

# The Value of Vaccines in Disease Prevention

Vaccinations are an essential tool in our fight against infectious disease. According to the World Health Organization (WHO), vaccination has greatly reduced the burden of infectious disease globally.<sup>1</sup> Vaccines protect the vaccinated individual by direct immunization and can protect unvaccinated individuals through community protection or herd immunity.<sup>2</sup> Vaccination has also been highlighted as one of the main reasons for the fall in health disparities both within and across countries in the last century. It was recently estimated that since 1924, vaccinations have prevented 103 million cases of childhood infection, representing approximately 95 percent of infections that would have occurred, including 26 million in the last decade alone.<sup>3</sup>

There are well-documented reports that show how some vaccines decrease antibiotic use, thus lowering the likelihood of antibiotic resistance.<sup>4</sup> This suggests that vaccines can play a role in decreasing antibiotic resistant infections.<sup>2</sup> The CDC now advocates the use of vaccines as a tool for addressing antimicrobial resistance.

## Societal Health Impact

Vaccines have dramatically reduced the threat of diseases that were once widespread and oftentimes fatal.<sup>5</sup> Today, more people benefit from safe and effective vaccines than ever before — and the list of diseases that vaccines can help to prevent continues to grow. Vaccines help reduce health care costs to both patients and the broader health care system by reducing the incidence of vaccine-preventable illness.<sup>5</sup> Continued investment in new vaccine technologies is critical for the development of new and more effective ways to address unmet medical needs.

- According to the World Health Organization (WHO), immunizations save an estimated 2.5 million lives each year from tuberculosis, diphtheria, tetanus, pertussis (whooping cough), polio, measles, hepatitis B, and Hib (*Haemophilus influenzae b*) infections.<sup>6</sup>
- In 2010, an estimated 109 million children under the age of 1 were vaccinated with three doses of diphtheria-tetanus-pertussis (DTP3) vaccine worldwide. These children are protected against these infectious diseases that can have serious consequences like illness, disability, or death.<sup>7</sup>

## Economic Impact

Timely use of vaccinations and adherence to the U.S. Center for Disease Control and Prevention's recommended vaccination schedules prevent morbidity and mortality, and save millions of dollars in direct and indirect costs to the health care system each year.<sup>8</sup> The further development of new, innovative vaccines may continue to cut costs.

- In recent work by the Johns Hopkins School of Public Health, it was estimated that increasing childhood vaccination in pneumococcal disease, meningitis and rotavirus would be valued at over \$63 billion dollars.<sup>9</sup>

## KEY TAKEAWAYS

---

According to the World Health Organization (WHO), immunizations save an estimated 2.5 million lives every year.<sup>6</sup>

---

For every \$1 the U.S. spends on childhood vaccinations, we save \$10.20 in disease treatment costs.<sup>14</sup>

---

In the U.S., vaccine use saves \$13.5 billion in direct costs.<sup>12</sup>



For every **\$1.00** the U.S. spends on childhood vaccinations,



**\$10.20** is saved in disease treatment costs.

Centers for Disease Control and Prevention (CDC) – Immunizations and Respiratory Disease Factsheet. Retrieved from [http://www.cdc.gov/fmo/topic/budget%20information/factsheets/IRD\\_Factsheet.pdf](http://www.cdc.gov/fmo/topic/budget%20information/factsheets/IRD_Factsheet.pdf)

- The ability to avert 3.7 million deaths by using pneumococcal, Haemophilus influenzae type b, and rotavirus vaccines has an estimated value of \$115 billion for those in at-risk countries.<sup>9</sup>
- A 2011 study found that health departments were spending over \$2,000 per case of pertussis in their communities.<sup>10</sup> In 2010 alone, California responded to over 9,000 cases of pertussis and 10 infant deaths.<sup>11</sup> Given that the average cost of the pertussis vaccine is \$3.50, significant cost savings on treating cases of pertussis could have been realized through vaccination.
- A recently published analysis showed that routine childhood immunization among children born in the US during 2009 will prevent ~42,000 early deaths and 20 million cases of disease, with net savings of \$13.5 billion in direct costs and \$68.8 billion in total societal costs, respectively. The direct and societal benefit-cost ratios for routine childhood vaccination with these 9 vaccines were 3.0 and 10.1.<sup>12</sup>
- Globally, vaccinations help save billions of dollars by avoiding expenses. Avoiding short-term costs of treatment saves \$1.4 billion; avoiding lost wages of caretakers saves \$313 million; avoiding long-term costs of lost productivity due to disability and death may add savings of around \$61 billion.<sup>9</sup>
- Outbreaks of vaccine-preventable diseases are not only detrimental to people’s health, they are also very costly. A 2008 measles outbreak in Southern California resulted in 839 people being exposed to the disease, 11 cases of measles (all intentionally unvaccinated children), and the hospitalization of an infant too young to be vaccinated. Stopping the spread of this outbreak cost the state \$10,376 per case; 48 children needed to be quarantined at an average family cost of \$775 per child.<sup>13</sup> Had these children been vaccinated, the resulting costs of treating the disease and limiting its spread could have been avoided.

**A 2008 measles outbreak in Southern California** resulted in **839 people** being exposed to the disease, **11 cases** of measles (all in unvaccinated children) and the hospitalization of an **infant** too young to be vaccinated.

**What it cost to stop the outbreak:**  
 11 cases of measles X \$10,376 per case  
 48 children quarantined X \$775 per child

**\$151,336**

**What it would have cost to vaccinate all 11 children:**

**\$20 – \$60**  
(approximately)

David E. Sugerman, Albert E. Barsky, et al. “Measles Outbreak in a Highly Vaccinated Population, San Diego, 2008: Role of the Intentionally Undervaccinated.” Pediatrics 2010; 125, 747-755.  
 CDC Vaccine Price List 2013; <http://www.cdc.gov/vaccines/programs/vfc/awardees/vaccine-management/price-list/>

## Vaccine Innovation

The development and use of newer vaccine technology helps us fight against infectious diseases that had been previously difficult to vaccinate against. Since new strains are constantly emerging, our ability to update vaccines is ideally suited to meet the challenges of infectious diseases.

Vaccines have proven to be an extremely effective way to prevent morbidity and mortality associated with infectious disease. CDC epidemiological surveillance demonstrates up to 99 to 100 percent reductions in several life-threatening infectious diseases in the U.S., as shown in the adapted figure below.

### The Impact of Vaccines on Infectious Disease Morbidity in the United States

	Pre-vaccine Era Estimated Annual Morbidity in the US*	Most Recent Reports of Cases in the US†	% Decrease
Diphtheria	21,053	0 <sup>‡</sup>	100%
H. Influenzae	20,000	243 <sup>‡</sup>	99%
Hepatitis A	117,333	11,049 <sup>‡</sup>	91%
Hepatitis B	66,232	11,269 <sup>‡</sup>	83%
Measles	530,217	61 <sup>‡</sup>	99%
Mumps	162,344	982 <sup>‡</sup>	99%
Pertussis	200,752	13,506 <sup>‡</sup>	93%
Pneumococcal Disease	16,069	4,167 <sup>‡</sup>	74%
Polio	16,316	0 <sup>‡</sup>	100%
Rubella	47,745	4 <sup>‡</sup>	99%
Congenital Rubella	152	1 <sup>‡</sup>	99%
Smallpox	29,005	0 <sup>‡</sup>	100%
Tetanus	580	14 <sup>‡</sup>	98%
Varicella	4,085,120	449,363 <sup>‡</sup>	89%

Adapted from; CDC. *JAMA*, November 14, 2007; 298(18):2155–63. † CDC. *MMWR*, January 8, 2010; 58(51,52):1458–68. ‡ 2008 estimates, *S. pneumoniae* estimates from Active Bacterial Core Surveillance.

## Endnotes

- 1 United States Fund for UNICEF. (n.d.). Immunization for All Children: Think BIG. Retrieved from <http://www.unicefusa.org/work/immunization/?gclid=CJbxlOK0mr0CFbBj7Aod0noAcg>
- 2 Andre, F. E., et al. (Feb. 2008). Vaccination Greatly Reduces Disease, Disability, Death and Inequity Worldwide. *Bulletin of the World Health Organization*, 86(2), 81-160. Retrieved 12 Dec. 2013 from <http://www.who.int/bulletin/volumes/86/2/07-040089/en/>
- 3 Van Panhuis, W.G., et al. (18, November 2013). Contagious Disease in the United States from 1888 to the Present. *New England Journal of Medicine*, 369(22).
- 4 Zhou, F., A. Shefer, Y. Kong, and J. P. Nuorti. Trends in Acute Otitis Media-Related Health Care Utilization by Privately Insured Young Children in the United States, 1997-2004. *Pediatrics* 121.2 (2008): 253-60.
- 5 U.S. Department of Health and Human Services. (n.d.). *2020 Topics & Objectives; Immunization and Infectious Diseases*. Retrieved 12 Dec. 2013 from <http://www.healthypeople.gov/2020/topic-objectives/2020/overview.aspx?topicid=23>
- 6 WHO, UNICEF, World Bank. (2009) *State of the world's vaccines and immunization*, 3rd ed. Geneva, World Health Organization.
- 7 World Health Organization. (n.d.). *World Immunization Week 2012, Quick Facts*. Retrieved 12 Dec. 2013 from [http://www.who.int/immunization/newsroom/events/immunization\\_week/2012/further\\_information/en/index1.html](http://www.who.int/immunization/newsroom/events/immunization_week/2012/further_information/en/index1.html)
- 8 Centers for Disease Control and Prevention. (20 May 2011). Ten Great Public Health Achievements – United States, 2001-2010. Retrieved 11 Dec. 2013 from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6019a5.htm>
- 9 International Vaccine Access Center at Johns Hopkins Bloomberg School of Public Health. Vaccines Work: Key Facts and Figures. Retrieved at <http://www.jhsph.edu/research/centers-and-institutes/ivac/resources/vaccine-cost-effectiveness.html>
- 10 Centers for Disease Control and Prevention. (2011 January 14). Local health department costs associated with response to a school-based pertussis outbreak — Omaha, Nebraska, September-November 2008. *MMWR*, 60(1), 5-9. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6001a2.htm>
- 11 California Department of Public Health. (n.d.). Pertussis (Whooping Cough). Retrieved Dec. 2013 from <http://www.cdph.ca.gov/HealthInfo/discond/Pages/Pertussis.aspx>
- 12 Zhou, F., et al. (2014). Economic Evaluation of the Routine Childhood Immunization Program in the United States, 2009. *Pediatrics*, 133(4).
- 13 Sugarman, D.E., et al. (2010). Measles Outbreak in a Highly Vaccinated Population, San Diego, 2008: Role of the Intentionally Undervaccinated. *Pediatrics*. 125, 747-755. doi: 10.1542/peds.2009-1653.
- 14 Centers for Disease Control (CDC). Immunizations and Respiratory Factsheet. Retrieved from [http://www.cdc.gov/fmo/topic/budget%20information/factsheets/IRD\\_Factsheet.pdf](http://www.cdc.gov/fmo/topic/budget%20information/factsheets/IRD_Factsheet.pdf)