

NIH News in Health

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Safeguarding Our Health Vaccines Protect Us All

We share more than food and culture within our homes and communities. We can also spread disease. Luckily, we live in a time when vaccines can protect us from many of the most serious illnesses. Staying current on your shots helps you—and your neighbors—avoid getting and spreading disease.

Vaccines have led to large reductions in illness and death—for both kids and adults—compared with the “pre-vaccine era,” says Dr. David M. Koelle, a vaccine expert at the University of Washington in Seattle. Vaccines will prevent about 322 million illnesses, 21 million hospitalizations, and 732,000 deaths among U.S. children born over the last 20 years, according to a recent report.

Vaccines harness your **immune system**'s natural ability to detect and destroy disease-causing germs and then “remember” the best way to fight these germs in the future. Vaccination, or immunization, has completely eliminated naturally occurring smallpox worldwide—to the point that we no longer need to get shots against this fast-spreading, once-deadly disease. Polio too has been eliminated in the U.S. and most other nations as well, thanks to immunizations. Poliovirus can affect the brain and spinal cord, leaving people unable to move their arms or legs, or sometimes unable to breathe.

“These childhood diseases used to be dreaded problems that would kill or paralyze children,” says Koelle. “In the 1950s, it was a common occurrence for kids to be fine in the spring, get polio over the summer, and then have to go back to school in the fall no longer able to walk.”

Experts recommend that healthy children and teens get shots against 16 diseases (see Wise Choices box). With this growing list, many disabling or life-threatening illnesses have significantly declined in the U.S., including measles, rubella, and whooping cough. But, unlike smallpox, these disease-causing germs, or pathogens, still exist around the world.

“These days, the risks of not being vaccinated in a developed country, like the United States, may seem superficially safe because of low rates of infection due to vaccination and other advances in public health,” says Koelle. “But we live in an era of international travel where we can be exposed to mobile pathogens.” So even if you don’t travel, a neighbor or classmate could go overseas and bring the disease back to your area.

“When the rates of vaccination drop, there can be a resurgence of the disease,” explains Dr. Saad Omer, a global health researcher at Emory University in Atlanta. For instance, measles was completely eliminated in the U.S. in 2000. But since then, hundreds of travel-related cases have



occurred, with a spike of more than 600 measles cases in 2014.

Omer and colleagues examined U.S. reports on measles outbreaks since 2000. “We found that measles cases have occurred mostly in those who are not vaccinated and in communities that have lower rates of vaccination. And that’s true for many vaccine-preventable diseases,” Omer says. Most of the unvaccinated cases were those who chose not to be vaccinated or not to have their children vaccinated for non-medical reasons.

When enough people are vaccinated, the entire community gains protection from the disease. This is called community immunity. It helps to stop the spread of disease and protects the most vulnerable: newborns, the elderly, and people fighting serious illnesses like cancer. During these times, your immune system is often

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Definitions

Immune System

A collection of specialized cells and organs that protect the body against infectious diseases.

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too weak to fend off disease and may not be strong enough for vaccinations. Avoiding exposure becomes key to safeguarding your health.

"There's a huge benefit to all of us getting the recommended vaccines," explains Dr. Martha Alexander-Miller, an immune system expert at Wake Forest Baptist Medical Center in Winston-Salem, NC. "Number one, vaccines protect you. But they also limit the presence of disease-causing entities that are circulating in the



Wise Choices Recommended Vaccines

Talk to your doctor about staying up-to-date on shots for these 16 vaccine-preventable diseases. Learn more at www.cdc.gov/vaccines/schedules/easy-to-read/index.html.

- Bacterial meningitis
- Chickenpox
- Diphtheria
- *Haemophilus influenzae* type b
- Hepatitis A and Hepatitis B
- Cervical & other cancers caused by human papillomavirus (HPV)
- Influenza (flu)
- Measles, Mumps, and Rubella
- Pertussis (whooping cough)
- Pneumococcal pneumonia
- Rotavirus diarrhea
- Shingles
- Tetanus

community. So, you're helping to protect individuals who may not be capable of protecting themselves, for example because they are too young to get vaccinated."

When expectant moms are vaccinated, immune protection can pass through the placenta to the fetus. "Early on, the baby's immune system is immature. So there's a period of vulnerability where disease and death can occur," Omer explains. "But the mother's own antibodies—proteins formed by her immune system—can protect the baby."

Doctors recommend that moms-to-be get both flu and Tdap (tetanus, diphtheria, and whooping cough) shots, so her body will make antibodies against these diseases. A mother's antibodies can help protect the newborn until they can receive their own vaccinations.

Some vaccines must be given before pregnancy. Rubella, for instance, can cause life-altering birth defects or miscarriage if contracted during pregnancy. There's no treatment, but the measles, mumps, and rubella (MMR) vaccine given pre-pregnancy offers prevention. Vaccines for many other common diseases that put newborns at risk are being studied.

"We've made amazing progress in the development of effective vaccines," says Alexander-Miller. "Our ability to have such breakthroughs is the end result of very basic research that went on for years and years. But we still don't know everything that we need to know about how to create the very best vaccine." NIH-funded scientists are continuing to search



Web Links

For more about vaccines, click the "Links" tab at:

<http://newsinhealth.nih.gov/issue/Jul2016/Feature1>

for new ways to stimulate protection against various diseases.

Koelle studies how our bodies fight herpes viruses. There are 8 related herpes viruses, but the body responds differently to each one. So far, we only have a vaccine for one: varicella-zoster virus, which causes chickenpox and shingles.

Koelle's team is comparing how our immune system responds to chickenpox and the herpes simplex viruses, which cause mouth and genital sores. "We're hoping to harness the success that has been possible with the chickenpox vaccine and see if we can create a vaccine that would work for both chickenpox and shingles and also herpes simplex," he says.

Researchers are also working to improve existing vaccines. Some vaccines require a series of shots to trigger a strong immune response. The protection of other vaccines can fade over time, so booster shots may be needed. Some, like the flu vaccine, require a shot each year because the virus changes so that the vaccine no longer protects against new strains. So keeping up with the latest flu vaccines is important.

Ask your doctor's office whether your vaccinations are current. You may also find records of vaccinations at your state health department or schools. If you can't find your records, ask your doctor if it's OK to get a vaccine you might have received before.

Most side effects of vaccines are mild, such as a sore arm, headache, or low-grade fever.

"It can be easy to take vaccines for granted, because you'll never know all the times you would've gotten really sick had you not been vaccinated," says Alexander-Miller.

Help your community keep diseases at bay: Stay up-to-date with vaccines. ■

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A Blurry Worldview

Understanding Myopia

As a child in school, did you ever struggle to see what the teacher wrote on the board? Maybe you could easily read from a book, but things further away—like highway signs—looked blurry. Blurry distant vision is the main symptom of myopia, a condition that affects about a third of American adults.

If you have myopia, you'll have trouble seeing things far away, but you'll be able to see nearby things clearly. This is why myopia is commonly called nearsightedness. Other symptoms of myopia include headaches, eyestrain, and squinting.

Myopia typically begins in childhood. In most cases, the amount of nearsightedness someone has stabilizes by the time they reach adulthood. Some people, however, may have myopia that continues to worsen with age.

"Myopia develops gradually, says Dr. Mary Frances Cotch of NIH's National Eye Institute. "Children often

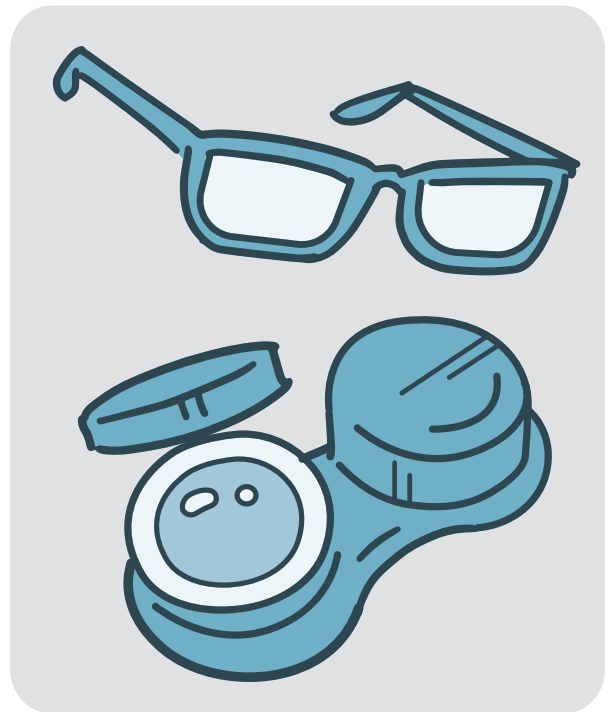
don't realize they are myopic because myopia develops gradually and they don't have any way of knowing that their blurry vision is different from others."

When you look at an object, the light rays of that object pass through the **cornea** and the lens of the eye. These bend (refract) the light and focus it on the light-sensitive tissue at the back of the eye (the retina). If you have perfect vision, the rays focus directly on the surface of the retina. In a myopic eye, the eyeball is usually too long from front to back. This causes light rays to focus at a point in front of the retina, rather than directly on its surface. This makes distant objects blurry.

Myopia can also be the result of a cornea that is too curved or a lens that is too thick. For some, myopia may be caused by a combination of these problems.

What causes the eyeball to grow too long isn't completely known, but NIH-funded researchers are exploring several possibilities. For many people, myopia appears to be inherited, so if you have a parent with myopia, you're at increased risk for developing it yourself.

Myopia is becoming increasingly common, both in the U.S. and around the world. The problem is especially prominent among school-age children living in urban areas in some Asian countries. In a study published in 2008, NIH experts found that the number of Americans with myopia



increased significantly from the 1970s to the early 2000s. The researchers estimated that at least 33% of Americans are nearsighted.

Researchers are looking to see if and how myopia might be related to a person's sex, age, ethnicity, and environmental exposures—such as sunlight or the amount of time spent doing close-up work. In the past, experts thought that myopia might arise in children who spent too much time indoors reading and writing, which require close-up vision, or from reading in poorly lit rooms. Recent studies, however, suggest that increased myopia in children might instead be related to kids spending less time outdoors. Continued research into how myopia develops will begin to sort out the potential causes and influences.

If distant objects seem out of focus, talk with an eye care professional. He or she can diagnose myopia or other eye problems and recommend options to improve your vision. ■



Wise Choices To Correct Myopia

- **Prescription lenses**, either eyeglasses or contacts, are precisely curved to refocus light before it enters the eye. This helps light hit the sweet spot on the retina to provide the clearest possible vision.
- **Eye surgery**, such as LASIK and PRK, changes the shape of the cornea so that light hits the retina properly. Phakic intraocular lenses (IOLs), a new option for people who are very nearsighted or whose corneas are too thin for LASIK or PRK, are surgically implanted inside the eye.
- **Visit an eye care professional** for a diagnosis, prescription lenses, and to discuss surgical options.



Definitions

Cornea

A clear dome-shaped surface that covers and protects the front of the eye.



Web Links

For more about myopia and eye health, click the "Links" tab at: <http://newsinhealth.nih.gov/issue/Jul2016/Feature2>



Health Capsules

For links to more information, see these stories online:
<http://newsinhealth.nih.gov/issue/Jul2016/Capsule1>

Physical Activity Linked to Reduced Cancer Risk

Leisure-time physical activity—such as walking, running, or swimming—is associated with a reduced risk of developing 13 different types of cancer, a new study reports.

Past research has shown that the benefits of physical activity can include weight control; strengthening bones and joints; and reducing the risk for heart disease and other disorders. An international research team decided to take a close look at the links between physical activity and different types of cancer.

The researchers pooled data from 12 studies that together followed 1.44 million people over time to assess cancer risk. Study participants ranged from 19 to 98 years old. They were surveyed about time spent in

moderate to vigorous leisure-time physical activities. The scientists took into account factors such as age, smoking, alcohol use, diet, and education.

During a follow-up of about a decade, 187,000 new cases of cancer arose. People with the highest level of leisure-time physical activity had a reduced risk for 13 of 26 types of cancer compared to those with the lowest level of activity.

Those with the highest activity had a 20% lower risk for 7 cancer types: esophageal adenocarcinoma, liver, lung, kidney, gastric cardia, endometrial, and myeloid leukemia. They also had a 10-20% lower risk for myeloma and cancers of the head and neck, rectum, bladder, and breast.

Leisure-time physical activity was also linked to a higher risk of malignant melanoma—likely due to greater sun exposure.

“Leisure-time physical activity is known to reduce risks of heart disease and risk of death from all causes. Our study demonstrates that it’s also associated with lower risks of many types of cancer,” says study lead author Dr. Steven Moore of NIH. “Health care professionals counseling inactive adults should promote physical activity as a component of a healthy lifestyle and cancer prevention.” ■

Understanding Aphasia

Aphasia is a complicated disorder that disrupts a person’s ability to communicate. It’s caused by damage to one or more of the language areas in the brain. People with aphasia may have trouble understanding and using language. Often, reading and writing abilities are also impaired. The condition affects about 1 million people in the U.S.

Aphasia often occurs following a stroke or head injury. It may also develop slowly, as the result of a brain tumor or neurological disease. The type and seriousness of language problems depend on the location of brain damage.

Two of the most common types of aphasia are Wernicke’s and Broca’s

aphasia. People with Wernicke’s aphasia may speak in long strings of real or nonsense words. They typically have trouble understanding language. Those with Broca’s aphasia may understand speech and know what they want to say, but they often speak in short phrases that are spoken with great effort; they may omit small words, such as “is” or “the.”

Language therapy should begin as soon as possible and be tailored to the needs of each person.

NIH supports a wide range of studies to better understand and treat aphasia. Learn more about aphasia at these NIH web pages: www.ninds.nih.gov/disorders/aphasia/aphasia.htm and www.nidcd.nih.gov/health/aphasia. ■

Featured Website Test Your Sense of Pitch

www.nidcd.nih.gov/tunestest/test-your-sense-pitch

Ever been told that you’re tone-deaf or have a tin ear? These relate to a sense of pitch—roughly speaking, the highness or lowness of a sound. Research shows that 2% to 5% of the U.S. population has problems with pitch perception. Want to test your own sense of pitch? Visit this NIH website and give it a listen.

The screenshot shows the NIH website interface for the 'Take the Distorted Tunes Test'. At the top, there is a navigation menu with links for Home, Health Info, Research, Funding, Training, News & Events, and About Us. Below the menu, there are links for 'Order free publications' and 'Find organizations'. The main content area is titled 'Take the Distorted Tunes Test' and includes a welcome message, instructions for taking the test, and a 'Play example tune' button. Below the button, there is a form with the question 'Was tune played correctly?' and 'Yes' and 'No' radio buttons. At the bottom, there is a message: 'Now you're ready to begin the test. Good luck and have fun!'.

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