

Vaccination of Adults in the United States

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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
- ❑ **Influenza²**
 - **3,000 to 49,000 total related deaths per year**
 - ~90% among adults 65 years and older
- ❑ **Pertussis³**
 - **41,880 total reported cases 2012**
 - ~9,000 among adults
- ❑ **Hepatitis B⁴**
 - **3,350 acute cases reported 2010**
 - 35,000 estimated
- ❑ **Zoster⁵**
 - **about 1 million cases of zoster annually in the 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 lacking in 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>

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

Recommended Adult Immunization Schedule—United States - 2013

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

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) ^{1*}		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).

VACCINE ▼	INDICATION ▶	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus (HIV)) ^{14,15,16,17}	HIV infection CD4+ T lymphocyte count ^{14,15,16,17}	Men who have sex with men (MSM)	Heart disease, chronic lung disease, chronic alcoholism	Asplenia (including elective splenectomy and persistent complement deficiencies) ^{18,19}	Chronic liver disease	Kidney failure, end-stage renal disease, receipt of hemodialysis	Diabetes	Healthcare personnel
Influenza ^{2*}			1 dose IIV annually				1 dose IIV annually				1 dose IIV or L20 if available
Tetanus, diphtheria, pertussis (Td/Tdap) ^{1*}		1 dose Tdap with pregnancy	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs								
Varicella ^{4*}		Contraindicated				2 doses					
Human papillomavirus (HPV) Female ^{5,*}			3 doses through age 26 yrs			3 doses through age 26 yrs					
Human papillomavirus (HPV) Male ^{5,*}			3 doses through age 26 yrs			3 doses through age 21 yrs					
Zoster ⁶		Contraindicated				1 dose					
Measles, mumps, rubella (MMR) ^{7,*}		Contraindicated				1 or 2 doses					
Pneumococcal polysaccharide (PPSV23) ^{8,9}						1 or 2 doses					
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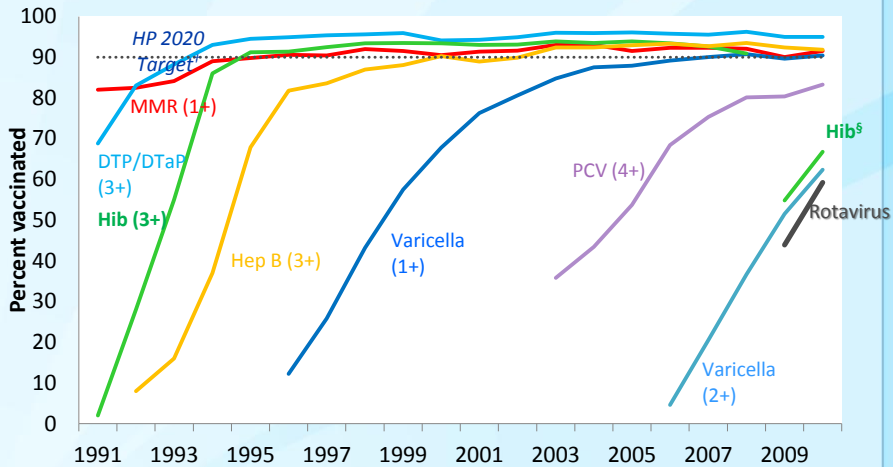
No recommendation

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.



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

Estimated Vaccination Coverage, Children 19-35 Months, 1991-2010*

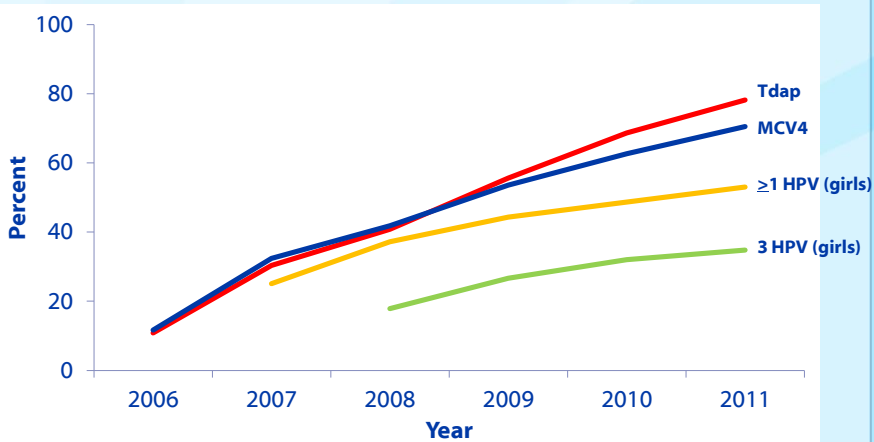


* Source: NHIS (1991-1993); NIS (1994-2010) children 19-35 months and NIS-Teen (2006-2010) teens 13-15 years

† Target is 80 percent for Rotavirus, Tdap (1+), MCV4 (1+), HPV (3+) and 90% for varicella (2+)

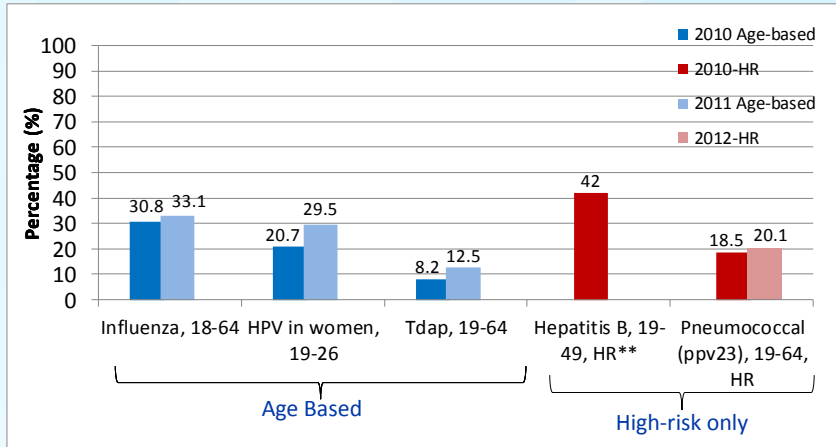
⁵ Full series Hib (≥3 or ≥4 doses, depending on product type received). Brand of Hib vaccine received was not collected on the NIS prior to 2009.

National Estimated Vaccination Coverage Levels among Adolescents 13-17 Years, NIS-Teen 2006-2011



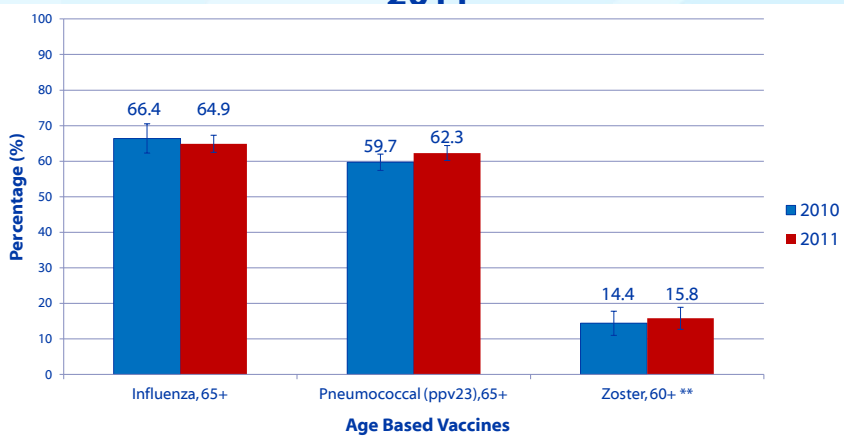
CDC. MMWR. 2012;61:671-677

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. 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

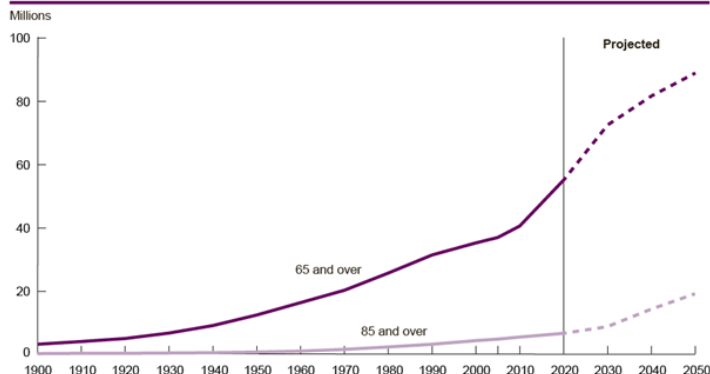
Vaccination coverage for target groups by vaccine, age, and high-risk status, NHIS 2010* and 2011



*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

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 (NP2008-12).

- In 2010, ≥ 65 years accounted for 13% of US population.
- With aging of “Baby Boomers”, projected population ≥ 65 years: 16.5% in 2020; 9.3% in 2030; and 20% in 2040.

www.Agingstats.gov

Highlights: Non-Influenza Adult Vaccination Coverage – NHIS, 2011

Compared with 2010 NHIS, limited increases for :

- ❑ Pneumococcal vaccination (62.3%) -- adults ≥ 65 years (+2.6 percentage points)
- ❑ Hepatitis B vaccination (≥ 3 doses) (35.9%) – adults, 19-49 years (+2.1 percentage points)
- ❑ Hepatitis A vaccination (≥ 2 doses) (12.5%) – adults, 19-49 years (+1.8 percentage points)
- ❑ Pneumococcal vaccination (20.1%) -- high-risk adults, 19-64 years (+1.6 percentage points)
- ❑ HPV vaccination (≥ 1 dose) (2.1%) -- men, 19-26 years (+1.5 percentage points)
- ❑ Herpes zoster (shingles) vaccination (15.8%) – adults, ≥ 60 years (+1.4 percentage points)

Pneumococcal Vaccination, 19-64 years, High-risk by Race/Ethnicity

Group	2010 (%)	2011 (%)	Difference*
19-64 years, HR, Overall	18.5	20.1	+1.6
Race/ethnicity			
White, non-Hispanic	19.0	20.1	
Black, non-Hispanic	18.6	22.8	
Hispanic	14.8†	18.3†	
Asian, non-Hispanic	11.5†	12.0†	
Others	26.0	21.7	

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.
† p<0.05 by T test for comparisons with non-Hispanic white as the reference.

Pneumococcal Vaccination, ≥65 years by Race/Ethnicity

Group	2010 (%)	2011 (%)	Difference*
≥65 years, Overall	59.7	62.3	+2.6
Race/ethnicity			
White, non-Hispanic	63.5	66.5	+3.0
Black, non-Hispanic	46.2†	47.6†	
Hispanic	39.0†	43.1†	
Asian, non-Hispanic	48.2†	40.3†	
Others	58.4	67.4	

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.
† p<0.05 by T test for comparisons with non-Hispanic white as the reference.

Herpes Zoster (shingles) Vaccination, 60 years and older – NHIS, 2011

Group and Race/ethnicity	2010 (%)	2011 (%)	Difference*
60 years and over, Overall	14.4	15.8	
White, non-Hispanic	16.6	17.6	
Black, non-Hispanic	4.5†	7.9†	+3.4
Hispanic	4.4†	8.0†	+3.6
Asian, non-Hispanic	12.7†	14.0†	
Others	8.2†	12.0	

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.

†p<0.05 by T test for comparison with non-Hispanic white as the reference.

Human Papillomavirus Vaccination Among Females (at least 1 dose) – NHIS, 2011

Age Group and Race/ethnicity	2010 (%)	2011 (%)	Difference*
19-26 years, Overall	20.7	29.5	+8.8
White, non-Hispanic	22.4	32.5	+10.1
Black, non-Hispanic	20.4	28.3	
Hispanic	15.1†	20.2†	
Asian, non-Hispanic	22.6	22.3	
Others	16.5	39.0	
19-21 years, Overall	28.2	43.1	+14.9
22-26 years, Overall	16.5	21.5	+5.0

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.

†p<0.05 by T test for comparison with non-Hispanic white as the reference.

Hepatitis B Vaccination (at least 3 doses) Ever – NHIS, 2011

Age Group and Race/ethnicity	2010 (%)	2011 (%)	Difference*
19-49 years, Overall	33.8	35.9	+2.1
White, non-Hispanic	35.6	37.8	
Black, non-Hispanic	34.5	33.0†	
Hispanic	25.3†	28.9†	+3.6
Asian, non-Hispanic	37.2	40.7	
Others	37.5	44.1	
19-59 years, with diabetes, overall	22.8	26.9	
60 years and over, with diabetes, overall	10.9	12.4	

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.
 †p<0.05 by T test for comparisons with non-Hispanic white as the reference.

Health Care Personnel (HCP) Hepatitis B Vaccination (at least 3 doses) Ever, ≥ 19 years

Race/ethnicity	2010 (%)	2011 (%)	Difference*
HCP, ≥19 years, Overall	63.2	63.8	
White, non-Hispanic	63.7	65.1	
Black, non-Hispanic	58.7	57.1†	
Hispanic	57.0	59.4†	
Asian, non-Hispanic	72.7	70.4†	
Others	70.2	70.0	

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.
 †p<0.05 by T test for comparison with non-Hispanic white as the reference.

Tetanus Vaccination Including Pertussis Vaccine, Past 6 Years, 19-64 years - NHIS, 2011

Group and Race/ethnicity	2010 (%)	2011 (%)	Difference*
19-64 years, Overall	8.2	12.5	+4.3
White, non-Hispanic	9.1	13.8	+4.7
Black, non-Hispanic	7.4†	11.0†	+3.6
Hispanic	4.8†	7.7†	+2.9
Asian, non-Hispanic	9.2	11.7	
Others	8.4	19.7	+11.3
Living with an infant aged<1 year	10.6	21.5	+10.9
Not living with an infant aged<1 year	8.1	12.1	+4.0

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.
† p<0.05 by T test for comparisons with non-Hispanic white as the reference.

Tdap Estimates – NHIS, 2011: Potential for Bias

Many were excluded (32.1% of respondents[n=25,783]):

- ❑ All those without a “yes” or “no” response for tetanus vaccination, past 10 years (4.3%)
- ❑ All those without response to tetanus vaccination during 2005-2011 (3.1%)
- ❑ Those who reported tetanus vaccination but not told what type (3.4%)
- ❑ Those who reported tetanus vaccination but did not know the vaccine type (21.3%)
- ❑ Sensitivity analysis to assess magnitude of bias: Tdap coverage could range from: 8.0% -36.4%

Tetanus Vaccination: Proportion Tdap, 19-64 years, NHIS 2011

Group	Not Told (%)	Not Recall (%)	Tdap/Td+Tdap*
Adults, 19-64 years, Overall	55.9	8.9	61.1
HCP, 19-64 years†	38.8	5.4	66.8[§]
Non-HCP, 19-64 years	58.3	9.4	59.7

*Respondents who reported that the doctor did not inform them of the vaccine type they received and those who could not recall the vaccine type were excluded.

† Adults were classified as HCP if they reported they currently work in a hospital, medical clinic, doctor's office, dentist's office, nursing home or some other healthcare facility, including part-time and unpaid work as well as professional nursing care provided in the home.

[§]p<0.05 by T test for comparisons between HCP and non-HCP 19-64 years.

Health Care Personnel (HCP) Tetanus Vaccination Including Pertussis Vaccine, past 6 years, 19-64 years

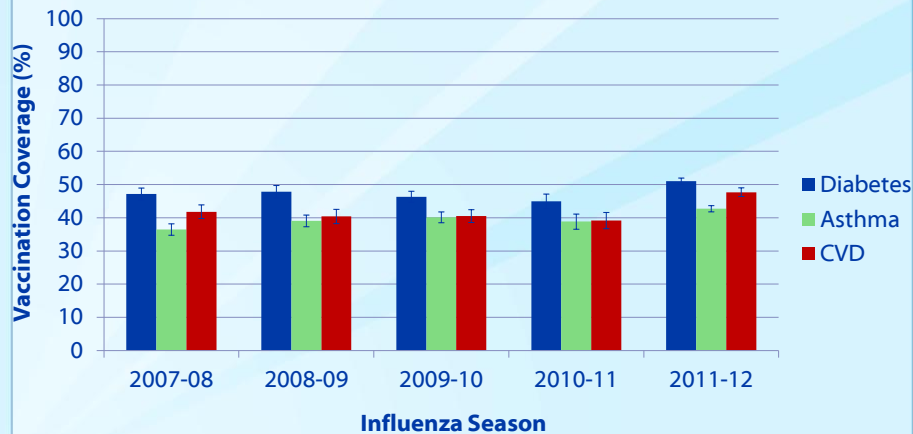
Race/ethnicity	2010 (%)	2011 (%)	Difference*
HCP, 19-64 years, Overall	20.3	26.8	+6.5
White, non-Hispanic	21.5	27.2	
Black, non-Hispanic	14.0	21.7†	
Hispanic	13.8	30.1	+16.3
Asian, non-Hispanic	26.9	27.8	
Others	--- [§]	--- [§]	--- [§]

*p<0.05 by T test for comparisons between 2011 and 2010 within each level of each characteristic.

†p<0.05 by T test for comparison with non-Hispanic white as the reference.

[§]Estimates are not reliable because of small sample size or relative standard error (standard error/estimates) >0.3.

Influenza Vaccination Coverage Among Adults 18-64 Years who Reported Selected Chronic Conditions, BRFSS 2007-2012



Limitations

- ❑ **NHIS excludes persons in the military and those residing in institutions – might result in underestimation or overestimation of coverage estimates**
- ❑ **Response biases can result in sampling bias if the nonresponse is unequal among participants regarding vaccination**
- ❑ **Self-report of vaccination subject to recall bias**
- ❑ **Tdap estimates: potential bias due to exclusions**
 - Implications for estimating coverage for other adults vaccines as well, e.g. PPSV23 versus PCV13
- ❑ **Age of vaccination not known for vaccines reported as “ever” received – unclear if vaccination occurred as an adult or as part of child or adolescent programs**

Conclusions

- ❑ **Many missed opportunities to vaccinate adults and reduce the significant burden of disease**
- ❑ **Although vaccine effectiveness generally lower for adults than children, vaccines offer substantial benefits**
- ❑ **Overall coverage for adult vaccines lags far behind pediatric vaccine coverage**
 - Multi-factorial
 - HP2020 targets
 - 90% for 65+ years for pneumococcal vaccine
 - 60% for high risk 19-64 years for pneumococcal vaccine
 - 90% for adults 65 years and older for influenza vaccine
 - 80% for adults 18-64 years for influenza vaccine
 - 30% for 60+ years for zoster vaccine
 - 90% for hepatitis B vaccine for healthcare personnel
 - Modest increases for HPV (women, 19-26) and Tdap (19-64 year olds) vaccines comparing 2010 to 2011
 - Racial and ethnic disparities remain

Conclusions

- ❑ **Documentation of vaccination (i.e., immunization information systems) will become increasingly important as adult schedule complexity increases and for providers to share vaccination information**
- ❑ **Multi-faceted efforts to raise coverage in adults needed and many actions in progress**
 - Increasing awareness of vaccines among patients
 - Increasing routine assessment of patient vaccination status and either offer or refer out to another provider during patient encounters
 - Increasing access to vaccination in provider offices, pharmacies and workplaces
 - Engagement of full range of adult immunization stakeholders provider groups, payers, health plans and others to incorporate immunizations into current activities



Shots aren't just for kids.

Vaccines for adults can prevent serious disease and even death. Ask your doctor about what immunizations you need. Because staying healthy at any age isn't kid stuff.



Enhancing Use of Clinical Preventive Services Among Older Adults
Closing the Gap

CDC
AQA
AAMA
CMAA



You can't stop time, but you can **STOP** serious diseases before they ever start.



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