal vaccination among older adults

# Faculty and Disclosure

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**Dr. Michael Donnelly** does not have any relevant financial relationships to disclose.

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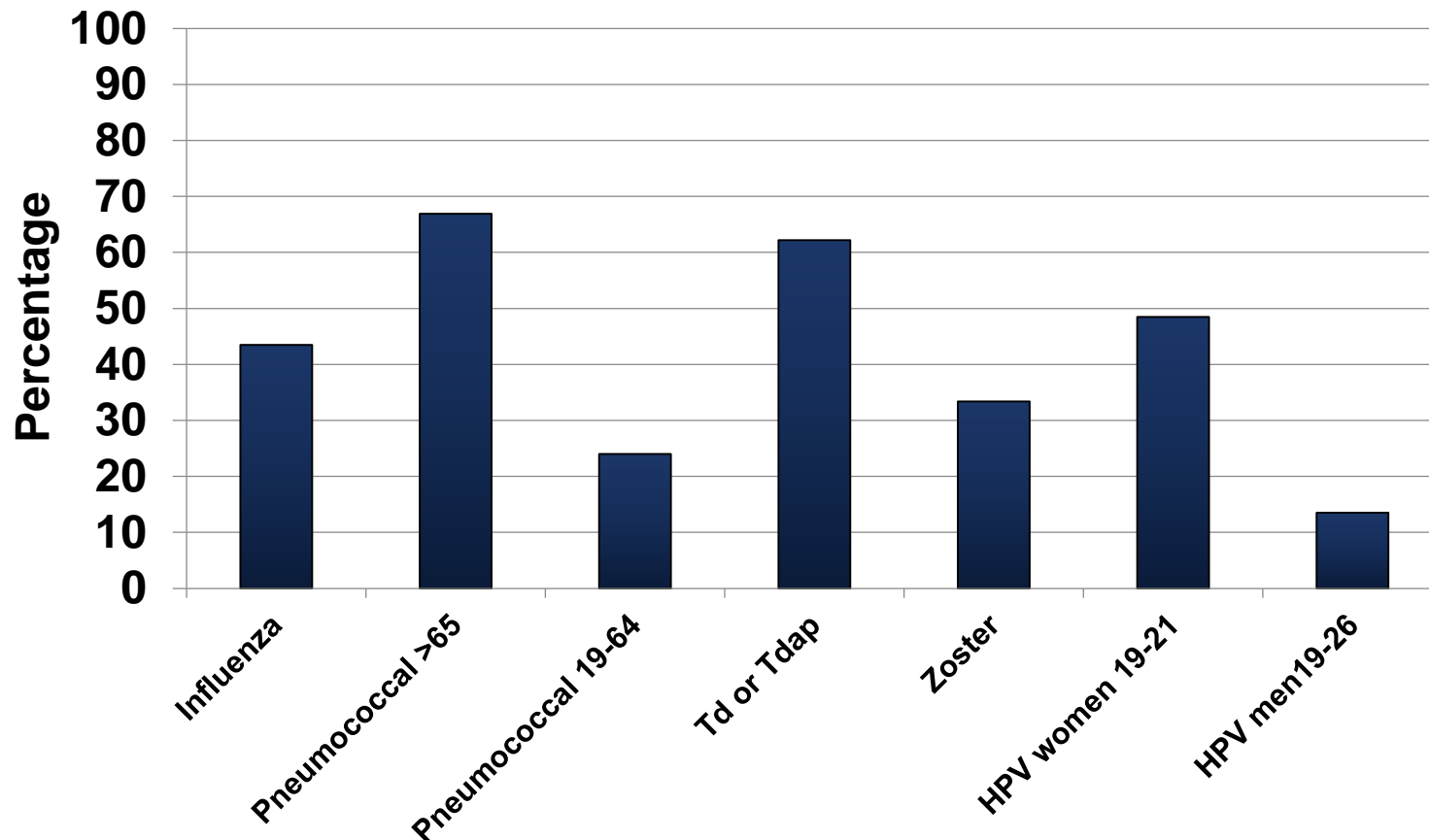
# Burden of Vaccine-Preventable Disease

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- Influenza
  - Since 2010
    - 140,000–710,000 flu-related hospitalizations per year
    - Between 12,000 and 56,000 deaths yearly
- Hepatitis B
  - 700k–1.4M people live with chronic hepatitis B
- We will take a close look at pneumococcal disease and HPV today

# Vaccination Rates 2016

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CDC. National Health Interview Survey, 2016. <https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/pubs-resources/NHIS-2016.html>.

# Why are adults harder to vaccinate?

**Vaccine  
CO\$T\$**

outlay  
of  
money

always  
rising

Supply  
Chain

**Storage**

MORE  
PROBLEMS  
TO  
ADDRESS

**Access**

Adults  
dont  
need  
school  
forms

**Reimburse  
ment**

Is it  
part  
D?

insurance  
companies

**Refusal**

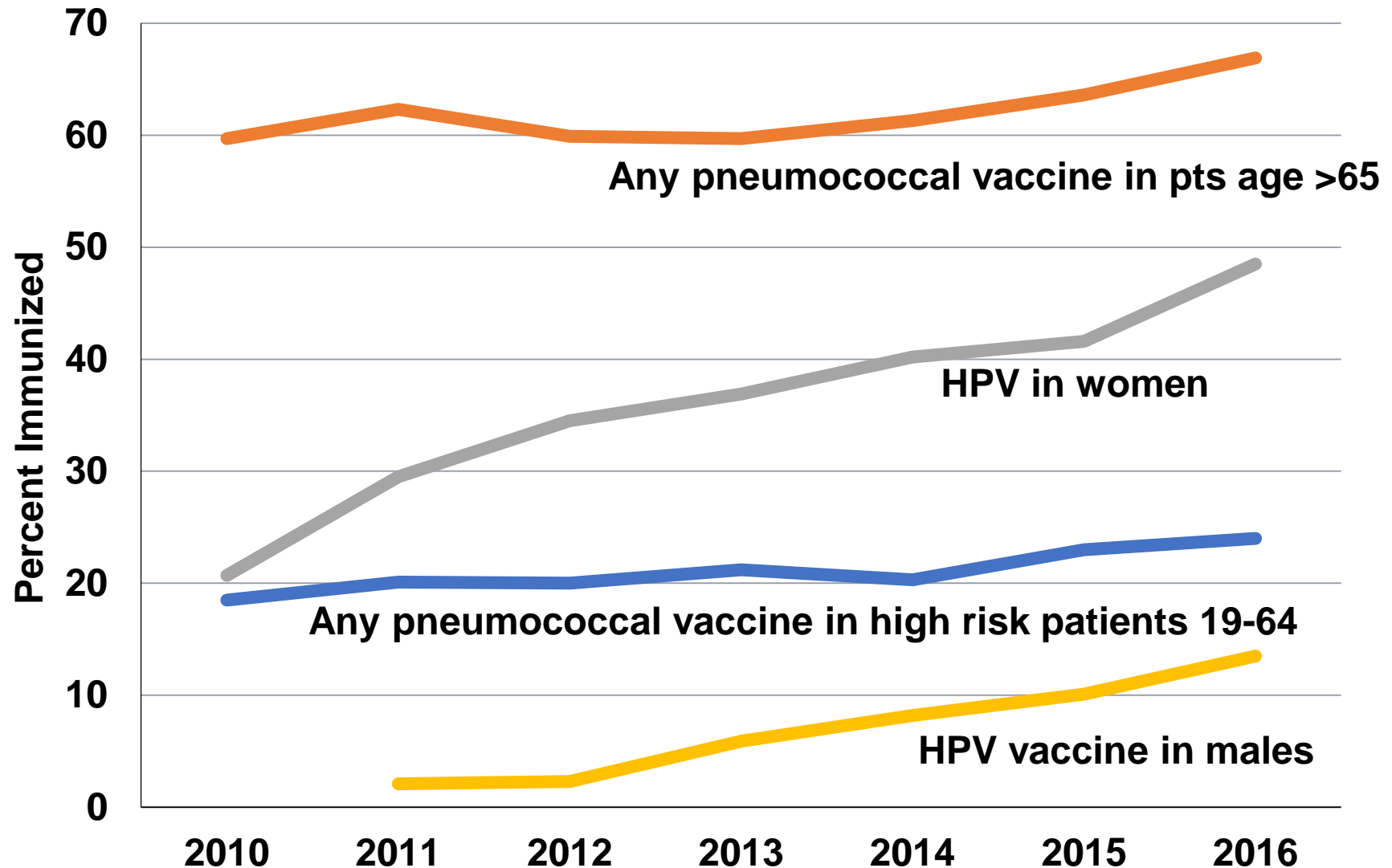
**Antivax**

**Guidelines**

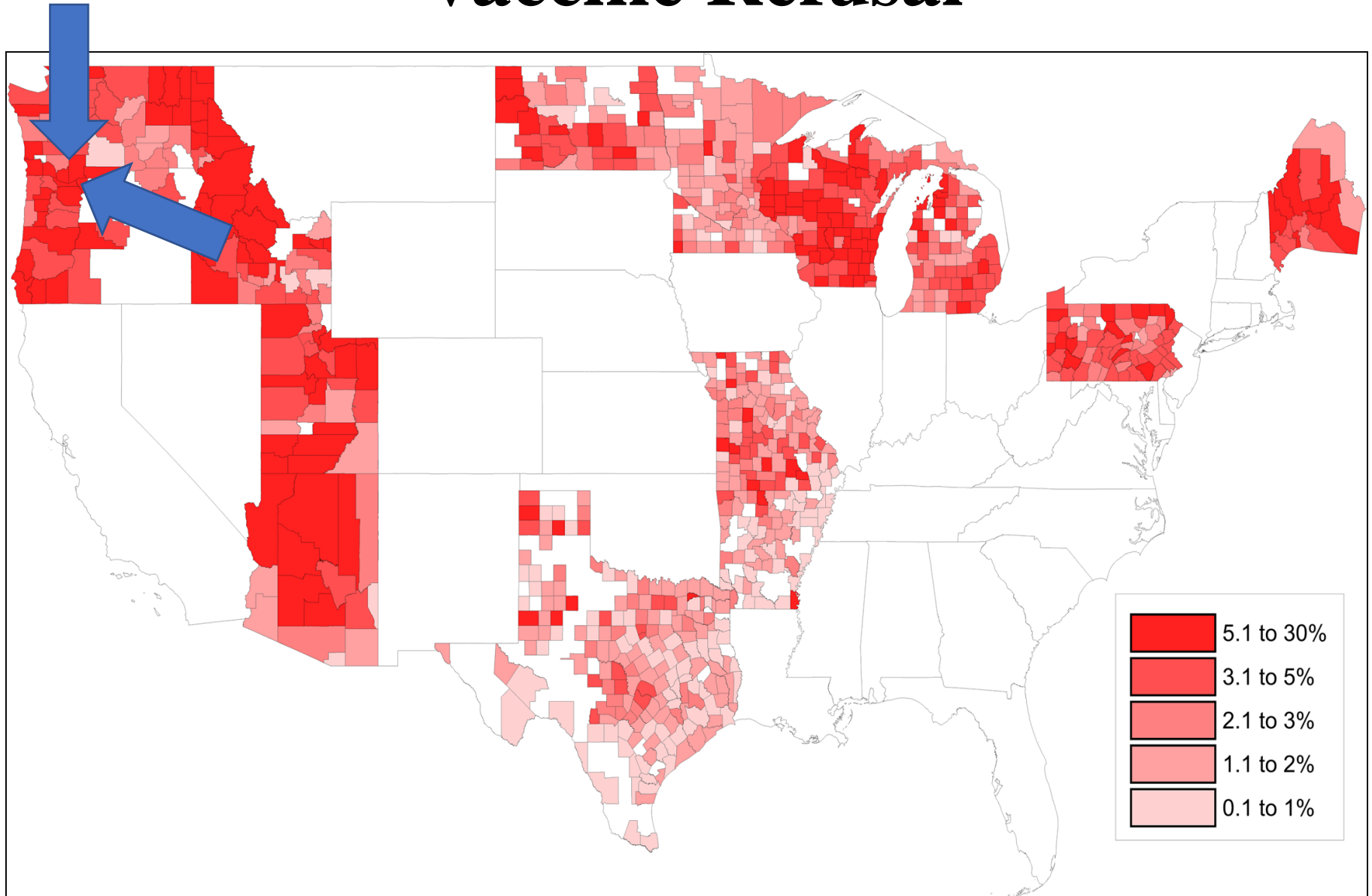
Ever  
Changing

Moving  
Target

# Adult Vaccination Rate for HPV and Pneumococcus Over Time



# Vaccine Refusal



The state of the antivaccine movement in the United States: A focused examination of nonmedical exemptions in states and counties.  
Jacqueline K, et al. *PLOS Medicine*. June 12, 2018. <https://doi.org/10.1371/journal.pmed.1002578>





Fri at 05:25 • 

Friends!!! I am desperate here: I am a newly non vaccinator and I want to write about vaccination dangers for my final thesis in college: however I



Health » Food | Fitness | Wellness | Parenting | Live Longer

Live TV

U.S. Edition +




# Superbugs and anti-vaxxers make WHO's list of 10 global health threats

By [Holly Yan](#), CNN

Updated 12:58 AM ET, Mon January 21, 2019



...does that I can use to prove my point effectively.

Thank you all!!! 



The fact that you cannot find any journals to back up your viewpoint MAY suggest you need to reassess your viewpoint...

# US Adults Attitudes Toward Vaccines

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## American Osteopathic Association

- The Harris Poll
- >2,000 US adults
- May 2019

# **45% of American Adults Doubt Vaccine Safety**

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**Which of the following have caused you to doubt the safety of vaccines?**

- Nothing—I don't doubt the safety of vaccines 55%

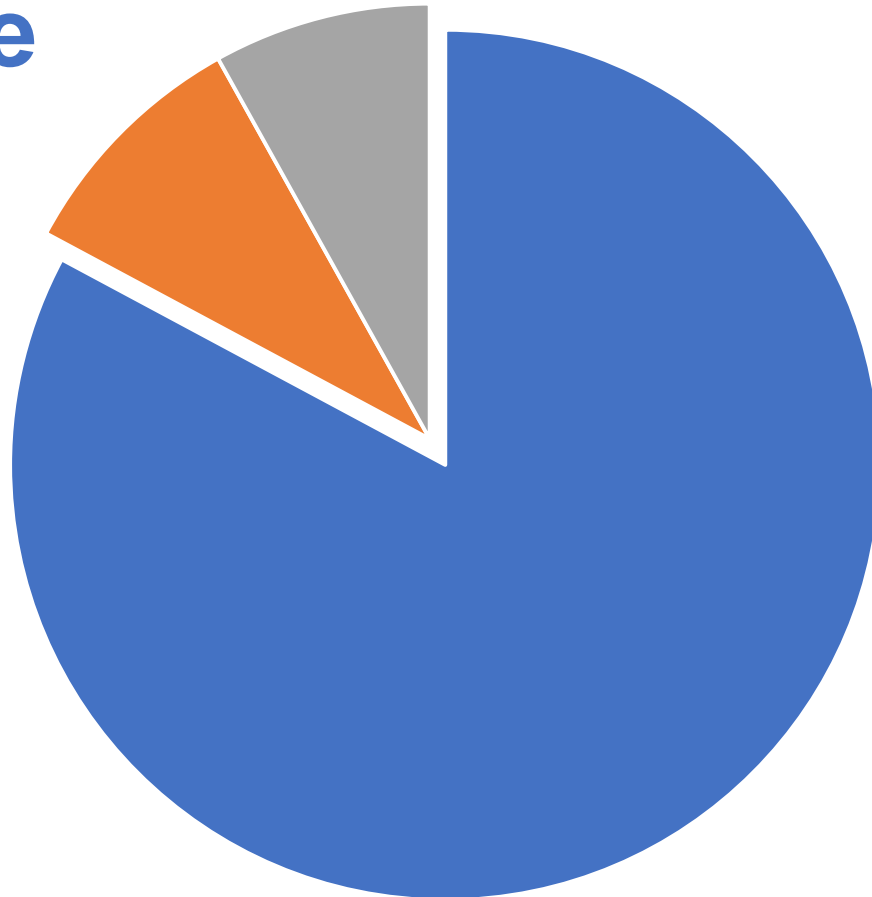
# Safety and Efficacy

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**82% favorable**

**9% unsure**

**8% negative**



# Sources of Information

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Top 3:

16% said Online Articles

12% past wrongdoing by industry

11% info from Medical Experts

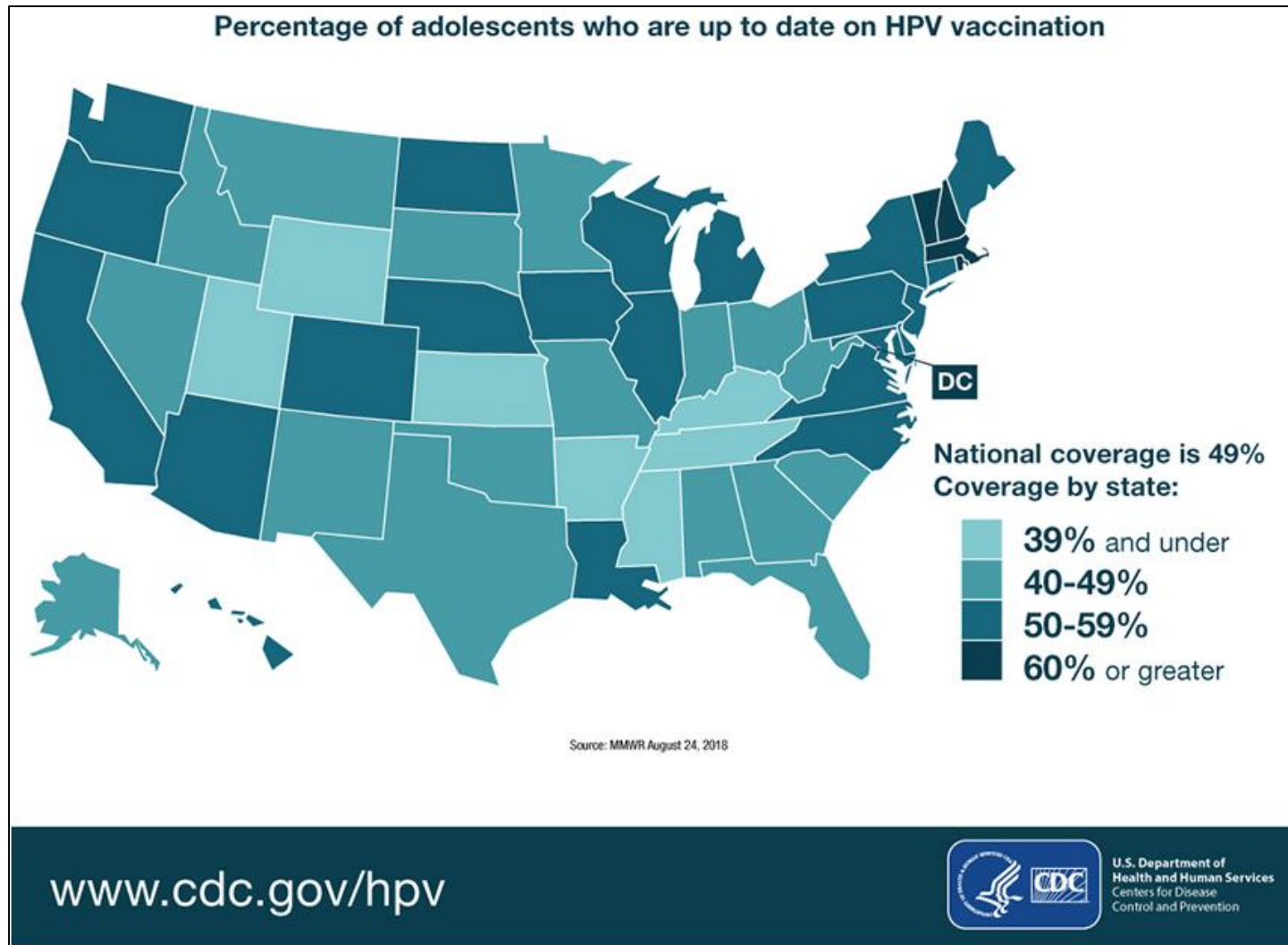
# HPV vaccine

## *it's not just warts*

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# Kansas Vaccination Rates



Walker TY et al. Natl, Reg, State, and Selected Area Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, 2018. MMWR 2019;68:718–723.

# HPV-Related Cancer Incidence

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In 2015 alone-

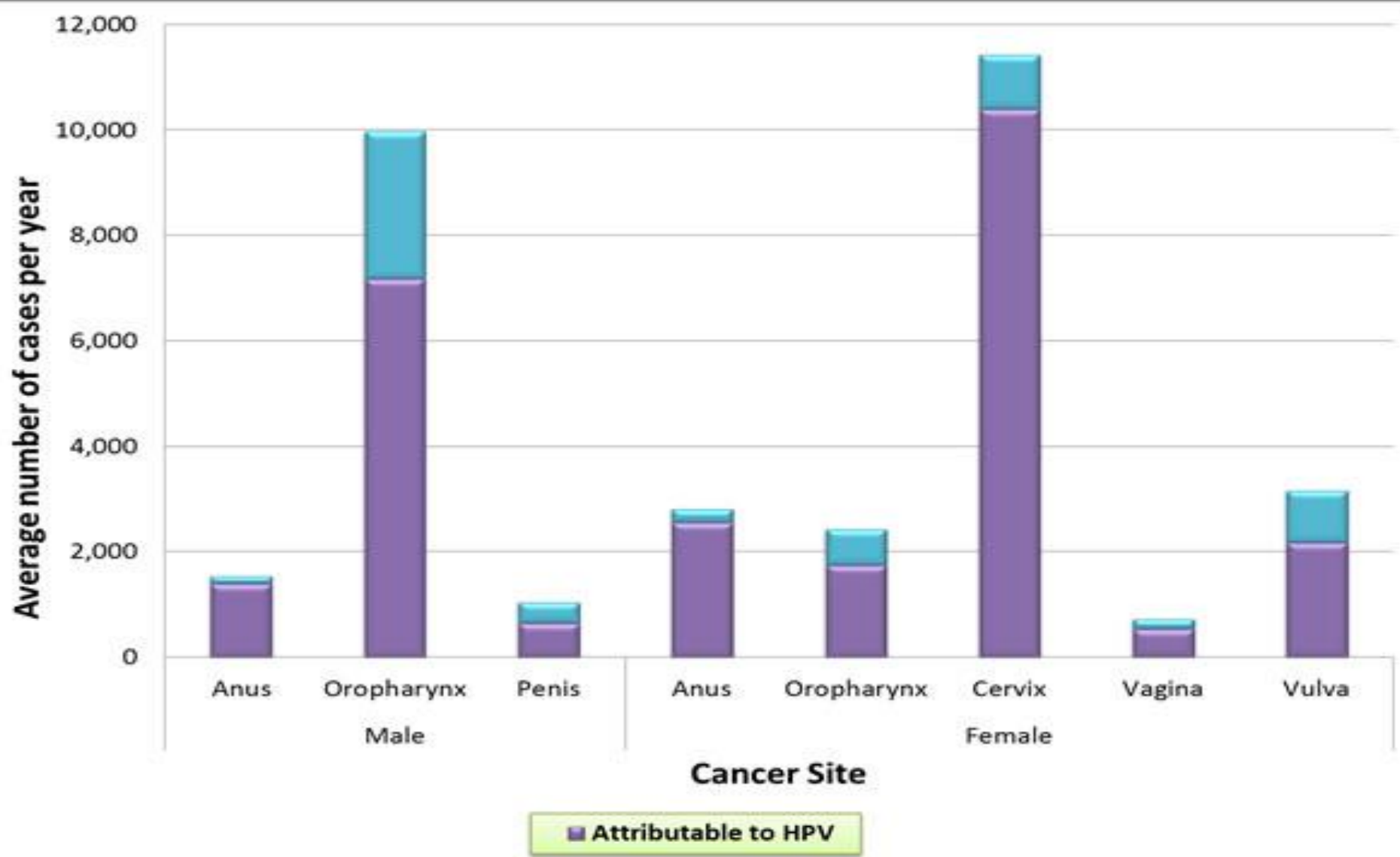
CDC estimate- **43,371** HPV-related cancers

- From 1999–2015
  - HPV-associated cancer incidence
    - rose by 0.9%
    - cervical cancer dropped by 1.6%
- **Estimated to result in ~18,000 deaths<sup>2</sup>**

<sup>1</sup>Van Dyne EA, et al. *MMWR Weekly*. 2018;67(33):918–924.

<sup>2</sup>American Cancer Society. Cancer Statistics Center. <https://cancerstatisticscenter.cancer.org/#/>.





**Over 90% of Anal and Cervical Cancers and 60% of Penile Cancers are HPV+**

Supplement: Assessing the Burden of HPV-Associated Cancers in the United States, *Cancer*. 2008;113(S10):2837–3057.

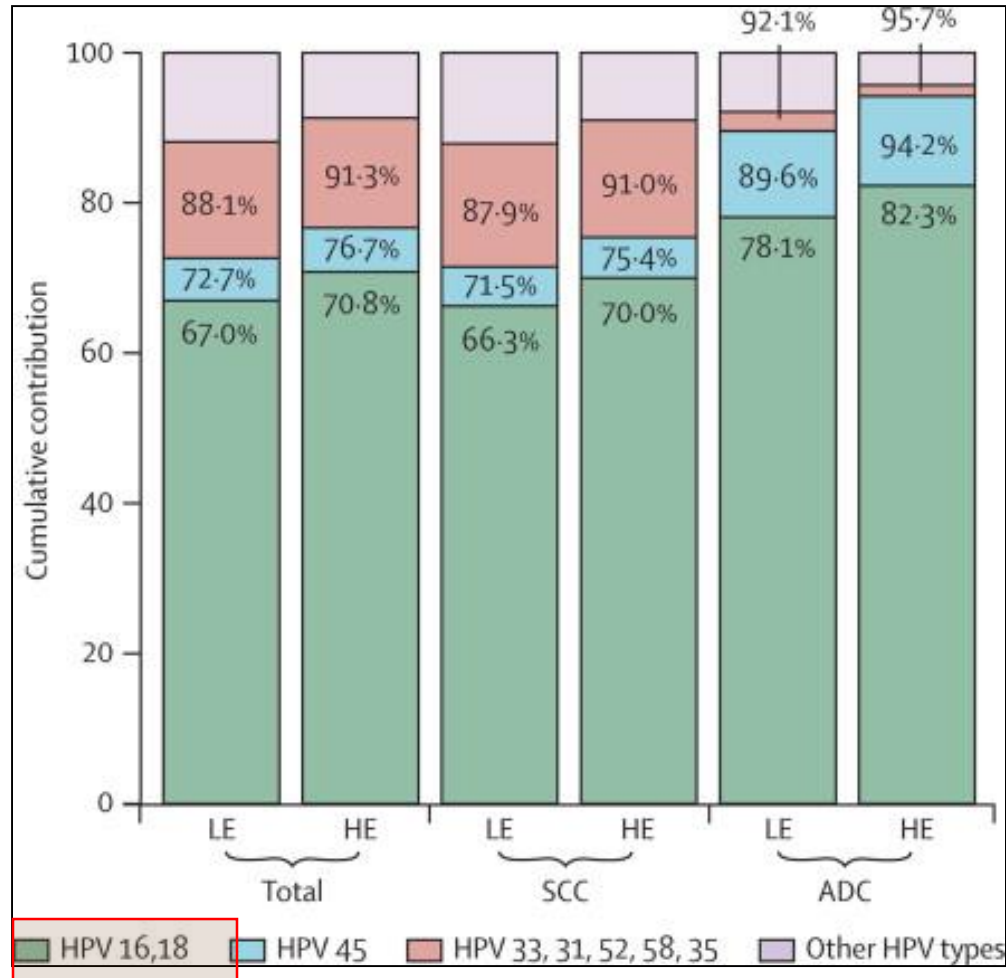
# Quiz

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**Which serotype of HPV is most carcinogenic?**

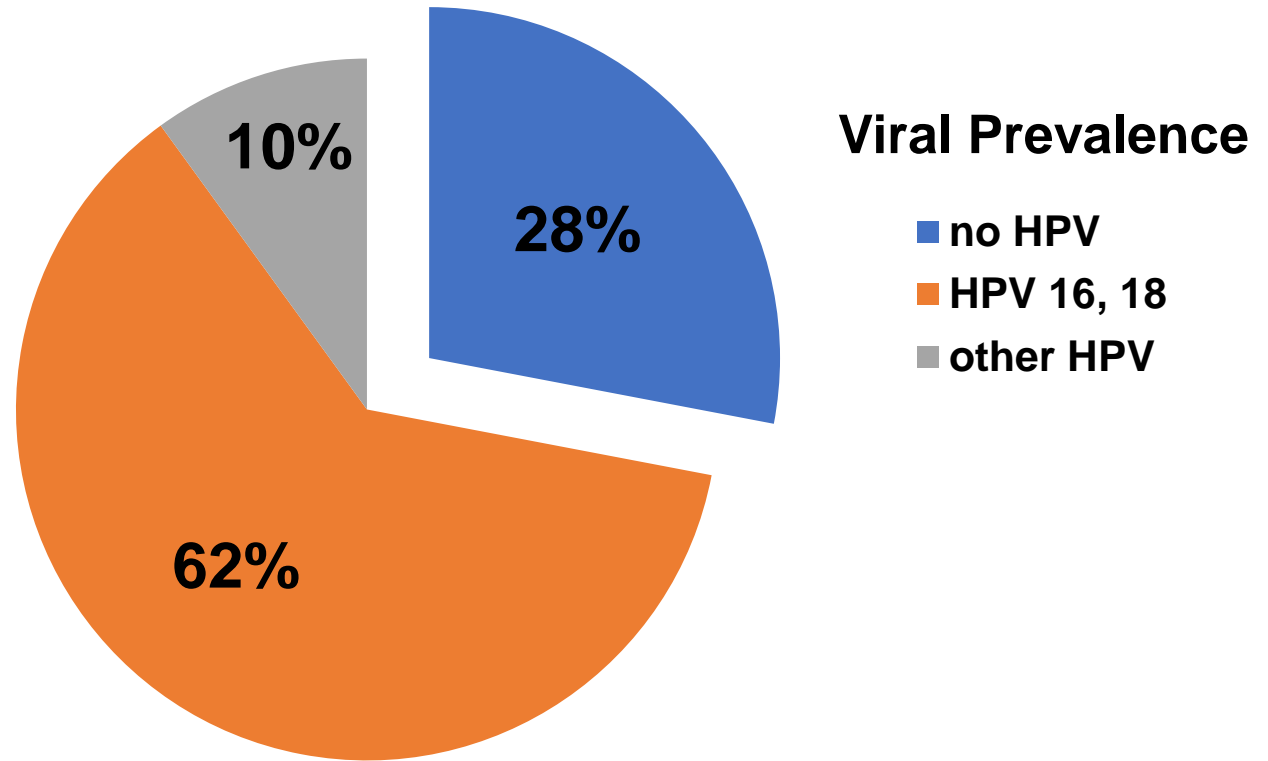
- A) 6
- B) 11
- C) 16
- D) 18
- E) 31

# Genotype Attribution for Cervical Cancer

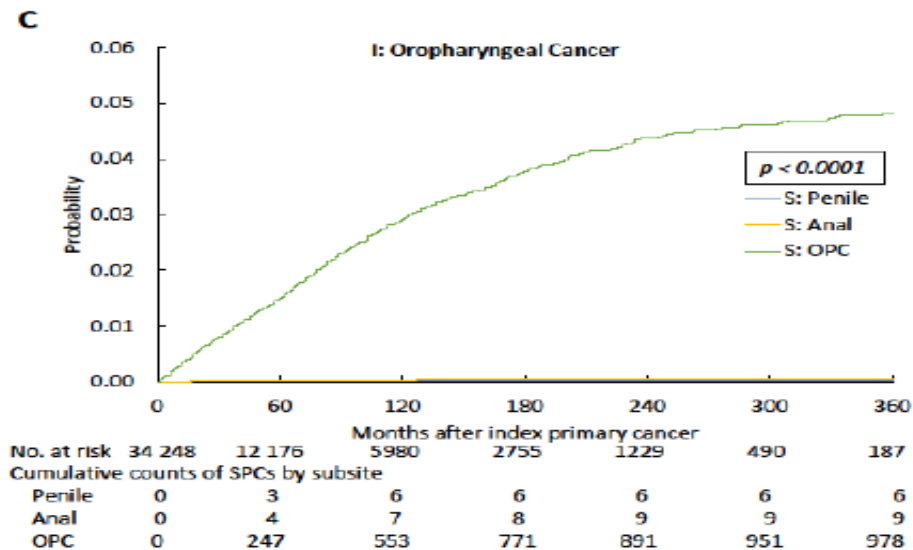
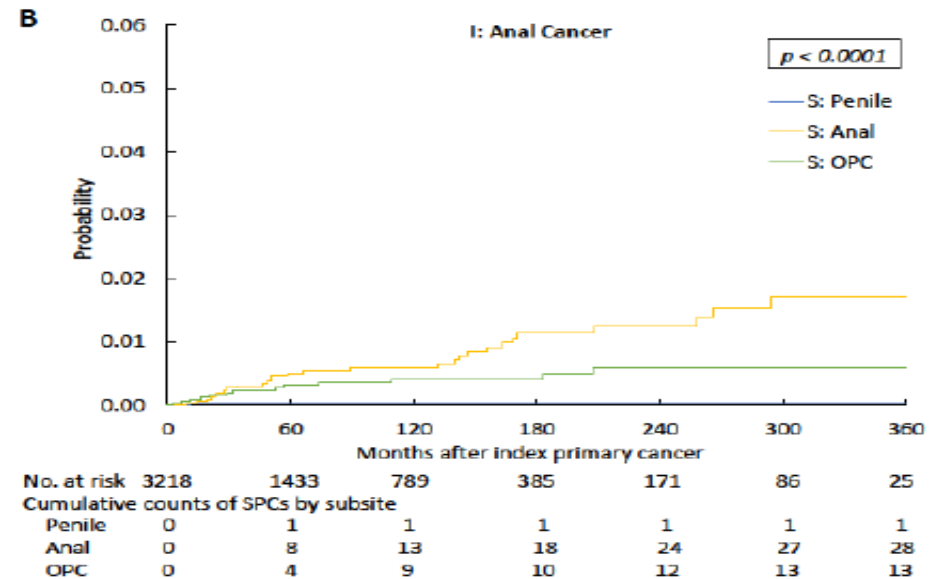
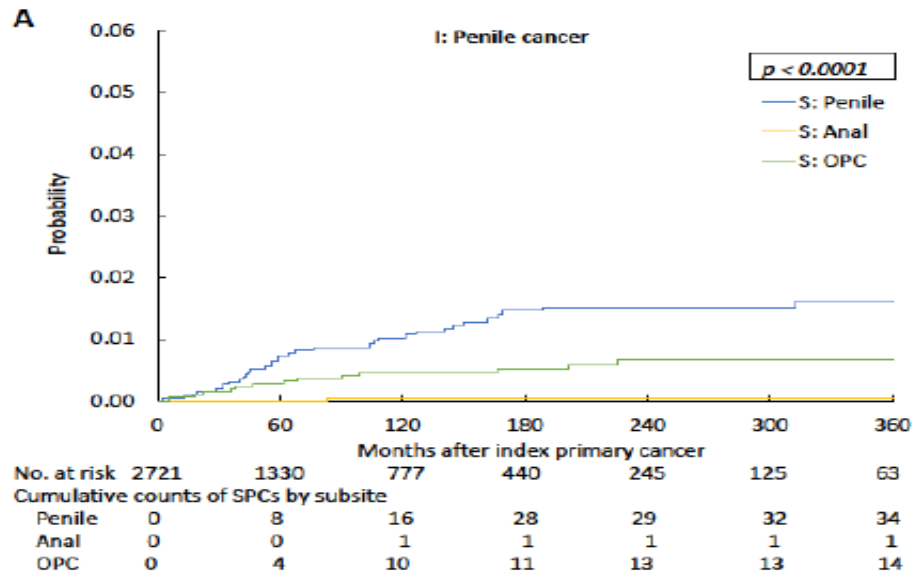


# Genotype Attribution: Oropharyngeal Cancer

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# Second Cancers Occur in Both Genders



**Cumulative incidence  
of 2<sup>nd</sup> HPV-associated  
primary cancers  
among men**

# Vaccine is Effective for HPV 16 & 18

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## Reduces Cervical Infection

- Reduced incidentally detected 6- and 12-month infection by 94% and 91%<sup>1</sup>

From 2003–06 to 2009–2012, 4vHPV-type prevalence decreased:

- 64% in 14–19-yr-olds
- 34% in 20–24-yr-olds<sup>3</sup>

## Reduces Oropharyngeal Infection

- Estimated vaccine efficacy: 93%<sup>2</sup>

1. Paavonen J, et al. *Lancet*. 2009;374(9686):301-14.

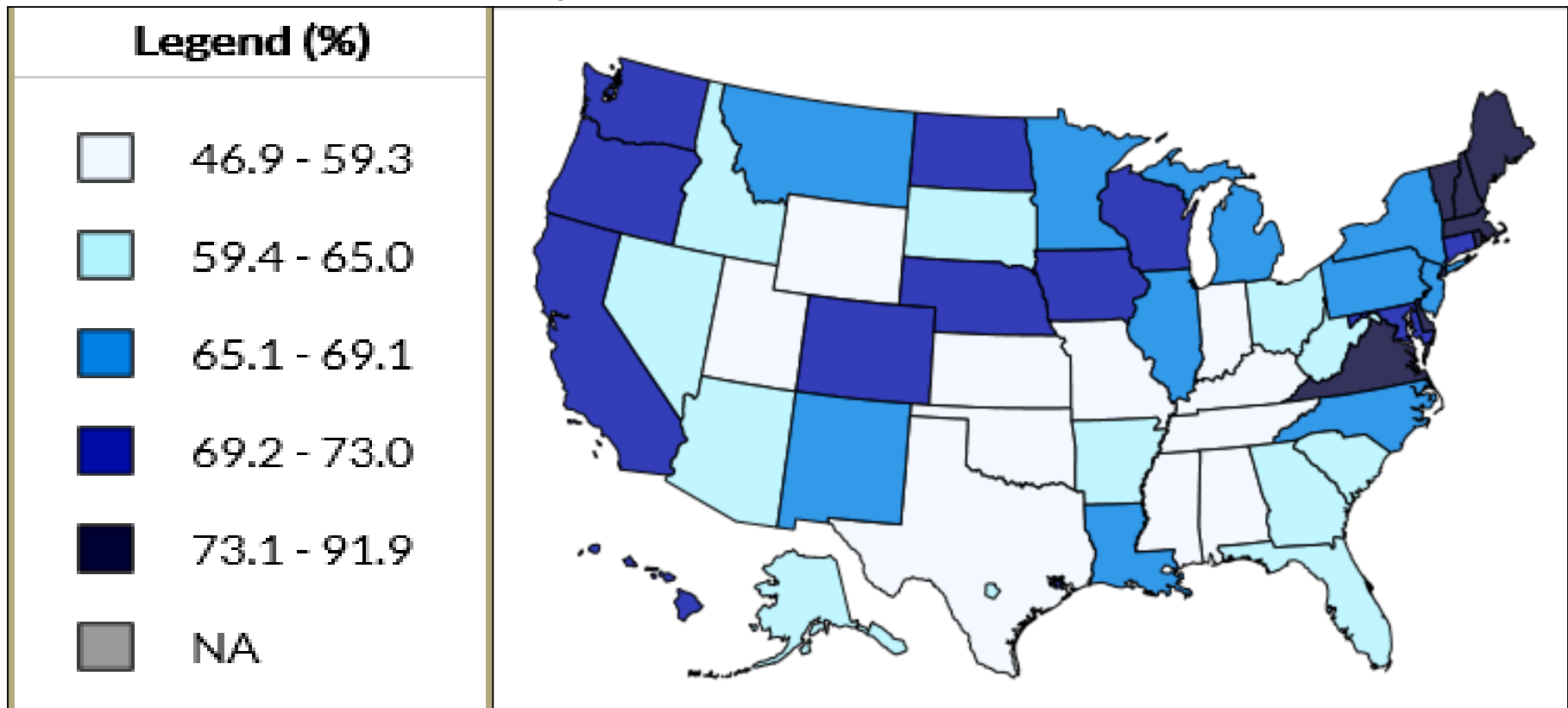
2. Herrero R, et al. *PLoS ONE*. 2013;8:e68329.

3. Markowitz LE, et al. *Pediatrics*. 2016;137(2):e20151968.

# Vaccine Rates in Teens are Increasing

NIS-Teen 2017 rates

|              | 2017  | 2016  |
|--------------|-------|-------|
| • Teen Girls | 53.1% | 49.5% |
| • Teen Boys  | 44.3% | 37.5% |



# Quiz

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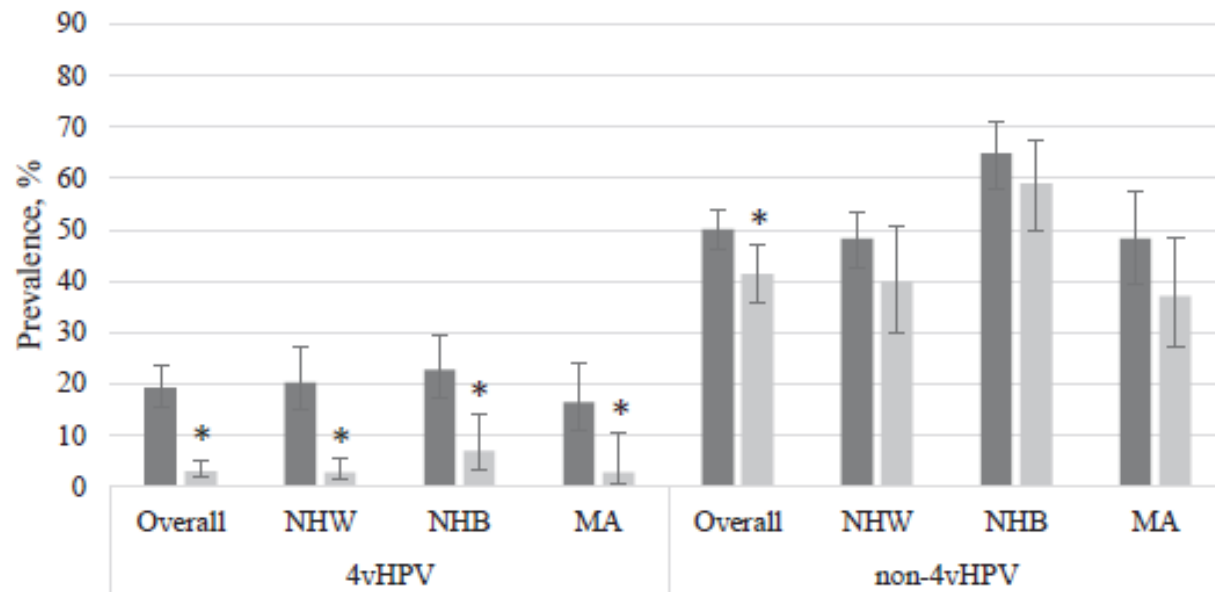
**HPV vaccine was initially recommended in the US in 2009 in women. Since that time, which of the following have been shown regarding the incidence of vaccine type HPV?**

- A) Cervical infection has decreased in women who have been unvaccinated.
- B) Cervical infection is unchanged in women who are unvaccinated.
- C) Oropharyngeal infection in males has decreased.
- D) Both A and C are correct.



## 14 to 19 year olds

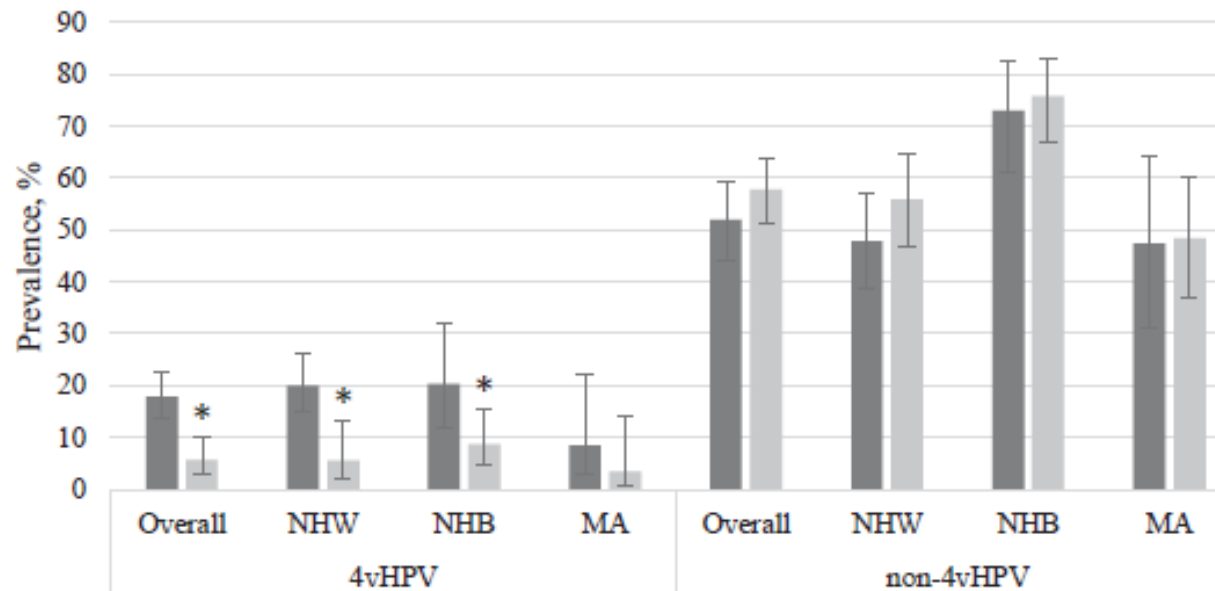
■ 2003-2006 ■ 2013-2016



**Prevalence of infection decreased 86% and 71%**

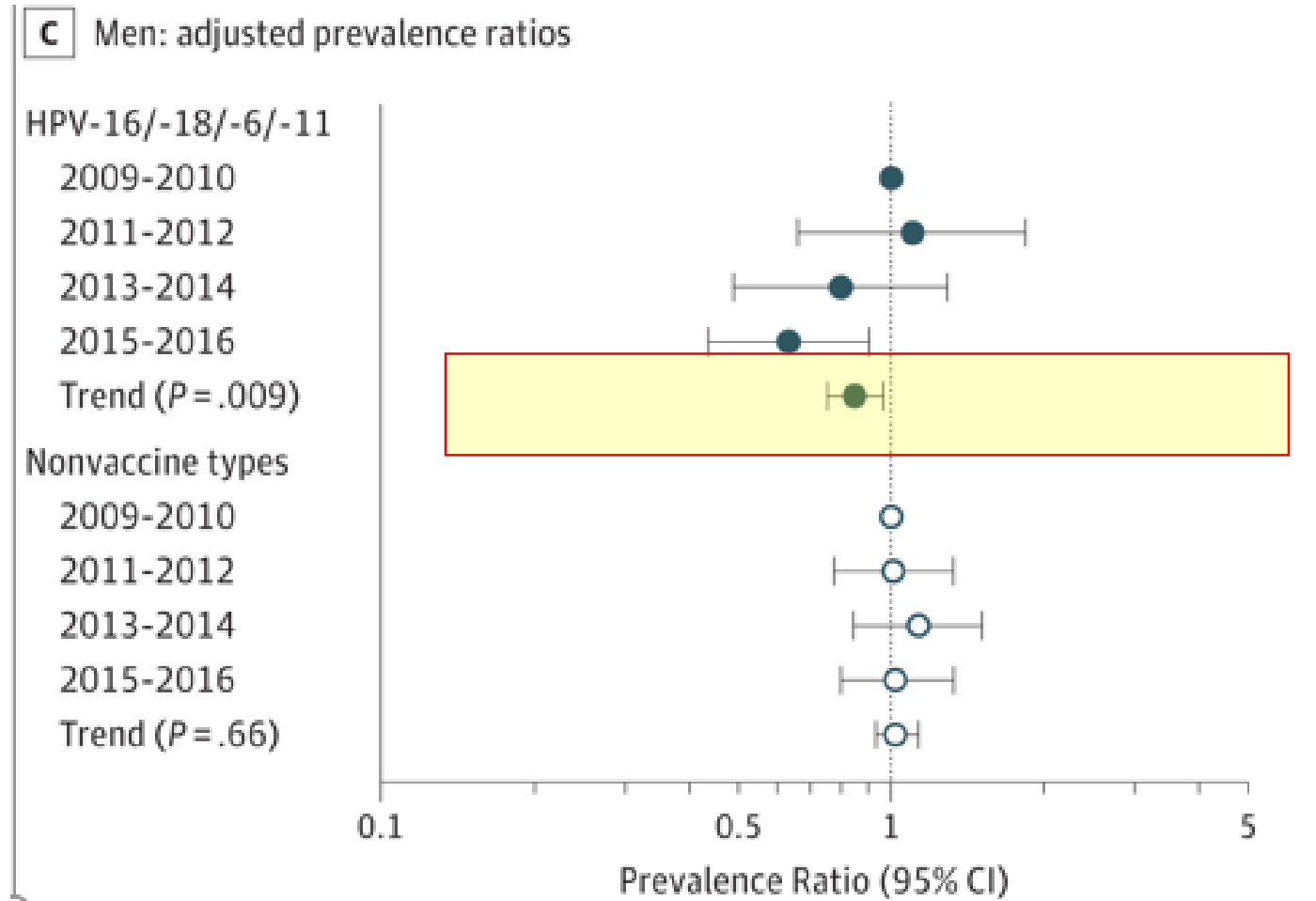
## 20 to 24 year olds

■ 2003-2006 ■ 2013-2016

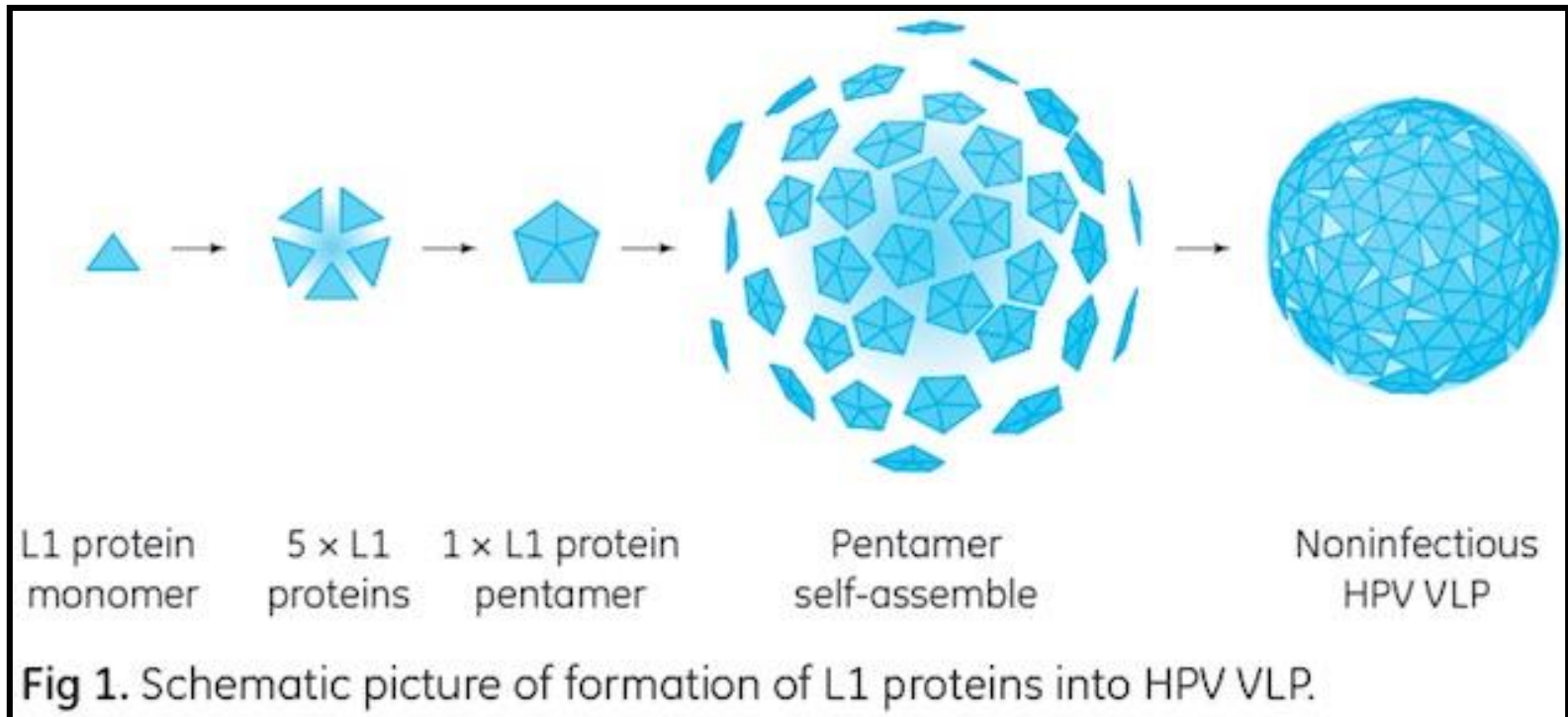


**From 03-06 to 13-16**

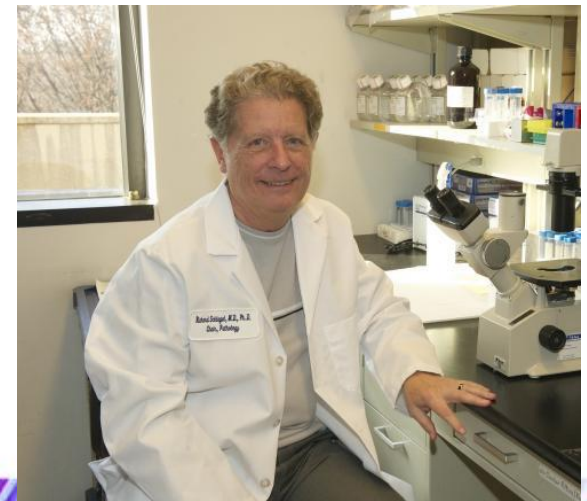
# Herd Immunity- Oral HPV Prevalence in Men



# How Do We Make It??



<http://biopharma-asia.com/technical-papers/use-capto-core-700-capto-q-impres-purification-human-papilloma-virus-like-particles/>



# ACIP Recommendations for HPV 9

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- Earliest: age 9 years
- Recommended: age 11–12 years
- 2 doses: 0 then 6–12 months if <15 years  
otherwise 3 doses
- Catchup
  - Males: 13–21 years, “may” vaccinate up to 26 years
  - Females: age 13 up to 26 years

# FDA Expands Indication to age 45 in October 2018

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- 10-year efficacy in women 27–45 years using quadrivalent HPV, not 9vHPV
  - (Merck study done in Columbia)

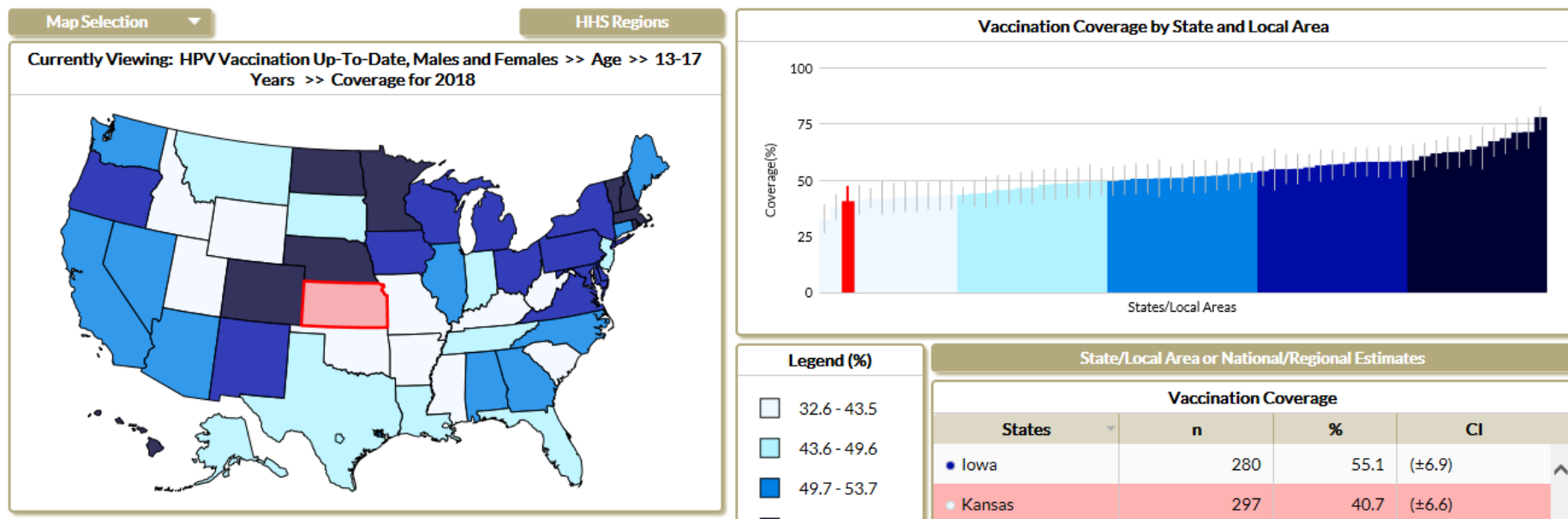
# ACIP June 2019

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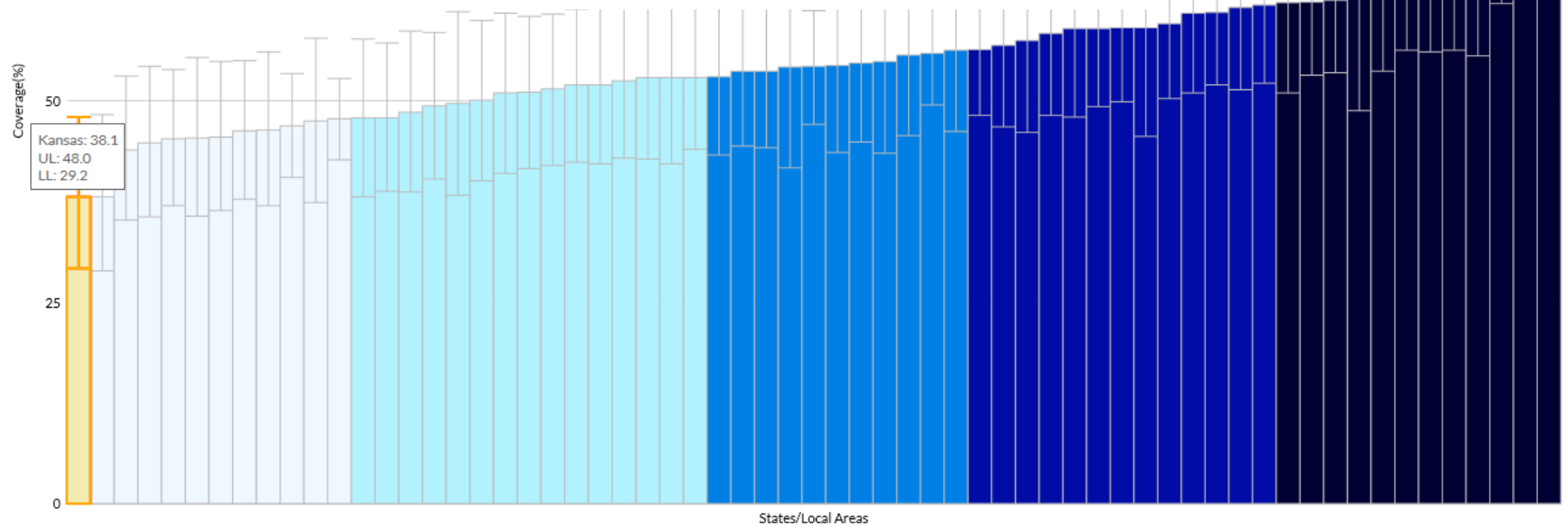
2 votes:

- HPV vaccination recommended for both males and females through age 26 years
- For ages 27 to 45 years, decision to vaccinate based on “shared clinical decision-making”

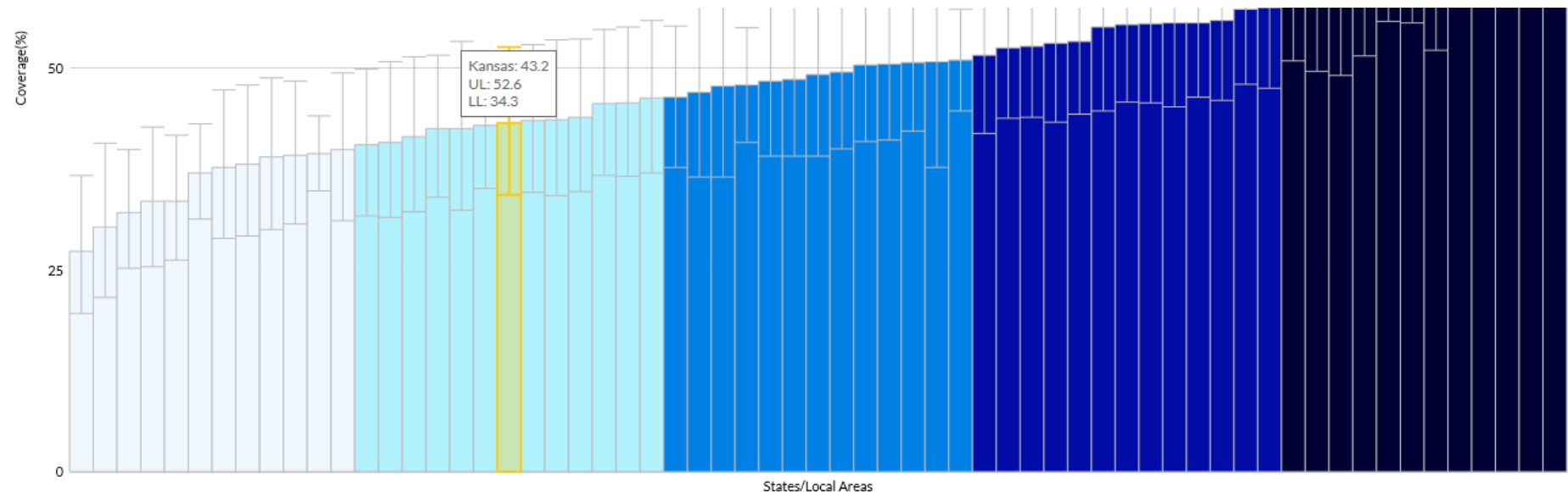
# HPV Vaccination Coverage Among Adolescents 13-17 years by State, HHS Region, and the US, National Immunization Survey-Teen (NIS-TEEN), 2018



# KS HPV rates for Girls (top) and Boys (bottom) ages 13-17



States/Local Areas



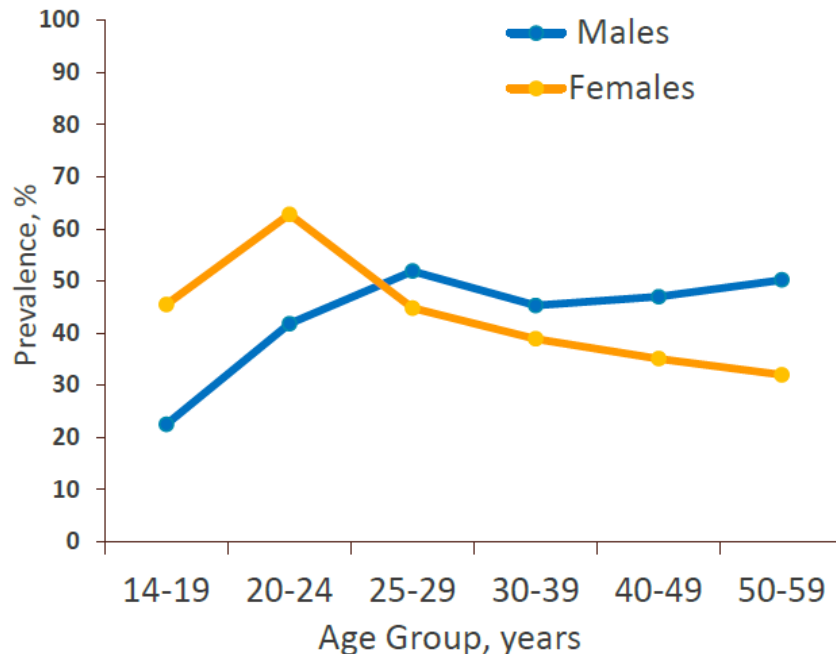
States/Local Areas



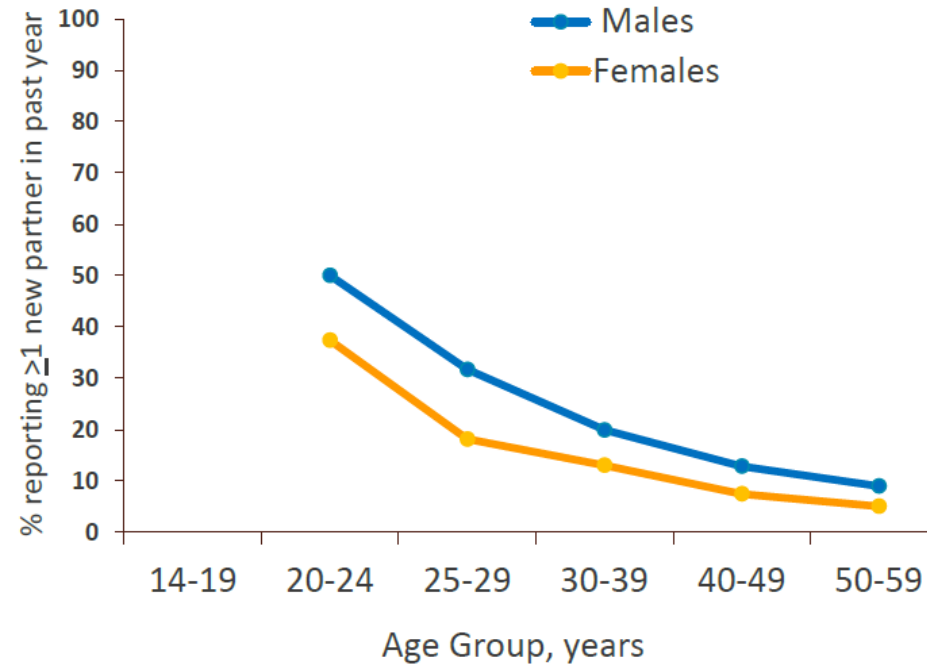
# HPV Over the Ages

## HPV DNA prevalence and report of at least 1 new sex partner — United States, 2013-2014

Prevalence of any genital HPV, NHANES\*



Percent reporting  $\geq 1$  new sex partner in the past year, NHANES\*



Lewis et al, JID 2018; Gargano et al, JID 2017  
NHANES, National Health and Nutrition Examination Survey

\*among sexually experienced persons \*CDC, unpublished data

# **Shared Decision Making Framework**

## **HPV Vaccine in 27-45 year olds**

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### **LEANS toward VACCINATE**

- **Having a new/multiple sex partners is a risk**
- **Vaccine efficacy is high if you haven't been exposed to that serotype**

### **LEANS toward DON'T VACCINATE**

- **Monogamous long term relationships**
- **Not likely ever to be sexually active**

# Vaccine Hesitancy

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- Hesitancy has been increasing among patients and parents
- It is a spectrum: many are neither pro nor anti-vaccine but are in the middle.
- Provider introduction and recommendation is very important.

# Hesitancy

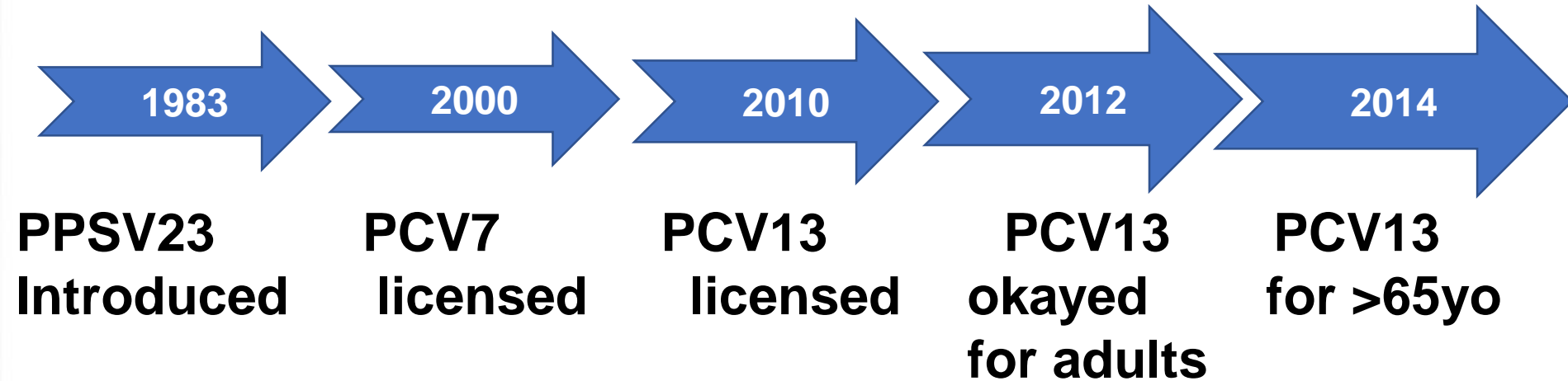
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- Presumptive style of communication
  - (continue discussion about why the vaccine is important vs deferring vaccination)
- Strong, direct communication
  - Even when parents verbally assertively expressed hesitancy, 33% were vaccinated same day.

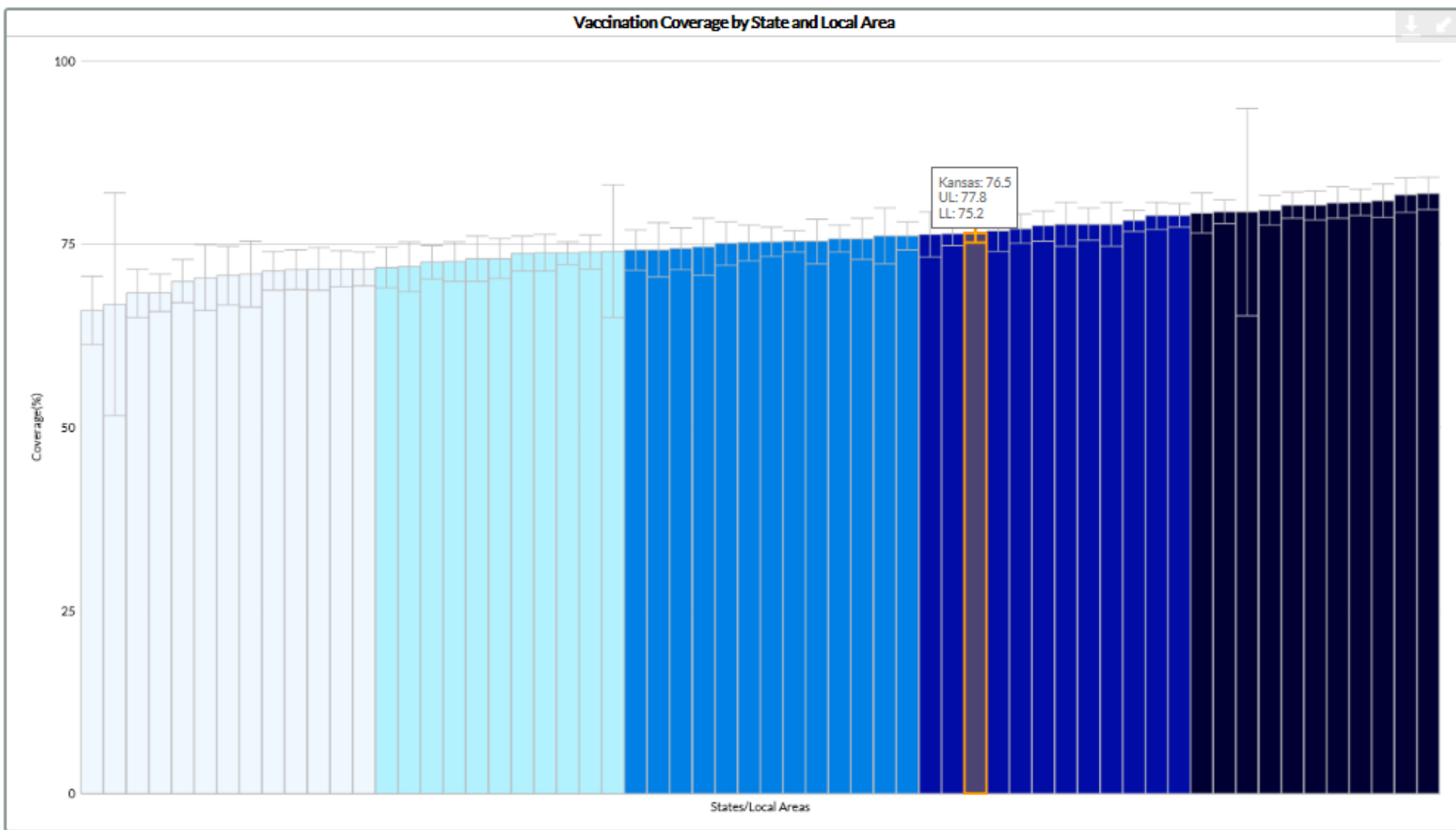
# Pneumococcal Vaccines

*Remember there are 2 of them*

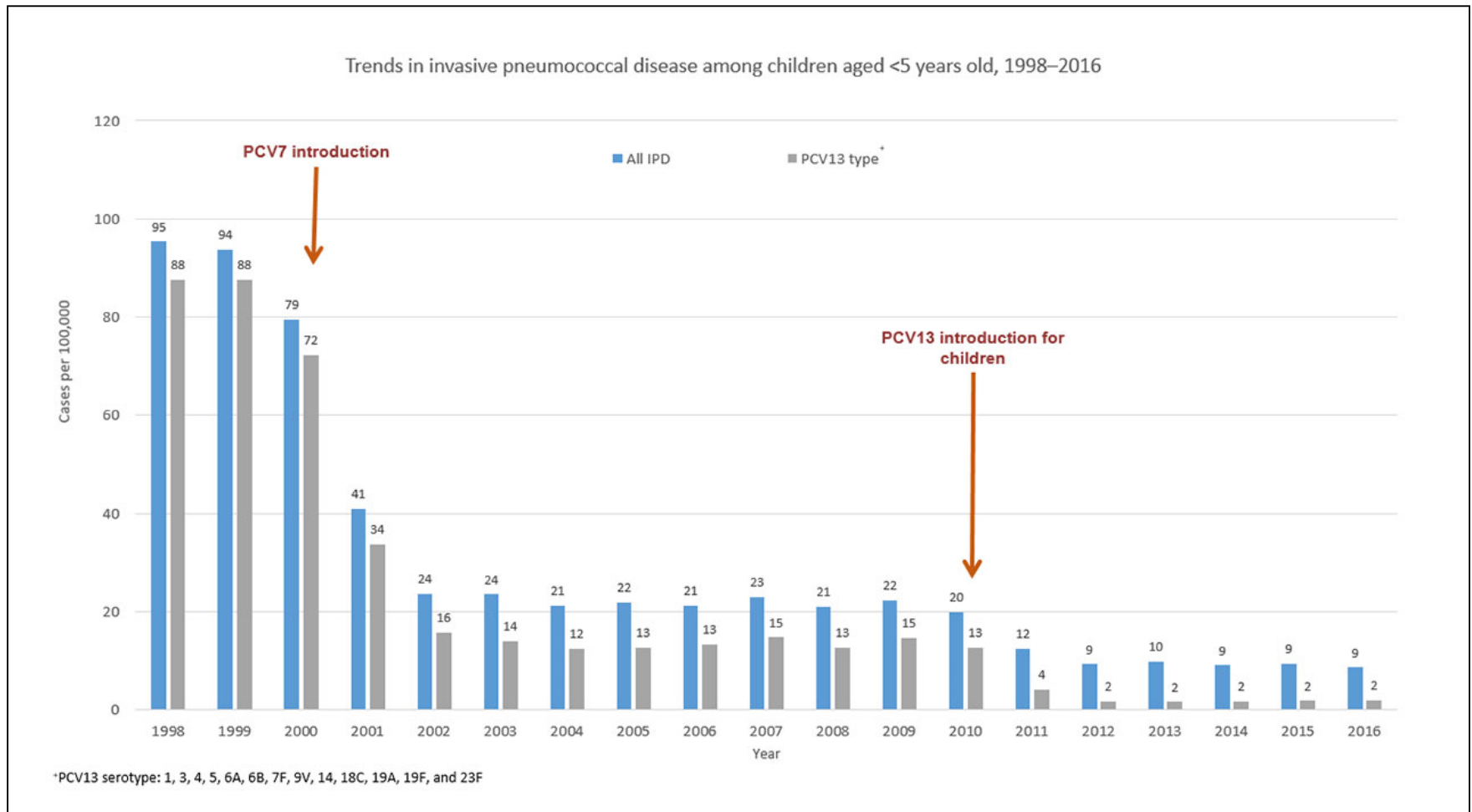
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Pneumococcal vaccination coverage among adults 18–64 years at increased risk and  $\geq 65$  years, Td and Tdap vaccination coverage among adults  $\geq 18$  years, and shingles vaccination coverage among adults  $\geq 60$  years by selected local area, state, HHS Region, and the United States, BRFSS, 2008 through 2017



# Pneumococcal Vaccines Effects in Children



# Quiz

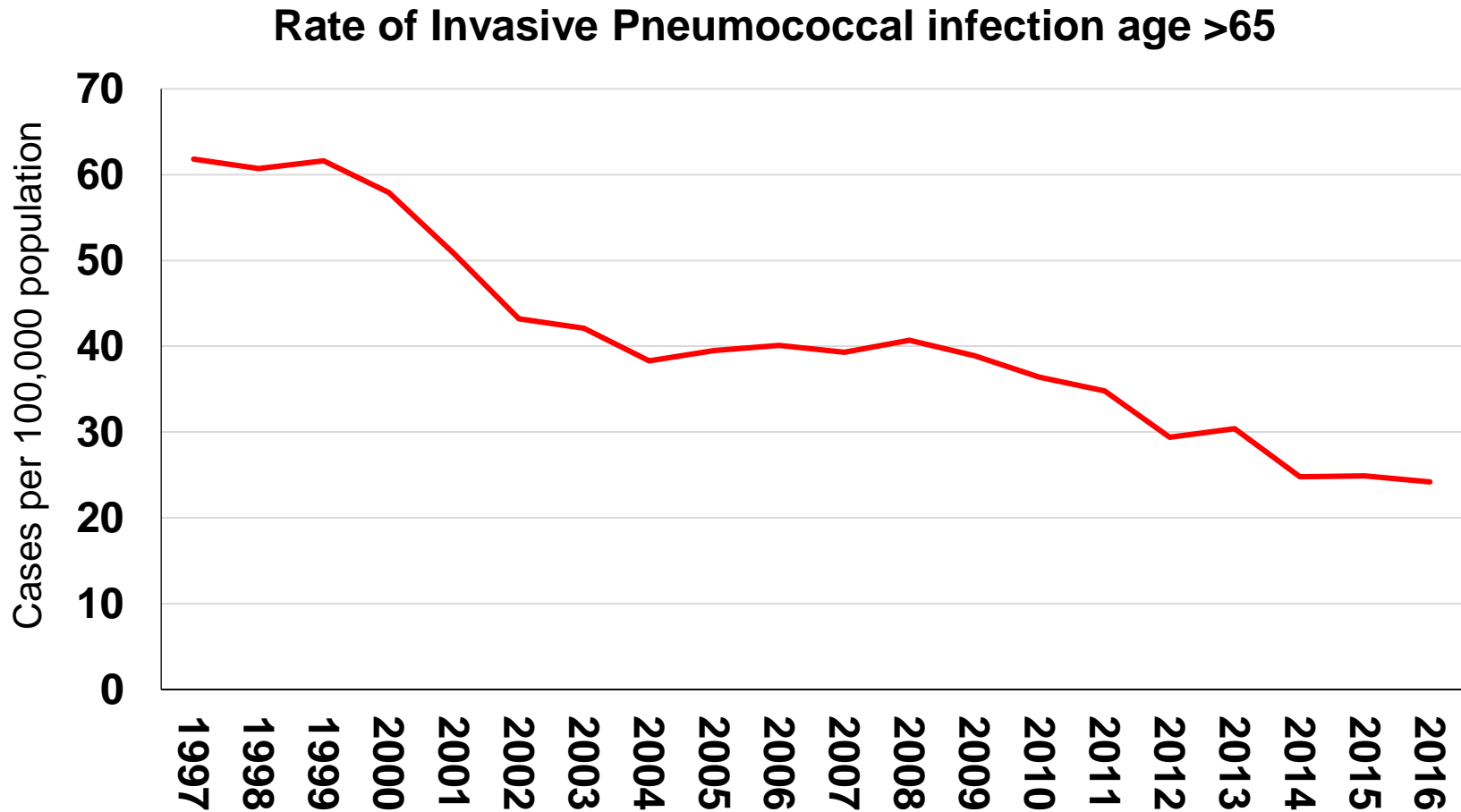
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**Which of the following had the largest impact on the incidence of IPD in US adults?**

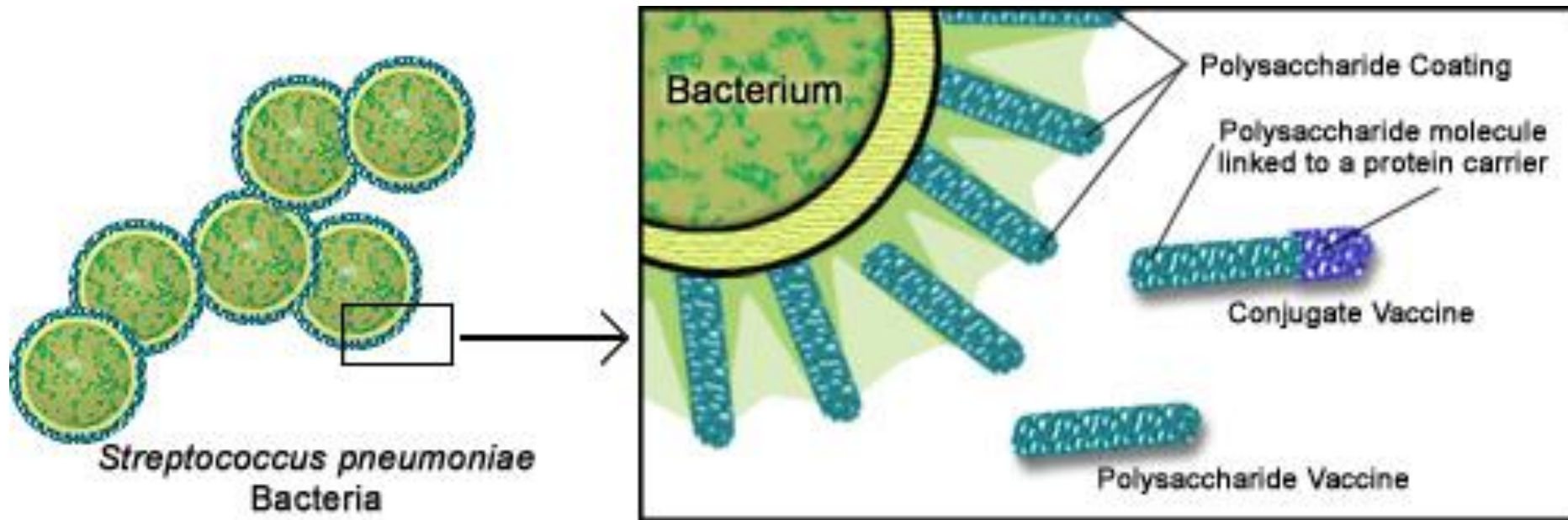
- A) PPSV23 Vaccination for 65 year olds
- B) PCV7 Vaccination in children
- C) PCV7/13 Vaccination of High Risk 19-64 yr olds
- D) PPSV23 Vaccination of High Risk 19-64 year olds



# Trends in Adults



# Polysaccharide vs. Conjugate



# Vaccine Effectiveness

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- PPSV23 is only **modestly** effective protecting against invasive disease (~50% reduction)
- **Poor** against non-bacteremic pneumonia (NPP) (4–17%)
- NPP is ~10 times more common than bacteremic pneumonia in adults

# Conjugates vs Polysaccharides

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- Induces herd immunity by decreasing naso-pharyngeal carriage. (Seen in Hib previously)
- Long-term immunity via T-cell activation also may decrease need for booster doses.





# So Who was Getting the Adults Sick?



<http://www.dailymail.co.uk/sciencetech/article-2650991/Should-let-baby-play-dirt-researchers-say-help-guard-boost-immune-guard-against-asthma.html>  
<http://news.hugobox.com/2013/10/07/project-wild-thing-make-your-childs-heart-sing/>

# Whom to Vaccinate: ACIP 2012

## Immunocompetent Patients

| Underlying medical condition                                    | PCV13        | PPSV23                          |
|---|--------------|---------------------------------|
| Chronic heart/lung/liver disease                                |              | ✓                               |
| Diabetics/smokers/alcoholism                                    |              | ✓                               |
| CSF leak  | ✓            | ✓                               |
| <b>Immunocompromised Persons</b>                                | <b>PCV13</b> | <b>PPSV23 + rpt<br/>in 5yrs</b> |
| Renal failure/nephrotic   | ✓            | ✓                               |
| Generalized or heme malignancy                                  | ✓            | ✓                               |
| <b>Iatrogenic immunosuppression</b> /transplant                 | ✓            | ✓                               |
| Congenital or acquired asplenia<br>Sickle cell/hemoglobinopathy | ✓            | ✓                               |

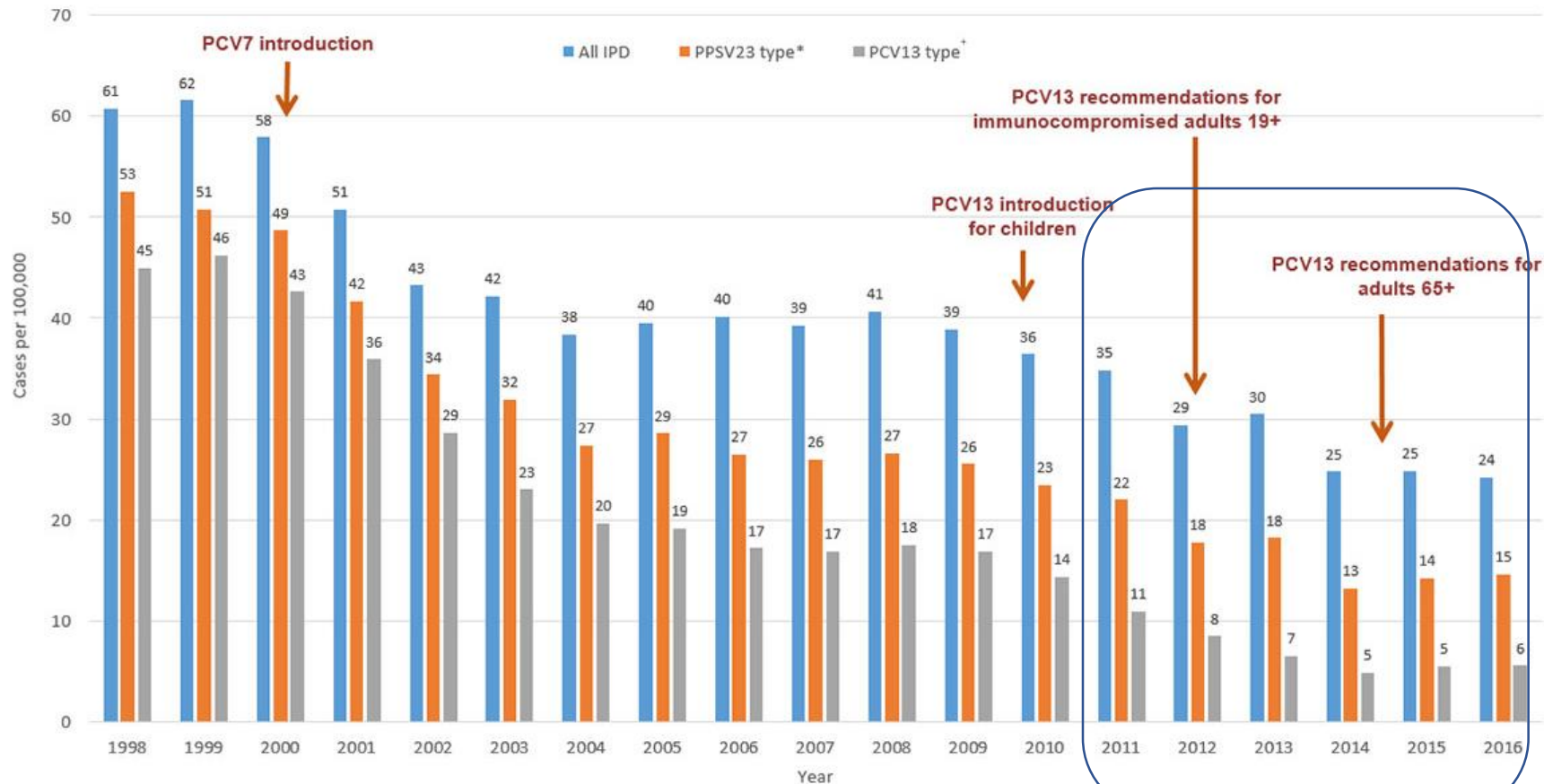
# ACIP Meeting June 2019

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For immunocompetent adults  $\geq 65$  years and no history of pneumococcal vaccine:

- Remove the recommendation for a single dose of PCV13
- “Shared clinical decision making” can be used to decide whom to vaccinate with PCV13
- A single dose of PPSV23 vaccine should continue to be administered

# Trends in IPD Among Adults $\geq 65$ Years, 1998–2016



\*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

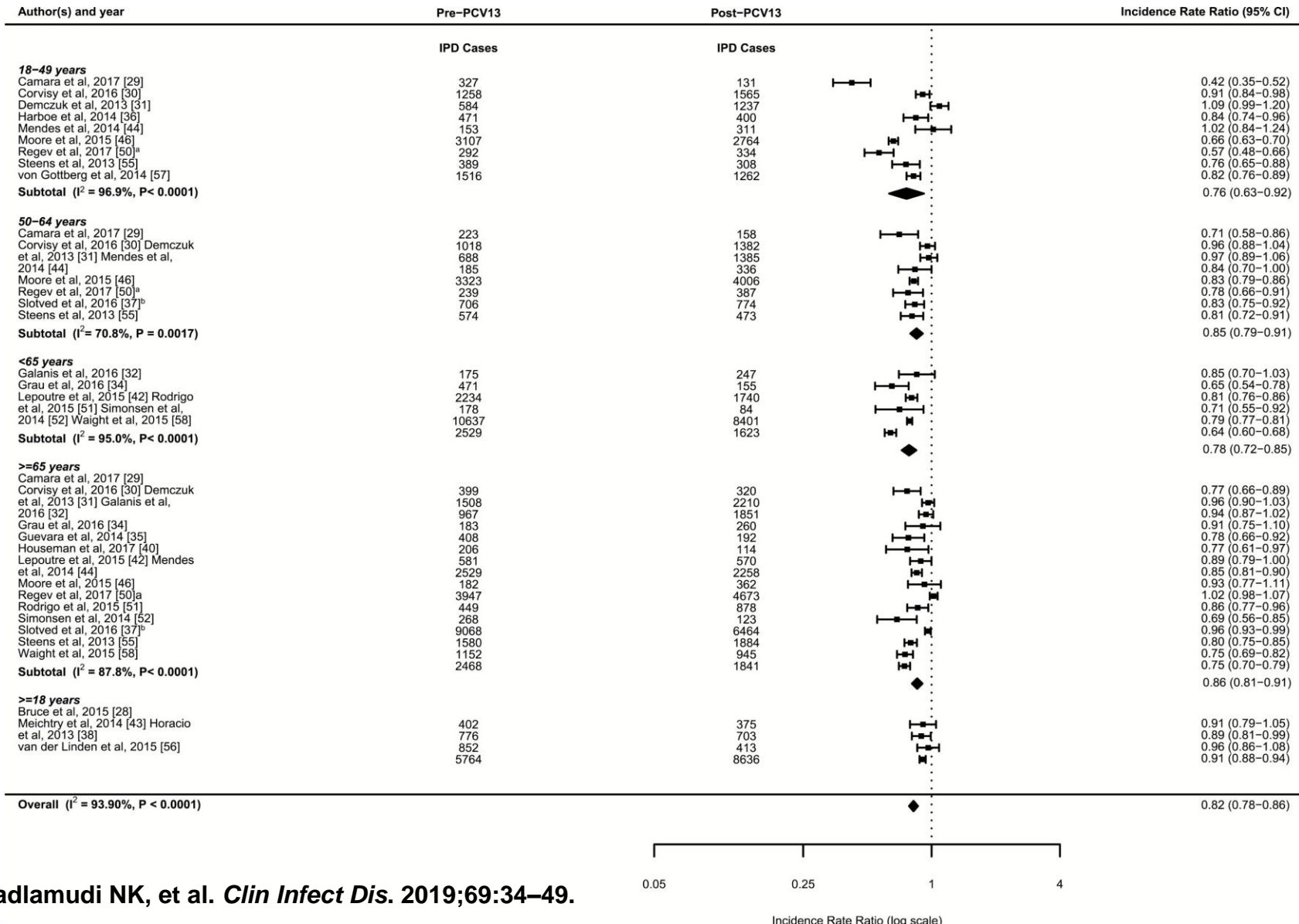


# Indirect Effect of Pediatric Vaccines

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- 9-fold reduction in IPD in adults >65 years  
In PCV13 types alone: 3-fold reduction
- Steady rate since 2014
- ~ Same as Europe
  - 77% reduction in PCV7 types
  - 38% reduction in PCV13-non7 types

# 16 Country Risk of Invasive Pneumococcal Disease, Before and After the Introduction of 13-valent Pneumococcal Conjugate ...



# Annual Number Needed to Vaccinate (NNV) among Adults ≥65 Years Old\*

| Outcome                          | Incidence per 100,000            | Vaccine Effectiveness (VE) | (95%CI)  | NNV          | (95%CI)          |
|----------------------------------|----------------------------------|----------------------------|----------|--------------|------------------|
| PCV13-type IPD                   | 5 <sup>a</sup>                   | 76% <sup>b</sup>           | (48, 89) | 26,300       | (22,500, 41,700) |
| PCV13-type pneumonia, inpatient  | 17 <sup>c</sup> –76 <sup>d</sup> | 43% <sup>e</sup>           | (12, 63) | 3,000–14,000 | (2,100, 50,200)  |
| PCV13-type pneumonia, outpatient | 88 <sup>f</sup>                  | 43% <sup>e</sup>           | (12, 63) | 2,600        | (1,800, 9,500)   |

\*Calculation:  $NNV = 1 / (\text{incidence rate} * VE)$

<sup>a</sup> Unpublished ABCs data [3]

<sup>b</sup> Bonten [1]\*

<sup>c</sup> Gierke [11], estimated by applying the %PCV13-type IPD to the NIPP incidence estimate

<sup>d</sup> Swerdlow [10]\*

<sup>e</sup> Webber [6]\*

<sup>f</sup> Nelson et al. 2008, estimated as 5.1% of all-cause outpatient pneumonia is PCV13-type

**While reasonable to remove the recommendation to vaccinate with PCV13, what does that mean for reimbursement, etc.?**

# **In conclusion, tremendous advances in science have given us new vaccines**

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**Which one of the following is NOT a method of developing a currently licensed vaccine?**

- A) use entire genome's open reading frames to synthesize proteins, inject them in a rodent to test immunogenicity, find one that evokes a response, then purify it.
- B) Make envelope protein from pentamers, get it to self-assemble to a larger particle.
- C) Get a harmless recombinant insect virus to infect a moth ovary and then secrete a target protein.
- D) Get a target protein, add HbSag to it, then also add AS01 adjuvant.
- E) Take a part of a polysaccharide capsule, and connect it to tetanus toxoid.

# The End

