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CORONAVIRUS

The BMJ Interview: Tim Spector on how data can arm us against covid-19

The epidemiologist and popular science author whose symptom tracker app has revealed some vital information about the virus tells **Rebecca Coombes** about opportunities to use data better—and how he thinks the UK's leadership failed in the pandemic

Rebecca Coombes *head of news and views*

It's the sleeper hit of the covid-19 pandemic in the UK, even though its creator thought that it might be shut down after a week. More than four million people use the Covid Symptom Study app, a symptom reporter designed by doctors and scientists at King's College, London, and the health science company Zoe. Data generated over nearly eight months, from users regularly logging their health and reporting their symptoms, have created the closest thing to a national covid-19 registry.

The smartphone app has made a household name of its genial and wiry leader, Tim Spector, professor of genetic epidemiology at King's. Previously better known for his nutrition research and popular science books, Spector is highly visible and eager to share emerging findings from the study. The Covid Symptom Study app was the first to generate sufficient data to demonstrate that loss of smell was a highly predictive symptom of covid, although anosmia had first been identified as a covid symptom by clinical reports from Italy, Belgium, and a group of UK ENT consultants led by Claire Hopkins. The app also found that children with covid often presented differently from adults and that delirium was a key sign in older, frail people (see [box 1](#)).

Box 1: Covid Symptom Study's successes

Key facts about covid-19 to come out of the symptom tracker app so far:

- Anosmia is one of the most predictive symptoms for a positive test
- Children may show different covid-19 symptoms than adults
- Delirium is a key sign of covid-19 in frail older people; and
- For hotspot identification, the study built a data model that can identify hotspots quickly: it identified Leicester ahead of the government placing it back into lockdown.

Although the app is now partly funded by government, Spector is clearly frustrated by the speed at which government guidelines have reflected the research findings generated by its data. It took Public Health England (PHE) until May to add anosmia as a symptom despite the app gathering good data early in the epidemic that loss of smell was “probably 90%” predictive of a positive covid test.

“Most other countries had acted by May,” he says. “I had dealt with six different government bodies; nobody knew who was in charge.” He adds that it was impossible to speak directly with PHE. “I was sceptical that they had public health interests at heart: they didn't seem to want to engage with the public, to speak with doctors,” he explains. “As with nutrition, they have behaved with covid—like a secret society that makes decisions behind closed doors.”

Test triage tool and long covid predictor

When the study was launched at the end of March, after a sleepless week of engineering during the height of the pandemic, Spector feared that it would have to be handed over to the NHS within a week. It wasn't—and today he's lobbying for its data to inform an algorithm to help triage the patients most in need of a test.

“We do have quite a large testing capacity in this country but no clear system about who is being tested,” he tells *The BMJ*. “The system is never going to keep fully up with demand: the government really ought to be thinking of ways of selecting people rather than the worried well.

“That's why I think some triage system allowing GPs to be more involved would clearly improve it. For example, if you have anosmia and fever there is no point having a test, as it is so likely to be positive.” With children, he adds, “runny nose, swollen glands, and sneezing are all negatively associated with a positive test.”

Data harvested by the app have identified symptom clusters that indicate the patients most likely to develop what's become known as “long covid,” where symptoms such as fatigue and breathlessness last for many weeks, or even months, after even a mild infection.

He says, “We are still identifying data, but there is a slight excess of females, a slight excess in people who are overweight, and some symptom clusters that seem to indicate long covid more than others. These are all things you would put into an algorithm rather than expect a GP to know that they will go on and have long covid.

“This lends itself to AI/‘big data’—you input the patient details, and if they still have a certain cluster of symptoms on day 7 you might put them into a steroid treatment trial, for example. But we need a

clear plan to try and stop this immune process early on—before a month—then you will save the country a huge amount of money and suffering.”

He believes that long covid patients are being overlooked. “As far as I can see, no one has taken responsibility for them,” he says. “I would be happy if my old specialty, rheumatology, started some clinics and got some expertise, but no one has done that. Everyone is waiting for someone else to take the lead.

“GPs don’t have enough cases to really be good at this, and it is still fairly rare: we estimate 20 000–60 000 people with more than three months’ illness. That’s double the size of lupus patients but still small when compared with most chronic diseases.”

Causes for optimism

There are some cautiously optimistic signs from the study that this winter may not see a return to the mayhem of this spring, including a conviction that immunity in the wider population has been underestimated.

“More people have been infected than we think,” says Spector. “Studies from my colleagues at King’s have shown that only half of people with ‘barn door’ covid in hospital had antibodies a month later, so there is this whole issue of the other T cell immunity being there. It looks like both groups must be immune, because half of those people without antibodies would be reinfected.”

Yet data from the app have shown that reinfection is rare. He says, “The good news is that, even with several million people using the app, we aren’t seeing any more than a couple who have been reinfected—which hopefully means immunity for the majority of people who’ve had covid.”

He sees this picture being played out in his home city of London, one of the cities hit first and hardest in the pandemic. “In London, it was only in mid-September that cases started to pick up again,” he says. “I think many of the people out on the streets must be immune by now. That’s why all the outbreaks are in the north, not London. You go to Soho, it’s all pedestrianised streets, crowded restaurants, a mass of people every night.”

The UK Twins Registry, set up by Spector almost three decades ago, now has a cohort of 15 000 identical and non-identical twins throughout the UK, who are now engaged in covid-19 studies. He says, “We have done studies with our twins and sent antibody tests to them, which suggest that a quarter have been exposed to the virus. It would be double that in health workers.”

However, the app’s survey of 1000 daily covid swab tests since May shows that the recent increases in cases is real and not just due to increased testing, as some believe. “We are definitely seeing an increase in cases,” Spector confirms. “I suspect it won’t be as bad as it was in the spring and that there will be a slower lag hitting hospitals. And deaths will be lower because we should be much better at dealing with covid, and a lot of susceptible people have died. But it is definitely going to get worse, and this is not an artefact of testing.

“But it could be milder overall, because we could be spreading less virus by socially distancing ourselves and wearing masks, so this dose effect could be important. It will be interesting to see.”

To this end, the app has introduced a feature looking at risk taking behaviours, in a bid to see whether people who do get covid and have also been taking lots of precautions get a milder form of the disease than those who have been less cautious.

Personalisation parallels

Before the pandemic Tim Spector was better known as an epidemiologist focused on the gut, which was the subject of *The Diet Myth*, his popular 2015 science book. In *Spoon-Fed*, his new book published in August (box 2), he shows how our reaction to food is highly personalised—and that nutrition advice should also be.

Box 2: “Nutrition should be the number one medical specialty”

Tim Spector’s latest book, *Spoon-Fed*, laments the lack of evidence behind many government nutrition guidelines and the way they perpetuate food myths. The fact that obesity raises your risk of severe illness from covid-19 brings new urgency to tackling the problem in the UK, says Spector. “We need to do three things: increase the sugar levy, which food companies have successfully lobbied against; improve nutritional support for patients; and treat obesity as a disease,” he explains.

But it will require a major shift in medical training, workforce, and research. “The whole emphasis needs to change,” he says. “It shouldn’t be this underfunded specialty—it should be the number one specialty, and all the best doctors should go there. There are virtually no medically trained nutrition experts out there.

“All the nutrition departments are massively underfunded and depend on food companies to keep going. It is outrageous, really, when you consider that obesity is the number one problem facing this country. We have the most junk food in the whole of Europe, we are the most obese, and we are the most poorly educated about nutrition and obesity. That needs to change.”

- *Spoon-Fed: Why Almost Everything We’ve Been Told about Food is Wrong* is published by Jonathan Cape, £12.99

“The assumption that we are all identical machines and that we all respond to foods in the same way is the most prevalent and dangerous myth about food,” he explains. “Normal people can vary 10-fold in their blood sugar responses to identical foods. We all respond differently to the same foods, and the idea that we can all follow the same advice and calorie limits no longer makes sense. In the same way we couldn’t be comfortable with the same car seat without adjusting it, just because it was made for the average person.”

Spector is struck by the parallels with covid-19. “The weirdest thing about this virus is that everyone reacts totally differently to it,” he tells *The BMJ*. “There are hardly any examples in medicine like this. This is true not only in terms of the 20 to 30-odd symptoms caused by covid but also the timescale, the severity, and this variation in immune response.

“We saw this in our twins research and in people with identical doses of the virus. The immune system and gut microbes are unique to all of us. This uniqueness has been ignored for a long time in medicine because it is so difficult to deal with personalisation.”

Muddled leadership concerns

Spector watches his words but cannot hold back over some of the basic mistakes he believes that the UK government has made, chiefly in its muddled leadership of the pandemic response.

“I worry that there are too many government groups involved and that no one is in charge,” he says. “If there is another pandemic, nobody knows who to turn to—is it the chief medical officer, NHS England, NHSX, the Department of Health? We need one group, whose leader is the one who goes on TV. It was far from clear, when you saw the chief medical or chief scientific officer, whether they were in charge.

“Most countries have their own equivalent of the US Centers for Disease Control: the German one seems to have worked very well. And they should be in charge—we shouldn’t need five different groups answering to different ministers. It’s become so bureaucratic.”

The data gathered by the app have identified hotspots around the UK, showing 10 times more daily cases now in the north west and Yorkshire than in the south west and south east—and explaining why Spector strongly supports different rules for different areas and giving power to local leaders. “I worry that this country is focused on a centralised, ‘keep it simple’ message, which treats the north west and south west in the same way,” he says.

The success of the Covid Symptom Study app may have surprised him, but he now believes that it could give us an insight into the future of medicine. He concludes, “If this can succeed with very little preparation and millions of people engage with the health app every day, allowing us to get algorithms out and personalise it, just think what you could do with that in all domains.

“This could be one of the few good things that come out of covid.”

Tim Spector’s CV

- Masters in epidemiology at the London School of Hygiene and Tropical Medicine
- Founder (1992) and director of the UK Twins Registry, set up to unravel the contribution of genes to human characteristics. It now comprises 15 000 identical and non-identical twins around the UK. A recent focus has been the gut and how the microbiome affects health. Today the cohort is also taking part in covid-19 research
- Professor of genetic epidemiology and head of department, Department of Twin Research and Genetic Epidemiology at King’s College, London
- Director, European Twin Registry Consortium (Discotwin)
- Senior investigator, National Institute for Health Research
- Fellowship of the Academy of Medical Sciences
- Former president, International Society for Twin Studies

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