



Are the numbers getting better yet? The brief guide to making sense of the COVID-19 statistics

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April 16 2020

How do we know if rates of COVID-19 are going up or going down? There seem to be so many variables that affect case numbers. Two of the most popular and informative websites for COVID-19 global and national statistics are from [Johns Hopkins University](#) and [Worldometers](#).

But how do we know if or when the infection rate in a given country is going up or down right now?

The most common statistics presented are numbers of cases, numbers tested and numbers of deaths. Some country-level websites also have hospital admissions. What's happening with COVID-19 in the community, which is what we really want to know, is only one of the factors that determines those numbers.

Each figure reveals a different part of the picture and none of it the full picture. This is a brief guide to how these factors overlap to influence the COVID-19 statistics.

Where in the COVID-19 natural history is each statistic measuring?

For the first 4 to 5 days COVID-19 causes no symptoms and all tests are negative (the incubation period). Therefore, it is impossible to measure what's happened to the epidemic in the past five days.

From about 5 days, individuals may develop typical symptoms (fever, cough). Their test at this stage would be positive. (However, most people are tested some time after their symptoms begin).

For people with severe symptoms, admission to hospital occurs about 7 days after symptom onset, or getting close to two weeks after first exposure. When, sadly, an individual does die from COVID-19, this occurs around 18 days after symptom onset or over three weeks from when the person was first exposed. [1-3]

How complete are the numbers at each time point?

A confirmed case is defined as a person with a positive test. Because testing capacity is stretched and testing is limited to specific situations, the number of new cases both underestimates and lags behind new infections.

To interpret the case numbers, therefore, you need to know the testing procedures for that country. Many countries only test patients admitted to hospital, which is a minority of cases, and therefore lag approximately 2 weeks behind infection/exposure, varying greatly [4]. These countries will have relatively low numbers of tests relative to the total cases.

Some countries are testing people in the community who might have been exposed (contact tracing) or have symptoms. In these countries the case number will be closer to the number of infected people (but will still be an underestimate) and will have a shorter lag. These countries have relatively high numbers of tests relative to the total cases.

The death rate is, perhaps, the ultimate measure of the seriousness of the impact of this epidemic. In many countries, reporting of deaths in hospital is the most complete and accurate measure, although probably less than 1 in 50 people die from COVID and there is a three-week lag between infection and death.

Finally, there can be delays in reporting and results. Tests can take a few days to come back and numbers from any of these statistics might take some days to be reported at the central level. Recent examples included the apparent dips in cases and reported deaths over the Easter public holidays in some countries.

So how to interpret the numbers:

Total Cases: numbers are added to this daily. The longer it goes on the higher this number. It doesn't tell you if infection rates are going up and down.

New cases: The most widely quoted number but may be the least accurate because testing is so limited. Most countries are trying to increase testing rates, and as they test more people the number of new cases will go up. If testing is overwhelmed, then case numbers won't go up. Any decrease in new cases over the last three to four days may be related to delayed reporting.

To help interpret this, take a look at the number of tests in the Worldometers tables, including the number of tests per 1m people. If the number of tests is high compared to total number of cases, then the new cases numbers will be more accurate and the lag will be shorter. If the number of tests is low compared to the number of cases, then the new cases will be more of an underestimate and the lag will be longer.

Patients in hospital with COVID-19: patients stay in hospital for up to three weeks. While this number is useful in assessing health service capacity, it doesn't tell you much about recent changes.

New hospital admissions: This number is potentially very useful, but it can be difficult to collect and centralise data from a lot of sources. Hospital admissions will continue to go up for at least 10–14 days after infection rates stabilise.

New deaths: this is the story of heartbreak and loss. It's also the last one to change. It is often the most accurate number. However, reporting can lag behind by 2 or 3 days (or more).

Summary:

Where testing is limited and cases are high, you shouldn't read too much into changes in new cases over time. The exception is where testing is very high capacity and where cases are at low numbers. The death rate might be the best indicator but it is at least three weeks behind what is happening in the community. If your country has highly accurate numbers on hospital admissions, you might learn about the decrease a week earlier

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2. Lauer, S.A., et al., *The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application*. *Ann Intern Med*, 2020.
3. Zhou, F., et al., *Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study*. *The Lancet*, 2020. **395**(10229): p. 1054-1062.
4. García-Basteiro, A.L., et al., *Monitoring the COVID-19 epidemic in the context of widespread local transmission*. *The Lancet Respiratory Medicine*, 2020.
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