Misconceptions about Vaccines

March of Dimes Foundation
A crowd of people receives inactivated poliovirus vaccine in Protection, Kansas

Many misconceptions about vaccines have persisted for decades because of a poor understanding of how vaccination works. Some of the most common vaccination-related misconceptions are addressed here.

The “Overloaded Immune System” **Misconception**

Perhaps the most common misconception is that a child’s immune system can be “overloaded” if the child receives multiple vaccines at once. This concern first began to appear as the recommended childhood immunization schedule expanded to include more vaccines, and as some vaccines were combined into a single shot. However, studies have repeatedly demonstrated that the recommended vaccines are no more likely to cause adverse effects when given in combination than when they are administered separately.

Some parents decide to “spread out” the time period during which their children receive vaccinations “just in case” this misconception is accurate. However, there is no scientific evidence to support this approach, and delaying vaccinations puts children at risk of contracting preventable diseases.

The “Disappeared Diseases” **Misconception**

Some people assume that because diseases like polio have disappeared from the United States, it’s no longer necessary to vaccinate children against them. However, polio is still widespread in other parts of the world, and could easily begin re-infecting unprotected individuals if it were re-introduced to the country. Another example is measles, which has become rare in the United States: U.S. outbreaks of the disease have occurred when Americans traveling to countries where measles remains widespread brought the disease back with them. With adequate vaccination rates, most of these types of outbreaks can be prevented. But if vaccination rates drop, “imported” cases of preventable diseases can begin to spread again. In the early 2000s, for example, low vaccination rates in England allowed measles to become endemic once again after earlier vaccination rates had halted its continuous transmission in the country.

The “More Vaccinated Than Unvaccinated People Get Sick” **Misconception**

When there’s an outbreak of a disease that’s rare for a given area, such as measles in the United States, unvaccinated people aren’t the only ones at risk. Because no vaccination is 100% effective, some vaccinated individuals will get the disease as well. In fact, during an outbreak, the number of vaccinated individuals who get sick will often outnumber the unvaccinated people who get sick. This, however, is not because vaccines are ineffective, but because there are so few people who avoid vaccination in the first place. Look at the numbers for a hypothetical outbreak:

You have a group of 500 people who have been exposed to an outbreak of a rare disease. Of those 500 people, 490 have been vaccinated; 10 have not. Different vaccines provide different rates of protection, but in this case, let's assume that 98 of every 100 people who are vaccinated will successfully develop immunity against the disease.

When exposed to the outbreak, all 10 of the unvaccinated individuals get the disease. What about the 490 who were vaccinated?

Based on the assumption of 98 of every 100 people developing successful immunity (leaving two of the 100 unprotected), about 10 of the 490 vaccinated individuals will get the disease—the same as the number of unvaccinated individuals.

Those numbers, however, don't take into account the *percentage* of vaccinated and unvaccinated individuals who got sick. Of those who fell ill, 10 had been vaccinated and 10 had not. But the 10 who had been vaccinated are only (10 / 490) = 2% of the individuals who had been vaccinated in the population of 500. The 10 who *hadn't* been vaccinated are (10 / 10) = 100% of those who weren't vaccinated. The final results of the outbreak, therefore, look like this:

Population size: 500

Vaccinated individuals: 490

Unvaccinated individuals: 10

Percentage of vaccinated individuals who fell ill: 2%

Percentage of unvaccinated individuals who fell ill: 100%

The "Hygiene and Better Nutrition Are Responsible for the Reduction in Disease Rates, Not Vaccination" **Misconception**

Improved hygiene and nutrition, among other factors, can certainly lower the incidence of some diseases. Data documenting the number of cases of a disease before and after the introduction of a vaccine, however, demonstrate that vaccines are overwhelmingly responsible for the largest drops in disease rates. Measles cases, for example, numbered anywhere from 300,000 to 800,000 a year in the United States between 1950 and 1963, when a newly licensed measles vaccine went into widespread use. By 1965, U.S. measles cases were beginning a dramatic drop. In 1968 about 22,000 cases were reported (a drop of 97.25% from the height of 800,000 cases in just three years); by 1998, the number of cases averaged about 100 per year or less. A similar post-vaccination drop occurred with most diseases for which vaccines are available.

Perhaps the best evidence that vaccines, and not hygiene and nutrition, are responsible for the sharp drop in disease and death rates is chickenpox. If hygiene and nutrition alone were enough to prevent infectious diseases, chickenpox rates would have dropped long before the introduction of the varicella vaccine, which was not available until the mid-1990s. Instead, the number of chickenpox cases in the United States in the early 1990s, before the vaccine was introduced in 1995, was about four million a year. By 2004, the disease incidence had dropped by about 85%.

The "Natural Immunity Is Better Than Vaccine-acquired Immunity" **Misconception**

Some people argue that the immunity gained from surviving a natural infection provides better protection than that provided by vaccines. While it's true that natural immunity *lasts* longer in some cases than vaccine-induced immunity can, the risks of natural *infection* outweigh the risks of immunization for every recommended vaccine.

For example, wild measles infection causes encephalitis (inflammation of the brain) for one in 1,000 infected individuals, and, for every 1,000 reported measles cases, two individuals die. The combination MMR (measles, mumps, and rubella) vaccine, however, results in encephalitis or a severe allergic reaction only once in every *million* vaccinated individuals, while preventing measles infection. The benefits of vaccine-acquired immunity extraordinarily outweigh the serious risks of natural infection, even in cases where boosters are required to maintain immunity.

Additionally, the Hib *(Haemophilus Influenzae* type b) and tetanus vaccines actually provide more effective immunity than natural infection.

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