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Coronavirus analysis: Don't blame false positives — look at the hospital figures

Tom Whipple, Science Editor | Monday September 21 2020, 12.00pm BST, The Times

Is it all just a mirage? Can we really trust the data that tells us a second wave is on its way?

Or as Sir Desmond Swayne, the Conservative MP for New Forest West, put it in parliament: "To what extent is . . . the very significant possibility of false positive[s] giving a distorted impression of the trajectory of the disease?"

Later, he expanded. “It doesn’t take a mathematician to tell you that a relatively small percentage of false positives will have a significant impact on our estimate of how many people are infected,” he said. “In fact a report by the ONS [Office for National Statistics] in June put false positives at 2.4 per cent.”

Could it be that our disease surveillance is fatally flawed by an elementary statistical misunderstanding?

Sir Desmond is right. It does not take a mathematician to tell you that 2.4 per cent false positives is worrying; 2.4 sounds low, until you do the sums. Imagine you tested 100,000 people, and the actual disease prevalence is currently just 0.1 per cent. That means that in that sample there are 100 true positives. Your test will find most of those. It will also, however, pick up 2,400 who don’t really have it at all.

There is no way for the test to distinguish the two groups — one of which is more than 20 times the size of the other. The false positives overwhelm the true ones and we haven’t the slightest clue what the disease is doing. If the false positive rate really is 2.4 per cent, we are in a bad way.

Sir Desmond is not the only one to express concern about false positives.

Professor Carl Heneghan, director of the Centre for Evidence-Based Medicine, has written about his worry that the tests are so highly tuned they are picking up dead virus — spotting infections that are no longer there.

Should we then, as Sir Desmond and a growing number of commentators on the right suggest, be suspicious of the testing that tells us a second wave is on the way? Unusually for those who might deem themselves corona-sceptics, this is a testable proposition.

If the false positive rate is 2.4 per cent then if, say, you tested 100,000 people, you would expect to see 2,400 positives even if all of them were actually uninfected. You could test for smallpox, bubonic plague or a virus that only attacks fish — you would get the same answer: thousands of people wrongly coming up positive.

Ordinarily, obviously, it would be all but impossible to conduct a test with that many people. These are not ordinary times: these days, we do it twice daily.

It was the figures of the ONS that Sir Desmond claimed to cite, so they are as good a place as any to start. Each week since early in the pandemic their researchers have tested over 100,000 people, randomly chosen from the population.

And how many of those 100,000 came up positive? At its lowest level, 50. For weeks and weeks, until very recently, just 0.05 per cent of tests were positive.

We cannot know how many of those were false positives. The only way you could do that is by having a better test to judge against. If we had a better test, we would be using it.

What we can say is that for this weekly survey the false positive rate cannot, by definition, be more than that level. It is provably impossible that in those weeks their false positive rate was 2.4 per cent since they only recorded a 50th of that level for all positives.

What about our other testing? In mid-July, official community testing recorded 352 cases. On the same day, there were over 120,000 tests — so there the proportion of positives was about 0.3 per cent. There are caveats with this. Community testing is messier data. First, some people take more than one test, which would suggest the false positive proportion could be higher. But, on the other hand, people self-select when they have symptoms — you would expect more true positives, putting false ones lower. Go abroad, and you see the same pattern. At one point in China ten million people were tested, and — assuming you trust the data — 300 came up positive.

False positives are a real issue. They are especially an issue when numbers are low. No protocol eliminates contamination, no manager removes human error, and no test is perfect. You tune it to pick up small amounts of virus but you do so accepting you will also pick up shadows that are never there. Professor Heneghan is right that we could well be spotting dead virus.

But he added, also correctly, this is an issue when the true spread of the virus is low. The greater the prevalence, the less relevant the errors are.

Once true positives start coming in, the false ones are swamped.

It is true that at the lowest point in our pandemic we have no idea how many cases we found were real. Once cases start to rise, that is no longer true.

There is no plausible statistical mechanism to explain a sudden exponential increase in false positives. There is, however, a very good viral mechanism to explain an exponential increase in true positives: the disease is spreading.

So where, then did the 2.4 per cent figure come from — a figure now being quoted regularly on lockdown sceptic forums?

Its origin is not the ONS — who estimate false positives as at most 0.04 per cent. It came to public attention after being cited in a paper presented tothe Scientific Advisory Group for Emergencies (Sage) in June. But Sage is not its origin either — the same Sage paper, in fact, used the same logic as above to say it could not be correct.

The figure comes, instead, from a study published ahead of peer review by Andrew Cohen, a US marine biologist. He realised when mass testing began that false positives would be an issue, and attempted to assess how much of an issue by analysing testing programmes for previous viruses.

When *The Times* spoke to him he said false positives were definitely an underappreciated problem. This is particularly true for those wrongly diagnosed. If an elderly person tests positive but isn't, and gets put on a Covid ward, he or she could easily become infected there and die.

This, he says, "is a dire issue", and one that has almost certainly happened.

But, as regards the population as a whole, he says that the findings should not be overinterpreted. "This is mainly an issue where prevalence is low," he said. "Its impact on the overall statistics is not going to be very high. It might reduce the overall case numbers by 5 or 10 or even 15 per cent but it's not going to get rid of them.

If you remain sceptical, he suggests a different metric. "The hospitalisation rates and the death rates, those are probably pretty accurate." On August 10, there were 84 people admitted to hospital in the UK with Covid. On September 18, after weeks of steady increase, there were 246.