

Why We Need More and Better Vaccines

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Vaccines have been a success story of modern medicine. The twentieth century was marked by tremendous achievements in controlling, through vaccination, once-common infections such as polio, measles, and diphtheria. As late as 1967, smallpox virus killed one in four victims; by 1977, this “king of terrors” had been completely eradicated by an unprecedented international immunization campaign.

Tragically, however, in some ways vaccines have become victims of their own successes. Consider the alleged link between the measles-mumps-rubella (MMR) vaccine and autism. First made in 1998 and now thoroughly discredited, many parents panicked and withheld MMR from their children. In the United Kingdom, for example, MMR coverage declined from 91 percent in 1997 to 82 percent in 2004—and cases of mumps rose twentyfold over the same period. A generation of young adults, now parents themselves, has come of age in a climate of ambivalence for, or distrust of, vaccines, without ever having to endure the devastating diseases now rendered rare or nonexistent by immunization.

Every year, seasonal influenza hospitalizes hundreds of thousands of Americans, killing roughly one-tenth of that number. Yet, only 40 percent of citizens get the annual flu shot to prevent it. Compounding that, when a new flu strain emerges, as happened in 2009, it takes too long to produce and distribute a vaccine specially tailored to prevent it. These needless problems could be solved by a universal influenza vaccine, one that would offer protection for ten years and be effective against new pandemic strains.

Less a problem in the developed world, tuberculosis and malaria are still the fourth and fifth leading causes

of death from infections worldwide. We need effective vaccines for both, particularly as drug-resistant strains render existing medications ineffective faster than we can invent new therapies. To curb diseases in the developing world, we must develop cost-effective technologies that would make obsolete the need for refrigeration and needles to administer the vaccines.

We also now see the promise of vaccines for the prevention and treatment of cancer. Some cancers that are triggered by viral infections—such as the cervical, anogenital, and head and neck cancers caused by some strains of human papilloma virus—can already be prevented by vaccination. In the U.S., about half of all cases of hepatocellular carcinoma, a form of liver cancer, are caused by the hepatitis B (HBV) and hepatitis C (HCV) viruses. We now have an effective vaccine against HBV but not yet against HCV, which currently infects an estimated 3 million to 4 million Americans, accounts for one-third of liver cancers, and imposes an enormous financial burden on the U.S. health care system.

History shows that vaccines can prevent many deadly diseases. With enlightened leadership and expanded funding for basic, clinical, and translational research into disease pathology and immunology, biomedical science could indeed conquer many of today’s plagues. Concurrently, public health campaigns must be expanded to better publicize the immense benefits and minimal risks of modern vaccines. It should be our moral and scientific imperative to do so.

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