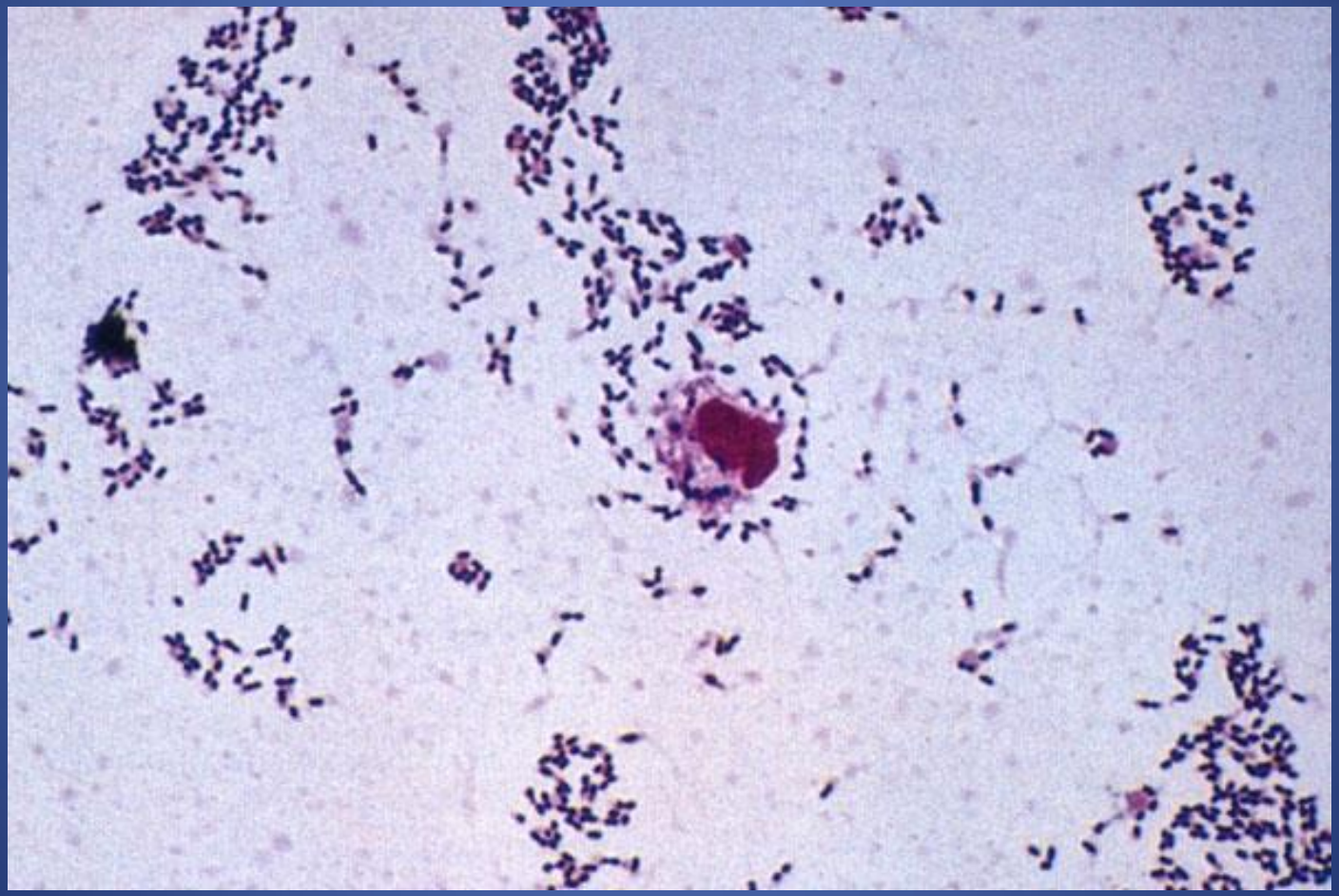
Vaccines for Primary Care

Pneumococcal, Shingles, Pertussis

Devang Patel, M.D.
Assistant Professor
Chief of Service, MICU ID Service
University of Maryland School of Medicine

Pneumococcal Vaccine



Pneumococcal Disease

- 2nd most common cause of vaccine preventable death in the US
- Major Syndromes
  - Pneumonia
  - Bacteremia
  - Meningitis

Active Bacterial Core Surveillance (ABCs)
Report Emerging Infections Program Network
Streptococcus pneumoniae, 2010 (ORIG)

	Cases		Deaths	
Age (years)	**No.**	**(Rate*)**	**No.**	**(Rate*)**
< 1	142	(34.2)	1	(0.24)
1	112	(26.6)	1	(0.24)
2-4	171	(13.1)	1	(0.08)
5-17	111	(2.2)	1	(0.02)
18-34	260	(3.8)	18	(0.26)
35-49	670	(10.5)	43	(0.68)
50-64	1,064	(18.8)	103	(1.82)
≥ 65	1,292	(36.4)	199	(5.61)
Total	3,822	(12.8)	367	(1.23)

* Cases or deaths per 100,000 population for ABCs areas

Vaccine Target

- Polysaccharide capsule allows bacteria to resist phagocytosis
- Antibodies to capsule facilitate phagocytosis
- >90 different pneumococcal capsular serotypes
- Vaccines contain most common serotypes causing disease

Pneumococcal Vaccines

	Serotypes
Pneumovax	1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A,11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, 33F
Prevnar-13	1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F

Pneumococcal Vaccines

- Pneumococcal polysaccharide vaccine (PPSV23; Pneumovax)
  - Contains capsular polysaccharides
  - 23 most commonly infecting serotypes
    - Cause 60% of all pneumococcal infections in adults
  - Not recommended for children <2 due to poor immunogenicity of polysaccharides

Pneumococcal Vaccines

- Pneumococcal conjugate vaccine (PCV13, Prevnar)
  - Polysaccharides linked to nontoxic protein
    - higher antigenicity
  - Stimulates mucosal antibody
    - Eliminates nasal carriage in young children
    - Herd effect in adults
      - Reduction in PCV7 serotype disease >90%

Prevnar 13

- 2000 - PCV7 approved for infants toddlers
- 2010 - PCV13 recommended for infants and toddlers
- 2012 – ACIP recommended PCV13 for high-risk adults
- 2014 – recommended for adults >65
- 2018 – ACIP will revisit PCV13 use in adults
  - Childhood vaccines may eliminate these vaccine strains from population

Adult 65 and Older

- CDC recommends all adult ≥ 65 receive 2 types of pneumococcal vaccines
  - One dose of PCV13 (first)
  - One dose of PPSV23 (6 to 12 months after PCV vaccine)
  - This age group requires both vaccines for the best protection against pneumococcal disease

Adult 19 to 64 Years Who Only Need PPSV23

- Those with chronic conditions
  - Asthma
  - Diabetes
  - Heart disease
  - Alcoholism
  - Liver disease
- Cigarette smokers
- Residents of nursing homes or other long-term care facilities
- When they turn 65 this group should receive a dose of PCV13

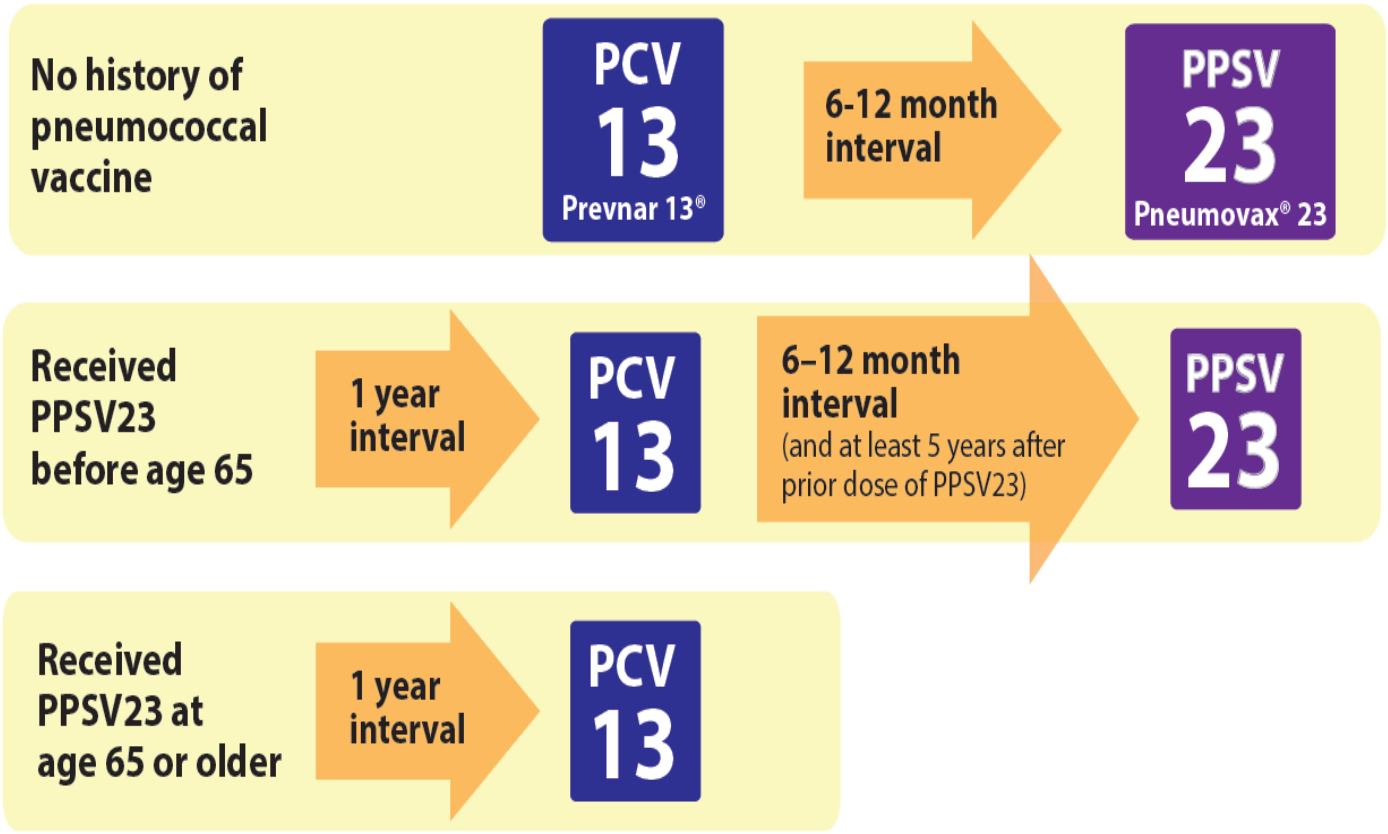
Adults 19 to 64 Who Should Receive both PCV13 and PPSV23*

- Functional or anatomic asplenia†
- Cochlear implants
- Cerebrospinal fluid leaks†
- Lymphoma, leukemia, Hodgkin disease,†
- Solid organ transplants†

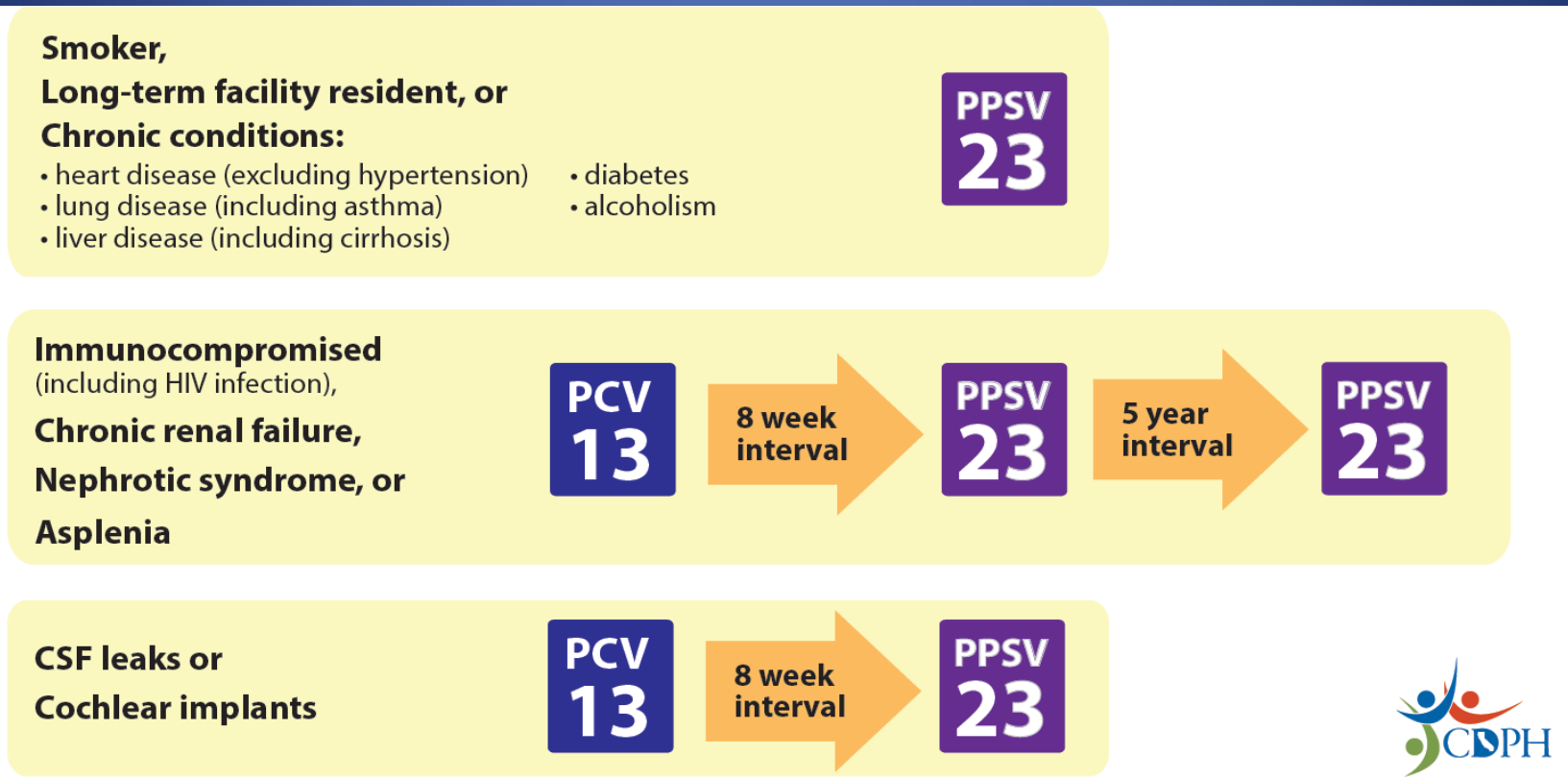
- * PCV13 and PPSV23 cannot be given at the same visit
- † A second PPSV23 vaccine is recommended for these individuals five years after the first PPSV23 dose

Age 65 Years or Older

- If PCV13 was given before age 65 years, no additional PCV13 is needed.



Age 19-64 Years with Underlying Conditions



• **DO NOT administer PCV13 and PPSV23 at the same visit.**

California Department of Public Health, Immunization Branch **www.EZIZ.org**
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Zoster

VZV

- Shingles recognized in ancient times
- 1875, Steiner inoculated “volunteers” with chicken pox from infected individual
- Only enveloped virions are infectious
  - Sensitive to detergents, air drying
- Spreads from cell to cell by direct contact
- Smallest of the herpesviridae

VZV Epidemiology

Chicken Pox

- Childhood
  - 90%<13yo
- Incubates 14 to 15 days
- More frequent in adults in tropics
- Infectious 48 hrs prior to lesions
- Infectious until lesions crusted over (4-5 days)

Shingles

- Reactivation
- All ages affected
- 5-10 cases/1000 age >60
- 4% experience 2nd episode
- Higher for immune compromised
- Lifetime risk of developing zoster is about 30%

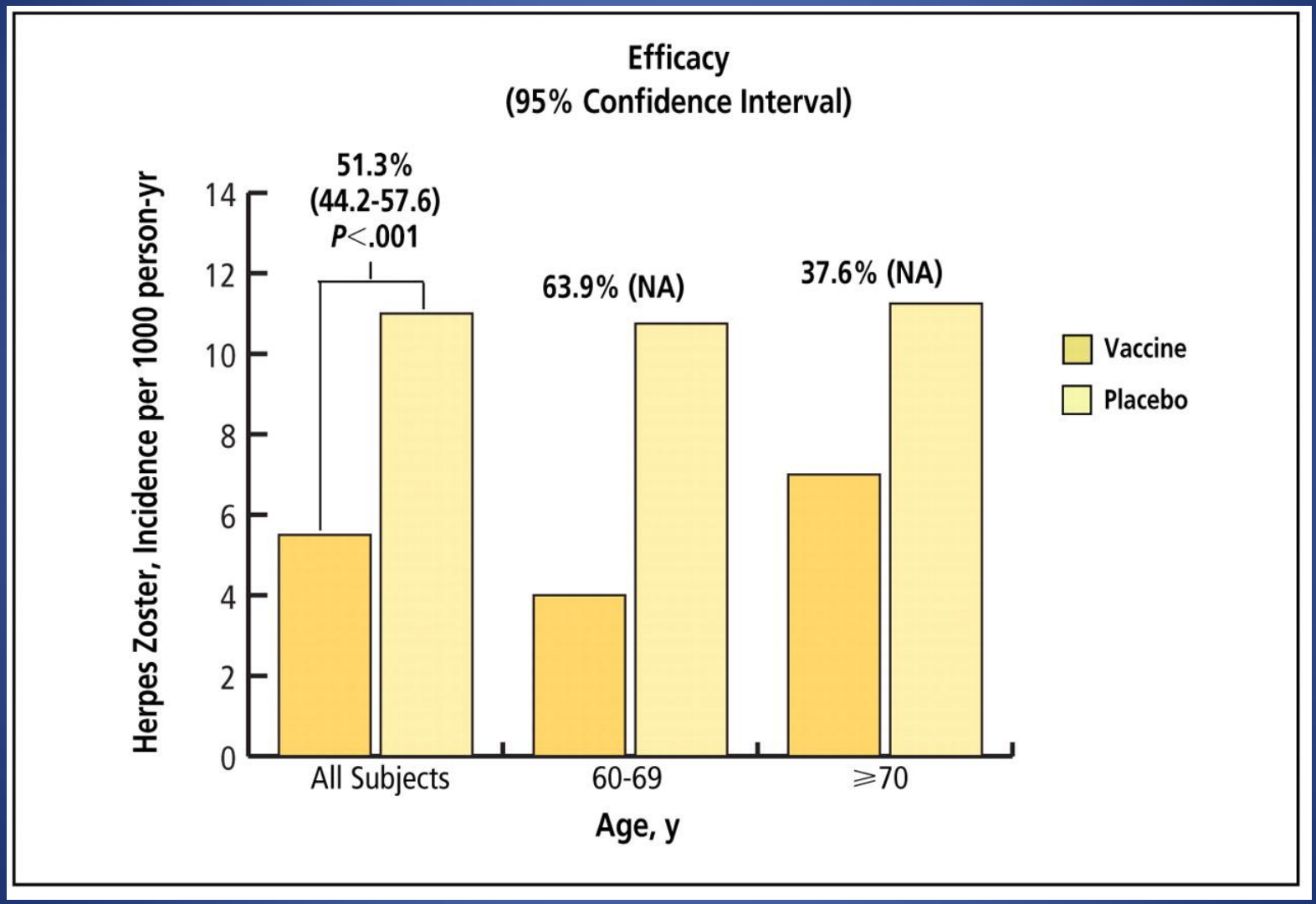
Reactivation

- Decline in cell-mediated immunity with age
- 30-40% over age 55 do not have detectable VZV-specific T cell responses
- Response improves with periodic subclinical VZV reactivation
  - Exposure to children with chickenpox

Herpes Zoster Vaccine - Zostavax

- Licensed by FDA in 2006
  - >38,500 non immunocompromised adults ≥60 years old
  - Median follow-up 3.1 years
  - Live-attenuated Oka-strain VZV (≥14X titer in Varivax)
  - Safety
    - Serious adverse events not more common in vaccinated group
    - Local reactions more common in vaccine group

Efficacy of Zoster Vaccine in the Shingles Prevention Study.



Oxman M N Clin Infect Dis. 2010;51:197-213

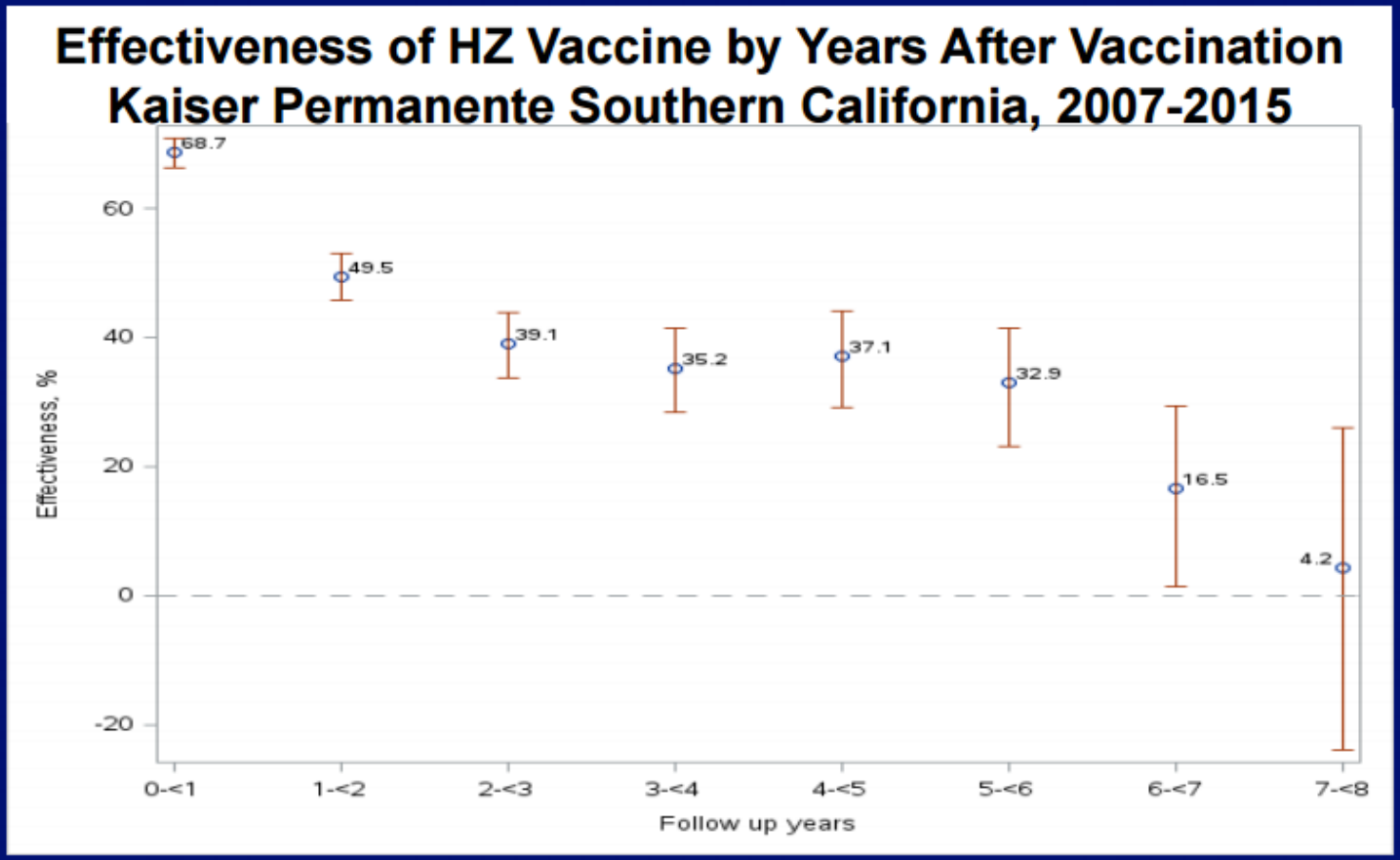
Zostavax – Advisory Committee on Immunization Practices

- 2008: Zostavax recommended by ACIP
  - 1 dose for adults ≥60 years
  - Contraindicated in immunocompromised
  - Vaccine efficacy: 51% vs. Herpes Zoster
  - Vaccine efficacy: 67% vs. Post Herpetic Neuralgia

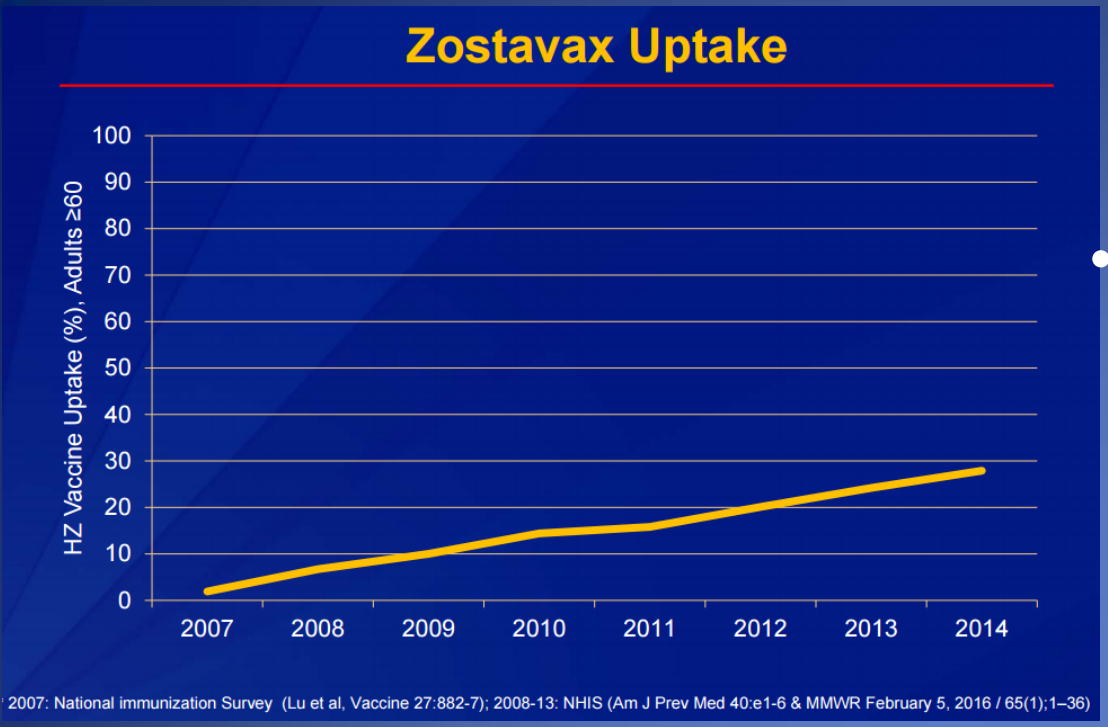
Zostavax ACIP

- 2011: FDA age expansion to 50-59 yr olds
  - ZEST study shows 70% reduction in of HZ in age 50-59
  - No change to ACIP recommendation
    - Vaccine shortages (now resolved)
    - Higher herpes zoster disease burden in people ≥60 years
- 2013: ACIP affirmed recommendation for adults 60 years and older
  - Waning of immunity

Zostavax: Duration of Protection against HZ



Tseng, et al., JID, 2016



- Why has uptake been sluggish?
  - Price
  - Storage & handling (frozen vaccine)
  - Supply shortages (resolved)
  - Medicare Part D reimbursement
  - Lower prioritization of adult vaccines
  - General fragmentation of preventive care for seniors

Contraindications/Precautions

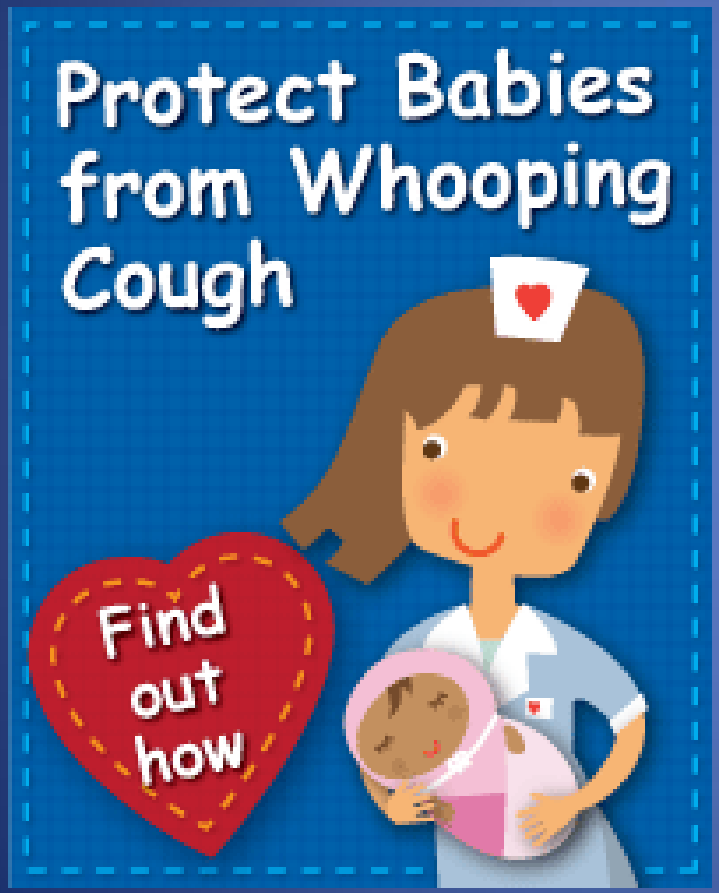
- Immunocompromised – should avoid
  - Primary or acquired immunodeficiency
  - HIV with CD<200
  - Stem cell or organ transplant
  - Biologics or prednisone >20 mg/day

- Lower efficacy with pneumococcal vaccine coadministration

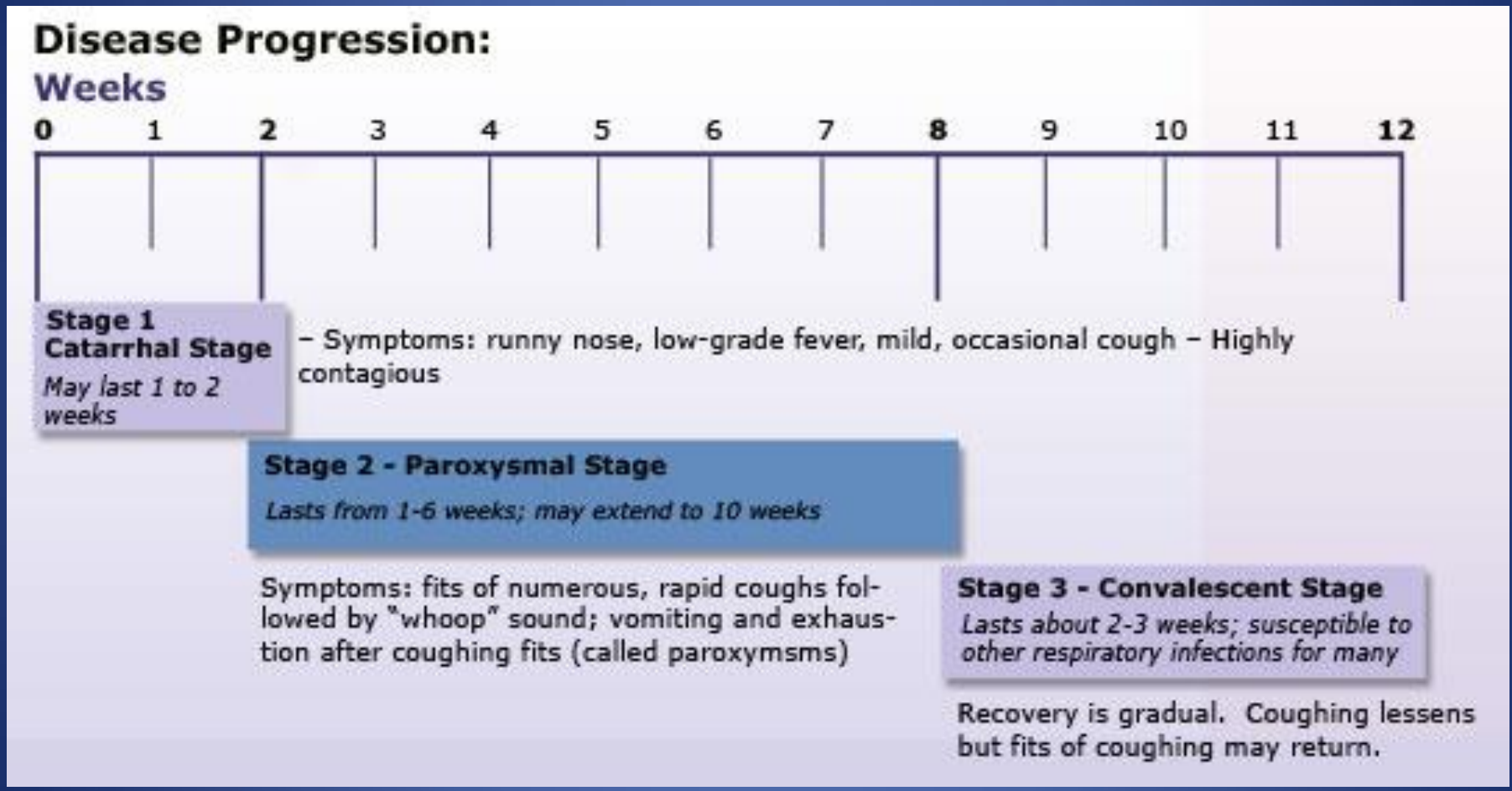
Investigational Vaccine (HZ/su)

- Inactivated zoster vaccine
- Not yet approved
- Ay be beneficial in those >70 years
- 90%+ efficacy
- Requires 2 doses

Pertussis Vaccine



Pertussis



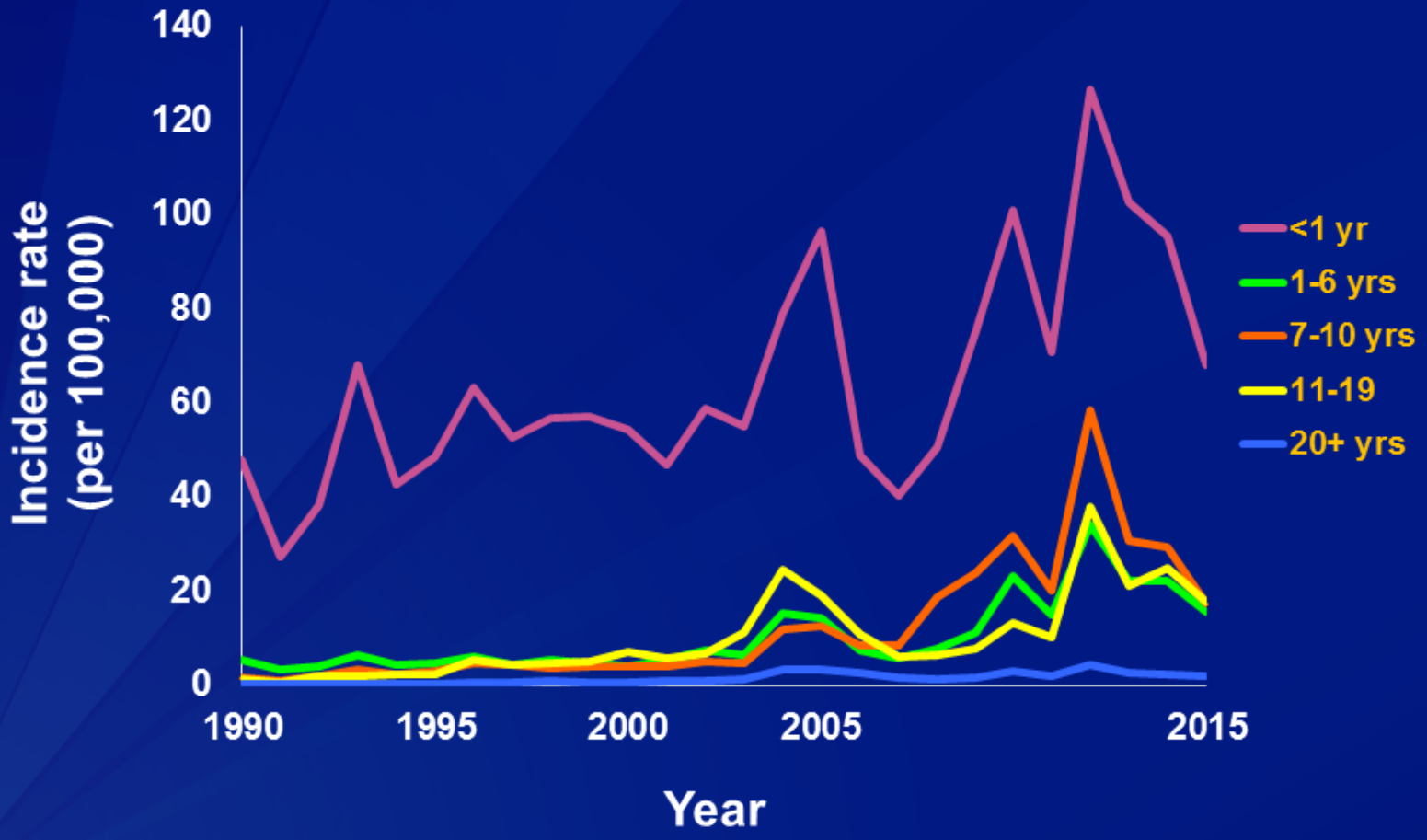
- Almost all deaths among infants < 6 months old

http://www.pkids.org/diseases/pertussis.html

Reported NNDSS pertussis cases: 1922-2015

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System and 1922-1949, passive reports to the Public Health Service

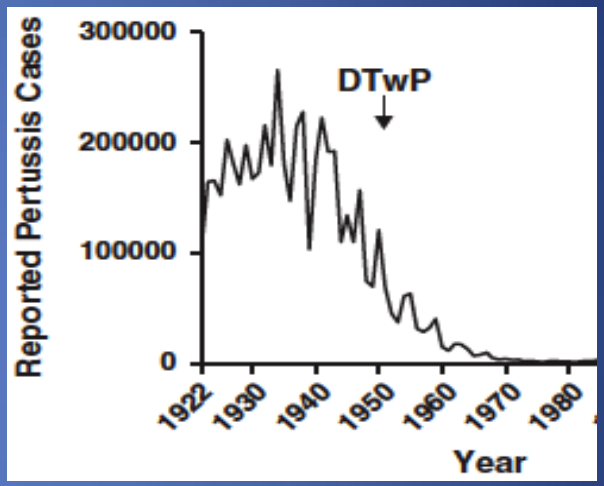
Reported pertussis incidence by age group: 1990-2015



SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System

Whole cell pertussis vaccine (wP)

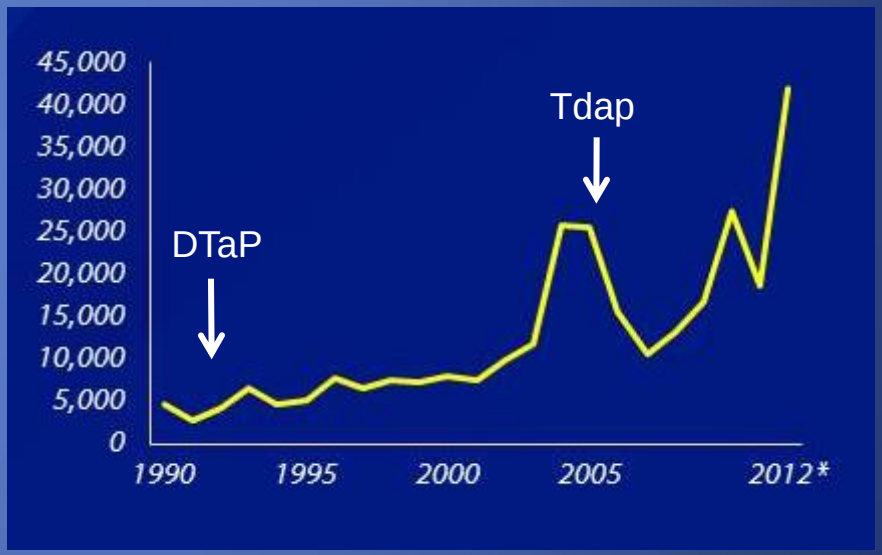
- 1st generation vaccine (1940s)
  - heat/formalin killed whole bacterial cells
    - Effective
    - Reactogenic (side-effects)
    - Still used in much of developing world



Pertussis Vaccines

- 2nd generation acellular vaccines (1990s):

- Approved for use in children in US in 1991 (DTaP)
- Approved for adults and adolescents in 2005 (Tdap)



But

- immunity wanes rapidly (3-5 yrs)
- pertactin (PRN)-deficient mutant strains now prevalent (vaccine escape mutants)

Possible reasons for increase in pertussis

Increased awareness and detection – PCR and serology diagnosis

Decrease in vaccination rate / increase in number of vaccine refusers

Ineffectiveness of acellular vaccines

Evolution of *B. pertussis* strains to evade vaccine-elicited immunity

Recommendations

- Single booster with Tdap
  - Adults age 19-64
  - Age >65 who have not previously received Tdap
- Higher importance
  - Adults who have close contacts with infants
    - Grandparents, childcare providers, HCWs
  - Obesity
  - Asthma
- All pregnant women (27-36 weeks gestation)
  - Re-immunization with subsequent pregnancies

Questions?