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Herd immunity to covid-19 may not be attainable in the UK A high vaccination rate will save many lives, but it probably won't be enough to stop covid-19 becoming a seasonal disease, finds Helen Thomson

THROUGHOUT the covid-19 pandemic, there has been constant reference to the tantalising phenomenon that signals the end: herd immunity. This is when enough people are immune to a virus that it can't spread, therefore protecting the whole community, even those who aren't immune.

More than 18 months into the pandemic, and with 59 per cent of the UK having received two doses of a covid-19 vaccine, how far is the country from the herd immunity threshold, and how will we know when it has got there?

Let's get the bad news out of the way: it is unlikely to be soon and may not be attainable at all. The good news is that we may not need herd immunity to live alongside the virus.

To appreciate why, first we need to understand herd immunity at its simplest: it is the point at which each person with covid-19 infects less than one other susceptible individual. This causes infections to decrease, with only sporadic cases that don't spread widely.

In theory, you can reach this goal through vaccination or past infection, as both provide some immunity from future infection. In reality, we have only reached herd immunity for other viruses, such as smallpox, through vaccination.

A key data point for herd immunity is the basic reproduction number – known as R or R_0 – which is the average number of people one person with an infectious disease will infect.

At the pandemic's start, the R_0 for the coronavirus was 2.5. It has since risen as the virus evolved to become more transmissible. Latest estimates put the delta variant's R_0 between 5 and 9.5, says Willem van Schaik at the University of Birmingham in the UK. "This would put the

herd immunity threshold at between 80 and 90 per cent of the population [being vaccinated]."

That may be possible to reach, but no vaccine is 100 per cent effective. Although current covid-19 vaccines are extremely effective at preventing severe disease, they don't completely block infections in everyone, which means some vaccinated people might still be able to pass on the virus. The latest data suggests that vaccines are up to 79 per cent effective against symptomatic infection from delta.

The road to herd immunity gets more complex when you consider other influencing factors, including how much social contact communities have, the age at which someone first gets infected, how people's immune systems differ, how influential pre-existing immunity is and the potential impact of genetics.

The only way to guarantee herd immunity is to have extremely effective vaccines that provide near-sterilising immunity – in

79%
Efficacy of vaccines against symptomatic delta infection

which pathogens are completely prevented from replicating – and have high uptake of these, says van Schaik. Considering these factors, it would take the impossible feat of vaccinating more than 100 per cent of the UK population to reach herd immunity, says Paul Hunter at the University of East Anglia in the UK.

You might think population immunity would build slowly over time as people gain immunity after infection. Unfortunately, immunity to covid-19 appears to be relatively short-lived, meaning reinfection is possible and booster shots may be



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needed. In addition, variants can evolve to evade existing immunity and push the goalposts back.

Finally, the varying speed and distribution of the global vaccine roll-out means that even if one country with high vaccination rates, such as Israel, gets past the herd immunity threshold, contact with people from other nations with low vaccination levels could spark new outbreaks. The UK has seen this happen with measles.

Ultimately, it all adds up to "no chance of ever reaching herd immunity for covid", says Hunter. He adds that at a UK all-party parliamentary committee held on 10 August, attending scientists were unanimous in their opinion that the UK wasn't going to reach herd immunity. Instead, most researchers seem to agree that the UK will reach what is known as an "endemic equilibrium", whereby covid-19 becomes seasonal.

The only way to avoid that situation is to get more than 95 per cent vaccine coverage in people over 12 and have a booster every year, or to develop a vaccine that creates sterilising immunity, says Thomas House at the University

National Health Service staff out in London to encourage vaccinations

of Manchester in the UK. "Or we could accept that there will be further waves, much like influenza," he says. "Before we had the vaccine, it wasn't appropriate to compare covid to flu because covid was so much worse. We shouldn't be sanguine about covid, people underestimate the effects, but post-vaccine we can compare the illness to flu."

Hunter's view aligns: "When we reach the endemic equilibrium, we will see infections vary from summer to winter and from one year to the next." But we can expect to see fewer and fewer of those infections causing severe disease, he says.

This all points in one direction: nobody should be banking on herd immunity. "Everybody should have the vaccine," says van Schaik. "Nobody can rely on 'the herd' for absolute protection against an illness that is potentially deadly and can have long-term health consequences." ■