

Assessing the Cost of Vaccine-Preventable Diseases

BETWEEN 2014 AND 2019, roughly 1900 cases of measles, a disease that was declared by the United States to be eradicated in 2000, have been recorded. The estimated cost to contain each case (including follow-up) was \$140,000, and the total cost to stop the spread of measles was approximately \$266 million.¹ Although immunizations help prevent millions deaths,² the United States spends nearly \$27 billion treating adults for diseases that could have been prevented with vaccinations.¹ Some models estimate that vaccinations administered to children born in the United States from 1994-2013 will prevent 322 million illnesses, 21 million hospitalizations, and 732,000 deaths over the course of their lifetimes. The same cohort is predicted to have a net savings of \$295 billion in direct costs and \$1.38 trillion in total societal costs.³

Given the role of immunization in reducing the incidence and prevalence—as well as morbidity and mortality—of vaccine-preventable diseases,⁴ wider adoption of vaccination administration is necessary to reduce the associated clinical and economic burden. This article provides an overview of immunization in the United States.

The Implications of Vaccine-Preventable Diseases

Age, lifestyle, overall health, and previous vaccinations all play a role in determining which vaccines individuals need, but it is generally recommended that adults receive immunizations for influenza (flu), pertussis, tetanus and diphtheria, herpes zoster (shingles), and pneumococcal disease.⁵ In childhood, vaccinations are especially important. From infancy through 6 years of age, the Centers for Disease Control and Prevention (CDC) has recommended 14 vaccinations to help prevent diseases. Staying up-to-date on infant vaccinations is also critical, as they can take up to a week to become effective.^{6,7}

Every time an individual is immunized against a specific pathogen, the rate of that disease decreases along with its associated asymptomatic carrier state. For many diseases to spread successfully, a certain proportion of the population must be susceptible.⁸ However, when a large proportion of the population is immunized, those who are unvaccinated can benefit from a lower risk of exposure to the pathogen (known as herd immunity).⁴

If individuals continue to receive immunizations for rare diseases, the diseases may eventually become eliminated.⁹ Sixteen diseases are under control or considered eradicated by vaccination¹⁰⁻¹²:

- varicella zoster
- diphtheria
- influenza
- hepatitis A
- hepatitis B
- human papillomavirus (HPV)
- measles
- meningococcal disease
- mumps
- pneumococcal disease
- rubella
- shingles
- tetanus
- pertussis
- poliomyelitis
- *Haemophilus influenzae*

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Although significant strides have been made in disease control through immunization, vaccination rates for both children and adults are well below recommended levels.¹³ Many patients are not aware of the recommendations for adult immunization or may not realize the importance of immunizations.¹⁴ Barriers such as lack of information, vaccine hesitancy, and lack of accessibility can interfere with immunization rates.⁴ Misinformation about vaccine safety can lead to more unvaccinated individuals, thereby increasing the risk of outbreaks of vaccine-preventable diseases.¹⁵ According to the SAGE Working Group on Vaccine Hesitancy, “Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccine type. It is influenced by factors such as complacency, convenience and confidence.”¹⁶

The CDC has launched a new initiative, Vaccinate with Confidence, to help combat myths about immunization. Its 3 main priorities include protecting communities that are under-vaccinated, empowering families and healthcare professionals to start effective conversations about vaccinations, and to stop the spread of misinformation associated with vaccinations. As part of its new Vaccinate with Confidence initiative, the CDC is working with local partners and social media companies to provide accurate information and combat myths about immunization.¹⁵

In addition to misinformation about immunizations and vaccine hesitancy, healthcare providers prioritize some vaccines over others, and many are not familiar with the Advisory Committee on Immunization Practices (ACIP) recommendations for immunizations.¹⁷ Only 60% of physicians and 56% of physician assistants, nurse practitioners, and registered nurses reported using official guidelines to inform their decisions regarding adult immunizations.¹⁷ Recommended vaccinations can also be missed when healthcare providers do not have up-to-date patient vaccine records.¹⁸

Vaccination Rates and Recommendations

With vaccination rates lower than recommended levels across the spectrum of vaccine-preventable diseases, it is important that patients, providers, and payers are educated regarding specific ACIP and CDC recommendations for each disease. Ahead is information regarding rates and recommendations for the 7 most common vaccine-preventable diseases.

HPV

There are more than 100 known types of HPV, which are most often transmitted sexually.¹⁹ HPV infections are common. About 80 million Americans are currently infected with some type of HPV, and about 14 million,

including teens, contract HPV each year.²⁰ In their lifetime, nearly all men and women in the US will contract at least 1 type of HPV.²⁰ Because most infections with HPV do not involve symptoms, patients typically do not know they have it unless it leads to cancer.²¹ Of the different types of HPV, 14 are known to cause cancer. Of these strains, 2 (16 and 18) are responsible for 70% of cervical cancers and precancerous cervical lesions, and can be prevented with the HPV vaccine.¹⁹

The HPV vaccine is indicated in men and women aged 9 to 26 years.²² It is administered in 2 injections; the second is given 6 to 12 months after the initial injection. For those who are not adequately vaccinated, ACIP and the CDC recommend a catch-up vaccination for patients through age 26 and vaccination based on shared clinical decision making for those aged 27 through 45 years. HPV vaccines are not for adults older than 45 years.²²

Rates of HPV immunization in women (49.5%) and men (37.5%) aged 13 through 17 years fall well below the CDC’s Healthy People 2020 goal of 80% coverage. This could be due to a lack of healthcare provider recommendation; if healthcare providers increase HPV vaccination rates in eligible recipients to 80%, the CDC predicts that 53,000 cases of cervical cancer could be prevented in the lifetime of patients currently younger than 12 years. An additional 4400 women will develop cervical cancer for every year the immunization rate does not rise.²³

Influenza

Influenza, commonly known as the flu, has caused approximately 9 million to 45 million illnesses and about 12,000 to 61,000 deaths each year since 2010.²⁴ Annual influenza vaccination is recommended by ACIP for all patients who are at least 6 months old and have no contraindications.²² In the 2018-2019 flu season, vaccination coverage was 62.6% in patients aged 6 months to 17 years and 45.3% among adults 18 years and older; this was higher than the previous season. Though flu vaccination rates have increased, coverage can always improve. Healthcare providers should offer influenza vaccination during routine healthcare visits and hospitalizations. There are alternatives, like the community pharmacy, for those who cannot visit a doctor’s office during the flu season.²⁵

Pneumococcal disease

Every year, 150,000 individuals are hospitalized in the United States due to pneumococcal pneumonia; an estimated 3600 individuals died of pneumococcal meningitis and bacteremia in 2017. Children and older adults are at a higher risk of the disease.²⁶ The pneumococcal polysaccharide vaccine is recommended for all adults aged 65 years or older and for individuals younger than 65 years who are at increased risk for the disease.²⁶

Herpes zoster

In the United States, 1 million people are infected with herpes zoster annually, and 1 in 3 will develop shingles in their lifetime. Those who have had varicella zoster (chickenpox) are at risk for herpes zoster. Incidence rises significantly among older patients and continues to increase with age. The herpes zoster vaccine is recommended for individuals aged 60 years and older.^{27,28}

Measles, mumps, and rubella (MMR)

The measles, mumps, and rubella (MMR) vaccine is recommended for children, who should receive 2 doses: one at 12 to 15 months and the other at 4 to 6 years of age. 1 dose of the MMR vaccine is 93% effective against measles, 78% effective against mumps, and 97% effective against rubella, and the rates increase with the second dose.²⁹

Tetanus-diphtheria and tetanus-diphtheria-acellular pertussis

Tetanus and diphtheria are rare in the United States today. During the most recent peak year for pertussis in 2012, 48,277 cases were reported in the United States; however, cases are often underdiagnosed or underreported.³⁰ It is recommended that children receive the diphtheria, tetanus, and pertussis (DTaP) vaccine at 2, 4, and 6 months, at 15 through 18 months, and at 4 through 6 years of age. Children should receive the DTaP vaccine at 11 through 12 years of age, and adults should receive a tetanus-diphtheria booster every 10 years. Notably, the vaccine is indicated in pregnant women, who should receive the immunization during the third trimester of every pregnancy to help protect the infant from whooping cough.³¹

Varicella zoster

Varicella zoster, also known as chickenpox, is a contagious disease. Two doses of the vaccine are approximately 90% effective; those who still acquire the disease after becoming vaccinated will usually have a milder form of the disease.³² The CDC recommends a 2-dose varicella vaccination in children, adolescents, and adults. Children who are 13 years and older who have not been vaccinated and are healthy should receive 2 doses 28 days apart.^{32,33}

Improving Preventive Care and Immunization Programs

When it comes to improving vaccination rates, one barrier to vaccination is cost. Medicare does not completely cover recommended vaccines, and there can be limited financing options for newly recommended vaccines.³⁴ In 2010, Congress passed the Patient Protection and Affordable Care Act (ACA), which covers a range of recommended preventive services and requires new health plans to cover preventive services.³⁵ Patients are eligible to receive

the following vaccinations, whether they are children or adults, without cost-sharing or co-pay requirements: Tdap, influenza, hepatitis A, hepatitis B, HPV, polio, MMR, meningitis, rotavirus, and varicella zoster.³⁵ The ACA promotes Medicaid; by law, insurance companies cannot deny patients coverage because of preexisting conditions.³⁶

On a broader level, efforts focused on disease prevention will continue to provide education and resources regarding immunization. The Community Preventive Services Task Force was established in 1996 by the Department of Health and Human Resources and systematically reviews the effectiveness of population-based interventions to increase coverage of recommended vaccines. Membership is appointed by the CDC, and the task force provides recommendations about population-based interventions. It has established the following patient and provider intervention recommendations to help improve immunization prevalence. For increasing vaccination prevalence among patients, the task force recommends implementing patient reminder systems, vaccine requirements for school entrance, patient incentives, reduced out-of-pocket costs, and increased access to vaccination services in schools, healthcare settings, childcare centers, healthcare programs, and homes (for hard-to-reach populations). For providers, the task force recommends provider reminder systems, provider assessment and feedback, standing orders, combined systems-based interventions, and immunization information systems.³⁷

To increase vaccination rates, education must be increased and misconceptions must be overcome. Specifically, age-based information and education to dispel myths surrounding vaccine adverse effects. Nonprofit organizations may provide a connection between the scientific community and the public, while also introducing and maintaining vaccination programs. The Immunization Action Coalition and the National Coalition for Adult Immunization provide resources for pharmacists to increase community-based immunization awareness. The CDC recommends expanding access to vaccinations through nontraditional settings, for example, through pharmacy, workplace, and school venues to reach individuals who may not visit a traditional provider during the flu season.¹⁷

Despite the essential role immunization plays in the healthcare continuum, challenges regarding optimal adoption of vaccines remain. Several stakeholders in the care continuum, such as physicians, pharmacists, and community organizations, play an important role in continued efforts to increase immunization. Other key contributors to education and adoption efforts include employers and payers. The following articles in this publication will further explore the potential of employer engagement of employees and health plan-based avenues for improving education and acceptance of vaccines. ♦

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