

# Chasing a better flu vaccine, with science and guesswork

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Credit: National Cancer Institute

In their first assessment of this season's influenza vaccine, federal health officials said last week that the current vaccine is 36 percent effective overall.

The report left many people wondering if it's worth getting a flu

shot—the answer is yes—but it also helped explain why the nation's [flu season](#) has been particularly severe this year and illuminates how researchers hope to produce a better [vaccine](#) in the future.

This year's vaccine falls in the middle range of seasonal effectiveness rates, which have varied from 10 percent to 60 percent since 2004. But the vaccine is only 25 percent effective against H3N2, the strain of influenza that is circulating widely and causing most of the infections this year.

"Frankly, H3N2 causes the more severe seasons," said Dr. Edward Belongia, who leads vaccine effectiveness research at Marshfield Clinic in north-central Wisconsin. "We see more hospitalizations, we see more deaths. Those are the years when we most need an effective vaccine—but those are the years when we see the least protection."

The Marshfield Clinic pioneered the current method of estimating vaccine effectiveness in the United States in 2004 and has remained central to that research ever since. It is one of five federally funded sites where outpatient clinics test vaccine effectiveness. To do that, they compare vaccination rates among patients who see their doctors for respiratory illnesses but don't have the flu with rates among patients who see their doctors for actual influenza.

The variability in vaccine effectiveness depends on many factors, including how well vaccine makers anticipate the various flu [strains](#) that will hit the United States as they circulate across the globe. Manufacturers typically have to start making vaccine months before the flu season begins in earnest, requiring a certain amount of guesswork and leaving the possibility of a mismatch between the vaccine they produce and the dominant strains that ultimately emerge.

"It is a flawed vaccine, but it is what we have at the present time," said

Dr. Priya Sampathkumar, an infectious disease specialist at the Mayo Clinic in Rochester, Minn. "We need to continue to work on the vaccine. Every year it is a guessing game what to include in the vaccine."

But the manufacturing process itself can also weaken protection against some strains, including the severe H3N2. Even when the right viruses are selected to be included in the vaccine, problems can be caused by the most common method of growing vaccine: cultivating it in hens' eggs.

"They are difficult to grow in eggs and the process induces mutations," said Belongia. As a result of the mutations, the vaccine loses efficacy at fighting real-world viruses.

Belongia said this argues for more research into alternative cell-based vaccine growing technologies, and eventually the development of a [universal vaccine](#) that provides protection against all strains.

"The long term game plan is a universal vaccine," he said.

A universal vaccine would take the guesswork out of selecting flu strains for the virus. It also might provide lifetime protection, eliminating the need for the annual shot.

Compared to a decade ago, researchers understand much more about influenza and vaccines, Belongia said. Rather than simply examining different strains of the virus, scientists can now examine different molecular subtypes to see how they are affected by vaccines. Belongia has researched whether vaccine is more effective when people get shots every year, and whether its effectiveness wanes over the course of a single season.

"The good news is we're asking questions now that no one was even asking 10 years ago," he said. "That's progress but we still have a long

way to go."

But even at 36 percent effectiveness, doctors say a flu shot is valuable: It protects the public by limiting the spread of the flu and it can reduce the symptoms among individuals who do get infected.

"It may not protect you from getting the illness. It will protect you from getting as ill," said Sampathkumar. Significantly, she added, vaccine has been shown to reduce hospitalizations and prevent deaths.

Because the flu is so widespread, even a vaccine with limited effectiveness can save thousands of lives, Belongia said.

"If it is a bad season—and this is a bad season—that's going to prevent thousands of hospitalizations and deaths," he said. "Twenty-five percent [vaccine effectiveness](#) translates into thousands of prevented hospitalizations and ICU admissions and many deaths prevented."

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