Vaccination of Adults in the United States

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Question One

Can patients who have had shingles get the shingles vaccine?

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- **2. No**
- **3. No, unless it has been at least 3 years since they had shingles**

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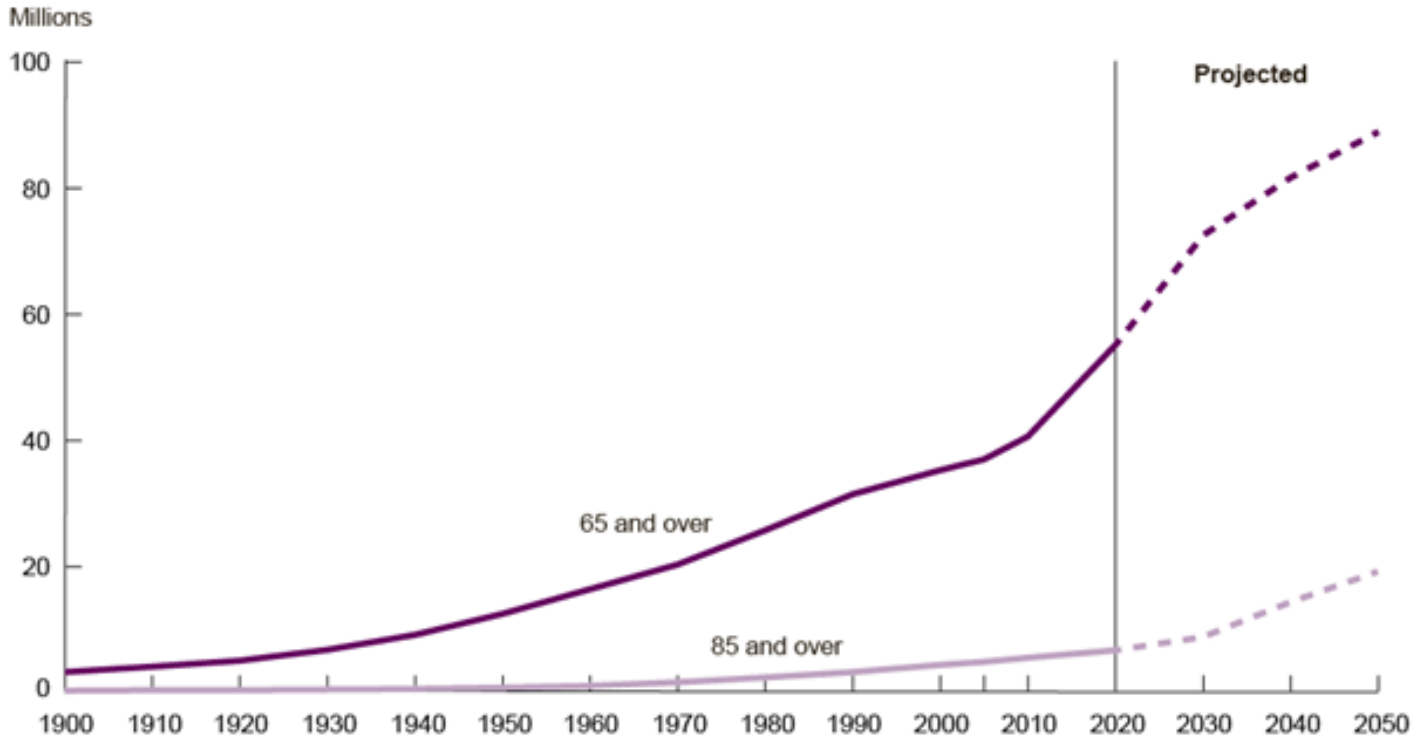
Outline of Presentation

- Burden of vaccine preventable diseases
- 2013 U.S. immunization schedule for adults and recent changes
  - Update on Tdap
  - Update on PCV13 and PPSV23
- National immunization coverage among adults
- Challenges and opportunities vaccinating adults
- Update on influenza vaccine
- Conclusions

Population age 65 and over and age 85 and over, selected years 1900–2010 and projected 2020–2050



NOTE: These projections are based on Census 2000 and are not consistent with the 2010 Census results. Projections based on the 2010 Census will be released in late 2012.

Reference population: These data refer to the resident population.

SOURCE: U.S. Census Bureau, 1900 to 1940, 1970, and 1980, U.S. Census Bureau, 1983, Table 42; 1950, U.S. Census Bureau, 1953, Table 38; 1960, U.S. Census Bureau, 1964, Table 155; 1990, U.S. Census Bureau, 1991, 1990 Summary Table File; 2000, U.S. Census Bureau, 2001, *Census 2000 Summary File 1;* U.S. Census Bureau, Table 1: Intercensal Estimates of the Resident Population by Sex and Age for the U.S.: April 1, 2000 to July 1, 2010 (US-EST00INT-01); U.S. Census Bureau, 2011. *2010 Census Summary File 1;* U.S. Census Bureau, Table 2: Projections of the population by selected age groups and sex for the United States: 2010–2050 (NP2008-t2).

- In 2010, ≥ 65 years accounted for 13% of US population.

- With aging of "Baby Boomers", projected population ≥65 years: 16.5% in 2020; 19.3% in 2030; and 20% in 2040.

www.Agingstats.gov

Burden of Disease Among U.S. Adults for Diseases with Vaccines Available

- Invasive pneumococcal disease (IPD)[1]
  - 39,750 total cases and 4,000 total deaths in 2010
    - 86% of IPD and nearly all IPD deaths among adults
- Influenza[2]
  - 3,000 to 49,000 total related deaths per year
    - ~90% among adults 65 years and older
- Pertussis[3]
  - 41,880 total reported cases 2012
    - ~9,000 among adults
- Hepatitis B[4]
  - 3,350 acute cases reported 2010
    - 35,000 estimated
- Zoster[5]
  - about 1 million cases of zoster annually U.S.

1. CDC. Active Bacterial Core Surveillance. http://www.cdc.gov/abcs/reports-findings/survreports/spneu10.pdf.
2. CDC. Estimates of deaths associated with seasonal influenza – United States, 1976-2007. MMWR. 2010;59(33):1057-1062.
3. CDC. Notifiable Diseases and Mortality Tables. MMWR 2013. 61(51&52): ND-719 – ND 732.
4. CDC. Viral Hepatitis Surveillance United States, 2010. National Center for HIV/AIDS, Viral Hepatitis, STD& TB Prevention/Division of Viral Hepatitis.
5. CDC. Prevention of Herpes Zoster. MMWR 2008. 57(RR-5): 1-30.

Potential For Substantial Reduction in Burden

- Pneumococcal vaccines
  - PPSV23 VE (vaccine effectiveness) 30-70% vs invasive pneumococcal disease (IPD)
  - PCV13 VE estimates pending
- Zoster vaccine
  - 50% VE against shingles
  - 67% VE against post-herpetic neuralgia (PHN)
- Tdap – estimate is ~70% VE (data limited for adults)
- Hepatitis B vaccine – 80-95% VE in healthy adults
- HPV vaccine – 90-100% VE against HPV vaccine types
- Influenza vaccine – varies by year and type/subtype

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5602a1.htm

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
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Advisory Committee on Immunization Practices (ACIP) Recommended Immunization Schedules for Persons Aged 0 Through 18 Years and Adults Aged 19 Years and Older — United States, 2013

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Adult Immunizations in the U.S.

- **Immunization recommendations in the United States developed through input from the Advisory Committee on Immunization Practices (ACIP)**
  - ACIP is a U.S. Federal Advisory Committee – includes immunization, infectious disease, and public health experts
  - Vaccine-specific working groups and working groups for general immunizations, pediatric immunization schedule and adult immunization schedule present at publically held ACIP meetings three times per year
  - ACIP votes on recommendations to CDC
  - Final recommendations approved by the Director of CDC are published in the MMWR
- **Pediatric and adult immunization schedules summarize vaccine-specific recommendations**

2013 Adult Immunization Schedule

- **Updated annually**
- **Must be interpreted along with accompanying footnotes plus the figures**
- **Adult schedule approved by**
  - American College of Physicians
  - American Academy of Family Physicians
  - American College of Obstetricians and Gynecologists
  - American College of Nurse-Midwives

FIGURE 1. Recommended adult immunization schedule, by vaccine and age group[1]

These recommendations must be read with the footnotes that follow.

VACCINE ▼ AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
Influenza[2,*]	1 dose annually					
Tetanus, diphtheria, pertussis (Td/Tdap)[3,*]	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs					
Varicella[4,*]	2 doses					
Human papillomavirus (HPV) Female[5,*]	3 doses					
Human papillomavirus (HPV) Male[5,*]	3 doses					
Zoster[6]					1 dose	
Measles, mumps, rubella (MMR)[7,*]	1 or 2 doses					
Pneumococcal polysaccharide (PPSV23)[8,9]	1 or 2 doses					1 dose
Pneumococcal 13-valent conjugate (PCV13)[10]	1 dose					
Meningococcal[11,*]	1 or more doses					
Hepatitis A[12,*]	2 doses					
Hepatitis B[13,*]	3 doses					

*Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster

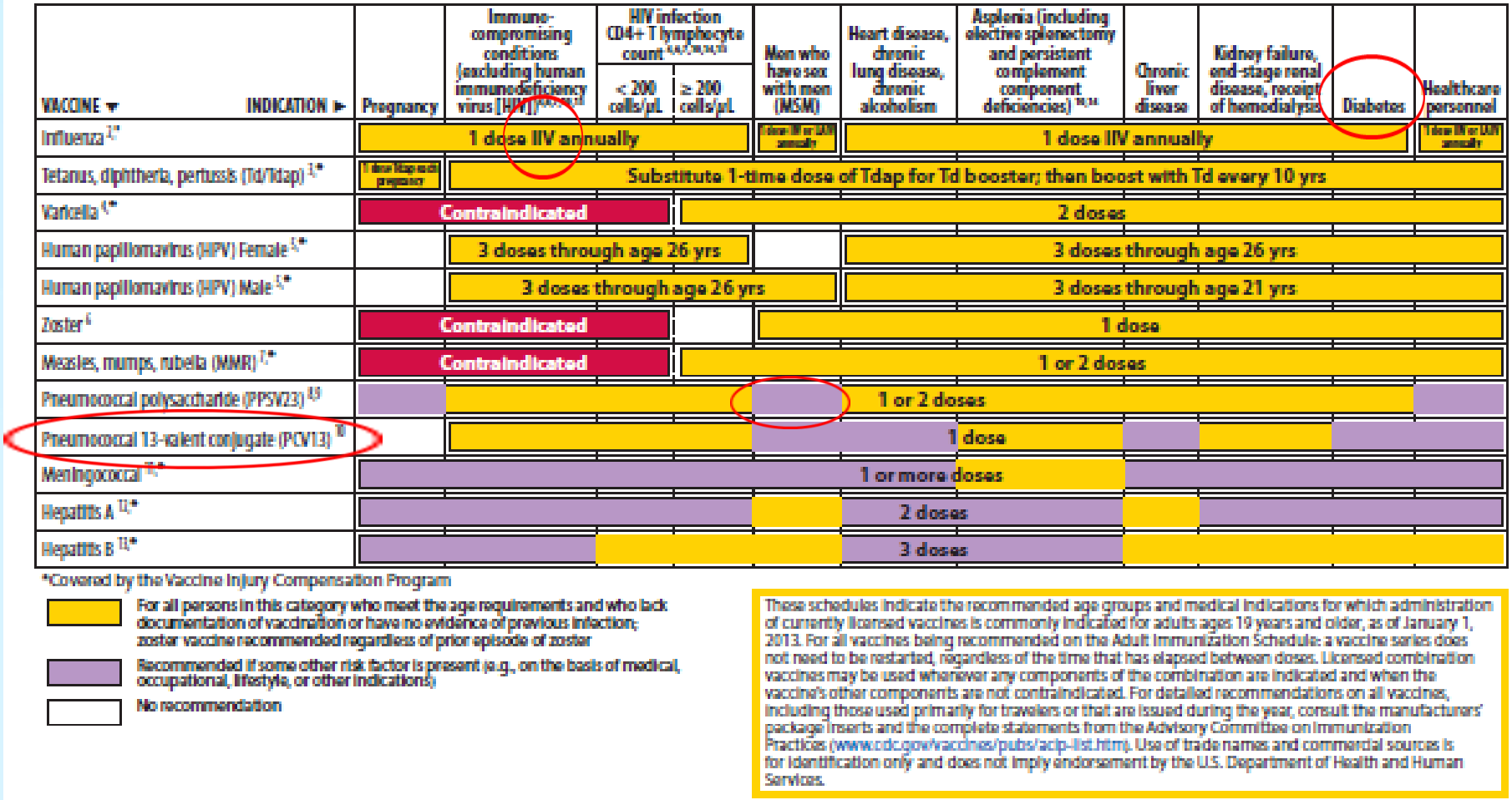
Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indication)

No recommendation

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.
Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400.
Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at www.cdc.gov/vaccines or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m. – 8:00 p.m. Eastern Time, Monday – Friday, excluding holidays.
Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG) and American College of Nurse-Midwives (ACNM).

FIGURE 2. Recommended vaccinations indicated for adults based on medical and other indications[1]



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- Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)
- No recommendation

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly indicated for adults ages 19 years and older, as of January 1, 2013. For all vaccines being recommended on the Adult Immunization Schedule: a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/pubs/acip-list.htm). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

Footnotes: Recommended Immunization Schedule for Adults Aged 19 Years and Older — United States, 2013

1. **Additional information**
   - Additional guidance for the use of the vaccines described in this supplement is available at http://www.cdc.gov/vaccines/pubs/acip-list.htm.
   - Information on vaccination recommendations when vaccination status is unknown and other general immunization information can be found in the General Recommendations on Immunization at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm.
   - Information on travel vaccine requirements and recommendations (e.g., for hepatitis A and B, meningococcal, and other vaccines) are available at http://wwwnc.cdc.gov/travel/page/vaccinations.htm.
2. **Influenza vaccination**
   - Annual vaccination against influenza is recommended for all persons aged 6 months and older.
   - Persons aged 6 months and older, including pregnant women, can receive the inactivated influenza vaccine (IIV).
   - Healthy, nonpregnant persons aged 2–49 years without high-risk medical conditions can receive either intranasally administered live, attenuated influenza vaccine (LAIV) (FluMist), or IIV. Health-care personnel who care for severely immunocompromised persons (i.e., those who require care in a protected environment) should receive IIV rather than LAIV.
   - The intramuscularly or intradermally administered IIV are options for adults aged 18–64 years.
   - Adults aged 65 years and older can receive the standard dose IIV or the high-dose IIV (Fluzone High-Dose).
3. **Tetanus, diphtheria, and acellular pertussis (Td/Tdap) vaccination**
   - Administer one dose of Tdap vaccine to pregnant women during each pregnancy (preferred during 27–36 weeks' gestation), regardless of number of years since prior Td or Tdap vaccination.
   - Administer Tdap to all other adults who have not previously received Tdap or for whom vaccine status is unknown. Tdap can be administered regardless of interval since the most recent tetanus or diphtheria-toxoid containing vaccine.
   - Adults with an unknown or incomplete history of completing a 3-dose primary vaccination series with Td-containing vaccines should begin or complete a primary vaccination series including a Tdap dose.
   - For unvaccinated adults, administer the first 2 doses at least 4 weeks apart and the third dose 6–12 months after the second.
   - For incompletely vaccinated (i.e., less than 3 doses) adults, administer remaining doses.
   - Refer to the Advisory Committee on Immunization Practices (ACIP) statement for recommendations for administering Td/Tdap as prophylaxis in wound management (see footnote #1).
4. **Varicella vaccination**
   - All adults without evidence of immunity to varicella (as defined below) should receive 2 doses of single-antigen varicella vaccine or a second dose if they have received only 1 dose.
   - Special consideration for vaccination should be given to those who have close contact with persons at high risk for severe disease (e.g., health-care personnel and family contacts of persons with immunocompromising conditions) or are at high risk for exposure or transmission (e.g., teachers; child care employees; residents and staff members of institutional settings, including correctional institutions; college students; military personnel; adolescents and adults living in households with children; nonpregnant women of childbearing age; and international travelers).
   - Pregnant women should be assessed for evidence of varicella immunity. Women who do not have evidence of immunity should receive the first dose of varicella vaccine upon completion or termination of pregnancy and before discharge from the health-care facility. The second dose should be administered 4–8 weeks after the first dose.
   - Evidence of immunity to varicella in adults includes any of the following:
     - documentation of 2 doses of varicella vaccine at least 4 weeks apart;
     - U.S.-born before 1980 except health-care personnel and pregnant women;
     - history of varicella based on diagnosis or verification of varicella disease by a health-care provider;
     - history of herpes zoster based on diagnosis or verification of herpes zoster disease by a health-care provider; or
     - laboratory evidence of immunity or laboratory confirmation of disease.
5. **Human papillomavirus (HPV) vaccination**
   - Two vaccines are licensed for use in females, bivalent HPV vaccine (HPV2) and quadrivalent HPV vaccine (HPV4), and one HPV vaccine for use in males (HPV4).
   - For females, either HPV4 or HPV2 is recommended in a 3-dose series for routine vaccination at age 11 or 12 years, and for those aged 13 through 26 years, if not previously vaccinated.
   - For males, HPV4 is recommended in a 3-dose series for routine vaccination at age 11 or 12 years, and for those aged 13 through 21 years, if not previously vaccinated. Males aged 22 through 26 years may be vaccinated.
   - HPV4 is recommended for men who have sex with men (MSM) through age 26 years for those who did not get any or all doses when they were younger.
   - Vaccination is recommended for immunocompromised persons (including those with HIV infection) through age 26 years for those who did not get any or all doses when they were younger.
   - A complete series for either HPV4 or HPV2 consists of 3 doses. The second dose should be administered 1–2 months after the first dose; the third dose should be administered 6 months after the first dose (at least 24 weeks after the first dose).
   - HPV vaccines are not recommended for use in pregnant women. However, pregnancy testing is not needed before vaccination. If a woman is found to be pregnant after initiating the vaccination series, no intervention is needed; the remainder of the 3-dose series should be delayed until completion of pregnancy.
   - Although HPV vaccination is not specifically recommended for health-care personnel (HCP) based on their occupation, HCP should receive the HPV vaccine as recommended (see above).
6. **Zoster vaccination**
   - A single dose of zoster vaccine is recommended for adults aged 60 years and older regardless of whether they report a prior episode of herpes zoster. Although the vaccine is licensed by the Food and Drug Administration (FDA) for use among and can be administered to persons aged 50 years and older, ACIP recommends that vaccination begins at age 60 years.
   - Persons aged 60 years and older with chronic medical conditions may be vaccinated unless their condition constitutes a contraindication, such as pregnancy or severe immunodeficiency.
   - Although zoster vaccination is not specifically recommended for HCP, they should receive the vaccine if they are in the recommended age group.
7. **Measles, mumps, rubella (MMR) vaccination**
   - Adults born before 1957 generally are considered immune to measles and mumps. All adults born in 1957 or later should have documentation of 1 or more doses of MMR vaccine unless they have a medical contraindication to the vaccine, or laboratory evidence of immunity to each of the three diseases. Documentation of provider-diagnosed disease is not considered acceptable evidence of immunity for measles, mumps, or rubella.

   Measles component:
   - A routine second dose of MMR vaccine, administered a minimum of 28 days after the first dose, is recommended for adults who
     - are students in postsecondary educational institutions;
     - work in a health-care facility; or
     - plan to travel internationally.
   - Persons who received inactivated (killed) measles vaccine or measles vaccine of unknown type during 1963–1967 should be revaccinated with 2 doses of MMR vaccine.

   Mumps component:
   - A routine second dose of MMR vaccine, administered a minimum of 28 days after the first dose, is recommended for adults who
     - are students in a postsecondary educational institution;
     - work in a health-care facility; or
     - plan to travel internationally.
   - Persons vaccinated before 1979 with either killed mumps vaccine or mumps vaccine of unknown type who are at high risk for mumps infection (e.g., persons who are working in a health-care facility) should be considered for revaccination with 2 doses of MMR vaccine.

   Rubella component:
   - For women of childbearing age, regardless of birth year, rubella immunity should be determined. If there is no evidence of immunity, women who are not pregnant should be vaccinated. Pregnant women who do not have evidence of immunity should receive MMR vaccine upon completion or termination of pregnancy and before discharge from the health-care facility.

- TIV changed to IIV for inactivated influenza vaccine since QIV anticipated in 2013
- Tdap vaccination recommended during each pregnancy, preferred during weeks 27-36 of gestation.
- Documentation of provider-diagnosed disease is no longer considered acceptable evidence of immunity for measles, mumps or rubella – formerly provider diagnosis of measles or mumps was acceptable.
- HPV vaccine and pregnancy issues clarified

HCP born before 1957:

- For unvaccinated health-care personnel born before 1957 who lack laboratory evidence of measles, mumps, and/or rubella immunity or laboratory confirmation of disease, health-care facilities should consider vaccinating personnel with 2 doses of MMR vaccine at the appropriate interval for measles and mumps or 1 dose of MMR vaccine for rubella.

8. **Pneumococcal polysaccharide (PPSV23) vaccination**
   - Vaccinate all persons with the following indications:
     - all adults aged 65 years and older;
     - adults younger than age 65 years with chronic lung disease (including chronic obstructive pulmonary disease, emphysema, and asthma); chronic cardiovascular diseases; diabetes mellitus; chronic renal failure; nephrotic syndrome; chronic liver disease (including cirrhosis); alcoholism; cochlear implants; cerebrospinal fluid leaks; immunocompromising conditions; and functional or anatomic asplenia (e.g., sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, splenic dysfunction, or splenectomy [If elective splenectomy is planned, vaccinate at least 2 weeks before surgery]);
     - residents of nursing homes or long-term care facilities; and
     - adults who smoke cigarettes.
   - Persons with immunocompromising conditions and other selected conditions are recommended to receive PCV13 and PPSV23 vaccines. See footnote #10 for information on timing of PCV13 and PPSV23 vaccinations.
   - Persons with asymptomatic or symptomatic HIV infection should be vaccinated as soon as possible after their diagnosis.
   - When cancer chemotherapy or other immunosuppressive therapy is being considered, the interval between vaccination and initiation of immunosuppressive therapy should be at least 2 weeks. Vaccination during chemotherapy or radiation therapy should be avoided.
   - Routine use of PPSV23 is not recommended for American Indians/Alaska Natives or other persons younger than age 65 years unless they have underlying medical conditions that are PPSV23 indications. However, public health authorities may consider recommending PPSV23 for American Indians/Alaska Natives who are living in areas where the risk for invasive pneumococcal disease is increased.
   - When indicated, PPSV23 should be administered to patients who are uncertain of their vaccination status and there is no record of previous vaccination. When PCV13 is also indicated, a dose of PCV13 should be given first (see footnote #10).
9. **Revaccination with PPSV23**
   - One-time revaccination 5 years after the first dose is recommended for persons aged 19 through 64 years with chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (e.g., sickle cell disease or splenectomy); and for persons with immunocompromising conditions.
   - Persons who received 1 or 2 doses of PPSV23 before age 65 years for any indication should receive another dose of the vaccine at age 65 years or later if at least 5 years have passed since their previous dose.
   - No further doses are needed for persons vaccinated with PPSV23 at or after age 65 years.
10. **Pneumococcal conjugate 13-valent vaccination (PCV13)**
    - Adults aged 19 years or older with immunocompromising conditions (including chronic renal failure and nephrotic syndrome), functional or anatomic asplenia, CSF leaks or cochlear implants, and who have not previously received PCV13 or PPSV23 should receive a single dose of PCV13 followed by a dose of PPSV23 at least 8 weeks later.
    - Adults aged 19 years or older with the aforementioned conditions who have previously received one or more doses of PPSV23 should receive a dose of PCV13 one or more years after the last PPSV23 dose was received. For those that require additional doses of PPSV23, the first such dose should be given no sooner than 8 weeks after PCV13 and at least 5 years since the most recent dose of PPSV23.
    - When indicated, PCV13 should be administered to patients who are uncertain of their vaccination status history and there is no record of previous vaccination.
    - Although PCV13 is licensed by the Food and Drug Administration (FDA) for use among and can be administered to persons aged 50 years and older, ACIP recommends PCV13 for adults aged 19 years and older with the specific medical conditions noted above.
11. **Meningococcal vaccination**
    - Administer 2 doses of meningococcal conjugate vaccine quadrivalent (MCV4) at least 2 months apart to adults with functional asplenia or persistent complement component deficiencies.
    - HIV-infected persons who are vaccinated also should receive 2 doses.
    - Administer a single dose of meningococcal vaccine to microbiologists routinely exposed to isolates of *Neisseria meningitidis*, military recruits, and persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic.
    - First-year college students up through age 21 years who are living in residence halls should be vaccinated if they have not received a dose on or after their 16th birthday.
    - MCV4 is preferred for adults with any of the preceding indications who are aged 55 years and younger; meningococcal polysaccharide vaccine (MPSV4) is preferred for adults aged 56 years and older.
    - Revaccination with MCV4 every 5 years is recommended for adults previously vaccinated with MCV4 or MPSV4 who remain at increased risk for infection (e.g., adults with anatomic or functional asplenia or persistent complement component deficiencies).
12. **Hepatitis A vaccination**
    - Vaccinate any person seeking protection from hepatitis A virus (HAV) infection and persons with any of the following indications:
      - men who have sex with men and persons who use injection or non-injection illicit drugs;
      - persons working with HAV-infected primates or with HAV in a research laboratory setting;
      - persons with chronic liver disease and persons who receive clotting factor concentrates;
      - persons traveling to or working in countries that have high or intermediate endemicity of hepatitis A; and
      - unvaccinated persons who anticipate close personal contact (e.g., household or regular babysitting) with an international adoptee during the first 60 days after arrival in the United States from a country with high or intermediate endemicity. (See footnote #1 for more information on travel recommendations). The first dose of the 2-dose hepatitis A vaccine series should be administered as soon as adoption is planned, ideally 2 or more weeks before the arrival of the adoptee.
    - Single-antigen vaccine formulations should be administered in a 2-dose schedule at either age 0 and 6–12 months (Havrix), or age 0 and 6–18 months (Vaqta). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, administer 3 doses at 0, 1, and 6 months; alternatively, a 4-dose schedule may be used, administered on days 0, 7, and 21–30, followed by a booster dose at month 12.
13. **Hepatitis B vaccination**
    - Vaccinate persons with any of the following indications and any person seeking protection from hepatitis B virus (HBV) infection:
      - sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than one sex partner during the previous 6 months); persons seeking evaluation or treatment for a sexually transmitted disease (STD); current or recent injection-drug users; and men who have sex with men;
      - health-care personnel and public-safety workers who are potentially exposed to blood or other infectious body fluids;
      - persons with diabetes younger than age 60 years as soon as feasible after diagnosis; persons with diabetes who are age 60 years or older at the discretion of the treating clinician based on increased need for assisted blood glucose monitoring in long-term care facilities, likelihood of acquiring hepatitis B infection, its complications or chronic sequelae, and likelihood of immune response to vaccination;
      - persons with end-stage renal disease, including patients receiving hemodialysis; persons with HIV infection; and persons with chronic liver disease;
      - household contacts and sex partners of hepatitis B surface antigen–positive persons; clients and staff members of institutions for persons with developmental disabilities; and international travelers to countries with high or intermediate prevalence of chronic HBV infection; and
      - all adults in the following settings: STD treatment facilities; HIV testing and treatment facilities; facilities providing drug-abuse treatment and prevention services; health-care settings targeting services to injection-drug users or men who have sex with men; correctional facilities; end-stage renal disease programs and facilities for chronic hemodialysis patients; and institutions and nonresidential daycare facilities for persons with developmental disabilities.
    - Administer missing doses to complete a 3-dose series of hepatitis B vaccine to those persons not vaccinated or not completely vaccinated. The second

- Clarifies who needs 1 vs 2 vs 3 doses of PPSV23 and when vaccine history unknown.
- Added PCV13 vaccine information and timing of PCV13 relative to PPSV23.
  - PCV13 for adults ≥19 years with:
  - immunocompromising conditions
  - functional or anatomic asplenia
  - CSF leaks or cochlear implants
- Give PCV13 first then PPSV23 8+ weeks later.
- But, if already PPSV23 vaccinated, give PCV13 ≥one year after PPSV23.
- Clarified that illicit injection and non-injection drug use are both indications for hepatitis A vaccine.

dose should be administered 1 month after the first dose; the third dose should be given at least 2 months after the second dose (and at least 4 months after the first dose). If the combined hepatitis A and hepatitis B vaccine (Twinrix) is used, give 3 doses at 0, 1, and 6 months; alternatively, a 4-dose Twinrix schedule, administered on days 0, 7, and 21–30 followed by a booster dose at month 12 may be used.

- Adult patients receiving hemodialysis or with other immunocompromising conditions should receive 1 dose of 40 µg/mL (Recombivax HB) administered on a 3-dose schedule at 0, 1, and 6 months or 2 doses of 20 µg/mL (Engerix-B) administered simultaneously on a 4-dose schedule at 0, 1, 2, and 6 months.

14. Selected conditions for which *Haemophilus influenzae* type b (Hib) vaccine may be used

- 1 dose of Hib vaccine should be considered for persons who have sickle cell disease, leukemia, or HIV infection, or who have anatomic or functional asplenia if they have not previously received Hib vaccine.

15. Immunocompromising conditions

- Inactivated vaccines generally are acceptable (e.g., pneumococcal, meningococcal, and influenza [inactivated influenza vaccine]), and live vaccines generally are avoided in persons with immune deficiencies or immunocompromising conditions. Information on specific conditions is available at http://www.cdc.gov/vaccines/pubs/acip-list.htm.

- Added dosing schedule information for Hepatitis B vaccine Recombivax.

TABLE. Contraindications and precautions to commonly used vaccines in adults[1*†]

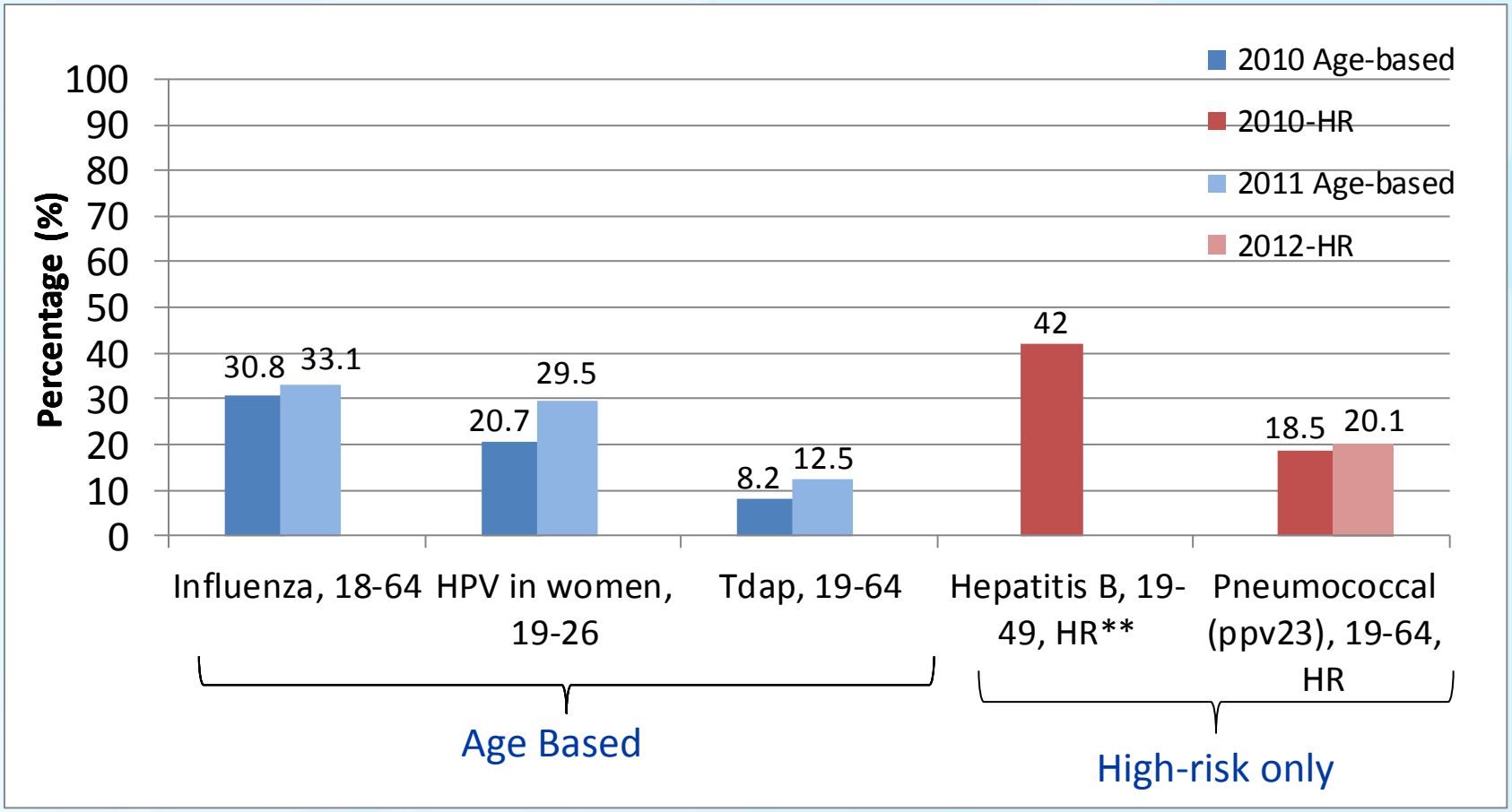
Vaccine	Contraindications	Precautions
Influenza, inactivated vaccine (IIV)	Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine or to a vaccine component, including egg protein.	Moderate or severe acute illness with or without fever. History of Guillain-Barré Syndrome (GBS) within 6 weeks of previous influenza vaccination. Persons who experience only hives with exposure to eggs should receive IIV with additional safety precautions.[2]
Influenza, live attenuated (LAIV)[3]	Severe allergic reaction (e.g., anaphylaxis) after previous dose of any influenza vaccine or to a vaccine component, including egg protein. Conditions for which the Advisory Committee on Immunization Practices (ACIP) recommends against use, but which are not contraindications in vaccine package insert: immune suppression, certain chronic medical conditions such as asthma, diabetes, heart or kidney disease, and pregnancy.[4]	Moderate or severe acute illness with or without fever. History of GBS within 6 weeks of previous influenza vaccination. Receipt of specific antivirals (i.e., amantadine, rimantadine, zanamivir, or oseltamivir) 48 hours before vaccination. Avoid use of these antiviral drugs for 14 days after vaccination.
Tetanus, diphtheria, pertussis (Tdap); tetanus, diphtheria (Td)	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. For pertussis-containing vaccines: encephalopathy (e.g., coma, decreased level of consciousness, or prolonged seizures) not attributable to another identifiable cause within 7 days of administration of a previous dose of Tdap or diphtheria and tetanus toxoids and pertussis (DTP) or diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine.	Moderate or severe acute illness with or without fever. GBS within 6 weeks after a previous dose of tetanus toxoid–containing vaccine. History of arthus-type hypersensitivity reactions after a previous dose of tetanus or diptheria toxoid–containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus toxoid-containing vaccine. For pertussis-containing vaccines: progressive or unstable neurologic disorder, uncontrolled seizures, or progressive encephalopathy until a treatment regimen has been established and the condition has stabilized.
Varicella[2]	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy[5] or patients with human immunodeficiency virus (HIV) infection who are severely immunocompromised). Pregnancy.	Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product).[6,7] Moderate or severe acute illness with or without fever. Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; avoid use of these antiviral drugs for 14 days after vaccination.
Human papillomavirus (HPV)	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.	Moderate or severe acute illness with or without fever. Pregnancy.
Zoster	Severe allergic reaction (e.g., anaphylaxis) to a vaccine component. Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, or long-term immunosuppressive therapy[5] or patients with HIV infection who are severely immunocompromised). Pregnancy.	Moderate or severe acute illness with or without fever. Receipt of specific antivirals (i.e., acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination; avoid use of these antiviral drugs for 14 days after vaccination.
Measles, mumps, rubella (MMR)[3]	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy[5] or patients with HIV infection who are severely immunocompromised). Pregnancy.	Moderate or severe acute illness with or without fever. Recent (within 11 months) receipt of antibody-containing blood product (specific interval depends on product).[6,7] History of thrombocytopenia or thrombocytopenic purpura. Need for tuberculin skin testing.[8]

See footnotes on page 18.

- Added information on IIV vaccination among persons with only hives after exposure to eggs.
- Clarified use of antivirals when varicella or zoster vaccines given
- Removed pregnancy as a precaution for hepatitis A vaccine so now parallel with hepatitis B and other inactivated vaccines
  - Both vaccines remain “purple” for pregnant women – to be given only if increased risk of exposure

U.S. IMMUNIZATION COVERAGE

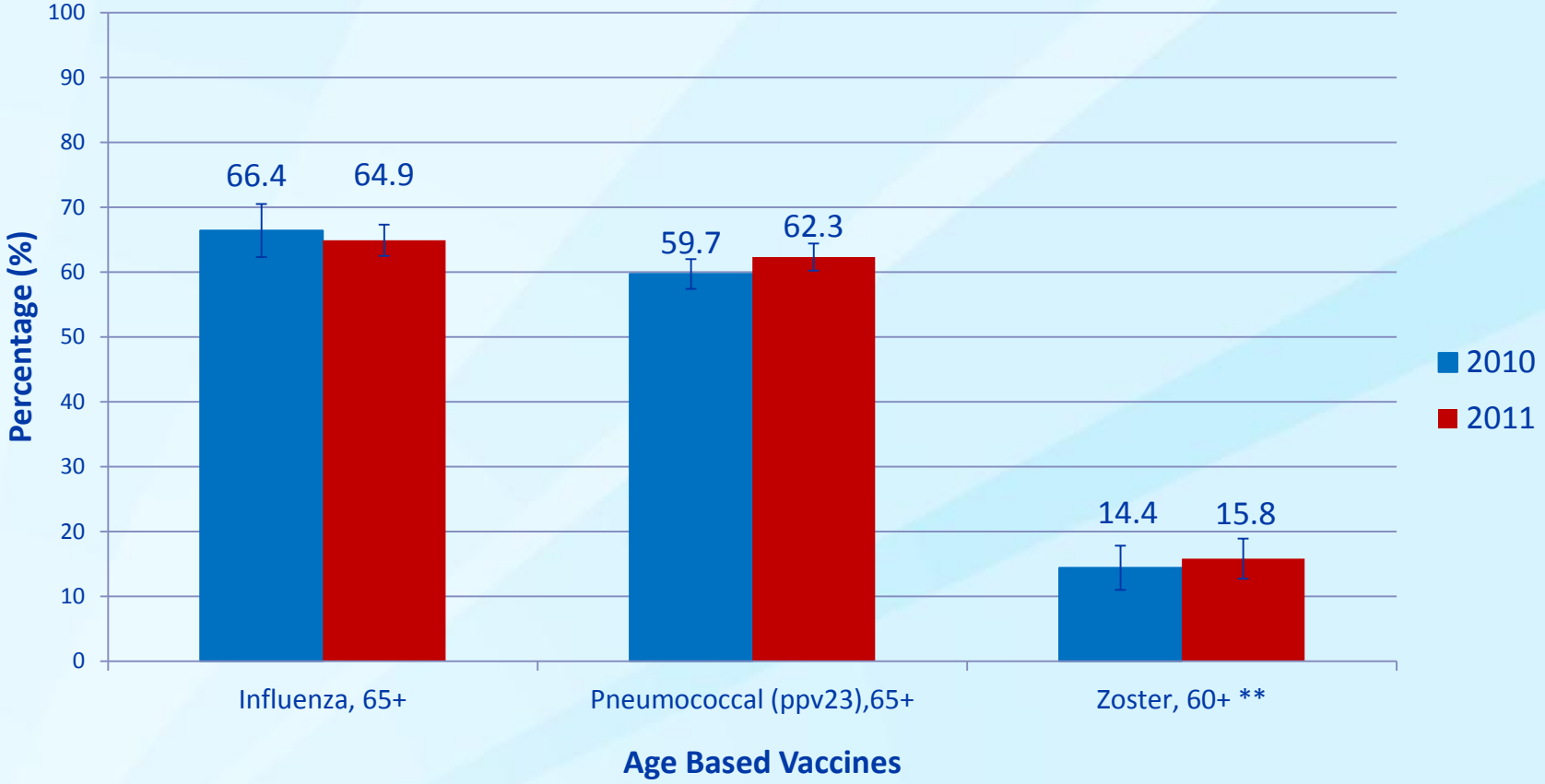
Vaccination coverage for target groups by vaccine, age, and high-risk status, NHIS 2010* and 2011



*Data source: 2010 National Health Interview Survey. CDC. Adults Vaccination Coverage — United States, 2010. MMWR 2012; 61(04);66-72. and NHIS 2011 – Non-influenza vaccine coverage among adults – United States, 2011. MMWR 2013;62:66-72.

**Hepatitis B, 19-49 HR data not collected in 2011

Vaccination coverage for target groups by vaccine, age, and high-risk status, NHIS 2010* and 2011



*Data source: 2010 National Health Interview Survey. CDC. Adult Vaccination Coverage — United States, 2010. MMWR 2012; 61(04);66-72.

** Statistically higher than 2010 coverage rates

Race/ Ethnicity Disparity in Pneumococcal Vaccination Coverage

Vaccine	2011 Coverage %	% Point Difference from 2010	HealthyPeople 2020
Pneumococcal (ppv23) (65+)	62.3	+2.6	90%
-white	66.5	+3.0	90%
-black	47.6	+.8	90%
-Hispanic	43.1	+4.2	90%
-Asian	40.3	-7.9	90%

Conclusions

- **Many missed opportunities to vaccinate adults and reduce the significant burden of disease**
  - Improving coverage nationally in healthcare workers
- **Racial and ethnic barriers remain**
- **Little progress nationally 2010 to 2011**

RECOMMENDATIONS FOR PNEUMOCOCCAL VACCINES: PPSV23 AND PCV13

Question 2

PCV13 vaccine is recommended for adults in all of the following groups except:

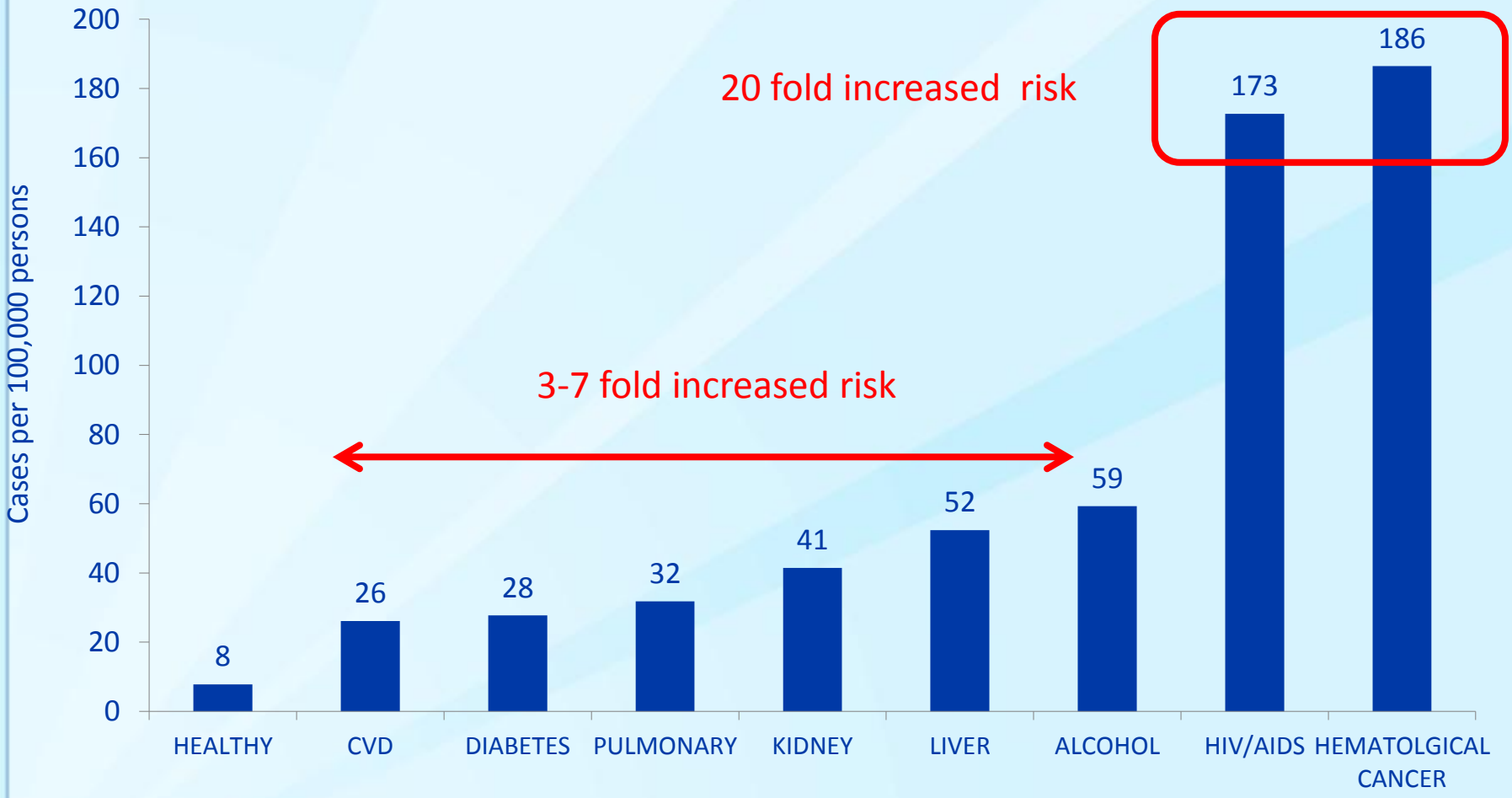
- **1. Immune compromised persons**
- **2. Persons with CSF leak or cochlear implant**
- **3. Functional or anatomic asplenia**
- **4. Chronic heart disease**
- **5. Chronic renal disease**

Question 2

PCV13 vaccine is recommended for adults in all of the following groups except:

- 1. Immune compromised persons
- 2. Persons with CSF leak or cochlear implant
- 3. Functional or anatomic asplenia
- **4. Chronic heart disease**
- 5. Chronic renal disease

Incidence of IPD in adults aged 18--64 years with selected underlying conditions, United States, 2009



Kyaw, JID 2005;192:377-86

ACIP and ACIP Pneumococcal Working Group

- Conducted extensive review of literature and conducted GRADE analysis
- Conclusions:
  - Extremely high burden of disease among immunocompromised adults
  - Indirect effects of PCV13 use in children unlikely to eliminate PCV13 serotypes from immunocompromised adults
  - Benefits of PCV13 use in this group outweigh the harms
  - PCV13 alone may not provide adequate coverage of serotypes causing disease
  - Combined regimen of PCV13 and PPSV23 likely better than either vaccine alone

Benefits likely outweigh harms and both PCV13 and PPSV23 are recommended for adults with immunocomromising conditions

ACIP-Recommended Indications for PCV13

- Adults 19 years or older with
  - Functional or anatomic asplenia
  - Immunocompromising conditions
    - Congenital or acquired immunodeficiencies
    - HIV infection
    - Chronic renal failure or nephrotic syndrome
    - Leukemias, lymphomas, Hodgkin disease
    - Generalized malignancy
    - Diseases requiring treatment with immunosuppressive drugs, including long-term systemic corticosteroids or radiation therapy
    - Solid organ transplantation
    - Multiple myeloma
  - CSF leaks and cochlear implants – PCV13 vaccine already indicated for children with these two conditions

Recommendation for PCV13 and PPSV23

- **Vaccine naïve adults:**
  - PCV13 dose is recommended to be given before PPSV23, whenever possible
  - PPSV23 should be given **at least 8 weeks** after a dose of PCV13
  - Recommendations for additional doses of PPSV23 remain unchanged
- **PPSV23-immunized adults**
  - A dose of PCV13 is recommended to be given to adults with immunocompromising conditions who received 1 or more doses of PPSV23 **1 or more years** after the last PPSV23 dose
  - Total number and interval between PPSV23 doses unchanged from current recommendations

Question 3

How many doses of PPSV23 and PCV13 vaccine should be given to a person with HIV?

- **1. PPSV23 every 5 years and PCV13 once as a substitute for a dose of PPSV23**
- **2. PCV13 once followed by one dose of PPSV23 and PPSV23 again at age 65 years?**
- **3. PCV13 once followed by 2 doses of PPSV23 given 5 years apart?**
- **4. PCV13 once followed by 2 doses of PPSV23 given 5 years apart and again at age 65 years**
- **5. Neither PSV13 nor PPSV23 are recommended for persons with HIV.**

Question 3

How many doses of PPSV23 and PCV13 vaccine should be given to a person with HIV?

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- 3. PCV13 once followed by 2 doses of PPSV23 given 5 years apart?
- **4. PCV13 once followed by 2 doses of PPSV23 given 5 years apart and again at age 65 years**
- 5. Neither PSV13 nor PPSV23 are recommended for persons with HIV.

Prevention of pneumococcal disease among adults with immunocompromising conditions

Recommendation for PPSV23-naïve adults

Adults 19 years of age or older with immunocompromising conditions, functional or anatomic asplenia, CSF leaks, or cochlear implants, and who have not previously received PCV13 or PPSV23 receive a dose of PCV13 first followed by currently recommended doses of PPSV23

PCV – PPSV – PPSV + PPSV (@ 65 years or later)

≥8 weeks ≥5 years

Recommendation for adults previously vaccinated with PPSV23

Adults 19 years of age or older with immunocompromising conditions , functional or anatomic asplenia , CSF leaks or cochlear implants, and who have previously received one or more doses of PPSV23 receive a dose of PCV13 one or more years after the last PPSV 23 dose was received”

For those that require additional doses of PPSV23, the first such dose should be given no sooner than 8 weeks after PCV13 and at least 5 years since the most recent dose of PPSV23.

Contraindications and Precautions

- PCV13 is contraindicated for people who have had an anaphylactic reaction to a diphtheria-toxoid containing vaccine, because the antigens in PCV13 are conjugated to diphtheria CRM197 protein.
- PCV13 is contraindicated for anyone with a history of anaphylactic hypersensitivity to any vaccine component. For a list of PCV13 vaccine contents, see the package insert or http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/excipient-table-2.pdf.
- PCV13 packaging does not contain latex.
- "The presence of a moderate or severe acute illness with or without a fever is a precaution to administration of all vaccines." (ACIP General Recommendations on Immunization, p. 11)

Risk group	Underlying medical condition	PCV13	PPSV23	PPSV23 5-year Revaccination
Immune competent persons	Chronic heart disease†		✔	
	Chronic lung disease§		✔	
	Diabetes mellitus		✔	
	Cerebrospinal fluid leak	✔	✔	
	Cochlear implant	✔	✔	
	Alcoholism		✔	
	Chronic liver disease, cirrhosis		✔	
	Cigarette smoking		✔	
Persons with functional or anatomic asplenia	Sickle cell disease/other hemaglobinopathy	✔	✔	✔
	Congenital or acquired asplenia	✔	✔	✔
Immunocompromised persons	Congenital or acquired immunodeficiency	✔	✔	✔
	Human immunodeficiency virus infection	✔	✔	✔
	Chronic renal failure	✔	✔	✔
	Nephrotic syndrome	✔	✔	✔
	Leukemia	✔	✔	✔
	Lymphoma	✔	✔	✔
	Hodgkin disease	✔	✔	✔
	Generalized malignancy	✔	✔	✔
	Iatrogenic immunosuppression**	✔	✔	✔
	Solid organ transplant	✔	✔	✔
	Multiple myeloma	✔	✔	✔

Question 4

Which vaccines are recommended specifically DURING pregnancy?

- 1. MMR
- 2. Hepatitis B
- 3. Tdap
- 4. Inactivated influenza vaccine
- 5. 3 and 4
- 6. None of the above

Question 4

Which vaccines are recommended specifically DURING pregnancy?

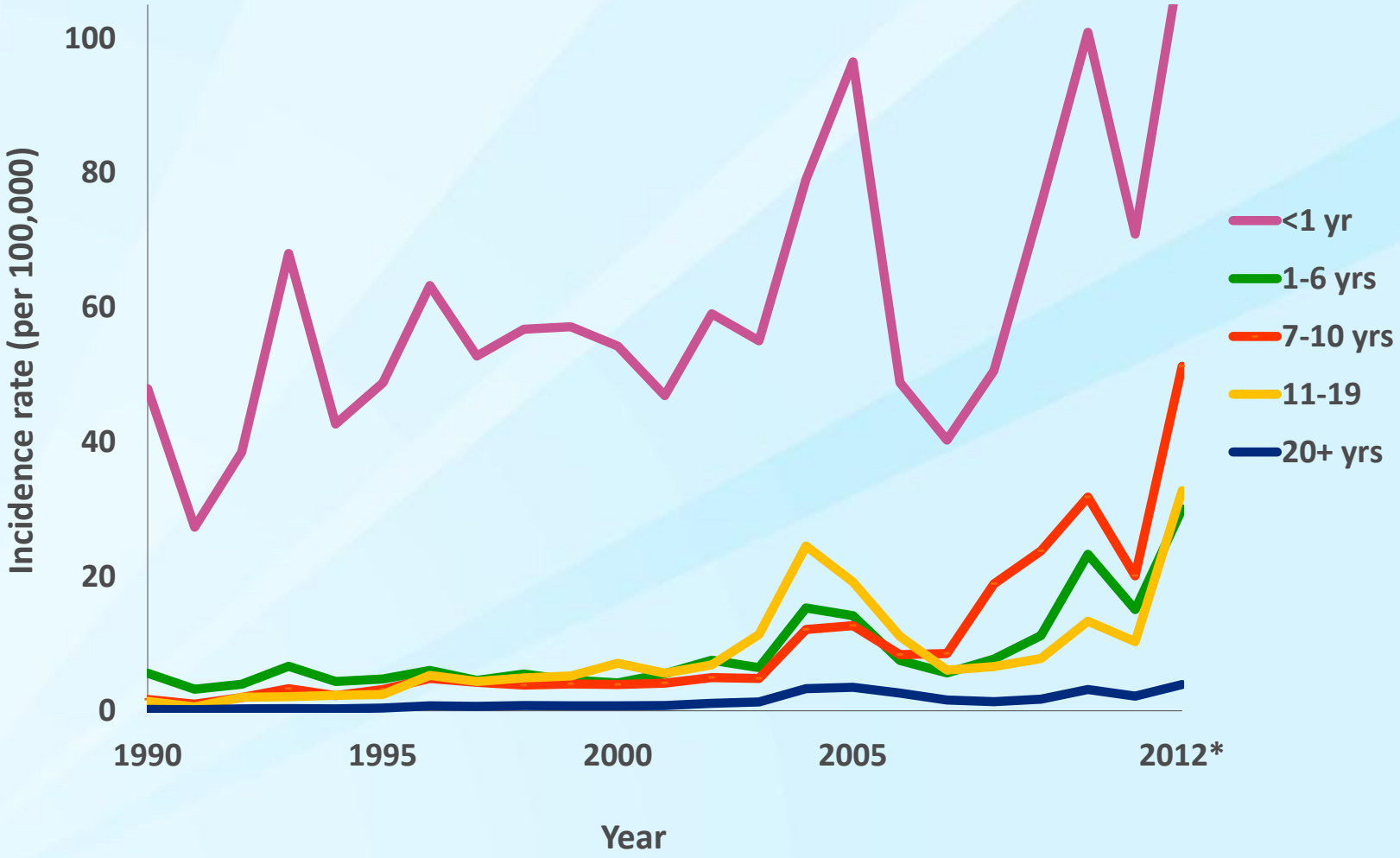
- 1. MMR
- 2. Hepatitis B
- 3. Tdap
- 4. Inactivated influenza vaccine
- **5. 3 and 4**
- 6. None of the above

TDAP VACCINE RECOMMENDATION FOR PREGNANT WOMEN

Overview

- **Epidemiology of pertussis in infants**
- **Rationale for Tdap vaccination at each pregnancy**
  - Barriers to vaccinating pregnant women
  - Antibody response during pregnancy
  - Safety of multiple doses of Tdap
  - Statistics on births in the United States
- **2012 Tdap recommendation for pregnant women**

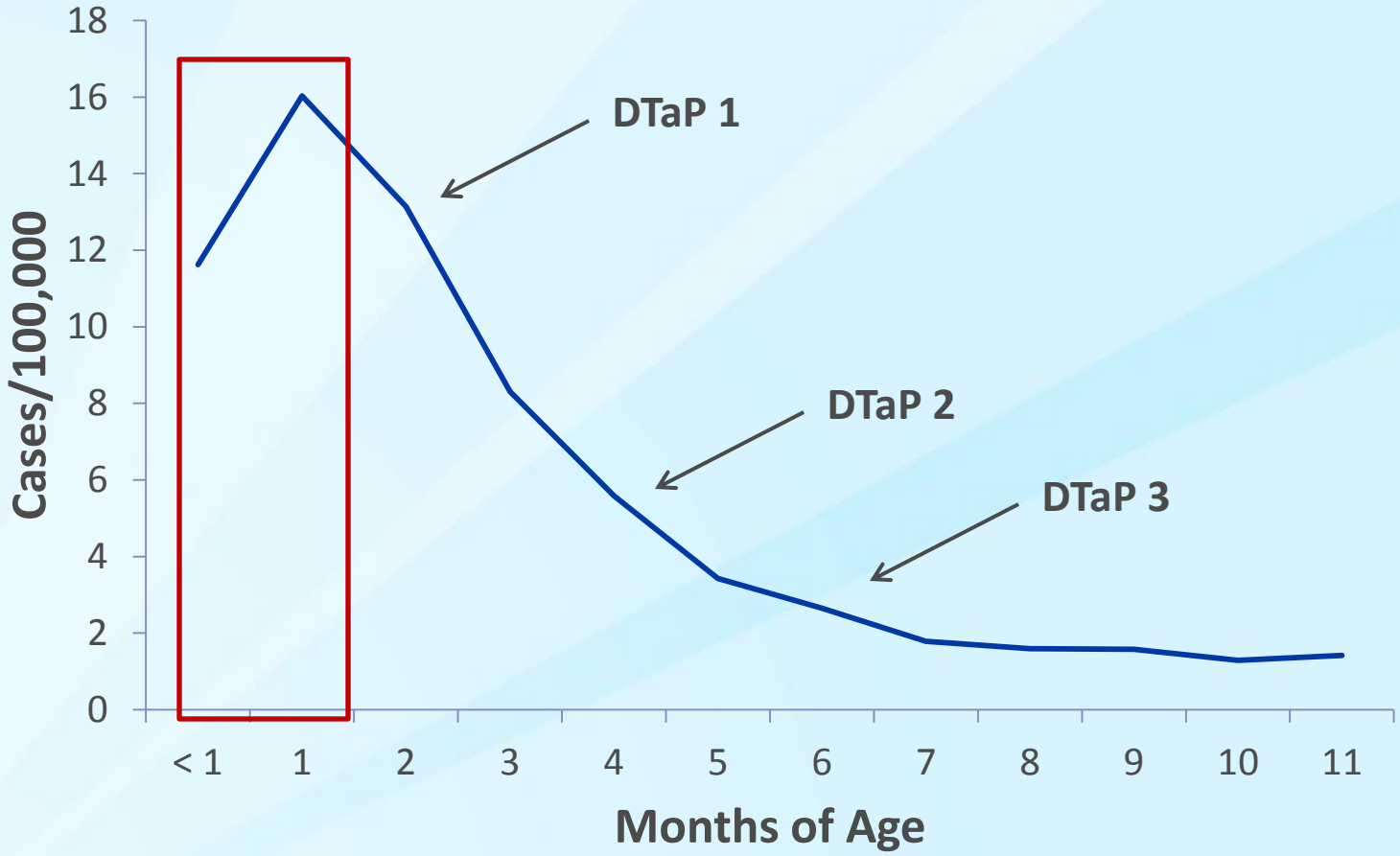
Reported pertussis incidence by age group: 1990-2012*



*2012 data are provisional.

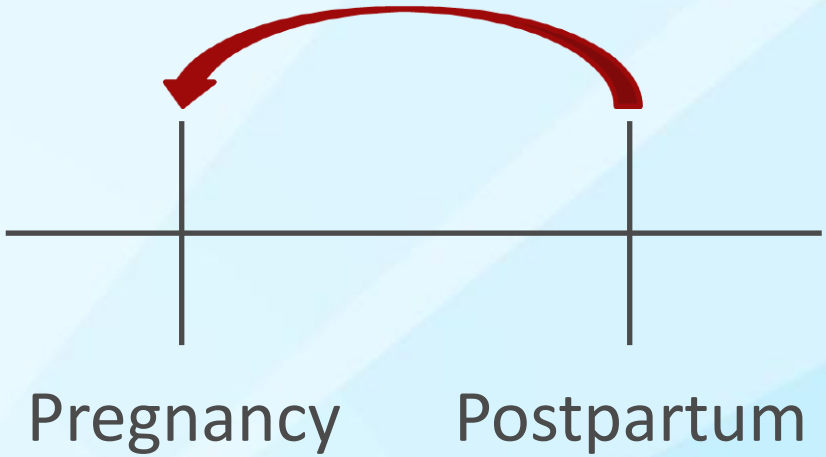
SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System

Pertussis incidence among infants, 2001-2011



Source: CDC. National Notifiable Diseases Surveillance System, 2011

Shifting the timing of mother's Tdap dose



- Provides earlier protection to mother and therefore indirect protection to infant
- High levels of transplacental maternal antibodies transferred to infants may provide direct protection

ACIP Tdap recommendation for pregnant women 2011

ACIP recommends that women's health-care personnel implement a Tdap vaccination program for pregnant women who previously have not received Tdap. Health-care personnel should administer Tdap during pregnancy, preferably during the third or late second trimester (after 20 weeks' gestation). If not administered during pregnancy, Tdap should be administered immediately postpartum.

CDC. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine (Tdap) in Pregnant Women and Persons Who Have or Anticipate Having Close Contact with an Infant Aged <12 Months --- Advisory Committee on Immunization Practices (ACIP), 2011. MMWR; 60(41);1424-1426

Barriers to vaccinating pregnant women with Tdap

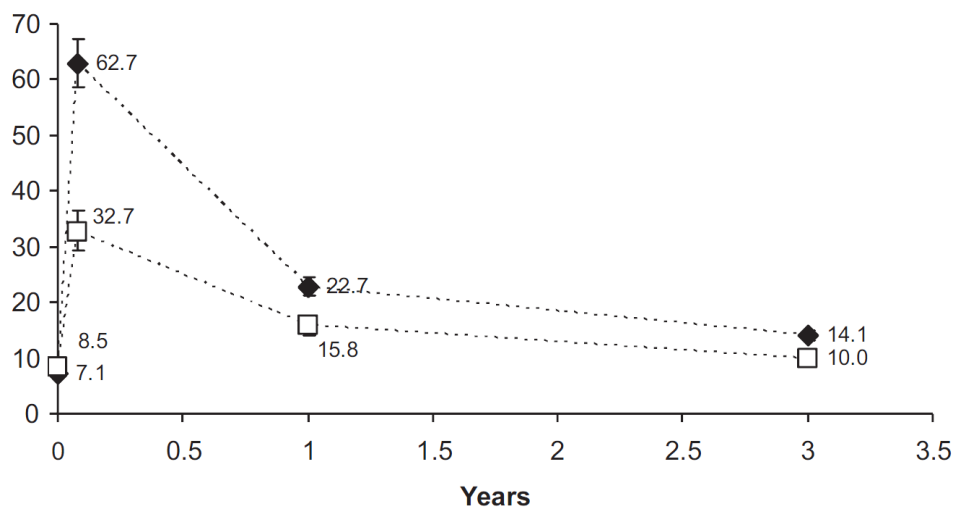
- **Lack of Tdap vaccination documentaion**
  - Provider hesitancy to vaccinate
- **Programs still focused on postpartum Tdap**
- **Getting the message out**
  - Several initiatives aimed at improving vaccination of pregnant women
- **Provider recommendation is the best predictor of vaccination (Tong 2008, Meharry 2012)**

Tong A, et al. A cross-sectional study of maternity care providers' and women's knowledge, attitudes, and behaviours towards influenza vaccination during pregnancy. MJ Obstet Gynaecol Can. 2008 May;30(5):404-10.

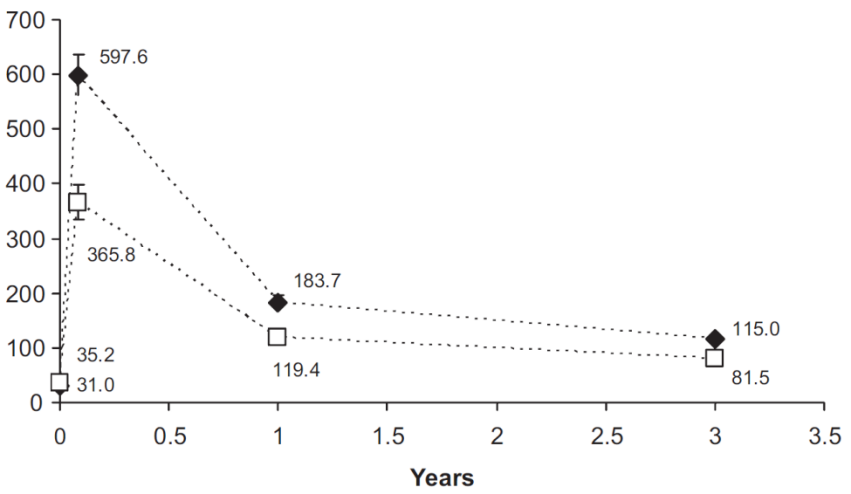
Meharry et al. Reasons Why Women Accept or Reject the Trivalent Inactivated Influenza Vaccine (TIV) During PregnancyMatern Child Health J. 2012 Feb 25.

Persistence of pertussis antibodies 3 years after Tdap vaccination of non-pregnant adults

Anti-PT antibody GMCs (EU.L/mL)



Anti-FHA antibody GMCs (EU.L/mL)



GMC = gemetric mean concentration

Weston W, et. al. Persistence of antibodies 3 years after booster vaccination of adults with combined acellular pertussis, diphtheria and tetanus toxoids vaccine. Vaccine. 2011 Nov 3;29(47):8483-6.

Decline of maternal antibody concentrations after receipt of Tdap

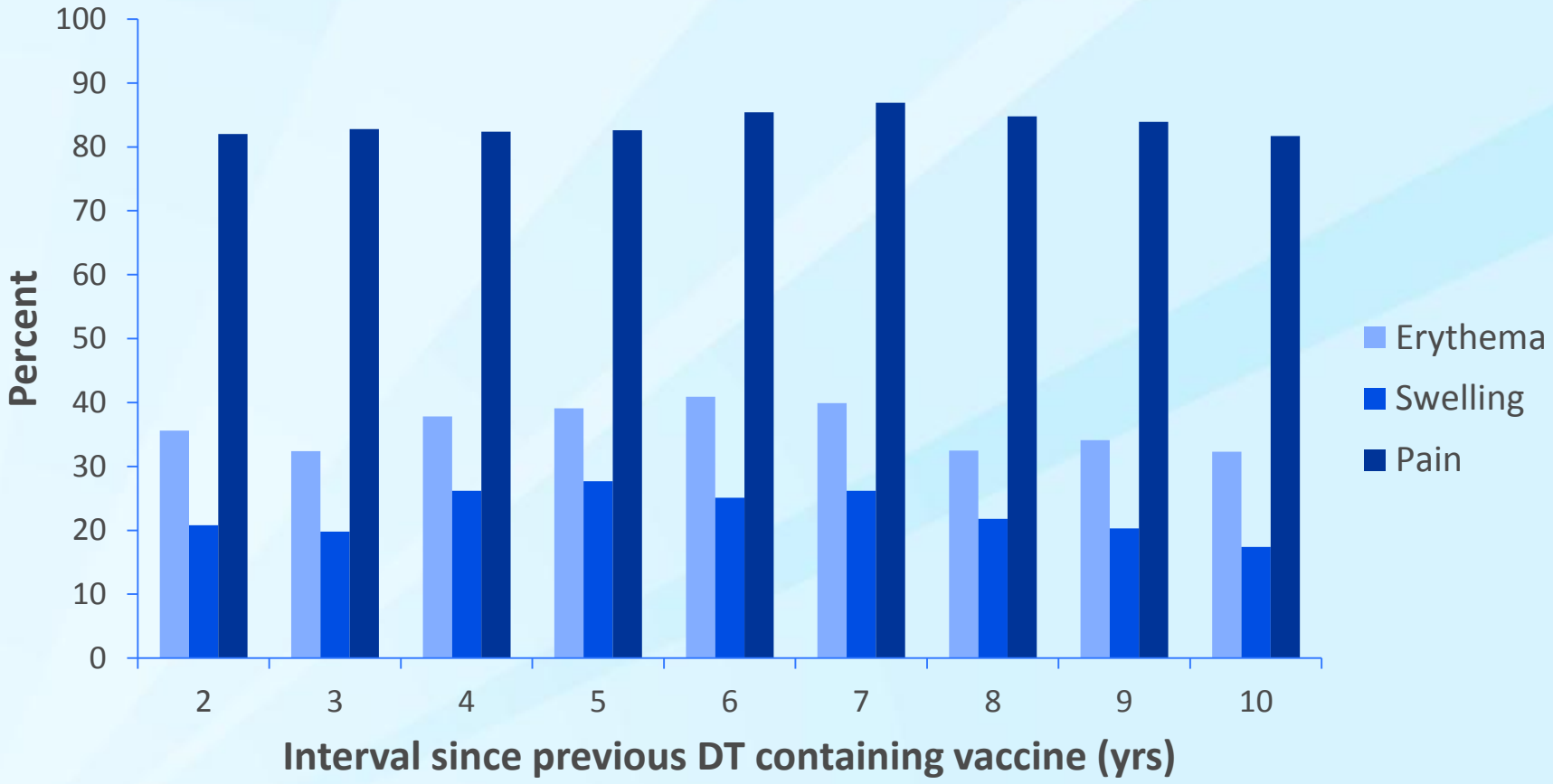
- **105 maternal delivery: placental cord pairs**
  - Mean time from Tdap vaccine: 13.7mths (2.3-23.9)
  - ~70% Tdap postpartum after prior baby
  - 19 immunized during pregnancy
  - Median gestation: 6 weeks (1 – 28 weeks)
- **Results**
  - Efficient placental transport of pertussis-specific antibodies
  - Little difference in pertussis-specific IgG in neonates of women vaccinated before or early in pregnancy
  - At time of first DTaP (2 mths), estimated PT-specific IgG in infants fell to levels likely too low to ensure protection in mothers immunized preconception.

Healy CM, Rench MA, Baker CJ. Importance of timing of maternal Tdap immunization and protection of young infants. Clin Infect Dis 2013;56:539–44.

Tdap protection for subsequent pregnancies: ACIP conclusions

- A single dose of Tdap at one pregnancy is insufficient to provide protection for subsequent pregnancies.

Percent of reported solicited adverse events in the 14 days after immunization with Tdap



Halperin SA, et. al. How soon after a prior tetanus-diphtheria vaccination can one give adult formulation tetanus-diphtheria-acellular pertussis vaccine? Pediatr Infect Dis J. 2006 25(3):195-200.

Reported adverse events
Receipt of Tdap or Tdap-IPV <2 yrs after Td

- **Most commonly reported at injection site (3 to 14 days)**
  - Pain (67.9% – 82.6%)
  - Redness (20.2% – 25.2%)
  - Swelling (19.4% – 37.8%)
- **Systemic adverse events:**
  - Headache (20.2%)
  - Fever (1.7%-9.6%)
  - Myalgia (15.3%)
- **Serious adverse events related to the receipt of Tdap or Tdap-IPV - not reported or observed**

Beytout J, et. al. Safety of Tdap-IPV given 1 month after Td-IPV booster in healthy young adults: a placebo controlled trial. Hum Vaccin 2009;5(5).

Talbot EA, et. al. The safety of immunizing with tetanus-diphtheria-acellular pertussis vaccine (Tdap) less than 2 years following previous tetanus vaccination: Experience during a mass vaccination campaign of healthcare personnel during a respiratory illness outbreak. Vaccine (2010).

Plans for safety monitoring in pregnant women vaccinated with Tdap

- **Vaccine Adverse Event Reporting System (VAERS)**
  - Enhanced monitoring for adverse events in pregnant women following Tdap
  - Inherent limitations of passive surveillance, including biased reporting

- **Vaccine Safety Datalink (VSD)**
  - Implementing studies assessing acute adverse events, adverse pregnancy outcomes affecting the mother and birth outcomes (excluding congenital anomalies) following receipt of Tdap (and other vaccines) during pregnancy.
    - Study power for Tdap depends on uptake and may take a few years

ACIP Tdap recommendation for pregnant women 2012

- **ACIP recommends that providers of prenatal care implement a Tdap immunization program for all pregnant women. Health-care personnel should administer a dose of Tdap during each pregnancy, irrespective of the patient's prior history of receiving Tdap.**

- **Guidance for Use**
  - To maximize the maternal antibody response and passive antibody transfer to the infant, optimal timing for Tdap administration is between 27 and 36 weeks gestation although Tdap may be given at any time during pregnancy.
  - For women not previously vaccinated with Tdap, if Tdap is not administered during pregnancy, Tdap should be administered immediately postpartum.

CDC. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine (Tdap) in Pregnant Women — Advisory Committee on Immunization Practices (ACIP), 2012. MMWR; 62(7));131-135

ACIP Tdap recommendation for pregnant women Special Situations (1)

- **Pregnant women due for tetanus booster**. If a tetanus and diphtheria booster vaccination is indicated during pregnancy (i.e., >10 years since previous Td), then Tdap should be administered. Optimal timing is between 27 and 36 weeks gestation to maximize the maternal antibody response and passive antibody transfer to the infant.
- **Wound management for pregnant women**. As part of standard wound management to prevent tetanus, a tetanus toxoid–containing vaccine might be recommended for wound management in a pregnant woman if ≥5 years have elapsed since the previous Td booster. If a Td booster is recommended for a pregnant woman, health-care providers should administer Tdap.

CDC. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine (Tdap) in Pregnant Women — Advisory Committee on Immunization Practices (ACIP), 2012. MMWR; 62(7));131-135

ACIP Tdap recommendation for pregnant women Special Situations (2)

- **Pregnant women with unknown or incomplete tetanus vaccination**. To ensure protection against maternal and neonatal tetanus, pregnant women who never have been vaccinated against tetanus should receive three vaccinations containing tetanus and reduced diphtheria toxoids. The recommended schedule is 0, 4 weeks, and 6 through 12 months. Tdap should replace 1 dose of Td, preferably between 27 and 36 weeks gestation to maximize the maternal antibody response and passive antibody transfer to the infant.

CDC. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccine (Tdap) in Pregnant Women — Advisory Committee on Immunization Practices (ACIP), 2012. MMWR; 62(7));131-135

Question 5

Which groups of healthcare personnel should *not* be vaccinated with the live attenuated influenza vaccine?

- **1. Younger than 50 years**
- **2. Non-pregnant women of child-bearing age**
- **3. Work with immune compromised persons in outpatient setting**
- **4. Pregnant women**
- **5. Both 3 and 4**
- **6. None of the above**

Question 5

Which groups of healthcare personnel should *not* be vaccinated with the live attenuated influenza vaccine?

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- **5. Both 3 and 4**
- **6. None of the above**

UPDATE ON INFLUENZA VACCINES

Influenza Vaccines Anticipated for 2013-14

- **Multiple types of influenza vaccines available:**
  - Inactivated ("killed") influenza vaccine injected in muscle
    - Ages 6 months and older, differs by manufacturer
    - Mix of trivalent and quadrivalent for 2013-14
    - Traditional egg-grown and new cell culture
  - Nasal spray vaccine (LAIV): healthy individual
    - ages 2-49 years
    - HCP not working with patients in a protected environment
    - All likely quadrivalent for 2013-14
  - High-dose inactivated injectable vaccine
    - 65 years and older
  - Intradermal inactivated vaccine
    - 18-64 years old
  - Recombinant HA vaccine – new for 2013-14
    - 18-49 year old
- **ACIP currently expresses no preferences— except**
  - IIV rather than LAIV for those with mild egg allergy (hives only) and those caring for severely immunosuppressed (those needing protective environments).

Influenza Vaccines Composition for 2013-14

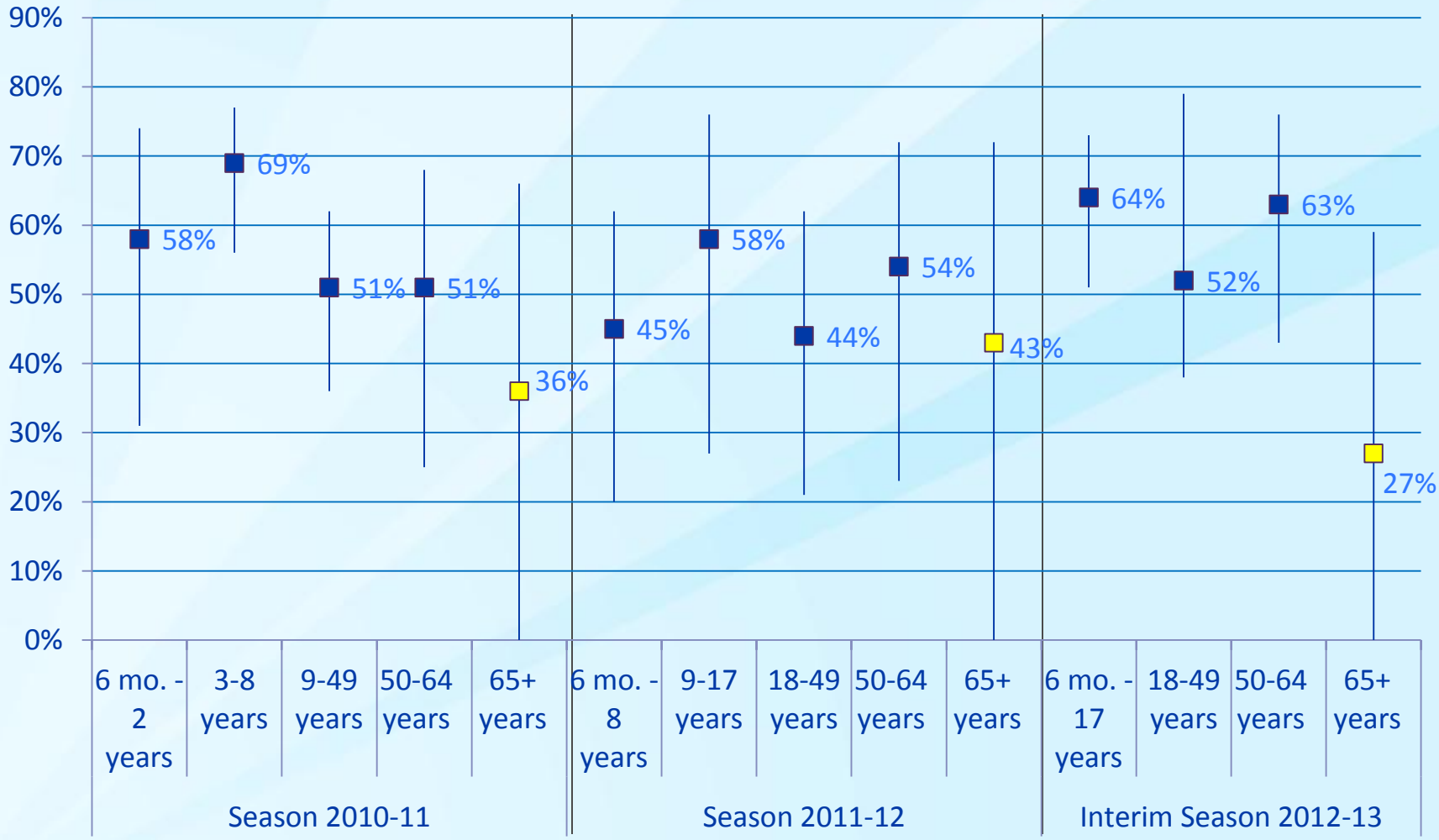
- **Trivalent vaccines**
  - A/California/7/2009-like (2009 H1N1) virus,
  - A(H3N2) virus antigenically like the cell-propagated, or cell-grown, virus A/Victoria/361/2011 (A/Texas/50/2012),
  - B/Massachusetts/2/2012-like (B/Yamagata lineage) virus.
- **Quadrivalent vaccines containing an additional influenza B virus contain a B/Brisbane/60/2008-like (B/Victoria lineage) virus**
- **Updates from 2012-13**
  - B/Yamagata virus changed from B/Wisconsin/1/2010 to B/Massachusetts/2/2012
  - A/H3N2 component update to A/Texas/50/2012

2012-13 Mid-season adjusted influenza vaccine effectiveness (VE) against A and B

	Influenza and Vaccination Status				Vaccine Effectiveness	
	Influenza-Positive Cases		Influenza-Negative Controls		Adjusted †	
	No. Vaccinated /Total	(%)	No. Vaccinated /Total	(%)	(%)	(95% CI)
Influenza A and B						
All ages	367/1115	(32)	793/1582	(50)	**(56)**	(47-63)
6 mo. – 17 years	118/463	(26)	275/565	(49)	**(64)**	(51-73)
18 – 49 years	100/353	(28)	256/604	(42)	**(52)**	(38-79)
50-64 years	63/174	(36)	143/248	(58)	**(63)**	(43-76)
65+ years	86/125	(69)	119/165	(72)	**(27)**	(-31,59)

- † Vaccine effectiveness was estimated as 100% X (1 – odds ratio [ratio of odds of being vaccinated among the cases to the odds of being vaccinated among the controls]) using logistic regression. Multivariate models adjusted for age, race/ethnicity, study site, days from illness onset to enrollment, and self-rated health status. For the all ages models, age was represented as categories; age in years was used in age-stratified models.

Adjusted VE (95% CI) against circulating strains by season in US Flu VE Network



Acknowledgments For Influenza Vaccine Effectiveness Study Data

- **CDC**: Mark Thompson, Alicia Fry, Swathi Thaker, Jill Ferdinands, Po-Yung Cheng, Sarah Spencer, Erin Burns, LaShondra Berman, David Shay, Joseph Bresee, Nancy Cox
- **Group Health**: Lisa Jackson, Mike Jackson
- **Marshfield**: Ed Belongia
- **Scott & White**: Manju Gaglani
- **U Michigan**: Arnold Monto, Suzanne Ohmit
- **U Pittsburgh**: Rick Zimmerman, Tricia Nowalk

2010-11 Estimates of Influenza Vaccine Effectiveness (VE)

- **Two recently published estimates for 2010-11, both cohort, non-randomized studies with laboratory confirmed outcomes**
  - Castilla J, et al study in Spain Vaccine 2011
    - Population: **adults with high risk conditions and/or greater than 60 years old**
    - Average age 51 years in unvaccinated, 71 years in vaccinated
    - Using two different methods, adjusted estimated **VE: 58-59%** among high risk and elderly

1. Castilla J, et al. Vaccine effectiveness in preventing influenza hospitalizations in Navarre, Spain, 2010–2011: Cohort and case–control study. Vaccine (2011), doi:10.1016/j.vaccine.2011.11.024

2010-11 Estimates of Influenza Vaccine Effectiveness (VE)

- **Kissling E, et al study in 8 EU countries, PLoS ONE 2011**
  - Population: all age groups
  - Adjusted VE against all influenza
    - 0-14 years: 65.7% (95% CI 15.4-86.1)
    - 15-59 years: 41.3% (95% CI -2.6-66.4)
    - 60 and older: 59.9% (95% CI 16.7-80.7)

1. Kissling E, Valenciano M, Cohen JM, Oroszi B, Barret A-S, et al. (2011) I-MOVE Multi-Centre Case Control Study 2010-11: Overall and Stratified Estimates of Influenza Vaccine Effectiveness in Europe. PLoS ONE 6(11): e27622.

Influenza Vaccine Effectiveness (VE)

- **Monto et al. RCT found 72% vaccine effectiveness for inactivated vaccine among adults**
  - Lower VE for live attenuated influenza vaccine (LAIV) in 2007-08 in adults
- **RCT of LAIV in children up to 92% effective in reducing lab confirmed influenza**
  - LAIV VE higher generally in young children compared to inactivated vaccine – approved for only 2 -49 years without any high risk conditions or reactive airways disease

1. Monto et al., NEJM 2009.
2. Belshe et al., NEJM 1998.

Influenza Vaccination & Pregnancy

- **Influenza infection associated with increased risk to pregnant women and fetuses**
- **Influenza vaccination of mothers during pregnancy effective in reducing influenza associated hospitalization of their infants <6 months**
  - Zaman et al, 63% effective against lab confirmed influenza[1]
  - Poehling et al, 45-48% less likely to have influenza hospitalization[2]
- **No increased incidence of adverse events among infants or their vaccinated mothers**
  - No difference in risk when given during any trimester[3]

1. Zaman et al, NEJM 2011.
2. Poehling et al, Am J Ob Gyn, 2011.
3. Tama et al, Am J Ob Gyn, 2009

Vaccine and Prevention of Transmission

- **Monto JID, 1973 Tecumseh study**
  - From 1968 pandemic, vaccination of school children reduced illness in children and adults compared to town that did not vaccinate children
- **Loeb JAMA 2009**
  - Recent study of Hutterite communities in Canada
  - Found 61% reduction in adult cases of influenza by vaccinating children
- **Hospital-based HCP vaccination reduced nosocomial influenza**
  - Salgado, et al. Infect Control Hospital Epidemiol 2004
- **Four studies of benefits of health care worker vaccination in nursing homes found reductions in patient deaths with healthcare worker vaccination**
  - Oshitani, et al; Potter, et al; Carmen, et al; Hayward et al.
  - Referenced in HCP Vaccination MMWR November 25, 2011

Cardiovascular Disease and Influenza Vaccine

- **Randomized trials of influenza vaccination**
  - Argentina: Patients with recent ischemic events or undergoing angioplasty randomized to influenza vaccine or no vaccination
    - Significant reduction in cardiovascular death at 1 year
    - 6% among vaccinated versus 17% among unvaccinated (p=0.0002)
  - Thailand: Patients recently hospitalized with acute coronary syndrome (ACS)
    - Vaccination led to significant decrease in primary endpoint (combined major cardiovascular events, including death, hospitalization from ACS, heart failure, or stroke) 9.5% versus19.3% (p=0.004)
    - Non-significant decrease in CV death (2.3% vs. 5.5%, p= 0.088)
  - Poland: RPCT (double-blind) “optimally treated CAD patients” n=658
    - Death outcome after 298 days: 0.63% vaccine, 0.76% placebo (NS)
    - Composite outcome ischemic event or hospitalized for MI: 6.02% vaccine, 9.96% placebo (p=0.047, HR 0.54)

Phrommintikul Euro Heart J 2011; Gurfinkel Euro Heart J 2004; Ciszewski Euro Heart J 2008;

Influenza Vaccine Effectiveness Conclusions

- **Vaccine effectiveness**
  - Depends on strain match and patient characteristics (age, health)
  - Can vary from year to year
- **2012-13 adjusted VE against influenza A and B was 56% (47-63%)**
  - Similar to earlier unadjusted VE of 62% (51-71%) against A and B
- **Vaccination reduced the risk of outpatient medical visits:**
  - Due to influenza A(H3N2) by half (47%); consistent for ages <65
  - Due to influenza B by two-thirds (67%); consistent for all ages
- **Similar to other interim estimates from this season**
  - Canada: VE against A(H3N2) = 45% (13%–66%)
  - UK: VE against A = 49% (-2%-75%) and against B = 52% (23%-70%)
  - I-MOVE: VE against A and B = 62% (21%-82%)
- **Even modest VE can have substantial benefits in populations where the burden of disease is high**

ADULT VACCINATION BARRIERS AND OPPORTUNITIES

Barriers to Adult Immunization

- **Competing social and economic demands among adults**
- **Competing demands for providers' time and vaccines often not integrated into adult medical care practice**
- **Adult vaccine schedule is complex**
  - Especially for certain occupational and medical target groups
- **Fewer public health resources for adult immunization**
- **Limited patient awareness and demand for adult vaccinations except for influenza vaccine**
- **Complex payment/coverage for adult vaccines even among the insured**
- **Multiple sources for vaccines and vaccine documentation**

Adult Vaccination Opportunities

- **317 Program**
  - Requirement to address lagging coverage among children, adolescents AND adults
  - States can order vaccines for uninsured or underinsured adults off federal contract
- **Increasing state coverage data to be come available for adults through BRFSS**
  - Influenza and pneumococcal vaccine every year
  - Questions on Tdap, zoster, and place of influenza vaccination to be rotated every 3rd year starting in 2013
- **Increased access to vaccines at work, retail locations, pharmacies**
- **Increasing ability of health departments to bill for vaccinations**
  - Especially important for providers to refer patients for vaccines they don't stock
- **Increasing interest in adult immunizations from private and public sectors**

ACA and Clinical Preventive Services

- **Under the ACA, non-grandfathered private health plans must provide coverage for a range of preventive services without cost-sharing**
  - those services rated as “A” (strongly recommended) and “B” (recommended) by the U.S. Preventive Services Task Force,
  - vaccinations recommended by ACIP,
  - services recommended under the Bright Futures guidelines developed by HRSA and the American Academy of Pediatrics for children from birth to age 21, and
  - women’s preventive services recommended by HRSA based on an Institute of Medicine study committee

Adult Vaccination Opportunities

- **80% of adults with insurance coverage**
- **Medicare Part B includes coverage of some vaccines for adults**
  - Influenza and pneumococcal vaccine
  - Hepatitis B for high risk
  - Td as part of wound care management
- **Medicare Part D – covers other vaccines**
  - Out of pocket costs, etc vary by Part D program

Adult Vaccination Opportunities

MOST IMPORTANTLY

Primary care providers believe immunizations are important for adults

AND

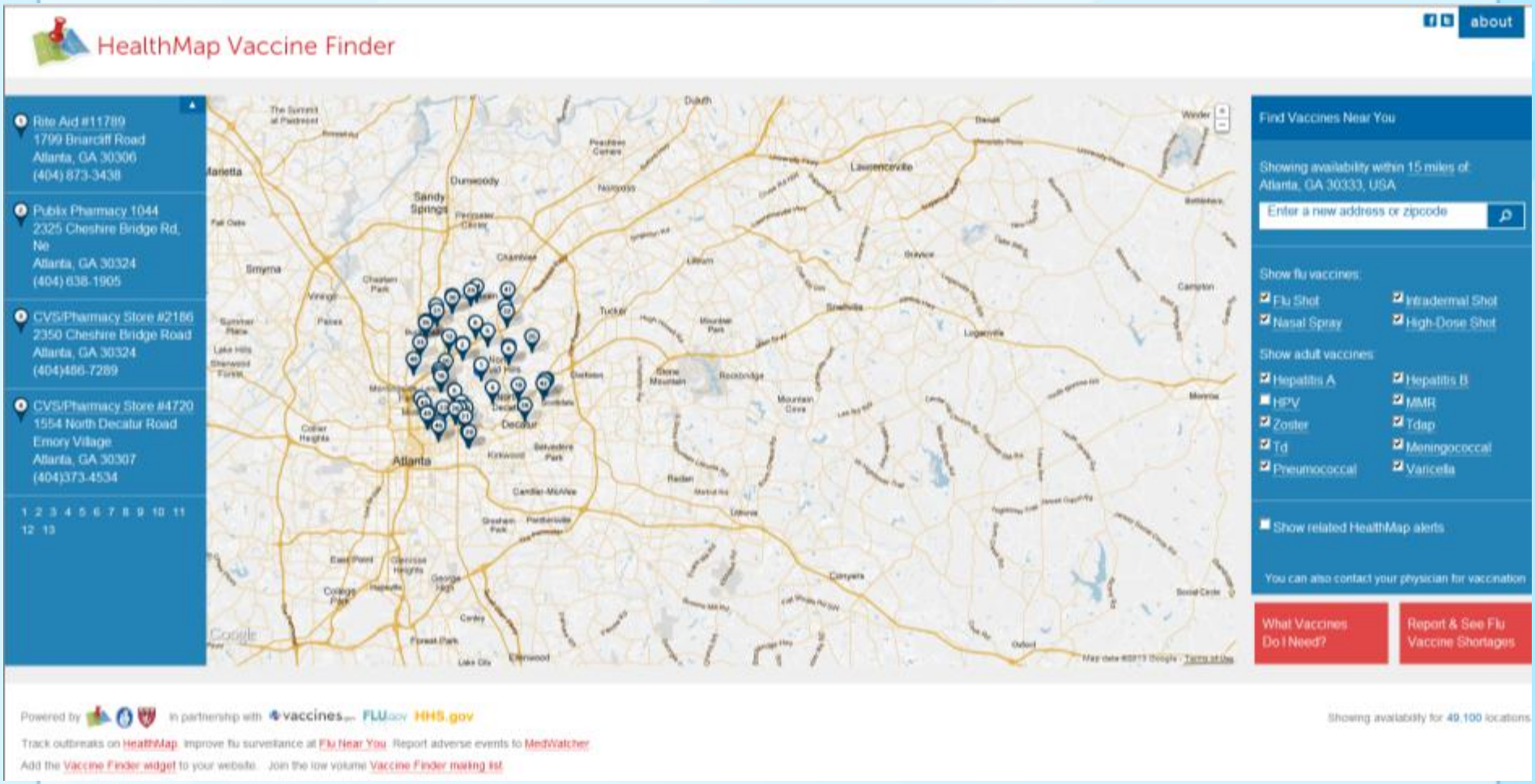
Adults are receptive to information about and getting vaccinated when recommended by their physician or other trusted healthcare provider

Influenza vaccination coverage among pregnant women by provider recommendation and offer, mid-November 2012

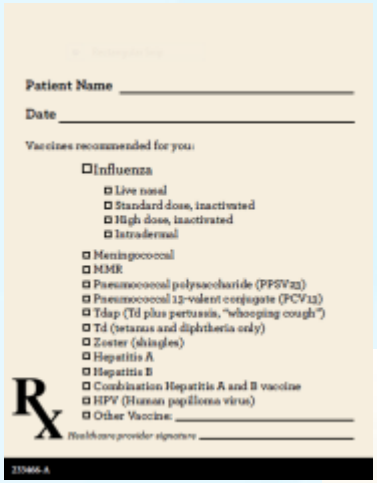
http://www.cdc.gov/flu/professionals/vaccination/pregnant-women.htm

RESOURCES FOR VACCINES RECOMMENDED FOR ADOLESCENTS AND ADULTS

http://vaccine.healthmap.org



Resources for Adult


Patient Name _____

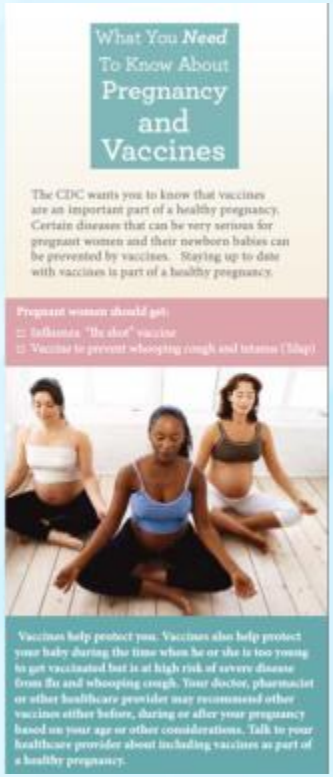
Date _____

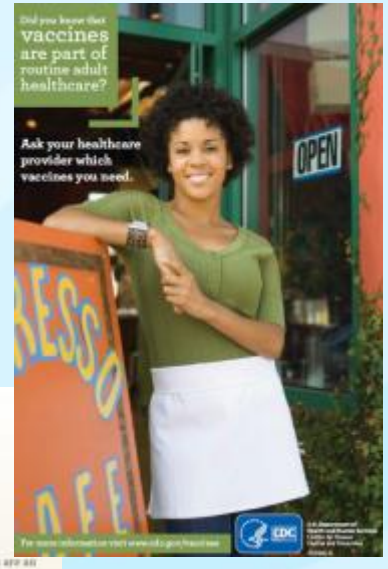
Vaccines recommended for you:

- ☐ Influenza
  - ☐ Live nasal
  - ☐ Standard dose, inactivated
  - ☐ High dose, inactivated
  - ☐ Intradermal
- ☐ Meningococcal
- ☐ MMR
- ☐ Pneumococcal polysaccharide (PPSV23)
- ☐ Pneumococcal 13-valent conjugate (PCV13)
- ☐ Tdap (Td plus pertussis, "whooping cough")
- ☐ Td (tetanus and diphtheria only)
- ☐ Zoster (shingles)
- ☐ Hepatitis A
- ☐ Hepatitis B
- ☐ Combination Hepatitis A and B vaccine
- ☐ HPV (Human papilloma virus)
- ☐ Other Vaccine: _____

Rx

Healthcare provider signature _____



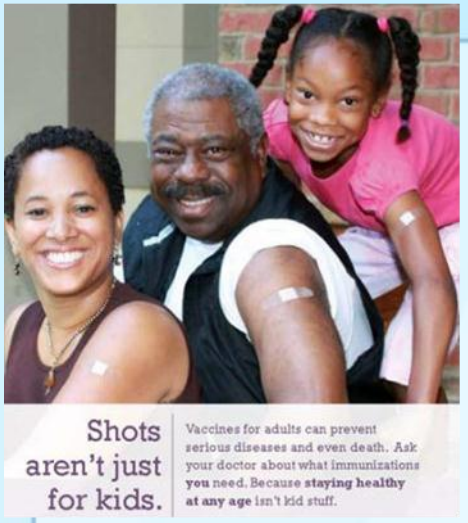


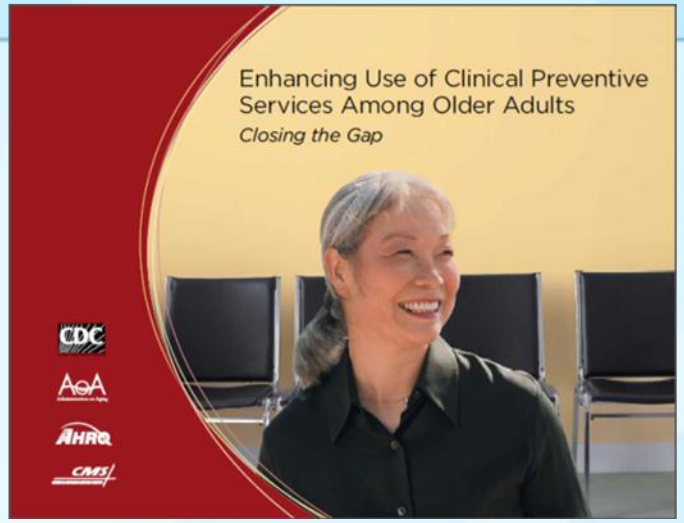
http://www.cdc.gov/vaccines/hcp/patient-ed/adults/index.html

http://www.preventinfluenza.org

Conclusions

- **Bulk of burden from vaccine preventable disease occurs in adults**
- **Although vaccine effectiveness generally lower for adults than children, vaccines offer substantial benefits**
- **Overall coverage for adult vaccines lags substantially behind pediatric vaccine coverage**
  - Multi-factorial, but includes more complex and incomplete financing for adult vaccinations
  - Racial and ethnic disparities remain for adults, but not children
- **Multiple opportunities in addition to challenges**
- **Efforts to raise coverage in adults includes**
  - Increasing awareness of vaccines among patients
  - Increasing routine assessment of patient vaccination status and either offer or refer out to another provider
  - Increasing access to vaccination in pharmacies and workplaces (adults)
  - Improving partnerships with provider groups, payers, health plans and others to incorporate immunizations into current activities





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