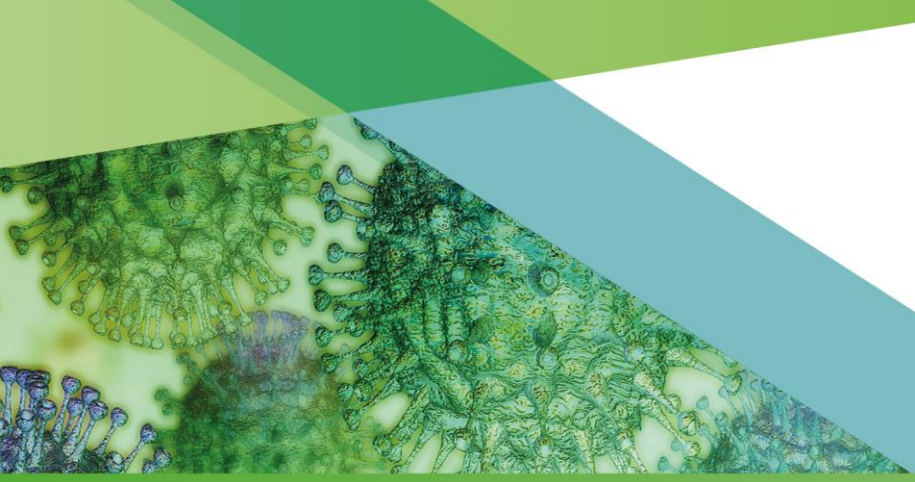

Population-wide testing of SARS-CoV-2: country experiences and potential approaches in the EU/EEA and the United Kingdom

19 August 2020

Key messages

- Different population-wide testing approaches have already been used in various countries, including household testing, individual testing and the testing of incoming travellers, irrespective of whether or not they are displaying symptoms.
- Factors that need to be considered prior to implementation of any population-wide testing strategy which is to include all individuals are the epidemiological situation, costs, logistics, technical feasibility, resource availability, contract tracing capabilities, barriers to testing, potential false positivity and timely notification.
- Population-wide testing strategies can complement other public health measures and are more effective when paired with case isolation and contact tracing.

European Commission request

The European Commission asked the European Centre for Disease Prevention and Control (ECDC) to organise a webinar where countries described their approaches and experience with regard to mass testing. In addition, ECDC was requested to gather all available information on mass/universal testing practices from European and non-European countries and provide a scientific opinion on this intervention.

Target audience

Public health authorities in the European Union and European Economic Area (EU/EEA) and the United Kingdom (UK).

Definition

Population-wide testing, or 'mass testing', generally refers to carrying out a high volume of tests for SARS-CoV-2 on individuals, irrespective of whether they are displaying symptoms, in a given population in order to identify cases with laboratory-confirmed SARS-CoV-2 infection and inform decisions regarding intervention measures.

Population wide testing is also referred to as mass screening, universal testing and population-based screening.

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Scope of this document

This document summarises country experiences and perspectives relating to the objective and application of different population-wide testing approaches and discusses the options in the context of the EU/EEA and the UK. The testing of all individuals in a specific setting as part of an outbreak investigation (e.g. related to an occupational setting) or a research study are not considered to be population-wide testing in the context of this document. Details on the screening of particular targeted populations (e.g. testing of pregnant women on labour and delivery wards, testing of residents and staff in long-term care facilities, testing of all patients prior to surgery, etc.) are also not included in this document.

Background

Robust testing capacity, prompt isolation of cases and timely and effective contact tracing and quarantine of identified contacts, along with other measures such as social distancing, are currently the main pillars of the COVID-19 public health response [1]. Over the course of the COVID-19 pandemic, testing strategies within the EU/EEA and the UK have focussed primarily on individuals with clinically compatible symptoms of SARS-CoV-2 infection and individuals in high-risk groups (e.g. healthcare workers, staff and residents of long-term care facilities), in accordance with the ECDC case definition, surveillance strategy and long-term care facility surveillance guidance [2-4].

Possible objectives of population-based testing are:

- to decrease incidence to manageable levels and prevent or reduce the need for stringent non-pharmaceutical interventions during widespread transmission;
- to estimate prevalence and understand how many cases are infectious at a given point in time to help control the epidemic;
- to identify areas or settings where it is not clear what is driving transmission and understand the true incidence and description of cases in terms of geography and demographics to allow for more targeted measures.

As response measures have gradually been lifted and the movement of people has increased, many countries within the EU/EEA and the UK have also expanded testing to include individuals, irrespective of whether they are displaying symptoms. Expanded testing strategies are based on the assumption that undetected asymptomatic or pauci-symptomatic and mild cases not accessing healthcare or being tested for SARS-CoV-2 infection can have a substantial impact on transmission and spread.

Methods

This report is based on information gathered during a webinar on strategies for population-wide testing arranged jointly by ECDC and the World Health Organization (WHO)'s Regional Office for Europe, literature searches, and email enquiries sent to country representatives.

Webinar on strategies for population-wide testing

On 31 July 2020, in collaboration with the WHO's Regional Office for Europe, ECDC invited over 53 countries, and representatives of the global centres for disease control and prevention (Africa, Canada, Caribbean, China, Korea, Israel, Thailand, and the United States) to participate in a webinar. Over 110 participants joined the webinar to listen to experts presenting from Denmark, the UK (England), Germany, Republic of Korea, Luxembourg and Singapore, and modelling experts from the Imperial College London, UK.

Literature search

Searches were performed on 11 August 2020 in a COVID-19 EndNote reference library database maintained by ECDC's Library. This included 47 678 records at the time of search.

The EndNote library database is designed to retrieve all new publications related to COVD-19 in PubMed from the start of the epidemic and is updated daily. It is complemented by the monitoring of journal websites, COVID-19 specific publishers' portals for new publications, and preprint portals for upcoming publications.

Natural vocabulary (i.e. keywords) were used to represent the concept of universal testing; searches were run in in all fields and truncation was applied. The search terms used were 'universal', 'population-wide', 'mass', 'group', 'comprehensive' and 'systematic' in a phrase with either 'test*' or 'screen*'. Additionally, all searches were run with either SARS-Cov-2 or COVID-19 in the middle of the phrase (e.g. universal SARS-Cov-2 test*). Different spellings/hyphenations of the same term were applied (e.g. population-wide, population wide, population-wide).

To be considered relevant, studies needed to address the description or experiences of population-wide testing in a country. All modelling studies and articles related to testing special populations with regard to outbreaks or clusters have been excluded. In addition to publications mentioned during the webinar, other sources were reviewed based on references within the articles. A total of 264 articles were identified from the searches. Of those 264 articles, seven were included after a screening of their title and abstract and of these, five were included based on a review of their full text.

Enquiry to the extended network of countries within the EU/EEA and UK and selected non-EU countries

On 24 July 2020, ECDC sent an enquiry to the extended network of ECDC National Focal Points for Influenza and the Operational Contact Points for Influenza and COVID-19 in 53 countries, including the EU/EEA, the UK and selected non-EU countries. The enquiry asked (both in English and Russian) whether their country was conducting or planning to conduct some form of population-wide testing of individuals, including those without symptoms. If yes, they were asked to share relevant references or links in their email reply (see Annex 1, Table A). Answers were free text and responses to the enquiry were supplied voluntarily. The recipients of the inquiry were reminded to respond several times prior to the deadline in order to ensure due diligence in capturing as many responses as possible.

Results

Testing capacity and implementation of population-wide testing

The basis of population-wide testing is the availability of a high testing capacity in a country or region. During the webinar, the presenting countries reported the following daily national testing capacities: Luxembourg's maximum testing was 1 800 tests/100 000 population (11 000 tests/day)[5], the UK 250 tests/100 000 population (165 750 tests/day) [5], Singapore 700 tests/100 000 population (40 000 tests/day), Denmark 280 tests/100 000 population (16 300 tests/day)[5], Germany conducts approximately 99 tests/100 000 population (82 000 tests/day)[5], and the Republic of Korea carries out 39 tests/100 000 population (20 000 tests/day).

Of the 53 countries asked about their plans to conduct some type of population-wide testing of individuals irrespective of symptoms, 26 replied. A total of 17 countries reported that they were not conducting any population-wide screening of individuals, irrespective of symptoms, while six countries (Denmark, France, Germany, Lithuania, Luxembourg, and the UK) reported conducting some type of population-wide testing of all individuals that met the scope of this report. Detailed strategies, as presented during the webinar, were included with the responses received via email in Table A of Annex 1.

Approaches to population-wide testing

Household testing

Testing of many households at the population-wide level will help to better understand the epidemiological situation in a country with more granular demographic data. In addition, the following objectives were presented for conducting population-wide household testing:

- to better understand transmission within the household setting and estimate secondary attack rates;
- to characterise secondary cases and understand the range of clinical presentations, risk factors for infection, and detect asymptomatic infections.

Several countries have applied such an approach and details appear below.

In the United Kingdom, there are several large population-based household studies looking at approximately 100 000 households to learn more about transmission, but no results are yet available.

Iceland conducted random population testing and tested 6% of the population in April 2020 [6].

From January to March 2020, the Republic of Korea analysed 59 073 contacts of 5 706 cases and of 10 592 household contacts, 11.8% of household contacts were COVID-19 positive compared to 1.9% positivity in non-household contacts [7].

Luxembourg's goal is to test one person within each household every week to gain a longitudinal perspective on household transmission. Family gatherings including dinner parties made up a large part of Luxembourg's identified clusters.

In South Africa, a community screening and testing approach was among the early responses to the pandemic, guided by the presence of a case and the social vulnerability of the community. Community health workers went from door to door to identify any person with COVID-19 symptoms [8].

With known rates of transmission higher in the household setting than in non-household settings, households represent potentially large numbers of undetected cases.

Population-wide individual testing

The objectives for individual-initiated testing for SARS-Cov-2 vary. For example, the public might be interested in knowing their COVID-19 test status and willing to play an active role in being tested for infection. If travel, movement, employment, and other factors are dependent on test status, the public might be required to initiate and seek out testing. Denmark, France, Luxembourg, the Republic of Korea, and other countries have made the testing process free and widely available to all those who want to be tested, resulting in a high-volume of tests being requested.

Different methods have been applied to the offer of individual-initiated testing and some countries have been innovative in their approaches - e.g. establishing mobile testing sites, or drive-through testing centres [9-11], and making the testing process free and widely available.

A public hospital in Seoul, in the Republic of Korea constructed phone booths to offer fast and easy testing for anyone concerned about their infection status. One person at a time can enter the glass-walled booth and have a quick consultation with a healthcare worker on the other side of the glass. After the consultation, the healthcare worker can place their arms into rubber gloves embedded into the walls and collect a sample before the booth is quickly disinfected and the total time taken is seven minutes per person [12]. Massachusetts General Hospital in the United States has also tested and deployed personal protective booths to provide tests for the community, using a human-centred design that also protects the healthcare worker [13]. The US reports having the capacity to test 2 000 tests/100 000 population (700 000 tests/day) [14], but has reported delays of up to two weeks in getting results back to individuals, thereby preventing effective contact tracing and timely isolation of positive cases.

Vietnam has established population-wide testing locations in Hanoi and provided free food and accommodation to everyone during the mandatory quarantine period, irrespective of nationality. All tests have also been provided for free to all suspected cases and close contacts of cases [15].

France is offering free testing for everyone and has established mobile testing centres located in places where there is a mix of people and/or high density populations, such as in touristic cities. All tests are free and are offered without prescription and, most of the time, without the need for an appointment (See Annex 1).

Patient-initiated testing tends to work best when testing is easily accessible, free, has low/no barriers to entry (e.g. does not require registration or prescription), and when case notification turnaround times are fast (<24 hours). In order to conduct such tests, testing sites and facilities need to be established, adequate staff trained and the logistics of testing and contact tracing coordinated.

Testing incoming travellers

In the Republic of Korea, Singapore, Germany, Luxembourg, and many other countries testing is mandatory for incoming travellers with the objective of limiting re-introduction and transmission of the virus.

Luxembourg has a large cross-border commuter population with over 200 000 incoming travellers every day. The objective of testing commuters at entry sites (airport, stations, and international entry points) was to identify cases and control the epidemic. In conjunction with the lifting of confinement measures, Luxembourg anticipated extended contact tracing to prevent the need for re-implementation of blanket confinement measures. Cross-border workers accounted for 16% of infections, with limited evidence of spread in the workplace setting itself. Luxembourg found that the lifting of measures and increased social interactions accounted for the rise in cases.

Singapore enforces temperature/health screening at ports of entry and has mandatory quarantine for all incoming travellers to reduce importation of cases. If travellers become symptomatic during their quarantine, they undergo swabbing. If they do not have any symptoms, they undergo pre-exit testing on Day 14. Singapore reported that 50% of those travellers testing positive were asymptomatic.

The Republic of Korea also performs temperature screening and testing of all incoming travellers on Day 3 and Day 14 of mandatory quarantine. Some travellers have been found positive on Day 14. Based on preliminary analysis, the proportion of asymptomatic cases confirmed among travellers is lower than the proportion of asymptomatic cases in community outbreaks and further analysis is ongoing to determine the underlying factors. Cases in travellers tended to be in younger age groups than cases in the general population. There is an ongoing evaluation of the results of this testing strategy.

In addition, several countries (e.g. USA and China) have carried out temperature screening to identify infected incoming travellers at airports [16].

Testing of incoming travellers requires ongoing communication on testing procedures and protocols concerning quarantine requirements. Protocols for primary and secondary screening require defined mechanisms, clear case definitions, an adequate number of trained, competent primary and secondary screeners, adequate personal protective equipment for personnel, and a way in which to isolate suspected cases safely from other travellers [17]. Other considerations which need to be taken into account when testing at ports of entry/exit are the volume of travellers, the types of travellers (foreign or domestic), the location's connectivity with other communities, transmission of COVID-19, and the safety and security of all those involved. Ideally, mechanisms for communication with airlines and authorities in other countries should be in place in order to facilitate contact tracing if infected travellers are identified.

Targeted testing of populations in specific settings

Most EU/EEA countries and the UK regularly test individuals in high-risk settings such as at healthcare facilities. Of the eight countries that responded to the ECDC enquiry that are not currently planning population-wide testing of individuals without symptoms, at least five regularly test individuals without any symptoms in high-risk settings – e.g. healthcare workers, individuals working in long-term care facilities, and people in various other settings, such as patients admitted to hospitals, individuals in specific occupational settings, prisons, etc.).

Testing in these settings has sometimes been described as occurring in response to a cluster of cases reported in that group or setting, or carried out to protect vulnerable populations (i.e. patient groups, health workers, patients or long-term care facility residents) and therefore the objectives may differ to those for population-wide testing, as defined in this document.

Test methodologies

Pooling or group testing of specimens is faster than individual testing and saves on resources [18]. According to evidence from mathematical modelling and a literature review, population-wide testing in large populations will only be possible by means of pool-based strategies [19]. For infection rates from 0–2.5%, binary splitting pooling seems to be the best method [19]. ECDC has provided a methodology for estimating the point prevalence of SARS-CoV-2 infection through pooled RT-PCR testing [18].

Another approach to consider is the use of high-specificity screening tests that produce results within less than an hour. For example, a rapid antigen test that has a high specificity but does not achieve the sensitivity of a nuclear acid amplification test (NAAT) could be used as a screening test [20]. As the number of false negative tests increases at lower sensitivity, the negative test results would need to be confirmed with an NAAT. The positive test results would be dependent on the specificity of the test. An example of a diagnostic decision tree based on a rapid antigen screening test is available from Mertens et al. [20].

Contact tracing

Population-wide testing could be complemented by contact tracing activities to contribute to transmission reduction by following up contacts of symptomatic cases and cases identified as pauci-, pre- or asymptomatic. Ideally, the resources in place to carry out contact tracing should be able to maximise the impact of population-wide testing rather than just isolating identified laboratory-confirmed cases. However, population-wide testing could potentially result in the identification of large numbers of cases, which could be a challenge for contact tracing operations, requiring considerable additional resources to follow up contacts. ECDC has published guidance on how to increase the contact tracing capacity [21]. If resources are limited, there are ways to prioritise contact tracing operations, such as only tracing those contacts with the highest risk exposure to the case. This and other resource-saving measures are included in the guidance [21]. ECDC has also published general guidance on how to perform contact tracing [22]. When conducting robust testing, it is important to remember that contact tracing is most effective when testing is conducted soon after symptom onset.

Considerations for testing strategies when physical distancing measures are being relaxed

When populations are subject to stringent physical distancing measures, enhanced testing and robust contact tracing are not as crucial as when people are allowed to move freely within the community. Singapore reported that while stringent measures were in place and people were working from home, contact tracing for cases consisted mainly of household contacts, ranging from 5–10 people per case. Before relaxing physical distancing measures, countries should increase testing availability and coverage, paired with robust contact tracing to achieve similar (modelled) results to strict physical distancing with a core (more limited) testing strategy [23]. Increased testing will ensure rapid feedback from surveillance systems on any resurgence in cases and help to target the reintroduction of measures on a geographical basis.

Challenges

Individuals' compliance with (repeated) testing, irrespective of symptoms

As healthcare workers in hospitals and long-term care facilities are at high risk of exposure, they are tested more often than other asymptomatic individuals in the general population. For example, Liechtenstein has reported that healthcare workers are becoming less willing to be tested regularly, due to the fact that they have already been tested so frequently. Other countries have expressed concern about issues concerning compliance with mandatory testing of incoming travellers. Luxembourg and Germany suggested that a 14-day mandatory quarantine could be issued if an individual refuses to be tested, although this option is not always possible for certain essential workers with high rates of exposure. Compliance issues can also arise when disease prevalence rates are low in the community. The public is less willing to be tested regularly when there does not appear to be a threat.

Logistics

The speed of testing and associated contact tracing following the identification of laboratory-confirmed cases is critical. While researchers continue to improve the accuracy of the tests, other aspects of testing can be addressed through logistics, such as notification of results via automated processes, apps, and/or only providing positive results. Testing is limited by access, supply shortages, and logistical issues related to diagnostic tests. Minimising the time from testing to result (i.e. turnaround time) and maximising the number of people who can be tested in a given time is essential.

While countries described a robust capacity for testing, they also described challenges in coordinating the logistics of multiple testing sites, laboratories, and the provision of timely notifications. Luxembourg reported that the time from sampling to notification of results was generally 24 hours but could be up to 48 hours. Long delays in waiting for test results lead to unnecessary quarantining and absenteeism from work, as well as delayed diagnosis and contact tracing. This in turn will increase the number of contacts to identify, placing an extra burden on resources and having an impact on the effectiveness of the contact tracing itself. Essential workers may become less willing to comply with regular testing as the pandemic progresses and during periods of low transmission.

Large-scale testing and test performance

When evaluating the impact of large-scale testing of asymptomatic people, it is important to understand the trade-off between reduced transmission resulting from the additional cases identified, and the proportion of extra effort and cost required due to the larger number of tests to be carried out. For example, the total number of people with a false positive result, who may end up being isolated and having their contacts quarantined unnecessarily, will increase. This number of false positives is a function of the specificity of the PCR, the number of non-infected individuals being tested and the prevalence of the infection in a population. For PCR-based tests, the specificity is generally very high (in the order of >99.5%) and many tests resulted in a virtual 100% specificity across several studies [24]. By analogy, the number of false negative results is a function of the sensitivity of the test, which is generally high for PCR-based tests, although not perfect.

As illustrated in Table 1 below, the positive predictive value will be lower if there is low disease prevalence. The table provides an example of the expected number of true/false positives and true/false negatives per million tests performed, for a test sensitivity of 98%, a test specificity of 99.9% and 0.1% of infected cases in the total population. Assuming that the test result is the sole basis for diagnosis, in this example 999 000 people would be tested unnecessarily, of whom 999 would be falsely diagnosed with COVID-19. Conversely, out of 1 000 actual COVID-19 cases, 20 would remain undetected (Table 1).

Table 1. Expected numbers of true/false positives and true/false negatives for one million tests performed, a test sensitivity of 98%, a test specificity of 99.9% and 0.1% of infected cases in the total population[1]

Has COVID-19	Test positive		Total
	Yes	No	
Yes	True positives: 980	False negatives: 20	1 000
No	False positives: 999	True negatives: 998 001	999 000
Total	1 979	998 021	1 000 000

[1] Note: sensitivity of PCR under field conditions may be lower than that calculated in the laboratory setting.

In addition to concerns about false positivity results, other issues to consider in relation to population-wide testing are that there is still no consensus on a CT value that can be used as a decision threshold and that viral load is not routinely measured in many settings. Therefore, population-wide testing may result in a number of RT-PCR cases that are no longer infectious but still result in unnecessary case isolation and quarantining of contacts.

Resource limitations

All testing approaches require significant resources and corresponding logistical support and guidelines. Moreover, population-wide testing requires a large number of reagents, consumables, human resources, and laboratory coordination and support. Testing approaches must be sustainable as it is predicted that SARS-CoV-2 will be in circulation for a long time. There will always be limitations on human resources, timeliness, national coordination, communication to and reception by the public. These cost should be weighed against possible savings in terms of reduced numbers of cases requiring hospitalisation and ICU support, mortality, work absenteeism and the need for lockdowns and other onerous measures. Therefore, before embarking upon population-wide testing, countries should assess the advantages, disadvantages, and appropriate geographical scale of this approach against the intended public health objectives.

The effectiveness of wide-scale testing remains unknown and the costs of finding one positive case among many individuals, irrespective of symptoms, might be high. In addition, population-wide testing can result in poor international alignment and biased comparisons of COVID-19 incidence rates among countries with differing testing indications and strategies.

Knowledge gaps

Future assessment studies of large-scale testing are needed to evaluate the yield of the efforts and to calculate the cost effectiveness of this approach compared to other measures. It is also important to understand the true proportion of asymptomatic cases within special groups or populations so that interventions and recommendations can be tailored for implementation at the local level. The infectiousness and transmissibility of asymptomatic cases remains unclear and warrants further study.

Information detailing population-wide testing strategies for SARS-COV-2 is largely missing from the peer-reviewed literature, meaning that the evidence available to guide countries in their decision-making is limited. In addition to the sparse literature, this report is limited to the information provided by the countries during the webinar and by the respondents to ECDC's email enquiry. It is possible that other countries may be able to provide more experience and further perspectives in this area, however these are unknown to ECDC at present.

Conclusions

In light of the evidence available at the time of writing, population-wide testing can be considered when:

- it is necessary to rapidly decrease disease incidence in a community and thereby reduce the pressure on the healthcare system;
- a community is experiencing very low levels of transmission and one of the public health goals is to eliminate the disease (e.g. to resume normal activities or relax non-pharmaceutical interventions);
- it is necessary to understand disease prevalence by age, ethnicity, setting, location, etc. in order to target public health measures (e.g. when community transmission continues despite appropriate non-pharmaceutical interventions and contact tracing).

If a country has a population-wide testing strategy and has achieved near disease elimination and is no longer detecting ongoing transmission, as in New Zealand and Iceland, it may consider testing domestic and foreign travellers upon (re)entry to avoid reintroduction of cases. Movement of people within and between countries is associated with a risk of ongoing transmission. However, focusing solely on high-volume testing of travellers from areas of high incidence should not supersede continuous monitoring of virus circulation within the population and continued implementation of reasonable non-pharmaceutical measures.

Nevertheless, the implementation of such large testing systems is complex and needs to be carefully evaluated, taking into consideration potential expected outcomes, costs, supplies, human resources, technical and logistical practicalities and population involvement and compliance.

In addition to the aforementioned challenges, other factors such as the epidemiological situation in the country, the testing objectives, and the structural differences of the respective healthcare systems (both locally and nationally) are crucial elements which need to be assessed before any testing strategy is adopted. The timely notification of test results should also be a key factor for effective testing. Turnaround times from sampling to transport, laboratory analysis and the sharing of the test results (in particular, positive test results) should be coordinated to ensure that they are as fast as possible (ideally within 24 hours).

When collecting large volumes of samples it is important to create a simple, accessible process. If the ultimate goal is to carry out population-wide testing of large groups of people, the testing should be simple to perform,

free-of-charge to the patient, accurate and offer quick notification of results to the public health sector and the individual. In order for test results to be provided to large numbers of individuals in a timely manner, phone- or computer-based messaging strategies need to be established, along with strategies for notifying positive cases.

In order to conduct population-wide testing, in addition to having adequate resources and laboratory coordination in place, countries must also have sufficient public and political will for this strategy. No testing strategy should compromise the testing quality (including test turnaround time) for people who are at high risk of developing severe disease or suffering a fatal outcome (e.g. the elderly, residents of long-term care facilities or other vulnerable groups.) Population-wide testing, when paired with case isolation, physical distancing, and other public health measures, may be enough to significantly limit ongoing transmission. Ideally, the resources in place to carry out contact tracing should be able to maximise the impact of population-wide testing rather than just isolating identified laboratory-confirmed cases.

Considering all of the challenges and knowledge gaps, population-wide testing may be one tool that can be used according to the target objectives of the Member State. The high costs, intensive logistics, and considerable human and consumable resources needed to conduct a population-wide testing strategy may not be feasible, reasonable or a priority for all Member States. However, potentially, these costs may be balanced by the economic savings in terms of hospital admissions, deaths, reduced work absenteeism, and use of more appropriate, non-pharmaceutical interventions. Population-wide testing may allow society to function with fewer stringent measures in place, enabling people to live more freely under the terms of the 'new normal' brought about by the pandemic which is also beneficial for people's well-being.

Efforts are still ongoing to assess the impact and effectiveness of testing strategies. The results of these assessments are still unpublished in the peer-reviewed literature and the testing strategy remains a topic for further consideration and discussion.

Testing strategies should be adapted as new evidence emerges, based on the development of the pandemic, with the aim of offering high-volume testing interventions conducted in a timely manner.

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Annex 1. Population-wide testing strategies in EU/EEA countries, the UK and selected non-EU countries

Table A. Responses to ECDC request concerning population-wide testing on 24 July 2020

Country	Wide testing	Comments
Belgium	No	No plan to organise a population-wide screening for asymptomatic individuals in Belgium but we are conducting seroprevalence studies in samples of the population. There is screening of asymptomatic persons in some domains (e.g. persons admitted to hospitals or nursing homes, travellers from 'red' countries)
Bulgaria	No	Screening high-risk people in other settings by RT-PCR for different administrative reasons (e.g. travel abroad, work requirements, admittance to hospital)
Croatia	No	We do not plan to conduct population-wide screening for asymptomatic individuals in Croatia. However, a substantial number of asymptomatic individuals are tested by PCR for different administrative reasons (e.g. travel abroad, work requirements, admittance to hospital).
Czechia	No	
Denmark	Yes	Testing is freely available on a voluntary basis for all Danish citizens irrespective of symptoms. See details in webinar summary above.
Finland	No	
France	Yes	• Extensive screening campaigns are currently being implemented in certain areas of the territory where clusters or over-incidence may be reported. The entire population is then invited to come and be tested, whether symptomatic or asymptomatic and whether or not they have been in at-risk contact with a case of COVID-19. • Mobile screening centres are also located in places where there is a mix and/or high population density (touristic cities, etc.). • All tests are free, without prescription and most of the time without appointment.
Germany	Yes	Germany follows a risk-based test strategy, including incoming travellers, alongside population-based studies and investigations in high-incidence areas Published testing strategy: https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Teststrategie/Nat-Teststrat.html Subnational testing (pages 20-22): https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Laborkapazitaeten.pdf?__blob=publicationFile Antibody studies: https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Projekte_RKI/Antikoerper-Studien.html See details in webinar summary above.
Ireland	No	Serial screening of healthcare workers in nursing homes.
Latvia	No	
Liechtenstein	No	Regular screening for asymptomatic healthcare workers in hospitals and nursing homes but only one person has been identified as a case when they were asymptomatic and the healthcare workers are becoming less cooperative (had enough of the tests).

Country	Wide testing	Comments
Lithuania	Yes	Lithuania examines asymptomatic individuals, high-risk and low-risk municipalities are announced on a weekly basis, and testing of health care workers is performed accordingly. Targeted prophylactic studies for COVID-19 (coronavirus infection) are organised according to municipal epidemiological indicators (14-day total disease rate per 100 thousand population): For low-risk municipalities, if at least one of the following criteria is met: • total morbidity level per 100 thousand population in the municipality is less than or equal to the total morbidity per 100 thousand population in Lithuania within 14 days; • the 14-day total morbidity rate per 100 thousand population in the municipality is less than or equal to 5; • no more than one case of COVID-19 disease (coronavirus infection) has been detected in the municipality within 14 days. For high-risk municipalities, if all the criteria are met: • the 14-day total morbidity rate per 100 thousand inhabitants in the municipality is higher than the total 14-day total morbidity rate per 100 thousand in Lithuania population; • the 14-day total morbidity rate per 100 thousand inhabitants in the municipality is higher than 5; • more than one case of COVID-19 (coronavirus infection) was detected in the municipality within 14 days. • if the municipality is classified as a low-risk municipality, between 2% and 5% per week must be surveyed, and if the municipality is classified as a high-risk municipality, between 15% and 20% must be surveyed, personal health care or social care workers and pharmacists. In Lithuanian municipalities, which are classified as high-risk in terms of COVID-19 morbidity, preventive screening for SARS-Cov-2 is organised for different groups of people working in trade, pharmacy, educational institutions and others. The groups of people to be surveyed are decided by the municipalities.
Luxembourg	Yes	See details in webinar summary above. Published testing strategy: https://guichet.public.lu/en/citoyens/sante-social/coronavirus/depistage-covid-19.html
Malta	Yes	Random swabbing of healthcare workers, staff in elderly care homes, police, armed forces, etc.
Moldova	No	Planning a seroprevalence study of the general population in August-September 2020.
Netherlands	No	Two systems of serological surveys that are repeated every few months; one among blood donors, and one among a random sample of the general population. No screening programmes for asymptomatic individuals using molecular testing.
Norway	No	In Norway, there is currently no ongoing population-wide screening for COVID-19 in asymptomatic individuals. It is only recommended to test asymptomatic individuals under special circumstances, described here: https://www.fhi.no/en/op/novel-coronavirus-facts-advice/testing-and-follow-up/test-criteria-for-coronavirus/ We are currently revising these criteria and consider soon to include all individuals that may been exposed to infection. This will most likely include all people that have travelled to a country with a high infection burden ('red country' which requires quarantine, for definition see here https://www.fhi.no/en/op/novel-coronavirus-facts-advice/facts-and-general-advice/travel-advice-COVID19/) We also plan to examine the infection prevalence in Norway this autumn in a nationwide study based on representative sampling from the Norwegian Mother, Father and Child Cohort Study (MoBa). It has not yet been determined what kind of samples will be collected from the participants, but most likely, saliva or respiratory samples will be collected for PCR analyses.

Country	Wide testing	Comments
		Until now, investigations of seroprevalence in this cohort have been performed, but so far only in Oslo https://www.fhi.no/nyheter/2020/antistoffundersokelse-koronavirus/ (in Norwegian). More information available here: https://www.fhi.no/en/publ/2020/seroprevalence-of-sars-cov-2-in-the-norwegian-population--measured-in-resid/ https://www.fhi.no/en/op/novel-coronavirus-facts-advice/testing-and-follow-up/test-criteria-for-coronavirus/
Poland	Yes	All are tested on quarantine - all contacts of confirmed cases – obligatory tested - people returning from other countries are offered a test - All going to the sanatorium - All before admitted to long term care facilities - All before being admitted to hospital for a planned procedure - comprehensive screening of all employees in case of outbreak - Hospital HCWs – according to local procedure and/or policy.
Portugal	No	Conducting seroprevalence studies in samples of the population.
Russia	No	Planning large-scale seroprevalence studies.
Slovenia	No	
Spain	Yes	Conduct broad diagnostic in some setting as agriculture territories with temporary workers, nightclub environments in many Spanish regions, and in admission of patients for surgery in all hospitals. Special studies as the National Study of SARS-CoV2 sero-Epidemiology in SPAIN ENE-Covid19 (https://portalcne.isciii.es/enecovid19/)
Sweden	No	
Switzerland	No	
United Kingdom	Yes	Currently conducting household studies; See details in webinar summary above.
Wales, United Kingdom	No	We are increasingly screening more asymptomatic individuals but they are in response to incidents; these are falling into the following categories: Screening an entire time to see if an outbreak form a factory had expanded into the community Pre surgery and admission to hospital Discharge to care homes – whether they have previously tested positive or not. All care home residents and staff where a case has been identified As part of mass screening of facilities where outbreaks have occurred. The concerns we have around this approach is the low incidence in the population that is very likely to increase the proportion of false positive results reported. No molecular test has been fully validated in this population and increasingly diagnostic laboratories are being turned into screening centres without clear algorithms about confirmation strategies that we would normally undertake when screening for infectious diseases. Invariably, adding in confirmation strategies will delay results when there is extraordinary pressure for fast results for track and trace interventions. Although we are confident that asymptomatic shedding does contribute to the pandemic, what would really help is a level of confidence around the actual contribution truly asymptomatic cases contribute, as currently delaying surgery and other medical interventions have a huge impact - especially if the result is a false positive.