

## COVID-19 epidemic in Switzerland: on the importance of testing, contact tracing and isolation

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### Summary

Switzerland is among the countries with the highest number of coronavirus disease-2019 (COVID-19) cases per capita in the world. There are likely many people with undetected SARS-CoV-2 infection because testing efforts are currently not detecting all infected people, including some with clinical disease compatible with COVID-19. Testing on its own will not stop the spread of SARS-CoV-2. Testing is part of a strategy. The World Health Organization recommends a combination of measures: rapid diagnosis and immediate isolation of cases, rigorous tracking and precautionary self-isolation of close contacts. In this article, we explain why the testing strategy in Switzerland should be strengthened urgently, as a core component of a combination approach to control COVID-19.

**Keywords:** COVID-19, SARS-CoV-2, testing

### Introduction

*“You cannot fight a fire blindfolded. And we cannot stop this pandemic if we don't know who is infected.”* (World Health Organization Director-General, 16 March 2020).

Switzerland is among the countries with the highest number of coronavirus disease-2019 (COVID-19) cases per capita in the world. As of 18 March 2020, the Swiss Federal Office of Public Health had reported 2772 confirmed COVID-19 cases and 21 deaths. The epidemiological situation is clear: the virus that causes COVID-19, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is spreading rapidly through the Swiss population, and the number of patients suffering from COVID-19 is following the spread of the virus, with a predictable delay. There are likely many people with undetected SARS-CoV-2 infection because testing efforts are currently not

detecting all infected people, including some with clinical disease compatible with COVID-19. The Swiss government announced important and drastic new social-distancing measures on Monday, 16 March 2020 to fight further propagation of this novel virus. In this article, we explain why the testing strategy in Switzerland should be strengthened urgently, as a core component of a combination approach to control COVID-19.

The spread of SARS-CoV-2 must be slowed dramatically and immediately. The Italian situation demonstrates how quickly the healthcare system can be overwhelmed. The number of deaths from COVID-19 in Italy (2978 by 18 March 2020) is already approaching that in the whole of China (3245) [1]. The fact that many patients deteriorate to a critical state and require intensive care for significantly more than one week is particularly concerning [2]. Basic epidemiological models of the spread of the SARS-CoV-2 virus suggest that, owing to its contagiousness and the lack of immunity in the population, 40–70% of the population could become infected unless strong measures are taken [3]. Data from China and Italy indicate that a sizable fraction (5–10%) of the symptomatic cases will need hospitalisation [4]. The overall fraction of SARS-CoV-2 infections that cause serious illness or death is still uncertain, but mortality from COVID-19 increases with age [3] and exceeds that from seasonal influenza.

Until an efficacious and safe vaccine becomes available – with even the most optimistic estimates putting this at 9 to 18 months – the only way to prevent the above scenario is to control the spread of SARS-CoV-2. While strict social distancing measures are necessary, nobody can imagine such measures being enforceable for extended periods of time. In the absence of pharmaceutical measures, the only way to return more quickly to a normal life is to keep the

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spread of the virus under control by preventing transmission, and with active, forceful and rapid extinction of local outbreaks. A liberal strategy for testing, contact tracing and subsequent self-isolation of individuals who test positive for SARS-CoV-2, and precautionary self-isolation of close contacts, is critical to achieve this goal.

Testing on its own will not stop the spread of SARS-CoV-2. Testing is part of a strategy. The World Health Organization recommends a combination of measures: rapid diagnosis and immediate isolation of cases, rigorous tracking and precautionary self-isolation of close contacts. An exceptionally high degree of population understanding and acceptance of these measures are critical for countries with ongoing outbreaks [2]. This strategy means that testing must be widely available and the barriers to testing have to be as low as possible, with testing facilities located outside of hospitals to prevent overburden of hospital resources and the risk of nosocomial transmission to other patients and healthcare workers. To change the epidemiological dynamics of the SARS-CoV-2 epidemic, the current testing recommendation in Switzerland, which is limited to the vulnerable population or patients requiring hospitalisation, needs to be adapted. While the protective effort must be focused on the vulnerable population, the general population must play the central role in this mitigation effort from an epidemiological perspective. Otherwise, the vulnerable population will continue to face very high exposure from the general population. In this document, we use the term “precautionary self-isolation of contacts” to mean “quarantine”, the term used by the World Health Organization [3].

### Why test and isolate?

Switzerland should dramatically upscale its testing capabilities and facilities. In this article, we assume the tests in use for detection of SARS-CoV-2 are validated. We also recognise that there are currently limits to the capacity of test centres and existing diagnostic laboratories in terms of personnel and reagents. In particular, disruption to the production and supply of laboratory reagents only a few weeks into the epidemic shows how severely global diagnostic preparedness has been neglected in recent years. A liberal testing strategy has direct and clear benefits:

1. Testing, followed by contact tracing and isolation of those with positive test results has been applied by all countries that have managed to keep the SARS-CoV-2 virus in check. The epidemiological reasoning is straightforward. Current estimates of the basic reproduction number  $R_0$  of COVID-19 are around 2–3 [5]. To bend the epidemic curve downwards (which will only happen once the effective reproduction number  $R < 1$ ), we must prevent 50–70% of possible transmissions [6]. Isolation of cases and precautionary self-isolation of contacts are key measures to do that, and the COVID-19 experience from other countries demonstrates that forcefully. Following a positive test result, that person should be isolated to prevent onward transmission. The person’s close contacts should be followed up and advised to go into precautionary self-isolation, unless a risk/benefit analysis deems this counterproductive. These measures can prevent a large fraction of possible transmission chains.

2. The Republic of South Korea has had a large epidemic of COVID-19, the cumulative number of cases exceeded 1000 on 26 February [1]. A central part of the control strategy was widespread and easily accessible SARS-CoV-2 testing, linked to contact tracing, and self-isolation. The epidemic curve suggests that the control strategy in South Korea has curtailed the epidemic. The number of new cases peaked on 29 February and had fallen to 84 by 17 March.
3. COVID-19 cases begin with mild symptoms, which peak, on average, 8–10 days after onset. Testing will detect infectious individuals, and will detect clusters, allowing contact tracing and precautionary self-isolation of contacts. More widespread testing will allow a more accurate estimate of the case fatality ratio, acknowledging that the time between disease onset and death is several weeks.
4. Accurate data about the extent of SARS-CoV-2 are essential for robust estimation and preparation of hospital resources and ICU bed requirements. Widespread testing for SARS-CoV-2 will allow a clear picture of the epidemiological situation on the ground to be obtained. It is incredibly difficult to manage a crisis without knowing the extent of the problem. It is particularly important to know more about the number of people affected in Switzerland, and what proportions have mild, severe and critical symptoms.
5. Ongoing monitoring of the results of SARS-CoV-2 testing will allow us to get a clear temporal picture of the dynamic of the COVID-19 epidemic. Without clear numbers, it will be extremely difficult to assess whether control measures were effective, and at which time point it is necessary to modify such measures.
6. A system for antibody testing (serology) will also need to be implemented at large-scale as soon as possible. Antibody testing provides additional information to that obtained from polymerase chain-reaction (PCR) detection of active infection. Antibody testing is the only way to reliably establish the fraction of the population that was infected by the virus – albeit with a delay of a few weeks. A cohort of people with documented infection should be monitored to determine the time to seroconversion, providing crucial input for large-scale testing. People with suspected exposure, healthcare workers in particular, should be tested as high antibody titres likely mean that they are no longer at risk of contracting or spreading the disease and can be preferentially employed in high-risk areas.

### Duration of isolation

Contact tracing identifies exposed contacts who need a 14-day period of precautionary self-isolation. Persons with a positive SARS-Cov-2 test result need to immediately self-isolate. Those with severe symptoms need to be treated with all the needed precautions. Current evidence indicates that “97.5% of those who develop symptoms will do so within 11.5 days” after time of infection, with further analysis finding that “the current period of active monitoring recommended by the US Centers for Disease Control and Prevention (14 days) is well supported by the evidence” [7]. Repeated testing could reduce the period of

precautionary self-isolation. The current recommendation from the Swiss Federal Office of Public Health for contacts of confirmed COVID-19 cases needs clarification to state whether the 5-day self-isolation period begins after symptom onset in the index case, or after presumed exposure.

## Conclusions

Although this document focuses on the epidemiological aspects of testing, there are economic and social benefits to a liberal testing strategy. The costs of increased testing, contact tracing and self-isolation are high in the short term. In the longer term, however, more rapid control will reduce the economic and social costs of social-distancing measures that adversely affect businesses, communities and individuals. A liberal approach to testing for SARS-CoV-2 in Switzerland is needed as part of the package of control measures. Liberal testing, contact tracing and self-isolation will help to manage the crisis due to the spread of SARS-CoV-2 infection and of severe or lethal COVID-19 disease until pharmaceutical interventions (vaccination to prevent infection, or treatments for COVID-19) are available. Other countries, South Korea in particular, have demonstrated it. Fully acknowledging the operational challenges, rapid and determined prevention of transmission through the approach outlined here is - in our assessment - needed to maintain a relatively open society and economy while minimizing the damage to the health of the population.

## Disclosure statement

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## References

- 1 World Health Organization. Coronavirus disease (COVID-2019) situation reports. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/> [Accessed 18 March 2020]
- 2 World Health Organization. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf> [Accessed 18 March 2020]
- 3 Anderson RM, Heesterbeek HK, Linkenberg DH, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? *Lancet*. 2020; doi: [http://dx.doi.org/10.1016/S0140-6736\(20\)30567-5](http://dx.doi.org/10.1016/S0140-6736(20)30567-5). PubMed.
- 4 The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) - China, 2020. *China CDC Weekly*. 2020;2(8):113–22. <http://weekly.chinacdc.cn/en/article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51>
- 5 Riou J, Althaus CL. Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. *Euro Surveill*. 2020;25(4). doi: <http://dx.doi.org/10.2807/1560-7917.ES.2020.25.4.2000058>. PubMed.
- 6 Hellewell J, Abbott S, Gimma A, Bosse NI, Jarvis CI, Russell TW, Centre for the Mathematical Modelling of Infectious Diseases COVID-19 Working Group. Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. *Lancet Glob Health*. 2020;8(4):E488–96. doi: [http://dx.doi.org/10.1016/S2214-109X\(20\)30074-7](http://dx.doi.org/10.1016/S2214-109X(20)30074-7). PubMed.
- 7 Lauer SA, Grantz KH, Bi Q, Jones FK, Zheng Q, Meredith HR. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Ann Intern Med*. 2020; Epub ahead of print. doi: <http://dx.doi.org/10.7326/M20-0504>. PubMed.