Society in New York City. Many of them arrive at markets from farms in China. "You bring all those naturally distant species to one location, so there are more chances to incubate and generate a new virus," says Qiuhong Wang, a virologist at the Ohio State University in Wooster.

Dwyer says it's crucial to find out whether workers at wildlife farms that supplied products to Wuhan markets have antibodies from SARS-CoV-2 infection. That, he says, will be key to homing in on the ultimate origin of the pandemic.

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CONTACT-TRACING APPS HELP TO REDUCE COVID INFECTIONS

Evaluations find apps are useful, but would benefit from better integration into health-care systems.

By Dyani Lewis

Since the beginning of the COVID-19 pandemic, dozens of countries have deployed digital apps that attempt to identify people exposed to the SARS-CoV-2 coronavirus and stop onward transmission. But evidence that these 'contact-tracing' apps work has been hard to come by. Now, evidence is mounting that apps can help prevent infections.

Contact-tracing apps are installed on smartphones, and many involve the Google/Apple Exposure Notification (GAEN) system, which uses the phone's Bluetooth signal to detect when two app users are close to each other — typically, within 2 metres of one another for more than 15 minutes. Users are notified if someone they have come in contact with tests positive. The exposed user can then get tested or quarantine, which should help to prevent onward transmission.

The GAEN system prevents health authorities from gathering personal information about app users or their devices, thereby helping to address privacy concerns. (This is not the case for all contact-tracing apps. Singapore's TraceTogether app has attracted criticism because the data that it collects could be used by police in criminal investigations.)

Emerging evidence

On 9 February, researchers in Britain released an evaluation[1] of the National Health Service (NHS) COVID-19 app, which was launched in England and Wales late last September. The evaluation, which has not yet been peer reviewed, found that the app sent out 4.4 exposure notifications for every user who tested positive for SARS-CoV-2 and agreed to the app notifying their contacts. That was more than twice the average of 1.8 contacts notified through manual contact tracing.

The team estimated that the app might have helped to avert more than 224,000 infections between October and December 2020. The model assumed that about 61% of people who received an exposure notification and were instructed to quarantine for up to two weeks followed that advice. That is slightly lower than the results of a 13 January survey[2] in the United Kingdom, which found that about 80% of people directed to quarantine did so.

So far, the app has been downloaded on more than 21 million phones, with about 16.5 million regular users. That's roughly 28% of the UK population, or 49% of people with compatible phones. The team estimates that every 1% increase in app users — above a minimum of 15% — reduces the number of infections by 0.8–2.3%. But epidemiologist Viktor von Wyl at the University of Zurich in Switzerland says it is difficult to conclude that
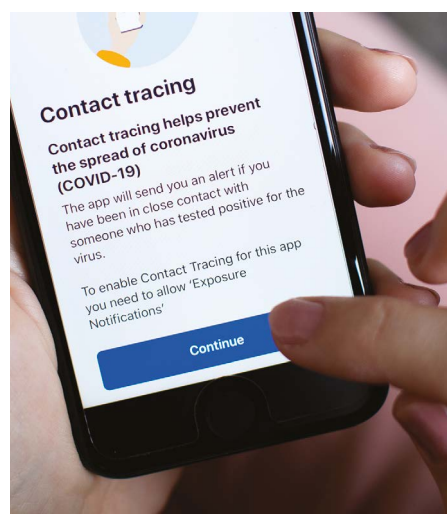
Contact-tracing apps are in widespread use.

infections and deaths were averted because people used the app. "Having people who are notified by the exposure notification doesn't mean that they would not have ended up on the radar of manual contact tracing," he says.

A pilot study[3] of Spain's Radar Covid app, conducted in the Canary Islands in July and published last month, also found that the app notified roughly twice the number of people exposed to simulated infections, compared with manual contact tracing. And an evaluation of the SwissCovid app, published as a preprint in February[4], found that the app boosted the number of people in quarantine in Zurich last September by 5%.

Digital contact tracing is particularly effective at identifying contacts who don't live together. Von Wyl and his team calculated that non-household contacts notified of exposure by the SwissCovid app entered quarantine a day earlier than did those notified through manual contact tracing[5]. The NHS COVID-19 app also shortened the delay to quarantine by 1–2 days, says infectious-diseases modeller Christophe Fraser at the University of Oxford, UK, who led the evaluation.

Integration crucial

But researchers have identified barriers to an app's effectiveness, such as how well the app is integrated into the local health-care system.

In Switzerland, for instance, users of the SwissCovid app who test positive are given a code from their local health authority or doctor that they must then input into the app to alert their close contacts. This makes the system manual rather than automatic, says von Wyl. When COVID-19 infections surged at the end of 2020, overwhelmed health authorities had less time to generate these codes, says von Wyl. "This is a bottleneck," he adds.

A similar situation exists in Spain, says Lucas Lacasa, a complex-systems mathematician at Queen Mary University of London, who led the Canary Islands pilot study. There are 17 autonomous communities across Spain, and not all promote Radar Covid's use or promptly issue a code to people using the app who have tested positive, says Lacasa. This means that notifications aren't always sent to app users who might have been exposed to infection. "It's very disappointing," he says.

The NHS COVID-19 app, by contrast, automatically issues codes to users who test positive, so they can initiate the notification process on their phone.

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