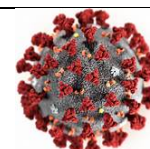


National COVID-19 Science Task Force (NCS-TF)



Type of document: Policy Brief	
In response to request from:	Date of request:
Expert groups involved: Digital Epidemiology (Salathé, Bugnion, Troncoso, Vayena, von Wyl) Diagnostics and Testing (Trono), Public Health (Flahaut, Puhan)	Date of response: 10/11/2020
Contact person: media@sciencetaskforce.ch	
Comment on planned updates :	
Title: Scalability and Efficacy Considerations for Test-Trace-Isolate-Quarantine (TTIQ)	
Executive summary: The TTIQ strategy aims at identifying index cases through testing, tracing their contacts as well as potential clusters that are potentially the source of their infection, and to isolate cases and quarantine contacts. Based on lessons from the start of the second wave, we make 8 recommendations aimed at ensuring the scalability and efficacy of TTIQ in Switzerland.	
Introduction <p>In the absence of licensed vaccines, the response to the COVID-19 epidemic relies on a set of non-pharmaceutical interventions (NPI) that prevent and mitigate the spread of the virus. The main prevention measures are the well-known combination of reduction of social contacts, maintaining physical distance, keeping the duration of contacts short, hand hygiene, consistent use of masks, proper ventilation of all indoor spaces, avoidance of large crowds, and in general avoidance of activities known to facilitate transmission. The core containment measure is the Test-Trace-Isolate-Quarantine (TTIQ) strategy, which aims at identifying index cases through testing, tracing their contacts as well as potential clusters that are potentially the source of their infection, and to isolate cases and quarantine contacts.</p> <p>During the first wave in spring, Switzerland did not follow a comprehensive TTIQ strategy. Broad testing was not available, and the base infrastructure for contact tracing collapsed rapidly. Following the high case numbers at the beginning of the autumn, the TTIQ strategy is under severe strain as of October (see NCS-TF Lagebericht of October 23, 2020 “Der vorübergehende Zusammenbruch von TTIQ” // “L’effondrement temporaire de la stratégie TTIQ”). Due to the lack of data, it is impossible to say precisely when and why this collapse happened at the cantonal and federal levels.</p> <p>We need to learn from the 2nd wave and rethink substantially the implementation of TTIQ with a specific focus on scalability and efficacy, in the context of the <i>special situation</i> of the Law on Epidemics.</p> <p>This policy brief provides 8 specific recommendations for the operational implementation of TTIQ to ensure that the strategy can scale, remain effective by delivering timely results to break infection chains, and provides reliable KPIs and early indicators of stress on the system.</p>	

What needs to change

The lessons learned from the 1st and the 2nd wave temporary collapse of TTIQ must be incorporated swiftly into a new, better integrated concept. This integration ensures that the TTIQ strategy will have an effective role in breaking infection chains early in the upcoming months of the epidemic. This becomes more important as the evidence shows that reduction in cases leads to the easement of some substantial prevention measures, at which point effective containment measures become essential.

We recommend the following, consistent with the current law of Epidemics and the current “special situation”:

1. **Gather indicator metrics.** Establish a set of technical metrics to monitor the scalability and efficacy of TTIQ. The primary purpose of these metrics is to serve as early warning indicators of breakdowns. Metrics should be publicly available at the cantonal and federal levels in near-real-time.
2. **Design and implement an industrial-scale testing** organization that combines classic RT-PCR, lamp-PCR and Antigen tests. To achieve this: **prioritize** symptomatic cases, critical personnel (regular testing), and selective contacts that have been exposed to the virus; **increase** the numbers of available tests; **train** and **deploy** more personnel to do the test, i.e., take swabs; **articulate** a strategy for national coordination of the distribution of reagents that allows for optimal utilization of each test type, multiplication of testing sites, availability of trained personnel and administrative support.
3. **Improve manual contact tracing scalability.** Simplify and streamline forward contact tracing procedures and interactions with index patients as well as contacts, and use technology mechanisms for quick, selective communication with the people about exposure risks and required actions.
4. **Investigate sources of infections.** Prioritize the human capital of contact tracing to the systematic identification of clusters and source of infections (sometimes referred to as backward tracing).
5. **Promote privacy-preserving presence tracing.** Extend SwissCovid to provide a national solution used for presence tracing using QR codes. All new digital approaches provided to the people should incorporate well-understood data protection principles of data minimization, purpose limitation, and decentralization whenever possible. A properly-designed digital presence tracing solution can assist in both forward- and backward-tracing.
6. **Establish systematic cross-cantonal communication.** Ensure that cross-cantonal contact tracing is possible **by design**, with appropriate infrastructure support.
7. **Subsidiarity principle in TTIQ.** Provide means at the Federal level to assist cantons under strain in their implementation of TTIQ. Such mechanisms must be planned ahead of time and be actionable at any point in time.
8. **Fund TTIQ as an integral part of the COVID-19 response of the Confederation.** Provide federal resources to cover the financial burden of TTIQ (and not just testing), to the extent the Law on Epidemics allows for it. In addition to the cost of testing (which is resolved), this includes the cost of contact tracing for the cantons and the compensation for lost wages for people isolated and quarantined. (see TF Policy Brief “Economic Considerations of Test-Isolate-Trace-Quarantine (TITQ)” of 10.5.2020)

The TTIQ Strategy and its Implementation

TTIQ is an accepted strategy recommended by the Swiss National COVID-19 Science Task Force (see 2020 Policy Briefs dated 24.4, 26.4, 9.5, 10.5, 15.5, 28.7) which is implemented and funded in part by the Confederation and the Cantons under the Special situation of the law on epidemics.

While TTIQ is a national strategy, there is no ***national system*** that governs it. Instead, there are multiple sub-elements that operate semi-autonomously from each other, and exchange information with different granularity in terms of information detail and delay.

Acknowledging that the distributed and decentralized nature of the implementation of TTIQ is required, we outline a number of operational considerations for each element in TTIQ needed to succeed at scale:

Testing:

- **Augment testing capability:** Multiple accredited labs, private, public, in university hospitals, etc. perform RT-PCR, lampPCR and soon AntiGen testing on behalf of individual patients, their primary care physician, or the hospital where they are under care. These labs operate currently with some fragmentation and only few industrial-sized operations.
- **Improve efficiency of test centers and augment staff at test centers:** Organizing efficient and safe test centers is challenging and there is large variability across centers. Also, there is a shortage of personnel to take swabs. Best practices on how to organize and run a high throughput test center together indicators for that (e.g. time between in and out of persons) should be shared (e.g. by sharing SOPs). Additional personnel must be trained and properly supervised. Simpler-to-obtain sample sources (e.g. oropharyngeal swab or saliva) should be used only if not at a prohibitive cost in sensitivity, knowing that the latter will be conditioned by the nature of the downstream test (e.g. antigen vs RT-PCR)
- **Fast patient communication:** Test labs must communicate results to individual patients either directly or through their primary care physicians. Positive results must be communicated to the cantonal physician office responsible for contact tracing.
- **Collect relevant indicators:** Individual physicians are expected to complete a form which provides a minimal essential data set of information to the FOPH. This database should provide key insights into the efficacy of the various measures, the causes for infection, and the reason why the infection was detected.
- **Financial support:** The Confederation is already financially responsible for all tests that meet a set of symptomatic or epidemiological criteria.

Tracing

- **Improve manual contact tracing scalability.** Simplify and streamline forward contact tracing procedures and interactions with index patients as well as contacts, and employ technology mechanisms for quick, selective communication with the people about exposure risks and required actions.
- **Balance forward-contact tracing with the investigation of sources of infections.** Prioritize the human capital of contact tracing to the systematic identification of clusters and source of infections (sometimes referred to as backward tracing). Existing forward-tracing methods should be reviewed for maximal scalability. For example, in many instances, index cases can be empowered to directly contact the candidates for quarantining.

- **Guarantee cross-cantonal coordination.** Cantonal physicians must coordinate with each other on contact tracing (forward or backward) that straddle cantonal lines, a very common occurrence as many index patients cross cantonal lines during their period of contagion.
- **Ensure fast delivery of Covidcodes.** Individual patients should receive **quickly** a Covidcode if they have installed SwissCovid, whether from the cantonal physician, their personal physician, FOPH, or an authorized delegate thereof.
- **Promote the use of SwissCovid through effective communication.** The efficacy of the app is expected to increase quadratically with increased usage.
- **Financial support.** The cantons are currently financially responsible for the operational costs of their contact tracing centers. These costs should be covered by the Confederation as part of the overall response.

Isolation:

- **Fast and clear communication to isolated patients.** Individual patients must receive a clear instruction to enter mandatory isolation as soon as the result is confirmed positive. Patients have a right to immediately receive a medical certificate as they are expected to stay home (even in the case of light symptoms) and should in no way go to work, attend school or visit any food supplier or market.
- **Financial support.** Sick leave insurance compensates for lost work of isolated patients.

Quarantining:

- **Fast and clear communication to quarantined contacts.** The cantonal physician follows up with contacts of the index cases and makes quarantining decisions, when warranted. A certificate of quarantining is expected to protect the economic rights of the contacts, and to prove that they cannot attend classes if they are students.
- **Ensure support for SwissCovid notified users.** Notified SwissCovid contacts who have called the federal Infoline and were qualified by the Infoline tracer to be at risk of exposure should be eligible for the same financial compensation for quarantine as contacts identified by manual contact tracing.
- **Allow possibility for early quarantine release.** Quarantine restrictions should be lifted following a negative test result performed during a high-sensitivity period after exposure.
- **Financial support.** The federal scheme for APG/ELO “Allocation de Pertes de Gain” compensates quarantined workers that cannot work from home. Full compensation should be considered to ensure maximal compliance.

Key Performance Indicators and KPI targets

To ensure the success of the TTIQ strategy, it is necessary to monitor the procedural performance of the multiple sub-elements that operationalize this strategy. Each subsystem operates according to a well-defined process from which **key performance indicators (KPI) must be extracted**. These performance indicators should measure the throughput, efficiency and delays of the process from the earliest known start time of relevant events in the system until their completion. For example, the delay between onset of symptoms and the delivery of the SwissCovid Covidcode can be measured and we can obtain the distribution of the duration of the test-communication-code delivery for different patients. This distribution provides key insights on when and where delays in the overall system occur, indicating where actions are needed.

Each subsystem contributing to TTIQ (and their cantonal or federal instances) should (i) identify which KPIs can be computed to reflect the aspects above, and (ii) compute these KPIs and report on them regularly.

We list the following KPI targets to monitor the **smooth operation** of the TTIQ. They provide a largely external view and help with understanding of the dynamics of the subsystem. **These targets are obviously subject to adjustment once metrics become available.** All targets assume that a daily report of the KPIs is available at the cantonal and national level. Any deviation from the targets should be viewed as a leading indicator of possible future collapse. The type of target that is not met, and its evolution, are indicators of which subsystem(s) are in risk of collapse.

Testing:

- **Test positivity** should remain low. WHO recommends that positivity remains below 5% to ensure that the circulation of the virus is under control.
- Current testing throughput of less than 25% of capacity at a national level, and less than 50% of capacity for each test site. This is designed to ensure scaling when needed.
- Predicted testing throughput for 3 weeks out should be within 50% of capacity at the national level. The forecast in testing demand should be based on the trailing combination of R_e , test positivity and test demand.
- Tests should be available by appointment on the day of the onset of symptoms if the appointment is requested before 12noon, else the following day (95% of the time).
- Tests should be available to asymptomatic contacts who ask for them, on day+5 or day+6 after exposure in 80% of the cases. This corresponds to a high-sensitivity period for PCR tests.
- PCR test results should be delivered within 12 to 24h of the test, 95% of the time.
- Nature of test, (score if quantitative test) should be systematically recorded for epidemiological purposes (e.g., to characterize parameters predictive of contagiousness through retrospective analyses).

Tracing

- Covidcodes should be delivered to the patient within 2h of the test result, 95% of the time.
- Each canton should yield a comparable number of Covidcode as a fraction of the number of positive tests within the canton. That yield should be stable over time and potentially increasing with increased adoption of SwissCovid app.
- Contact tracing should be able to complete the processing of 80% of all index cases within 24h.
- Cross-cantonal cases should be handled with a 1-day delay 80% of the time.
- Each cantonal contact tracing operation should operate at less than 50% of maximal capacity performing purely transactional operations (calling index cases, contacts and handling inbound calls). The balance of time should be used for cluster investigations, retraining, and process optimization, in anticipation of the next waves.
- Each cantonal contact tracing operation should be able to scale to meet the forecasted demand at least 3 weeks out, without exceeding 80% of capacity on transactional operations.

Appendices

Types of metrics

The goal of KPIs is to provide quantitative measures to gain understanding of a subsystem according to the following metrics:

- *Throughput* is a metric that measures the volume of tasks that are performed in a time period, typically per day. Throughput provides insights on the productivity of the subsystem. In this case, these also enable subsystems to monitor the state of the epidemic from their perspective (e.g., how many users require assistance from a contact tracer).
- *Capacity* is the maximal throughput for a given task per time period. In a purely static environment, the capacity of a system is often fixed (e.g. there are X call-center workers available). In a dynamic situation such as this epidemic, many capacity metrics are expected to fluctuate (e.g., by increasing the number of call-center workers as the situation worsens). In particular, we expect the number of tests that can be performed to increase over time. Understanding capacity is essential to determine scalability bottlenecks **before** they occur.
- *Yield* is the fraction of successful completion of a task, with the aim to maximize the metric. For example, the fraction of users that call a hotline and can resolve their problem; the fraction of index cases which request a Covidcode, receive it, and enter it in the SwissCovid system. Yield provides insights about the evolution of throughput. Changes in yield provide an **early indicator** of saturation.
- *Latency* is the delay to execute a task or a subtask, for example between requesting a test and the time of appointment, or between the appointment and the result. As latency varies over a period of time, typically we measure the distribution of delays over that period, typically a day. The latency distribution is a reflection of subcomponent failures. Understanding latency changes is key to identify queuing bottlenecks **as they emerge**. For example, see the [BFS statistics](#) for the latency distribution between onset of symptoms and delivery of the Covidcode) and its evolution over a week.