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For Parents

Vaccine Effectiveness

Do vaccines work?

Yes. Vaccination is one of the greatest achievements of medicine and has spared millions of people the effects of devastating diseases.

Before vaccines became widely used, infectious diseases killed thousands of children and adults each year in the United States:

- Before 1985, **Haemophilus Influenzae type b (Hib)** caused serious infections in 20,000 children each year, including meningitis (12,000 cases) and pneumonia (7,500 cases).¹ In 2002, there were 34 cases of Hib disease.
- In the 1964-1965 epidemic, there were 12.5 million cases of **rubella** (German measles).² Of the 20,000 infants born with congenital rubella syndrome, 11,600 were deaf, 3,580 were blind, and 1,800 were mentally retarded as a result of the infection.² There were **9 cases of rubella in 2004** and only four cases of congenital rubella between 2001 and 2004.
- Before 1963, more than 3 million cases of **measles** and 500 deaths from measles were reported each year.² More than 90% of children had measles by age 15.² In 2002, there were 44 cases of measles
- In 1952, **polio** paralyzed more than 21,000 people.² In 2002, there were no cases of polio in the United States.
- In the early 1940s, there was an average of 175,000 cases of **pertussis** (whooping cough) per year, resulting in the deaths of 8,000 children annually.² In 2002, 9,771 cases were reported.
- In the 1920s, there were 100,000 to 200,000 cases of **diphtheria** each year and 13,000 people died from the disease.² In 2002, there was only one case of diphtheria in the United States.

As a result of the high level of immunization in the United States these diseases have declined to near zero.

Is it better to be naturally infected rather than vaccinated?

No. Diseases cause suffering and, in some cases, permanent disability or death. Vaccines allow a person to be protected from the disease without experiencing the serious adverse effects of that illness.

- It is much better to gain immunity from a vaccine. Vaccine-preventable diseases can kill; they can cause permanent disabilities such as paralysis from polio, liver damage or liver cancer from hepatitis B infection, and deafness from meningitis caused by several bacteria (Hib, pneumococci, and meningococci). In addition, brain damage can result from measles, Hib meningitis, or pertussis. If a woman gets rubella while pregnant, her baby could have serious birth defects.
- Immunity from a vaccine offers protection against future disease that is similar to immunity acquired from a natural infection, although several doses of a vaccine may have to be given for a child to have a full immune response.
- For some vaccines (e.g. tetanus and Hib) the vaccine is sometimes better at creating immunity than a natural infection would be.²

Because of better hygiene and sanitation, hadn't diseases already begun to disappear before vaccines were introduced?

No, they had not begun to disappear. In the 20th century, infectious diseases began to be better controlled because of improvements in hygiene and sanitation (clean water and pest control). However, the incidence of vaccine-preventable diseases only began to drop dramatically after the vaccines for those diseases were licensed and began to be used in large numbers of children.

- For example, there were about 500,000 reported cases and 500 deaths from measles each year before the measles vaccine was licensed in 1963.² In 2002, only 44 cases were reported in the United States.³
- Since the Hib vaccine was introduced in 1985, serious Hib disease has declined from about 20,000 cases per year to 34 cases in 2002.¹⁴

During an outbreak, aren't the majority of people who catch a disease those who have been vaccinated?

Although vaccines have very high effectiveness rates, they are not completely effective for 100% of the people who receive them. For example, a full series of measles vaccine will protect 99 of 100 children from measles, and polio vaccine will protect 99 of 100 children from polio.² This means that when there is a disease outbreak, the very small number of people for whom the

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vaccine did not work may still be able to catch the disease. Because almost all of our children are immunized, and only few are not, it can be the case that during an epidemic the majority of cases occur among children who were immunized. However, the fact remains that those who have not received the vaccine are much more likely to catch the disease.

- By way of example, consider an actual measles outbreak in Colorado in December 1994.⁵ Out of 625 children exposed to the disease, 17 got measles. Of those 609 who had previously been vaccinated, only 10 (or 1.6%) developed measles. Of the 16 children who were not immunized, 7 (or 44%) developed measles. Thus, the risk for immunized children was less than 2% while the risk for unimmunized children was 44%.

If vaccine-preventable diseases have been virtually eliminated from the United States, why do American children need to be vaccinated?

Although many of these diseases have the potential to be eliminated, outbreaks of diphtheria, measles, and other vaccine-preventable diseases still occur.

- Children who are not vaccinated against measles are 35 times more likely than immunized children to catch the disease.⁶ Ten years ago (during the 1989 to 1991 measles epidemic), state health departments in the United States reported 55,622 measles cases, 11,251 hospitalizations, and 125 deaths.²⁷ Research has shown that these epidemic numbers are due to the fact that in some areas only 50% of preschool-aged children had received the vaccine.²
- Without vaccines, the diseases we are now protected from will return. Thousands of children will become sick, some will have long-lasting health problems, and some will die.
- Other countries do not have the same levels of immunization that we benefit from in the United States. Therefore, we must all remain protected with vaccines because dangerous diseases largely under control in the United States are only a plane ride away.

Recommended Books and Websites on this Topic

- American Academy of Pediatrics [web site](#)
- Centers for Disease Control and Prevention [web site](#)
- Humiston SG and Good C. Vaccinating your child: Questions & answers for the concerned parent. Atlanta: Peachtree Publishers; 2000.
- Offit PA and Bell LM. Vaccines: What every parent should know, revised edition. New York: IDG Books; 1999.

Sources

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6. Salmon DA, Haber M, Gangarosa E, Phillips L, Smith NJ, and Chen RT. **Health consequences of religious and philosophical exemptions from immunization laws.** *JAMA* 1999;282(1):47-53.
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Diseases Prevented by Vaccines

Anthrax	Diphtheria	Haemophilus Influenzae type b (Hib)
Hepatitis A	Hepatitis B	Human Papillomavirus (HPV)
Influenza	Japanese Encephalitis	Lyme Disease
Measles	Meningococcal	Mumps
Pertussis (Whooping Cough)	Pneumococcal Disease	Polio
Rabies	Rotavirus	Rubella
Shingles (Herpes Zoster)	Smallpox	Tetanus
Tuberculosis	Typhoid Fever	Varicella (Chickenpox)

Yellow Fever

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