Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Testing indicators to monitor the COVID-19 pandemic

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Two Articles in *The Lancet Infectious Diseases* have called for enhanced COVID-19 testing capacity after demonstrating good diagnostic performance for RT-PCR testing of self-collected pooled nasal and throat swabs and nasal swabs[1] and good sensitivity for rapid antigen diagnostic tests.[2] These important developments will help to control the pandemic, but the impact of changes in testing on surveillance data must be anticipated—ie, capacity to monitor the epidemiology of COVID-19.

Since the start of the pandemic, testing and contact tracing have been the primary measures used to control the spread of SARS-CoV-2.[3] Initially testing capacity was low, thus testing data were essential for interpretation of the COVID-19 case notification rate (ie, number of cases per 100 000 population) since the number of reported cases tended to only reflect the number of tests done. This remained true with increasing testing capacity, which enabled testing of mild or asymptomatic cases. The format of these indicators varied across countries, but the objectives were similar. For EU and European Economic Area (EEA) countries, the European Centre for Disease Prevention and Control (ECDC) calculates both testing rate (number of tests for SARS-CoV-2 infection per 100 000 population done in the previous week) and test positivity (percentage of positive tests among all tests for SARS-CoV-2 infection done in the previous week), which, among others, are also used by the European Council to coordinate the restriction of free movement in response to the COVID-19 pandemic.[4] The weekly testing rate at the level of EU and EEA countries has increased linearly since March, 2020, and exceeded 4000 tests per 100 000 population in May, 2021. This pattern continued despite fluctuations in notification rates.

Although test positivity is easily calculated, the interpretation of such, and in particular, changes over time, can be challenging when both numerators and denominators vary for factors independent from the epidemiology (eg, case definition or testing strategies). For example, the EU case definition for COVID-19 that initially relied on the detection of SARS-CoV-2 nucleic acid (RT-PCR) has included detection of SARS-CoV-2 antigen in a clinical specimen since late 2020, which is less sensitive than RT-PCR. The introduction of target groups who are less likely to be symptomatic for testing, such as school-aged children, might also affect the test positivity.

The emergence and rollout of new tests can impact testing indicators regardless of whether such indicators are listed in the laboratory criteria for case definitions. In the initial ECDC guidance on the use of rapid antigen tests for COVID-19 (before inclusion in the EU case definition), the inclusion of rapid antigen diagnostic tests was recommended when computing testing

rates and test positivity.[5] However, the guidance also indicated that "positive confirmatory PCR or recurring rapid antigen diagnostic tests investigations in the same individual should not be included in these counts". The definition of frequent rapid antigen diagnostic tests might be challenging in settings in which asymptomatic individuals are required to be tested on a regular basis, such as schools. In countries in the EU and EEA, rapid antigen diagnostic tests are now widely available, although it is difficult to estimate their impact since information on laboratory methods is not available for 75% of cases reported to the ECDC. In Slovakia, approximately 55% of cases reported in 2021 were diagnosed by rapid antigen diagnostic tests.

Now that self-tests are becoming more widely available, testing data might become even less reliable. Regarding the use of self-tests for COVID-19, the ECDC describes their possible impact on COVID-19 surveillance according to different scenarios considering the systematic use of confirmatory laboratory-based test, the reporting of self-test results, and the number of tests distributed.[6] In the absence of these components, there is a risk that testing indicators will be biased in an unpredictable way. Negative self-tests might not be reported and positive self-tests might not be confirmed by a laboratory-based test.

Testing data are seldomly used in routine surveillance of infectious diseases. In most instances, the laboratory information collected is limited to the laboratory methods used to ascertain cases, but negative tests are not collected. Some countries such as the UK are now offering repeated testing to their entire population, inviting individuals to report their results online or by telephone.[7] Assuming that all results will be reported, these data could still be biased toward specific groups or locations, and sampling strategies would remain of importance for surveillance purposes.[8] In response to the vaccine rollout and the continuous emergence of new variants, these strategies should be paired with sequencing strategies to ensure detection and monitoring of variants of concern.[9]

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Persistent SARS-CoV-2 infection: the urgent need for access to treatment and trials

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The management of patients presenting to health-care services with SARS-CoV-2 infection has developed rapidly over the past year, driven by the findings of high-quality randomised trials. These trials have been justifiably focused on preventing severe disease in patients with very early infection and on the treatment of acutely unwell patients. However, although applicable to the majority of patients, it has become apparent that there are specific patient cohorts not well served by these studies, to whom their conclusions might not apply, and who as a consequence risk missing out on access to potentially beneficial treatments.

Patients with persistent SARS-CoV-2 infection are one such cohort. Persistent SARS-CoV-2 infection can