

## Enhancing the indicator for COVID-19 confirmed cases

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The World Health Organization (WHO) from the beginning of the COVID-19 Pandemic had a simple message for the countries around the world: "Test-Test-Test" (1). The confirmed cases who have been already diagnosed with COVID-19 are being reported daily (2). However, ignoring some basic rules can undermine both financial and medical resources and thus results in the misinterpretation of the test findings. This paper endeavors to first explain the problems with the current reporting status of COVID-19 cases and then continue with some remedial suggestions.

Two important facts need to be taken into account to realize why the current reporting of the confirmed cases of COVID-19 is unrefined. First, the disease has different manifestations among different individuals (3). Although a large percentage of the infected individuals are asymptomatic or presymptomatic, fewer with severe symptoms require hospitalization, and some of the inpatients even require intensive care or respiratory care support. Moreover, the prognosis of the disease is different and can range from mild complications to death (4).

The second fact is that the PCR based diagnostic tests are expensive, and not all countries have adequate resources to make this test widely and easily available. In view of this, countries employ different

guidelines (5). For instance, though in a country, this test is mainly used for inpatients; in some other countries, this test is also available for outpatients or even common individuals.

Overall, the different manifestations of disease and different levels of access to the COVID-19 testing make it less worthy to compare countries with reliance to the number of the reported confirmed cases; this is because a country with a greater number of infected cases may discover and report fewer confirmed cases due to restrictions to testing. Then, it seems necessary to have an indicator that provides us with a more reliable comparison of the contamination status of the regions, regardless of the level of testing.

The recommended indicator can be called "the indicator of newly detected cases" instead of "the indicator for reporting infected cases". To enhance the indicator of newly detected cases of COVID-19, it needs to be reported by two additional facets as follows:

1. Using a classification method for the confirmed cases;
2. Reporting the ratio of the confirmed cases to all tests done in each class.

To classify confirmed cases, it is recommended to employ a simple approach based on clinical situations that can be easily applied by those who report the test results. The suggested classification method which is consistent with the viral dynamics of COVID-19 (6) is as follows:

- Class 1: Cases in the need for intensive care or respiratory care support;
- Class 2: Cases in need of hospitalization (no need

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to ICU);

- Class 3: Cases with mild symptoms (no need for hospitalization);
- Class 4: Asymptomatic cases.

This classification of confirmed cases can be helpful for four reasons:

1. Given the high percentage of undiagnosed cases, the prevalence of the disease and Infection Fatality Ratio (IFR) is mainly estimated based on the number of cases diagnosed in classes 1 and 2. Having accurate statistics about the number of cases in each class (by having the proportions of each class at the macro level) can help in a more accurate estimation of the rates.

2. Information about the class of detected cases helps policymakers to better understand the cases' situations and needs. Under circumstances wherein most of the cases are reported from class 1 or 2, it can be supposed that because of a shortage of resources, the focus of the health system is directed towards detecting the cases among inpatients (treatment approach). However, if any of the cases are reported from class 3 and 4, it can indicate that a preventive approach is on the agenda.

3. Most of the time, there is relatively useful information about the confirmed inpatients; however, the evidence seems to be inadequate for outpatients asymptomatic or presymptomatic cases. If the classification of the cases is registered from the early days of detection, it allows for tracking the course of the disease (according to different classes) and their outcome (recovery or death). Improved prediction of the course of COVID-19 can pave the way for feeling ready in both preventive and curative measures.

4. When the results of the interventions are reported according to the clinical classification of the cases, the evaluation of the results seems to be more authentic and practical.

To set the scene for enjoying the benefits, it seems indispensable to consider this classification when developing guidelines for the testing. As to the limitations, the preceding of the test for patients in classes 1 and 2 is recommended; then, if possible, classes 3 and 4 could be added for active case finding. A sign that we can think about expanding the application of the test to higher levels is that either all cases have been tested at previous levels or that the ratio of confirmed cases to all tests is low. The reason to report this classification is to ensure the accurate distribution of test resources (but not uniformly) across

different cases' classes and to reduce the risk of under-reporting (since the restriction of testing may prevent from detecting all the confirmed cases in a class). If the percentage of positive confirmed cases is close to 100% in a class; then it is more likely that the testing limitations prevent all cases from being detected.

This classification helps ensure that expensive and limited testing is provided to those most in need. It is of note that however, according to global statistics, the number of infected cases in classes 3 and 4 is much higher than in classes 1 and 2. In other words, many more diagnostic facilities are needed to cover the next class with acceptable positive rates. This is another reason why the expansion of testing for subsequent classes should be adopted with caution.

In this way, each day that a region or country reports its cases, it is expected to report the confirmed cases and the ratio of the positive results to all tests in each class. Table 1 is an example of two countries with the same populations with hypothetical numbers that illustrate how Enhancing the indicator for COVID-19 confirmed cases can provide more comprehensive information for comparison across regions or countries.

Suppose that *Region A* had only declared 252 cases as new confirmed cases in the past day and *Region B* had declared 276 cases, what would be our interpretation regard this information? Perhaps, it can be concluded that *Region B* is more infected than *Region A*. However, reporting the confirmed cases with more details based on the disease classification (Table 1) prepares much more information and a more accurate interpretation. *Region A* has found fewer confirmed cases than *Region B*, but it cannot be said with certainty that they have fewer confirmed cases indeed because *Region A* has performed much lower tests than *Region B* (500 tests vs 1000 tests). Meanwhile, an investigation of each class indicates that in classes 1, 2 and 3, there were more confirmed cases in *Region A*, but the difference is that in *Region B*, the test was also available for the individuals in class 4. Furthermore, the percentage of positive tests was also higher in *Region A* than in *Region B*.

On the other hand, it may be argued that *Region A* has made reasonable use of its resources as they found more new cases with much fewer tests. That might be due to the limited allocation of tests to classes 1, 2, and 3. In fact, limited tests should be assigned just to the lower classes. However, in *Re-*

**Table 1.** Comparison of confirmed and total daily stats of PCR test in region A and B by suggested case classification

Daily Statistics	Region A			Region B		
	Confirmed Cases	No. of performed tests	% of Positive Cases	Confirmed Cases	No. of performed tests	% of Positive Cases
Class 1	6	7	86%	5	5	100%
Class 2	56	69	81%	55	59	93%
Class 3	190	424	45%	185	495	37%
Class 4	-	-	-	31	441	7%
Total	252	500	50%	276	1000	28%

gion B, the percentage of positive cases to total suspected cases is higher in class 1 and 2 patients, and it is better to check whether enough tests have been performed on cases in this class, or under-reporting should be considered. Meanwhile, in this region, the test is available to cases in class 4 with no clinical symptoms.

## CONCLUSION

Different countries may use various guidelines according to their resource adequacy. For example, while a developed country with enough resources may offer PCR testing for most of its population, this would be specific to suspected symptomatic cases in underdeveloped countries.

Each country should try its best to prepare enough testing. For those who have serious problems such as financial or human resource shortages, prioritization of testing according to the above classification would be a reasonable solution. Another option is to use some other diagnostic criteria such as rapid antigen tests, CT Scan or some clinical manifestations instead of PCR test. This is also useful when the PCR result is negative, but the symptoms are highly suggesting of COVID-19.

It is recommended that all countries and regions report the indicator for COVID-19 confirmed cases based on the suggested classification, and report the ratio of confirmed cases to all test results. Enhancing this indicator by adding these two facets can help the analysts to have more comprehensive interpretations

and a better comparison between different regions across the time. Additionally, it provides a more appropriate platform for planning and evaluating interventions at regional and global levels.

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