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What we know so far about vaccines and Covid-19 variants

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Viruses' only purpose in life is to replicate — but that doesn't mean they're perfect at it. Mistakes, called mutations, show up as variations in their genetic code. These mutations are often inconsequential and don't change the way that the virus looks or behaves. But sometimes, a mutation makes a virus better able to replicate, by helping it evade the body's immune system or attach to human cells. The virus copies with that mutation form a new strain, or **variant**, of the virus.

Several variants of the SARS-CoV-2 virus have emerged over the course of the pandemic — some after the first vaccines were put into use. Governments, vaccine manufacturers and independent researchers are studying how well current vaccines work on high-profile variants. If a vaccine offers less protection from a given variant, companies may investigate variant-specific booster shots. The FDA has already stated that companies would only need to go through modified trials to prove any updated booster shots are safe and effective.

Vaccine efficacy against notable Covid-19 variants

A note on available information

There is a range of information available on vaccine reliability. Some of that data has been **peer-reviewed and published in scientific journals**, while some comes from **preprint studies** published online or **press releases from drug companies**. Though peer-reviewed journals are the gold standard in research, the publishing process can take months. During the pandemic, many groups relied on getting information out through speedier channels, even without the peer review.

Real-world studies or trials are the best way to assess how well vaccines work against variants. In these studies, scientists monitor how many people develop symptomatic Covid-19 in countries where certain variants are more prevalent. Scientists are also working on early **lab studies** where real-world studies haven't been possible yet. Only real-world studies and trials are shown in the below chart.

Information on real-world studies and data presented in this chart will be color-coded based on source:

Peer-reviewed, published study

Company statement, not peer reviewed

VARIANT

Location first identified

VACCINE	B.1.1.7 U.K.	B.1.351 South Africa	P.1 Brazil	B.1.617.2 India
Pfizer-BioNTech	Real world data: Multiple studies have shown slightly different results. One study in Israel found the vaccine was 89 percent effective at preventing symptomatic Covid-19 cases. Another study, in Qatar, found it was more than 95 percent effective at preventing symptomatic Covid-19 cases and more than 97 percent effective at preventing severe cases. ^{1,2}	Real world data: A study in Qatar showed the vaccine was 75 percent effective at preventing symptomatic Covid-19 cases and more than 97 percent effective at preventing severe infection. ²	No real-world studies available yet.	No real-world studies available yet.
Moderna	No real-world studies available yet.	No real-world studies available yet.	No real-world studies available yet.	No real-world studies available yet.
Johnson & Johnson	No real-world studies available yet.	Real world data: Results from South Africa showed the vaccine was 52 percent effective against moderate cases and 73 percent effective at protecting against severe cases. ³	Real world data: Results from Argentina, Brazil, Chile, Colombia, Mexico and Peru showed the vaccine was 66 percent effective against moderate cases and 82 percent effective at protecting against severe cases. ³	No real-world studies available yet.
AstraZeneca <i>Not yet authorized in the U.S. but available in the U.K.</i>	Real world data: This study in the U.K. tried to look at effectiveness against the U.K. variant. It seemed to be about 70 percent effective at preventing symptomatic cases. However, the confidence intervals (a form of statistical analysis to determine reliability of results) were large, so the data is not totally conclusive. ⁴	Real world data: A small study in South Africa showed the vaccine was about 22 percent effective against the variant. (To get emergency authorization, vaccines need to be at least 50 percent effective.) ⁵	No real-world studies available yet.	No real-world studies available yet.
Novavax <i>Not yet authorized in the U.S., U.K., or EU.</i>	Ongoing real world study: The company reports its vaccine is about 85 percent effective against symptomatic cases from the U.K. strain, in the U.K. ⁶	Real world data: Results from South Africa show the vaccine was 51 percent effective at preventing symptomatic cases. ⁷	No real-world studies available yet.	No real-world studies available yet.

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