ANTI-VACCINE MOVEMENT MIGHT UNDERMINE PANDEMIC EFFORTS

Studies of social networks show that opposition to vaccines is small but far-reaching — and growing.

By Philip Ball

As scientists work to create a vaccine against COVID-19, a small but fervent anti-vaccination movement is marshalling against it. Campaigners are seeding outlandish narratives: they falsely say that coronavirus vaccines will be used to implant microchips into people, for instance. In April, some carried placards with anti-vaccine slogans at rallies in California to protest against the state's lockdown. Last week, a now-deleted YouTube video promoting wild conspiracy theories about the pandemic and asserting (without evidence) that vaccines would "kill millions" received more than eight million views.

It's not known how many people would actually refuse a COVID-19 vaccine — and general support for vaccines remains high. But some researchers studying vaccine-opposition movements are concerned that the messages could undermine efforts to establish herd immunity to the new coronavirus. Online opposition to vaccines has rapidly pivoted to talk of the pandemic, says Neil Johnson, a physicist at George Washington University in Washington DC, who is studying the campaigners' tactics. "For a lot of these groups, it's all about COVID now," he says.

Groups opposing vaccines are small, but their online-communications strategy is worryingly effective and far-reaching, a report from Johnson's team suggests. Before the SARS-CoV-2 virus emerged, Johnson's team began mapping a network of views on vaccination, on Facebook. The researchers investigated more than 1,300 pages, followed by about 85 million individuals.

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Their findings, published on 13 May, suggest that anti-vaccination pages tend to have fewer followers than pro-vaccination ones, but are more numerous (see 'Online competition between vaccine views'). They are also more often linked to from other Facebook pages — such as parent associations at schools — whose stance on vaccination is undecided (N. F. Johnson *et al. Nature* http://doi.org/ggvvjx; 2020).

By contrast, pages that explain the scientific case for vaccination are linked in a network that is largely disconnected from this "main battlefield" for public sentiment, as Johnson puts it. An extrapolation using computer simulations suggests that opposition to vaccines might dominate the network of views on the subject within ten years, the team writes.

The work shows that "the pro-vaccine community are basically sticking to their narrative and talking to each other, and not reaching out and being responsive to the narratives that are out there among the undecided", says Heidi Larson, who directs the Vaccine Confidence Project, a group that monitors public trust in vaccines, at the London School of Hygiene and Tropical Medicine.

The issue isn't confined to Facebook. On 1 April, Johnson's team released a preprint of a study on online messaging about COVID-19 (N. Velásquez *et al.* Preprint at https://arxiv.org/abs/2004.00673; 2020). That report, which has not yet been peer-reviewed, suggests that, across different social-media platforms, links are growing between anti-vaccine groups debating COVID-19 and far-right extremists.

To counter anti-vaccine sentiment, scientists need an understanding of how the online map developed, says Bruce Gellin, president of global immunization at the Sabin Vaccine Institute in Washington DC. "We need to understand what it is about the conversations and content [around anti-vaccination] that compels people to listen and share it with others," he says.

Varied, emotive messages

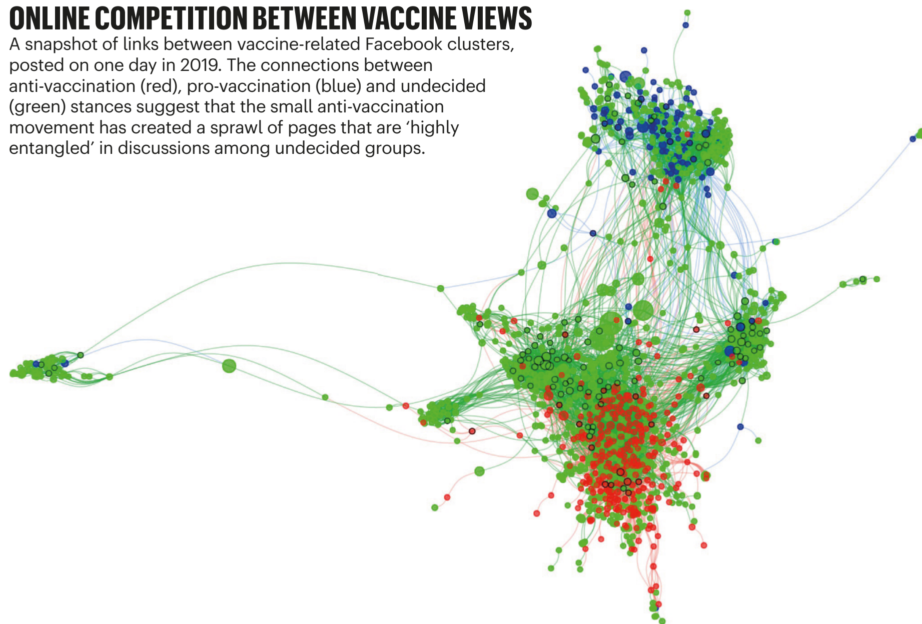
Pro-vaccine groups have a simple message: vaccines work and save lives. Anti-vaccine narratives are numerous — from sowing worries about children's health to advocating alternative medicines and linking immunizations to conspiracy theories. Anti-vaccine campaigners tend to win converts with personalized, emotive messages, says Larson; these are built not necessarily on fear (such as "Vaccines will kill you."), but on appeals to the heart ("Do you love your children?"). The public-health community, meanwhile, has simply been trying to get more people vaccinated, she says — which might lead to a feeling that they are just trying to get their numbers up. "The approach needs to be quite different with people who are undecided," she says. Vaccine-advocacy organizations are "not listening to concerns and questions".

Overall, most people support vaccines, points out Gellin, and are likely to do so in this pandemic. Still, global vaccination rates have plateaued in the past two decades, Larson says. Both she and Gellin worry that another reason for public suspicion about a COVID-19 vaccine might be the speed of its development. "We should be very clear and transparent about the development process," says Gellin. "Otherwise, when it shows up, people will ask, 'How can we be sure no shortcuts were taken?'".

The messaging around a vaccine will also need to be carefully thought out. If there are already fewer COVID-19 infections by then, it's going to be a hard sell, says Larson. "The thing that's going to change people's minds is if the government says that if you have the vaccine, you can go to work," she says.

ONLINE COMPETITION BETWEEN VACCINE VIEWS

A snapshot of links between vaccine-related Facebook clusters, posted on one day in 2019. The connections between anti-vaccination (red), pro-vaccination (blue) and undecided (green) stances suggest that the small anti-vaccination movement has created a sprawl of pages that are 'highly entangled' in discussions among undecided groups.



N. F. JOHNSON *ET AL. NATURE* HTTP://DOI.ORG/GGVVJX (2020)

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