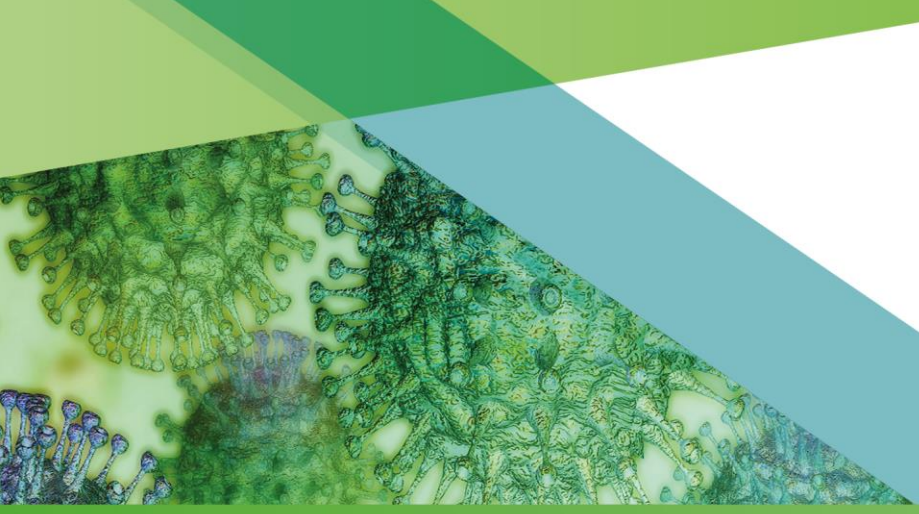

TECHNICAL REPORT

Strategies for the surveillance of COVID-19

9 April 2020

Background

All EU/EEA Member States and the United Kingdom are seeing widespread community transmission of coronavirus disease (COVID-19) and have implemented extensive public health, societal and economic measures to flatten the epidemic curve and avert overload or collapse of their healthcare systems. This document proposes an updated strategy for COVID-19 surveillance at national and EU/EEA level that specifically aims to reconcile the data needs for effective pandemic response with what is still feasible in countries and within healthcare systems under siege, while taking into account guidance issued by the World Health Organization [1,2].

Surveillance objectives

The objectives of COVID-19 surveillance at **national and EU/EEA level** are as follows:

- Monitor the intensity, geographic spread and severity of COVID-19 in the population in order to estimate the burden of disease, assess the direction of recent time trends, and inform appropriate mitigation measures.
- Monitor viral changes to inform drug and vaccine development, and to identify markers of severe infection.
- Monitor changes in which risk groups are most affected in order to better target prevention efforts.
- Monitor the epidemic's impact on the healthcare system to predict the trajectory of the epidemic curve and inform resource allocation and mobilisation of surge capacity as well as external emergency support.
- Monitor the impact of any mitigation measures to inform authorities so they can adjust the choice of measures, as well as their timing and intensity.

Additional objectives at **national level** are as follows:

- Detect and contain nosocomial outbreaks to protect healthcare workers and patients.
- Detect and contain outbreaks in long-term care facilities and other closed communities to protect those most at risk of severe disease and poor outcomes.

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Stockholm, April 2020

Routine surveillance systems

Objective 1. Intensity, geographic spread, severity

Intensity

Comprehensive surveillance. In countries comprehensively testing suspected cases for COVID-19, the most accurate indicators of intensity will be the absolute number of newly confirmed cases and their notification rate per 100 000 population. They provide a solid basis for monitoring trends over time and for intra-country (probably to a lesser extent: inter-country) comparison. Countries only testing severe cases for COVID-19 could use the number and notification rate of severe cases as a proxy of intensity for trend monitoring, taking into account changes in testing policy over time.

Sentinel syndromic surveillance. Countries no longer testing mild suspected cases for COVID-19, but still encouraging such cases to consult their primary healthcare providers (including telephone consultations), should integrate COVID-19 surveillance with sentinel surveillance of influenza-like illness (ILI) or acute respiratory infection (ARI), which is in place in most EU/EEA Member States. The naso-pharyngeal swabs obtained by sentinel physicians from a systematic sample of patients presenting with ILI/ARI should also be tested for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in addition to influenza virus and other respiratory viruses. In countries where sentinel physicians are not able to swab their patients, other approaches can be considered, such as self-swabbing and shipping of specimens using dedicated channels. The intensity of COVID-19 could then be derived from the weekly number of positive specimens over specimens tested and/or the weekly number of confirmed cases over the number of ILI/ARI consultations. In countries/areas where the proportion of positive sentinel specimens is high, the incidence of ARI/ILI over time is a good proxy of the incidence of COVID-19. The denominator for calculating incidences is the number of individuals registered with the sentinel physicians, or the population under their catchment area, or the total number of consultations per week. Where feasible, these sentinel surveillance systems should be expanded to include more physicians and thus improve their population coverage. In all countries, these systems would need to be maintained beyond the end of the influenza surveillance season in week 20 because surveillance of COVID-19 would need to continue.

Helplines, surveys, participatory surveillance. Countries not systematically testing most suspected cases while limiting physical access to primary healthcare (for example by encouraging people to call specific COVID-19 helplines, or when people are placed in in lockdown) should consider analysing data from alternative sources. These could include phone consultations of sentinel physicians, calls to regional/national healthcare telephone helplines, consultations of online healthcare apps or self-assessment tools for advice on COVID-19 testing, or population-based participatory syndromic surveillance schemes for influenza that exist in a number of Member States. Resources permitting, countries can also conduct their own regular telephone surveys. Numbers of ILI/ARI over the respective denominator in each of these approaches would offer at least a rough indication of the intensity of mild respiratory symptoms compatible with COVID-19, especially outside the influenza season.

Geographic spread

Comprehensive or sentinel syndromic surveillance. In countries comprehensively testing suspected cases for COVID-19, any first confirmed case with no known epidemiological link in a region signifies spread to this region. With decreasing certainty, geographic spread could also be inferred from sentinel syndromic surveillance or any of the alternative data sources described for intensity. Unlike intensity, however, geographic spread requires categorisation, for example based on the proportion of affected subnational jurisdictions, to be meaningful at national and EU/EEA level.

Severity

Comprehensive surveillance. Countries comprehensively testing suspected cases for COVID-19 should monitor the number and proportion of hospitalised cases, cases admitted to intensive care units (ICU) or high-dependency units (HDU), and cases with fatal outcome among the number of confirmed cases.

Hospital-based SARI surveillance. Countries no longer testing mild suspected cases for COVID-19 should at least test all severe acute respiratory infection (SARI) cases admitted to hospital and ICU/HDU, and monitor the proportion of confirmed COVID-19 cases among all SARI. This type of surveillance system can be comprehensive or based on a number of representative sentinel hospitals or areas. Sentinel hospitals should be selected if their catchment population is known and stable. A suitable alternative is to select all hospitals in a given area/region and use the population of that area/region as denominator.

Mortality surveillance. While the surveillance of fatal outcome among hospitalised confirmed COVID-19 cases remains important and will be relatively feasible, it may not reflect the true magnitude of COVID-19-related

mortality in a population. Elderly people may die outside of hospital settings, e.g. in long-term care facilities (LTCF), as already observed in a number of Member States. Specific LTCF-based surveillance data, or mortality data from national statistics offices may be considered if frequently updated and readily available. Alternatively, EuroMOMO supplies weekly age-specific all-cause excess mortality data for the majority of Member States.

Qualitative indicators: In the context of influenza pandemics, WHO has suggested a set of qualitative indicators to assess severity (pandemic influenza severity assessment, PISA) which might also lend themselves to COVID-19 [3]. In the PISA framework, severity is composed of **transmissibility, seriousness and impact**. Transmissibility can be measured, for example through the indicators obtained from sentinel ILI/ARI surveillance while seriousness and impact derive, for example, from indicators obtained from SARI surveillance, mortality surveillance or COVID-19-related bed occupancy in hospitals. According to agreed definitions, transmissibility, seriousness and impact are reported as qualitative categories (e.g. no activity, low, moderate, high, extraordinary) and may support public health decisions which would need to be taken in the context of large pressures on health services.

Objective 2. Virological surveillance

Virological sentinel surveillance of COVID-19 should be based on the clinical specimens obtained through national sentinel surveillance of ILI/ARI/SARI. The recommended diagnostic test uses nucleic acid amplification, such as RT-PCR, to detect SARS-CoV-2 RNA in oropharyngeal and nasopharyngeal swabs [2][1]. Furthermore, integrated epidemiological and virological surveillance will play a significant role – once vaccines and antivirals become available – to monitor virus/vaccine match and the possible emergence of antiviral resistance.

Representative stains of virus from different geographic locations and time points, as well as from patients of both genders, and across the age and severity spectrum should be selected for sequencing in order to monitor virus evolution and changes in the virus genome. Particular attention should be paid to any changes reducing the sensitivity of detection assays and mutations in surface proteins that may affect the antigenicity of circulating viruses. Any RT-PCR with a Ct value less than 30 is considered a good source of sequencing material. Countries without sequencing capacity are encouraged to send samples to WHO referral laboratories for COVID-19 testing, following WHO guidance for laboratories shipping specimens or request sequencing support from ECDC (email to influenza@ecdc.europa.eu). Further details are available on the ECDC laboratory support webpage. Sequencing results should be deposited in the *Global Initiative on Sharing All Influenza Data* (GISAID) database.

Laboratories involved in the COVID-19 national response are encouraged to participate in the ECDC and WHO external quality assessments to evaluate the reliability of their testing assays and resulting data quality.

As per WHO biosafety guideline, non-propagative diagnostic laboratory work (for example, sequencing, nucleic acid amplification) should be conducted at a facility using procedures equivalent to biosafety level 2 (BSL-2). Propagative work (for example, virus culture, isolation or neutralisation assays) should be conducted at a containment laboratory with inward directional airflow (BSL-3). Patient specimens from suspected or confirmed cases should be transported as UN3373, 'biological substance category B'. Viral cultures or isolates should be transported as category A, UN2814, 'infectious substance, affecting humans' [2].

Objective 3. Changes in risk groups

Enhanced surveillance of hospitalised cases. Risk groups should be identified and monitored by enhanced comprehensive or sentinel surveillance of hospitalised cases of COVID-19 with a focus on patient age, gender, medication, underlying conditions, smoking and healthcare worker status, as well as ICU/HDU admission and clinical outcome. Regular descriptive and multivariable analysis should inform targeted preventative measures and messages.

[1] Various other commercial assays (molecular point-of-care tests, SARS-CoV-2 rapid antigen detection and antibody detection tests) are available or under development. Although some of these tests have a CE/IVD mark, clinical validation of their diagnostic performance under real-life conditions is pending. These assays should be carried out in a sufficiently large number of target population subjects and compared with a gold standard test before introducing them into the routine. ECDC is working in close cooperation with the European Commission, Member State authorities, the Foundation for Innovative New Diagnostics (FIND) (https://www.finddx.org/) and WHO on the validation of these tests.

Objective 4. Impact on healthcare system

Operational healthcare system data. Possible quantitative indicators to monitor the impact of the COVID-19 pandemic on national healthcare systems are:

- the number of confirmed cases and deaths among healthcare workers and their proportion among healthcare workers overall and among those working in dedicated COVID-19 hospitals/treatment centres;
- sick-leave numbers among healthcare workers overall and in dedicated centres;
- the COVID-19-related bed occupancy in hospitals overall, dedicated centres, ICUs and HDUs, beds with ventilators;
- the mean number of days' worth of personal protective equipment left before depletion of stock; and
- the proportion of long-term care facilities with at last one case of COVID-19 among staff or residents or with increased mortality.

A possible **qualitative indicator** is whether healthcare systems, at regional or national levels, are still largely coping. In reality, the definition of this qualitative indicator would probably be at least vaguely based on operational healthcare system data (see above).

Objective 5. Impact of mitigation measures

Escalation and maintenance of mitigation measures

Intensity, geographic spread, impact on healthcare system. While escalating and maintaining mitigation measures, their effectiveness should be assessed at regular short intervals to ensure the desired reduction or interruption of COVID-19 transmission in the population. This is best accomplished by monitoring intensity, geographic spread, and the impact on the healthcare system. At this stage, perhaps more than any other, it is imperative to frequently, publicly and comprehensibly communicate and explain the latest figures if the population are to accept and comply with the chosen mitigation measures over an extended period of time.

Data from **contact tracing,** especially changing transmission patterns, can also be analysed to assess the effectiveness of mitigation measures. Such data may include number of contacts, type of contacts most affected, or common settings of transmission and may ultimately inform de-escalation planning.

De-escalation of mitigation measures

De-escalation of mitigation should be considered as soon as intensity, severity and healthcare system impact indicators justify the conclusion that the incidence of COVID-19 has decreased to a level where systematic case finding and isolation, contact tracing and quarantine are sufficient to control, and ultimately contain, the pandemic within a country.

If de-escalation of mitigation measures leads to an increase of COVID-19 cases, requiring fast re-escalation, surveillance and monitoring needs will not differ from the initial escalation phase. If de-escalation results in (seemingly) nationwide lasting absence of COVID-19 cases, the surveillance systems and indicators informing the escalation phase might be too crude to detect persisting low-level community transmission. The following elements could alleviate this:

- **Temporarily enhanced sentinel ILI/ARI surveillance** at regional or national level: for a limited period of time, such as two weeks, the number of sentinel physicians could be increased, each of them sampling a higher-than-usual proportion of ARI/ILI cases for COVID-19 testing.
- **Telephone helplines:** calls to regional/national healthcare telephone helplines could be used to sample a proportion of cases meeting the ILI/ARI case definition for COVID-19 testing.
- Population-based **seroprevalence studies** could provide valuable additional information regarding age-specific population immunity against COVID-19 in the different phases of the pandemic at the local/regional/national level. In addition, prevalence studies using RT-PCR can provide information on the extent of community transmission.
- **Contact tracing** following each detected case is crucial during de-escalation to ensure containment. Data from contact tracing will help understand transmission patterns and guide further action.

Objectives 6 and 7. Detection of nosocomial outbreaks and outbreaks in long-term care facilities

Routine surveillance of outbreaks. Nosocomial outbreaks of COVID-19 and outbreaks in long-term care facilities should be notifiable to local public health authorities within 24 hours of detection. Given the potential dire consequences, the threshold for testing should be low. The rationale would be to rapidly contain the event,

improving infection prevention and control measures and tracing contacts, protecting healthcare workers and patients/residents at high risk of severe disease and poor outcome, and preserving vital healthcare infrastructure. At national level, the number of such outbreaks of COVID-19 and the proportion of affected facilities might serve as additional indicators of intensity, geographic spread and impact on the healthcare system.

Minimum reporting to ECDC

ECDC appreciates the enormous efforts of some Member States to report detailed data for each confirmed case of COVID-19. Many Member States, however, can no longer keep up with the reporting and their reporting burden should be eased. To reduce the reporting burden, Member States should, as a minimum, once per week report a basic aggregate dataset on all cases, a reduced case-based dataset on all severe cases, viral sequence data to GISAID, qualitative indicators for geographic spread, and qualitative indicators for pandemic impact on the healthcare system. A detailed description can be found in the COVID-19 reporting protocol. If no cases of COVID-19 are detected, e.g. after de-escalating mitigation measures, zero reporting is expected. Table 1 shows how each indicator relates to the relevant surveillance objective.

ECDC and WHO will use these data to compile and publish a weekly COVID-19 report.

Table 1. Minimum COVID-19 surveillance data to be reported to ECDC/GISAID

	Objective	Indicator					
		Quantitative/ qualitative	Numerator	Denominator	Format	Database	Frequency
1	Intensity	Quantitative	Total confirmed (n)	Total tested (n)	Aggregate	TESSy	Weekly
	Intensity	Quantitative	Confirmed cases by age (n)		Aggregate	TESSy	Weekly
	Intensity	Quantitative	Positive ILI/ARI total (n)	ILI/ARI total tested (n)	Aggregate	TESSy	Weekly
	Intensity	Quantitative	Total ILI/ARI	Individuals registered with the sentinel physicians (n) OR population under sentinel physician catchment area OR total number of consultations per week	Aggregate	TESSy	Weekly
	Geogr. spread	Qualitative				TESSy	Weekly
	Severity	Quantitative	Total hospitalised (n)		Aggregate	TESSy	Weekly
	Severity	Quantitative	Total ICU /HDU (n)		Aggregate	TESSy	Weekly
	Severity	Quantitative	Total SARI positive (n)	Total SARI tested (n)	Aggregate	TESSy	Weekly
	Severity	Quantitative	Positive SARI by age (n)	SARI tested, by age (n)	Aggregate	TESSy	Weekly
	Severity	Quantitative	Positive SARI by age (n)	Hospital catchment area	Aggregate	TESSy	Weekly
	Severity	Quantitative	Total confirmed deaths (n)		Aggregate	TESSy	Weekly
	Severity	Quantitative	Confirmed deaths by age (n)	Confirmed cases by age (n)	Aggregate	TESSy	Weekly

Objective		Indicator					
		Quantitative/ qualitative	Numerator	Denominator	Format	Database	Frequency
2	Viral changes	Quantitative	Genetic mutations		Sequence-based	GISAID	Weekly
3	Risk groups	Quantitative			Case-based	TESSy	Weekly
4	Impact on healthcare system	Qualitative				TESSy	Weekly

In addition, ECDC and WHO are piloting the PISA indicators: transmissibility, severity and impact (Table 2).

Table 2. PISA indicators currently piloted

Objective		Indicator					
		Quantitative/ qualitative	Numerator	Denominator	Format	Database	Frequency
1	Transmissibility	Qualitative				TESSy	Weekly
	Seriousness	Qualitative				TESSy	Weekly
	Impact	Qualitative				TESSy	Weekly

Testing priorities in case of limited resources

In situations where testing capacities are available and primary care services are accessible, all patients presenting to the healthcare system with symptoms of acute respiratory infection should be considered suspected cases of COVID-19 according to the EU case definition and should be tested for SARS-CoV-2 virus as part of active case finding. If the number of suspected cases exceeds the available testing capacity in a country or an area, testing of the following groups should be considered a priority (in decreasing order of importance):

- Healthcare workers visiting patients (regardless of setting) in order to:
  - reduce the risk of transmission to their patients;
  - reduce the impact on the healthcare workforce.
- Elderly people and those with underlying chronic medical conditions such as lung disease, cancer, heart failure, cerebrovascular disease, renal disease, liver disease, hypertension, diabetes, and immunocompromising conditions who show signs of acute respiratory illness, because they may need respiratory support sooner than people who are not in a risk group.
- Hospitalised patients with SARI in order to inform appropriate clinical management, including isolation and wearing of PPE, as well as for surveillance purposes.
- All cases, even those with mild symptoms, developing acute respiratory infection in hospitals, long-term care facilities or other vulnerable communities (or, as a minimum, the first cases to confirm an outbreak in a closed setting) in order to guide:
  - infection control and PPE use and protect vulnerable persons and healthcare workers;
  - isolation and early treatment to prevent severe disease and fatal outcome in risk groups;
  - decisions on healthcare workers' exclusion from, and return to, work to ensure continued health and social care services.
  - subsets of patients with ARI or ILI in sentinel outpatient settings.

Further information on laboratory testing guidelines is available from the ECDC webpage on laboratory support for COVID-19 in the EU/EEA and WHO documents [4].

Additional data sources

ECDC is liaising with major clinical networks and EU-Commission-funded projects (Recover, I-MOVE+, ISARIC) to explore ways of collaborating and data sharing.

ECDC is also looking into alternative data sources for surveillance such as online self-assessment tools and healthcare apps including ways in which ECDC can help collate information from such tools.

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