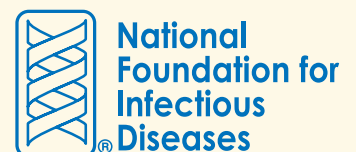


*Call to Action*

# Adolescent Immunization



*Bridging from a Strong Childhood Foundation  
to a Healthy Adulthood*



This initiative is made possible by unrestricted educational grants to the National Foundation for Infectious Diseases by GlaxoSmithKline, Novartis Vaccines and sanofi pasteur.

## U.S. Adolescents Are Vulnerable to Vaccine-Preventable Diseases

Vaccines recommended for adolescents are underused, leaving our nation's teens vulnerable to serious morbidity and even death. Health care providers should make every effort to vaccinate adolescents according to our national immunization schedule to benefit adolescents, their close contacts and society at large.\* The U.S. immunization schedule is the product of careful and extensive review of all aspects of vaccines (e.g., effectiveness, safety, cost) by a 15-member expert panel, the Advisory Committee on Immunization Practices (ACIP), and the adoption of the committee's recommendations by the Centers for Disease Control and Prevention (CDC) in collaboration with the American Academy of Pediatrics, the American Academy of Family Physicians and other professional organizations.<sup>1</sup>

Vaccines recommended for use in adolescents can be grouped into several categories (Table 1).<sup>2</sup> Influenza vaccine is recommended every year for all children, including adolescents, up to age 18. Three more recently licensed vaccines are recommended for first-time administration during adolescence. "Catch-up" vaccines, which have been available for a longer time, are for administration to adolescents who were not immunized or were under-immunized as infants and toddlers. There are also three vaccines recommended for use in certain high-risk adolescent subpopulations. Together, these vaccines protect adolescents from 14 infectious diseases.

Achieving and maintaining high immunization rates is critical for disease prevention. The highly effective U.S. childhood immunization program has led to elimination of smallpox, greater than 99 percent reductions in diphtheria, measles, polio and rubella, and to a greater than 90 percent reduction in mumps, tetanus and pertussis.<sup>3</sup> These successes are rooted in widespread infant and toddler vaccination. Widespread immunization of adolescents can lead to similar positive results.

## National Data Show Immunization Gaps for All Vaccines

In 2008, the CDC reported second-year results from the National Immunization Survey-Teen (NIS-Teen). This national survey assesses adolescent vaccination rates based on data gathered from health care providers.<sup>4</sup>

Table 1

### Vaccines for Adolescents\*

#### *Vaccines for routine administration to all Adolescents<sup>†</sup>*

- Influenza (1 dose annually)
- Human papillomavirus (3-dose primary series)
- Meningococcal conjugate vaccine (1 primary dose)
- Tetanus, diphtheria and acellular pertussis (1 booster dose)

#### *Catch-up vaccines for adolescents not fully immunized previously*

- Hepatitis B
- Inactivated polio
- Measles, mumps and rubella
- Varicella<sup>‡</sup>

#### *Vaccines for certain high-risk adolescents*

- Hepatitis A
- Pneumococcal polysaccharide

\*See MMWR for each vaccine for detailed information.

<sup>†</sup>Influenza vaccination needed annually, all other recommended at 11-12 years of age.

<sup>‡</sup>As of 2006, two doses are recommended (at 12-15 months and 4-6 years). Adolescents who received one dose should have a catch-up dose.

Source: CDC. MMWR. 2008;57(01):Q1-Q4.<sup>2</sup>

None of the vaccines in the survey had coverage rates of 90 percent, the goal established by "Healthy People 2010," the Department of Health and Human Services' national preventive health care initiative (Figure 1).<sup>5</sup> Rates were higher for the catch-up vaccines, likely because they have been on the immunization schedule for a longer time, and lower for the newer vaccines. However,

\*A CME-accredited monograph, Roadmaps for Clinical Practice: Improving Adolescent Immunizations—A Primer for Physicians, is available from the American Medical Association at <http://www.ama-assn.org/ama/pub/category/6886.html>.

it is encouraging to note that rates for all vaccines increased compared with data from the first NIS-teen report in 2007. Of the vaccines on the schedule for at least five years, MMR vaccine coverage is highest at 89 percent and tetanus-containing vaccine coverage is lowest at 72 percent. The latter is a combined rate that includes vaccination with either the older tetanus and diphtheria vaccine (42 percent) or with the newer Tdap vaccine (30 percent), which includes acellular pertussis. Inclusion of pertussis is particularly important because pertussis has been on the rise in the U.S. since 1976.<sup>6</sup>

### Vaccines Prevent Serious Morbidity and Mortality

Vaccine-preventable diseases can cause serious morbidity and mortality in adolescents and their close contacts. Even when treated quickly and appropriately, **meningococcal disease** kills about 10 to 14 percent of people infected, and 11 to 19 percent of survivors suffer serious long-term effects such as hearing loss, brain damage and digit or limb amputation.<sup>7-9</sup> About 70 percent of cases of meningococcal disease in U.S. adolescents are caused by strains included in the vaccine.<sup>10</sup> Vaccinating adolescents at 11-12 years of age is important because adolescents are at increased risk of meningococcal disease.<sup>11</sup>

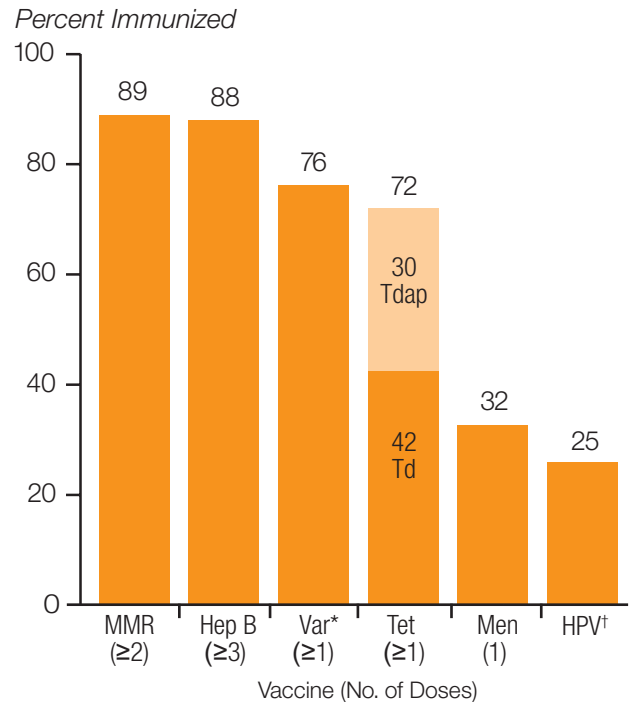
**Pertussis** is substantially underreported, making it difficult to pinpoint U.S. incidence,<sup>12</sup> but some estimates range from 1 million to over 3 million cases per year.<sup>13,14</sup> Whether cases in adolescents are subclinical, of minor clinical importance or more severe, infected adolescents may serve as an important reservoir of infection for neonates and others at higher risk of serious illness or pertussis-related death.<sup>15-18</sup> Tdap is a highly effective vaccine that replaces the previously recommended Td vaccine as the booster at 11-12 years of age or in older adolescents who need a Td booster.<sup>2</sup>

There are over 6 million new **human papillomavirus (HPV)** infections in the U.S. each year; nearly three in four are in females 15-24 years of age.<sup>19</sup> While most of these infections will be cleared by the immune system, infection can lead to cervical cancer. The three-dose

HPV vaccine series provides protection against genital warts and two HPV types (16 and 18) that cause about 70 percent of cervical cancers.<sup>20</sup>

Figure 1

### Vaccination Rates in Adolescents 13-17 Years of Age, U.S.—2007



\*Coverage among teens without a reported history of disease.  
 †HPV rates among adolescent females only.  
 Hep=hepatitis; Men=meningococcal disease; NA=not available;  
 Tet=tetanus-containing vaccine; Var=varicella.

Source: CDC. *MMWR*. 2008;57(40):1100-1103.<sup>4</sup>

### Catch-up vaccines are more widely used, leading to substantial disease prevention

The catch-up vaccines are associated with much higher vaccination rates and, therefore, with much greater benefits to date. For example, from 1990 to 2004, incidence of acute **hepatitis B** declined 75 percent as infant immunization increased;<sup>21</sup> the last indigenous case of **polio** reported in the U.S. was in 1979;<sup>22</sup> and, since the introduction of vaccines to combat **measles, mumps and rubella**, U.S. incidence of these illnesses has decreased 99 percent.<sup>23</sup>

### Influenza vaccine recommendations expanded to include all adolescents

In 2008, CDC expanded its influenza recommendations to include annual immunization of all children 6 months to 18 years of age.<sup>24</sup>



Influenza kills more Americans every year than all other vaccine-preventable diseases combined.<sup>25</sup>

While deaths in children are not common, they do occur in children of all ages and health status.

In the 2003-2004 season, 37 percent of the 153 pediatric deaths reported were

in children 5 to 18 years of age and 67 percent were in children with no underlying risk factor<sup>26</sup>

### A Broad Approach Is Necessary to Increase Vaccination Rates

Barriers to increased immunization\* rates can be grouped into three main categories: family- or patient-related, provider-related and system-related. All three need to be addressed if immunization rates in adolescents are to be increased.

One of the most important issues facing adolescents is less than optimal use of medical homes and lack of regular well-care visits. Most primary care visits for adolescents are not preventive visits.<sup>27</sup> Therefore, a comprehensive health care visit is recommended for all adolescents at 11-12 years of age.<sup>28</sup> Making this visit routine for all adolescents would provide an opportunity to deliver much needed preventive health services, including vaccines. However, the absence of such a routine visit should not deter health care providers from using all other opportunities (e.g., visits for illness or injury, sports physicals) to provide vaccines or education and counsel about the importance of immunization. The end-of-high-

school/college entry point is also a great time to review immunization status and provide necessary vaccines before insurance coverage changes.

Changing behavior among adolescents and their parents or guardians will require education and outreach. While younger children have little or no control over health care decisions, adolescents often play a key role in decision making. Therefore, it is important that adolescents, as well as their parents or guardians, are educated about the value of vaccines and the seriousness of vaccine-preventable diseases. Once empowered, adolescents and their parents or guardians may generate discussion with their health care providers about vaccines and other preventive health measures.

Health care providers must prepare if they are to meet increased demand for immunization against vaccine-preventable diseases in adolescents. They can establish standing orders for vaccination services, use existing immunization information systems, develop vaccination “quick visits,” especially for multiple dose vaccines, establish office guidelines for vaccine delivery, implement reminder and recall systems, create immunization teams (or an immunization leader in the practice) whose job is to focus on this issue, and use the CDC’s Comprehensive Clinic Assessment Software Application (CoCASA†) to assess office immunization practices. Health care providers also need to educate themselves and their colleagues about vaccines and the diseases they prevent.

However, even if every traditional vaccinator in the country were perfectly prepared, delivery of all recommended vaccine doses to adolescents would remain a challenge. Vaccinations administered at alternative sites, like schools and pharmacies, may be an integral component of optimal immunization efforts.

System-related vaccination barriers are not remedied easily by the action of individual health care providers or the public. However, supportive efforts to minimize such barriers (e.g., a nationwide immunization tracking system and a vaccine financing system that allows adolescents to receive all necessary vaccines, without cost barriers, at their medical home location) may be instituted.

\*NFID refers readers interested in this topic to the following publication, released as this Call to Action was being completed: Strengthening the Delivery of New Vaccines for Adolescents. *Pediatrics*; 2008 Jan;121(Supplement 1).

†Information about CoCASA is available at <http://www.cdc.gov/vaccines/programs/cocasa/default.htm>.

## References

1. Centers for Disease Control and Prevention. Vaccine and Guidelines. Advisory Committee on Immunization Practices. Available at <http://www.cdc.gov/vaccines/recs/acip/default.htm>. Accessed November 17, 2007.
2. Centers for Disease Control and Prevention. Recommended immunization schedule for persons aged 0-18 years—United States, 2008. *MMWR* 2008;57(01):Q1-Q4.
3. Roush SW, Murphy TV, and the Vaccine-Preventable Disease Table Working Group. Historical comparisons of morbidity and mortality for vaccine-preventable diseases in the United States. *JAMA* 2007;298(18):2155-2163.
4. Centers for Disease Control and Prevention. Vaccination coverage among adolescents aged 13-17 years—United States, 2007. *MMWR* 2008;57(40):1100-1103.
5. U.S. Department of Health and Human Services. Healthy People 2010. Available at <http://www.healthypeople.gov/>. Accessed November 15, 2007.
6. Centers for Disease Control and Prevention. Preventing Tetanus, Diphtheria and Pertussis Among Adults: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine. *MMWR* 2006;55(RR-17):1-33.
7. Centers for Disease Control and Prevention. Prevention and control of meningococcal disease. *MMWR* 2005;54(RR-7):1-21.
8. Kirsch EA, Barton P, Kitchen L, Giroir BP. Pathophysiology, treatment, and outcome of meningococemia: a review and recent experience. *Pediatr Infect Dis J* 1996;15:967-979.
9. Edwards MS, Baker CJ. Complications and sequelae of meningococcal infections in children. *J Pediatr* 1981;99:540-545.
10. Centers for Disease Control and Prevention. Active Bacterial Core Surveillance unpublished data.
11. Centers for Disease Control and Prevention. Notice to readers: Revised recommendations of the Advisory Committee on Immunization Practices to vaccinate all persons aged 11-18 years with meningococcal conjugate vaccine. *MMWR* 2007;56(31):794-795.
12. Edwards KM. Pertussis epidemiology and transmission. *Adv Stud Med* 2005;5(5A):S440-S443.
13. Forsyth K. Pertussis, still a formidable foe. *Clin Infect Dis* 2007;45(11):1487-1491.
14. Centers for Disease Control and Prevention. Pertussis—United States, 1997-2000. *MMWR* 2002;51(4):73-76.
15. Long SS, Welton CJ, Clark JL. Widespread silent transmission of pertussis in families: antibody correlates of infection and symptomatology. *J Infect Dis* 1990;161(3):480-486.
16. Deen JL, Mink CA, Cherry JD, et al. Household contact study of *Bordetella pertussis* infections. *Clin Infect Dis* 1995;21(5):1211-1219.
17. Izurieta HS, Kenyon TA, Strebel PM, Baughman AL, Shulman ST, Wharton M. Risk factors for pertussis in young infants during an outbreak in Chicago in 1993. *Clin Infect Dis* 1996;22(3):503-507.
18. Halperin SA, Wang EE, Law B, et al. Epidemiological features of pertussis in hospitalized patients in Canada, 1991-1997; report of the Immunization Monitoring Program-Active (IMPACT). *Clin Infect Dis* 1999;28(6):1238-1243.
19. Weinstock H, Berman S, Cates W Jr. Sexually transmitted diseases among American youth: incidence and prevalence estimates, 2000. *Perspect Sex Reprod Health* 2004;36:6-10.
20. Centers for Disease Control and Prevention. Quadrivalent human papillomavirus vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2007;56(RR-2):1-24.
21. Centers for Disease Control and Prevention. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States. *MMWR* 2005;54(RR-16):1-23.
22. Centers for Disease Control and Prevention. Poliomyelitis prevention in the United States. *MMWR* 2000;49(RR-5):1-22.
23. Centers for Disease Control and Prevention. Measles, mumps, and rubella—vaccination use and strategies for elimination of measles, rubella, and congenital rubella syndrome and control of mumps. *MMWR* 1998;47(RR-8):1-57.
24. Centers for Disease Control and Prevention. Prevention and Control of Influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2008. *MMWR* 2008;57(RR-7):1-60.
25. Glezen WP. Influenza control. *N Engl J Med* 2006;355(1):79-81.
26. Bhat N, Wright JG, Broder KR, et al. Influenza-associated deaths among children in the United States, 2003-2004. *N Engl J Med* 2005;353:2559-2567.
27. Rand CM, Shone LP, Albertin C, Auinger P, Klein JD, Szilagyi PG. National health care visit patterns of adolescents: implications for delivery of new adolescent vaccines. *Arch Pediatr Adolesc Med* 2007;161(3):252-259.
28. Centers for Disease Control and Prevention. Immunization of adolescents. Recommendations of the Advisory Committee on Immunization Practices, the American Academy of Pediatrics, the American Academy of Family Physicians, and the American Medical Association. *MMWR* 1996;45(RR-13):1-16.

**Suggested citation:** National Foundation for Infectious Diseases. Call to action: Adolescent vaccination—Bridging from a strong childhood foundation to a healthy adulthood. Bethesda, MD, 2008.

## Organizational Supporters

The following organizations agree that immunization rates in adolescents need to be improved to reduce the impact of vaccine-preventable diseases in this population.

- American Academy of Pediatrics
- American Academy of Physician Assistants
- American Medical Association
- American Nurses Association
- American Pharmacists Association
- America's Health Insurance Plans
- Asian and Pacific Islander American Health Forum
- Centers for Disease Control and Prevention
- Kaiser Permanente Northern California
- National Alliance for Hispanic Health
- National Association of County and City Health Officials
- National Association of Pediatric Nurse Practitioners
- National Association of School Nurses
- National Foundation for Infectious Diseases
- National Medical Association
- Pediatric Infectious Diseases Society
- Society for Adolescent Medicine
- Vermont Child Health Improvement Program
- Wellpoint Inc.

### *About the National Foundation for Infectious Diseases*

The National Foundation for Infectious Diseases is a non-profit, tax-exempt (501c3) organization founded in 1973 and dedicated to educating the public and health care professionals about the causes, treatment and prevention of infectious diseases.

National Foundation for Infectious Diseases

4733 Bethesda Avenue, Suite 750

Bethesda, Maryland 20814-5278

E-mail: [info@nfid.org](mailto:info@nfid.org)

This document is available online at: [www.nfid.org](http://www.nfid.org)



## **Adolescent Immunization**

*Bridging from a Strong Childhood Foundation  
to a Healthy Adulthood*