Test Accuracy
and
COVID-19

Amber Buckingham
amber.buckingham@bwcigroup.com

> *the greatest risk is that arising from false negative results*

The Bailiwick of Guernsey is now well into Phase 5c of the Exit from Lockdown framework. This means that self-isolation requirements are reduced for travellers coming from any areas with low levels of virus prevalence. The trade-off for reduced periods of self-isolation is an increased focus on testing. This new phase coincides with substantially increased testing capabilities, to a potential capacity of more than 2,000 tests a day. In addition, some of the testing will be on a supervised self-swab basis.

The new regime recognises that a negative test result does not necessarily mean that an individual does not have Covid-19 and there is still a risk that they could be unknowingly at risk of infecting others. The risk framework put in place around the new arrangements therefore involves a period of ongoing monitoring and restrictions, until the risk of passing on the virus is perceived to be extremely low.

Given the reliance on Covid-19 tests to limit the spread of the virus within the Bailiwick, we have taken a look at how the accuracy of tests is measured.

Defining accuracy

An "accurate" test correctly differentiates between positive and negative cases.

One way to measure accuracy is to calculate the proportion of tests that give the correct answer – so if the test gives the right answer every time it is performed, it is said to be 100% accurate. However, imagine you are testing for a condition which only affects 3% of the population. If the test gave a negative result every time, it would be said to be 97% accurate, even though it had failed to identify any of the positive cases at all!

This example shows that this simple way of describing accuracy can be distorted by the relative proportions of people with and without a condition in the population. Therefore we need to think about things differently. The true accuracy of a test can be analysed by considering the rate of **false positive** and **false negative** results; ideally we want both of these to be low.
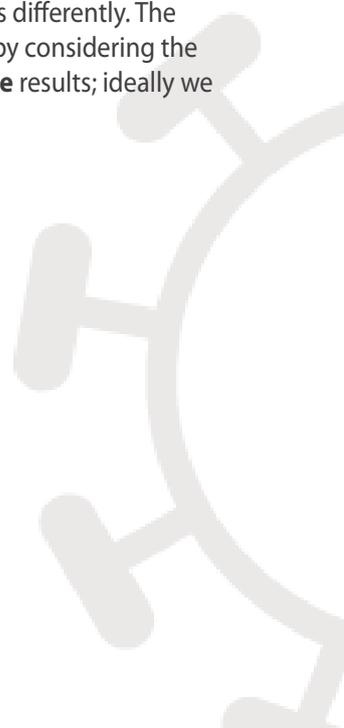
An alternative definition

There are four possible results for a test:

	Test says you don't have it	Test says you do have it
You really don't have it	**TRUE NEGATIVE**	**FALSE POSITIVE**
You really do have it	**FALSE NEGATIVE**	**TRUE POSITIVE**

The false positive rate is calculated as the proportion of healthy people who are falsely identified as having the condition. The false negative rate is the proportion of people with the condition who test negative.

In the above example (where the test never identified positives), the false positive rate would be:
(0 / 0 + 97) = 0%. This is a perfect result.

However, the false negative rate would be:
3 / (0 + 3) = 100%.

In other circumstances, the false positive rate might instead be high. Having either a false negative or false positive rate above a certain level should be a cause for concern, so both measures are important and need to be considered together when evaluating the usefulness of a test.

COVID-19 test accuracy

Both false negatives and false positives have been reported with COVID-19 tests, but the rates vary significantly depending on which source you look at.

"Specificity" and "Sensitivity" are the two terms that are used to quantify the "accuracy" of a test:

- Specificity is a measure of the accuracy of the negative results; and
- Sensitivity is a measure of the accuracy of the positive results.

The COVID-19 test is highly specific, and therefore a positive result indicates that you have almost definitely been infected with the virus. However, some scientists have recently hypothesised that the scale of the pandemic is being overstated, as false positives in recovered patients are occurring due to the tests being so sensitive that they pick up remnants of dead virus. Although this is not a danger to the community as a whole (as those who test positive would be required to enter self-isolation), it would have an impact on those misdiagnosed, and any contacts who may incorrectly be required to isolate.

On the flip side, false negative results are more concerning as individuals may incorrectly believe they are not infectious and therefore fail to take precautions to avoid transmission within their community. These errors most commonly occur where the correct testing protocol is not observed. However, false negatives may also crop up in the early stages of infection, or where the individual is already partially recovered, so the level of the virus collected on a swab sample may be too low to detect.

In Phase 5c, incoming travellers to the Bailiwick of Guernsey will need to take supervised self-swab tests on arrival. It is recognised that this may have a small impact on efficacy of testing, however supervision of tests and clear instructions are intended to mitigate this risk.

It is not possible to say for certain how accurate COVID-19 tests are, but some inaccuracy is inevitable. The greatest risk for the wider community is that arising from false negative results. This underlines the importance of ensuring that those travelling follow all instructions given when self-administering tests, and then comply fully with the mandatory isolation requirements.