Herd immunity was sold as the path out of the pandemic. Here's why we're not talking about it any more

June 3 2022, by Hassan Vally

Credit: cottonbro studio from Pexels

Early in the pandemic, the term "herd immunity" hit the headlines, along with a polarized discussion on how to achieve it.

Some groups were attached to the now-discredited notion of letting a dangerous virus rip through the population to reach the critical level of population immunity needed to reduce transmission.

But a more serious conversation focused on the prospect of attaining herd immunity by vaccination.

This is the idea that vaccines—when available and taken up at sufficient levels—could squash virus transmission. This would lead to the possible elimination or eradication of SARS-CoV-2, the virus that causes COVID.

The promise was this would herald the return of life back to normal.

> Can current COVID vaccines get us to herd immunity? Harvard doctor says yes. @JeffNBCBoston reports: https://t.co/f7zQzJyal4 pic.twitter.com/O3leScxh8Q
>
> — NBC10 Boston (@NBC10Boston) March 7, 2021

It's understandable why this notion gained so much attention, as it promised a complete return to a world without COVID. But in reality it was probably always a pipe dream.

As time wore on, herd immunity became even less reachable.

Here's why we're not talking about it any more, even with the high vaccination rates we see today.

What is herd immunity?

If enough people in the community develop immunity to an infectious agent such as a virus, an epidemic is unable to grow.

In fact, much like a bushfire goes out when it runs out of fuel to burn, an epidemic begins to decline when the virus runs out of susceptible people to infect.

The level of vaccine coverage needed in a population to get you over the line to achieve herd immunity is the "herd immunity threshold."

This depends on two main parameters—the infectiousness of the virus and the effectiveness of the vaccine.

In short, the more infectious the virus and the less effective the vaccine, the more people you need to vaccinate to achieve herd immunity.

Further and further out of reach

As the pandemic progressed, herd immunity via vaccination moved further and further out of reach. In fact, based on what we know about currently circulating viral variants, today, herd immunity via vaccination is mathematically impossible.

Back at the beginning of 2020, we were grappling with the original strain of SARS-CoV-2, which was much less infectious than current circulating variants.

The original strain had an estimated R0 (basic reproduction number) of two to three. That is, someone infected with the virus would spread it to, on average, two to three others.

If we assume we were working with a vaccine with an effectiveness of 80%, this yields a herd immunity threshold estimate of 60–80%. That is, when the original strain of the virus was circulating we would have needed to vaccinate 60–80% of the whole population to see the epidemic decline. Mathematically at least, this was not out of reach.

However, as we know, circumstances have changed dramatically over the course of the pandemic, with the original SARS-CoV-2 virus superseded by far more infectious variants.

Although estimates of the infectiousness for the variants are subject to some uncertainty, it is reasonable to assume delta has a reproduction number of about five and omicron may be in the ballpark of about 20, placing it up there among the most infectious diseases known.

Based on these numbers for delta and omicron, the herd immunity threshold estimates go up to 100–118%.

As you cannot vaccinate more than 100% of the population, you can see how relying on vaccination to achieve herd immunity has become progressively more mathematically impossible as the pandemic progressed.

That's not all

Over the course of the pandemic we have learnt more about how the vaccines have performed in the real world and the nature of our immune response.

Vaccines don't block all transmission

Herd immunity via vaccination, and the calculations above, assume vaccines stop transmission 100% of the time.

Although vaccines reduce transmission to a significant degree, they do not prevent it completely. If we factor this into our calculations, the challenge to achieve herd immunity becomes harder again.

Immunity wanes over time

Attaining herd immunity also assumes immunity against COVID is maintained long term. But we now know immunity wanes after vaccination and after natural infection.

So if immunity is not sustained, even if herd immunity were theoretically possible, it would only be transient. Preserving it would only come with significant effort, requiring regular delivery of boosters for the whole population.

New viral variants

Then we've seen new variants emerge with an ability to evade the immune response. Any change in the immunogenicity of new variants moves the goal posts further away, compromising our ability to achieve herd immunity to an even greater extent.

So why are we bothering to vaccinate?

While attaining herd immunity via vaccination is no longer a realistic proposition, this needs to be put into perspective.

Vaccines go hand-in-hand with other measures

It's better to consider herd immunity as a gradient rather than a binary concept. That is, even if we don't reach the herd immunity threshold, the greater the proportion of the population vaccinated, the more difficult it becomes for the virus to spread.

Therefore, vaccination can combine with other behavioral and environmental measures (such as physical distancing, wearing masks and

improving ventilation), to substantially impact the ability of the virus to move through the population.

Vaccines protect individuals

Despite the allure of herd immunity, the primary purpose of COVID vaccination has always been to protect individuals from severe illness and death, and thus the impact of disease on the population.

In this regard, despite the waning protection against infection, vaccines appear to afford more sustained protection against severe disease.

So being vaccinated remains as important now as it has always been. Right now, at the start of winter and with few COVID restrictions, it has never been more important to ensure you are fully vaccinated.

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Citation: Herd immunity was sold as the path out of the pandemic. Here's why we're not talking about it any more (2022, June 3) retrieved 18 December 2023 from https://medicalxpress.com/news/2022-06-herd-immunity-sold-path-pandemic.html

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