

## What does 95% COVID-19 vaccine efficacy really mean?

It is imperative to dispel any ambiguity about how vaccine efficacy shown in trials translates into protecting individuals and populations. The mRNA-based Pfizer<sup>1,2</sup> and Moderna<sup>3</sup> vaccines were shown to have 94–95% efficacy in preventing symptomatic COVID-19, calculated as  $100 \times (1 \text{ minus the attack rate with vaccine divided by the attack rate with placebo})$ . It means that in a population such as the one enrolled in the trials, with a cumulated COVID-19 attack rate over a period of 3 months of about 1% without a vaccine, we would expect roughly 0.05% of vaccinated people would get diseased. It does not mean that 95% of people are protected from disease with the vaccine—a general misconception of vaccine protection also found in a *Lancet Infectious Diseases* Editorial.<sup>4</sup>

In the examples used in the Editorial, those protected are those who would have become diseased with COVID-19 had they not been vaccinated. This distinction is all the more important as, although we know the risk reduction achieved by these vaccines under trial conditions, we do not know whether and how it could vary if the vaccines were deployed on populations with different exposures, transmission levels, and attack rates.

Simple mathematics helps. If we vaccinated a population of 100 000 and protected 95% of them, that would leave 5000 individuals diseased over 3 months, which is almost the current overall COVID-19 case rate in the UK. Rather, a 95% vaccine efficacy means that instead of 1000 COVID-19 cases in a population of 100 000 without vaccine (from the placebo arm of the abovementioned trials, approximately 1% would be ill with COVID-19 and 99% would not) we would expect 50 cases (99.95% of the population is disease-free, at least for 3 months).

Accurate description of effects is not hair-splitting; it is much-needed exactness to avoid adding confusion to an extraordinarily complicated and tense scientific and societal debate around COVID-19 vaccines.

I declare no competing interests.

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- 4 The Lancet Infectious Diseases. An exceptional vaccination policy in exceptional circumstances. *Lancet Infect Dis* 2021; **21**: 149.



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