

# Operational Considerations for Adapting a Contact Tracing Program to Respond to the COVID-19 Pandemic in non-US Settings

Accessible version: <https://www.cdc.gov/coronavirus/2019-ncov/global-covid-19/operational-considerations-contact-tracing.html>

## Who is the intended audience of this document?

This document is for CDC country offices, ministries of health, sub-national public health authorities, and other implementing partners in non-US settings. While select adaptations may be relevant for any jurisdiction, the document focuses on adaptations that might be especially useful in low- and middle-income countries. General contact tracing recommendations for which these adaptations may apply include CDC's US [COVID-19 Contact Tracing resources](#) and WHO's [Contact tracing in the context of COVID-19](#).

## Document Rationale

Contact tracing, including case and source investigation, is a key component of controlling transmission of infectious diseases. Contact tracing for the current COVID-19 pandemic, however, is distinct from that undertaken for other diseases (e.g., Ebola, HIV, TB) because in nearly all countries the number of cases and contacts has outpaced the capacity of the public health system to quickly notify and quarantine all contacts and isolate all cases.

As a result, contact tracing programs will need to prioritize activities to ensure that human and financial resources are utilized most effectively. Necessary adaptations will depend on the setting and will also need to adapt over time to best suit the current epidemiology of the outbreak. Measures that are feasible when there is one case or even one cluster of cases, may not be feasible once hundreds or thousands of new cases are reported a day. This document outlines considerations for optimizing contact tracing programs to maximize efficient use of limited resources.

Within the following document, these adaptations are grouped into the following four categories:

- 1. Workforce Adaptations** (i.e., who will do the case investigations and contact tracing): Ideally existing staff from a public health agency in country (e.g., Ministry of Health, National Centers for Disease Control, Field Epidemiology Training Program) would be able to implement these efforts. This document will review ways to expand the workforce if this is not feasible with current staff.
- 2. Epidemiologic Adaptations** (e.g., which contacts will be followed): Ideally all cases will be investigated to identify contacts and prevent further spread of SARS-CoV-2 by people exposed to the case. The source of the infection may also be investigated to identify if the infected person was at any gatherings, events, or locations associated with a cluster of infections. Additional cases identified are also then investigated. Once identified, all contacts will be listed, communicated with, and then referred for quarantine for 14 days after the last exposure to a potentially infectious person.
- 3. System Adaptations** (e.g., how will cases and contacts be notified and monitored): Ideally all cases and contacts will be contacted directly by public health officers, either in person or by phone. This document will review ways to improve the process if this is not feasible.
- 4. Financial, Logistical, and Operational Adaptations** (e.g., what resources will be available to support the system designed): Ideally financial, human, and logistical resources for contact tracing would be sufficient to meet the need. This document reviews how to adapt when these resources are limited.



## Key Terms

It is important to clarify the use of several terms as relevant for the current COVID-19 pandemic. In this document:

A contact is defined as **someone who had any contact with an infected person** (probable or confirmed COVID-19 case) while they were infectious - starting from 2 days before illness onset (or, for asymptomatic clients, 2 days prior to positive specimen collection) until the time the patient is isolated (or until the end of the infectious period, if not isolated before then).

Close contact is defined by CDC as someone who was **within 2 meters of an infected person for at least 15 minutes within a 24-hour period** starting from 2 days before illness onset (or, for asymptomatic cases 2 days prior to positive specimen collection) until the time the patient is isolated. The World Health Organization (WHO) additionally includes persons with direct physical contact with a probable or confirmed case, direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment, and other situations as indicated by local risk assessments.

Isolation refers to a strategy used to **separate people infected with the SARS-CoV-2 virus** (those with and without symptoms) **from people who are not infected**. The term is used here to refer to people who are isolated at home, a community care center (i.e., isolation shelter), or a health facility. In the home, anyone with COVID-19 symptoms or who has been diagnosed with the disease should separate themselves from others in the home to reduce the risk of transmission to others in the household and should stay home until it is safe for them to be around others. This also includes people who have signs and symptoms consistent with COVID-19, for whom test results are not yet or will not be available.

Quarantine refers to a strategy used to **keep someone who might have been exposed to COVID-19 but does not know if he or she is infected away from others**. Quarantine helps prevent spread of disease that can occur before a person knows that he or she is infected. People in quarantine should stay home, separate themselves from others, monitor their health, and follow directions from their local public health authorities.

Case Investigation refers to the process of confirming that the case knows their positive test result or diagnosis, encouraging self-isolation and providing guidance, interviewing the case to elicit the names and locating information for close contacts, and assessing needs and making referrals for medical care, medical monitoring, social and other support services during isolation..

Contact Tracing refers to the process of notifying contacts of exposure, addressing questions and concerns, referring for SARS-CoV-2 testing, encouraging self-quarantine, monitoring of symptoms, and assessing the need for additional supportive services during the quarantine period (14 days from last exposure).

Source Investigation refers to **identifying events or gatherings attended by a case in the 2-14 days prior to symptom onset to identify the source of infection**. Prioritize investigating those events or gatherings occurring in the 2-7 days before symptom onsets and investigating whether others in attendance were also infected by SARS-CoV-2.<sup>1</sup> When conducted, source investigation most often occurs as part of case investigation. Contacts identified from a source investigation may be notified depending on the length of time elapsed since exposure to a case. Contact tracing associated with source investigation is referred to as backward, retrospective, or reverse contact tracing.

In this document, three distinct actions are referenced. However, the roles and actions of case investigation, source investigation, and contact tracing may overlap in some settings and may change over the course of the response. For example, in some contexts, case investigators may be the ones who initially notify contacts of their exposure; this is commonly the case for household members of the case. In addition, these roles may have different titles in different places.

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<sup>1</sup> Cevik M et al. (2020) "SARS-CoV-2, SARS-CoV, and MERS-CoV viral load dynamics, duration of viral shedding, and infectiousness: a systematic review and meta-analysis." The Lancet Microbe, ISSN 2666-5247, ([https://doi.org/10.1016/S2666-5247\(20\)30172-5](https://doi.org/10.1016/S2666-5247(20)30172-5)).

## Figure 1. Summary of Operational Considerations for Adapting Contact Tracing Programs

The following figure summarizes the four areas of consideration outlined in the document and key questions to be answered in adapting contact tracing, as needed, to the COVID-19 pandemic response in a given jurisdiction. Each question is explored in detail in the following text.

<b>Workforce Adaptations</b>	<ul style="list-style-type: none"><li>• Can staff roles be re-evaluated to fill gaps?</li><li>• Can additional staff be recruited?</li><li>• What kind of staff should be recruited?</li><li>• Can additional staff be quickly trained?</li><li>• Can staff from other jurisdictions be deployed to areas needing additional support?</li></ul>
<b>Epidemiologic Adaptations</b>	<ul style="list-style-type: none"><li>• When can source investigations be conducted?</li><li>• Can cases be prioritized for investigation?</li><li>• Can contacts be prioritized for elicitation and notification?</li><li>• Can monitoring of close contacts be prioritized?</li><li>• Can higher-impact activities be prioritized?</li><li>• Can turnaround time for test results be reduced?</li><li>• Can a household unit be traced and monitored together?</li><li>• Can the testing strategy for contacts be modified?</li></ul>
<b>Systems Adaptations</b>	<ul style="list-style-type: none"><li>• Can case-driven notification be used?</li><li>• Can SMS, apps, or other technology or software be used to support remote follow-up?</li><li>• Is self-monitoring an option?</li><li>• Can digital tools be used to improve efficiency of contact tracing?</li><li>• Will digital proximity (bluetooth enabled applications) tools be adopted?</li><li>• Can digital tools be used to monitor workforce performance and support enhanced data utilization?</li></ul>
<b>Financial, Logistical and Operational Adaptations</b>	<ul style="list-style-type: none"><li>• Can financial resources be reallocated or used more efficiently to support a scale-up?</li><li>• Are logistical and operational supports for contact tracers in place to support a scale-up?</li><li>• Are logistical and operational supports for isolated and quarantined individuals in place to support a scale-up?</li><li>• Can local organizations and networks support the government public health authority?</li></ul>

## Workforce Adaptations

**IDEALLY** existing staff from the public health agency in country (e.g., Ministry of Health, National Centers for Disease Control, Field Epidemiology Training Program) would be able to implement these efforts.

However, the human resource demands of contact tracing in the context of the COVID-19 pandemic may outstrip the capacity of existing staff. Evaluate current capacity against projected need. This will involve two steps: (1) Reviewing staff rosters to determine how many staff are currently available, and (2) using calculators to determine how many staff will be needed, given the current outbreak epidemiology. Calculators are listed in the resource section at the end of this document under [Workforce Calculators](#). In reviewing staff rosters, ensure they are updated to reflect staff who are currently available to support the COVID-19 efforts full-time; have recently been trained; or may be unable to participate because they are at risk for severe illness.

### ***If the currently available staff are insufficient, consider the following:***

- ***Can staff roles be re-evaluated to fill gaps?*** One of the quickest adaptations may be to repurpose existing staff or shift their tasks – for example, from contact tracing efforts for other disease control programs, or community outreach roles that are not currently being performed or prioritized. It is important to ensure everyone is used to their full capacity. Someone who originally had just one role as a contact tracing team supervisor may also need to do daily follow-ups with contacts. Identifying contacts (during the case or source investigation) and notifying them are the highest-priority activities; if you find that a large proportion of cases and contacts are not being notified quickly, you may have to shift efforts from contact monitoring to these higher priority activities. This shift may require some retraining of contact tracers.
- ***Can additional staff be recruited?*** Consider what kinds of workers could have the right skills. Some ideas include medical/nursing students, community health workers, teachers, high school or university students, faith and community leaders, and social workers. Staff supporting community-level mobilization and education programs previously may be well positioned to support this work (e.g., community health workers). Determine whether the same people will be used for case investigation, source investigation, and contact tracing. If not, could they be cross trained so they could quickly transition between roles based on need? Generally, it is most efficient to cross-train investigators in both case and source investigation. What are the minimum qualifications for each type of position? These staff will need to receive specialized training to provide them with basic principles of epidemiology, surveillance, and risk communication.
- ***What kind of staff should be recruited?*** Ideally, contact tracers should be recruited from their own community and be adept at engaging the local community to create and maintain buy-in for the contact tracing program. Contact tracing staff should have high emotional intelligence (i.e., be sympathetic and able to emotionally connect with contacts/cases), be culturally respectful and speak local languages. Staff should understand the local context and any potential barriers to contact tracing.

Consider recruiting from lower risk groups, (i.e., people who are less likely to become seriously ill if they get infected, such as young people and those without underlying medical conditions). Good supervision is essential for training and quality assurance. Staff who were previously acting as contact tracers may transition into supervisors, which may require additional training, job shadowing, and mentorship.

- **Can additional staff be quickly trained?** Training will be necessary for newly recruited case/source investigators and contact tracing staff. CDC has created a [package of materials](#) with job aids and standard operating procedures developed by jurisdictions within the United States, but these materials will need to be adapted to the local context and translated into relevant languages. WHO has [GO Training](#) for case finding and contact tracing. Additional training resources are listed at the end of this document.

Periodic refresher training, particularly as new guidance and recommendations are released, is recommended. Assessment of training is also recommended and can be done through pre- and post-testing and interim knowledge checks, for continuous quality improvement. Feedback from trainees after they have been on the job for a few weeks can also be helpful to improve training quality and address any gaps or confusion.

- **Can staff from other localities be deployed to areas needing additional support?** Because the epidemiology of an outbreak can shift rapidly, identifying which regions need additional staff can be a challenge, especially in countries with decentralized health systems. Consider the minimum number of staff required for case or source investigation and contact tracing in each locality as well as surge support plans. In many places, staff maintained at the national or regional levels can be deployed (or remotely reassigned) as surge support. Using surge staff may help reduce the number of staff who need to be recruited and trained. Surge staff can be deployed in-person or work remotely utilizing mobile phones or the internet to communicate with cases and contacts. Such approaches may depend on the mobile phone and/or internet access in the country. Maintaining up-to-date estimates on the amount of time required for case or source investigation and contact tracing in each locality will be valuable to ensure staffing plans keep up with the evolution of the outbreak. That time may vary radically across areas, given differences in case load, modality (in-person vs. remote) and distances/transportation time.

## Epidemiologic Adaptations

**IDEALLY** all cases will be investigated to identify and quarantine their contacts, minimizing further spread of SARS-CoV-2. The source of the infection (whether a known person, or a large gathering or event) may also be investigated to identify other cases or contacts originating from the source person or event. Investigating source events may require gathering a list of event attendees and then contacting them for testing and quarantine or isolation. Once identified, all contacts will be listed, communicated with, and then referred for quarantine for 14 days after last exposure to a potentially infectious person. However, given limited resources, contact tracing programs must prioritize approaches, populations and procedures for implementation based on the current epidemiology of the pandemic in the local area and resource availability.

In settings with adequate testing capacity to diagnose cases with rapid turnaround, ministries of health may consider shortening the quarantine period. [Options to reduce quarantine](#) include stopping quarantine after 10 days with no symptoms, or after 7 days with a negative specimen collected and tested on or after day 5. With both options, contacts should still monitor for symptoms until 14 days after last exposure. The increased transmissibility of some COVID-19 variants raises the risks of such an approach as any infections occurring in the post-quarantine period have greater potential to spread rapidly. Increased transmission from these variants may outweigh the benefits of shortened quarantine periods, and ministries of health must determine the best approach for the local context.

- **Evaluate whether it is currently possible to interview all cases, list all contacts, notify all contacts, and monitor all contacts throughout their quarantine.** Review current surveillance data to assess whether this is possible with currently available staff. This is a question to return to often as there may be factors that increase capacity (e.g., recruitment and training of more staff) and factors that may increase demand (e.g., increased transmission, shifting hot spots). In most settings, contact tracing programs have been able to scale their efforts during epidemiological scenario 2 of the pandemic (see below), however adaptations may be required in many settings such as those in scenarios 3 and 4.

As case counts increase, more clusters are confirmed, and cases are reported in more geographic locations, resources may become strained – it may be necessary to prioritize activities to optimize resources and ensure they are used to maximum efficiency (e.g., interrupting as many transmission chains as feasible with available resources). During scenario 4 of the pandemic – during which widespread local transmission is reported – many jurisdictions may only be focused on the highest priority cases and contacts (e.g., those in institutionalized settings, health care settings, or other settings with the potential to be super-spreader events).

Plans for adaptation during scenarios 2-3 should be put in place in all settings in case a jurisdiction notices decreased performance in contact tracing metrics prior to widespread community transmission. Regardless of contact tracing infrastructure and epidemiological scenario, cases should be encouraged to self-notify household members and other close contacts of their positive test result and encourage the close contacts to quarantine and get tested if they develop symptoms (see “Can case-driven notification be used” below).

The seven [epidemiological scenarios](#) of the pandemic proposed by WHO are as follows, but scenarios may be different within a country:

- **Scenario 1:** no cases;
- **Scenario 2:** sporadic cases;
- **Scenario 3:** clusters;
- **Scenarios 4-7:** community transmission (4 subcategories – low, moderate, high, and very high incidence).

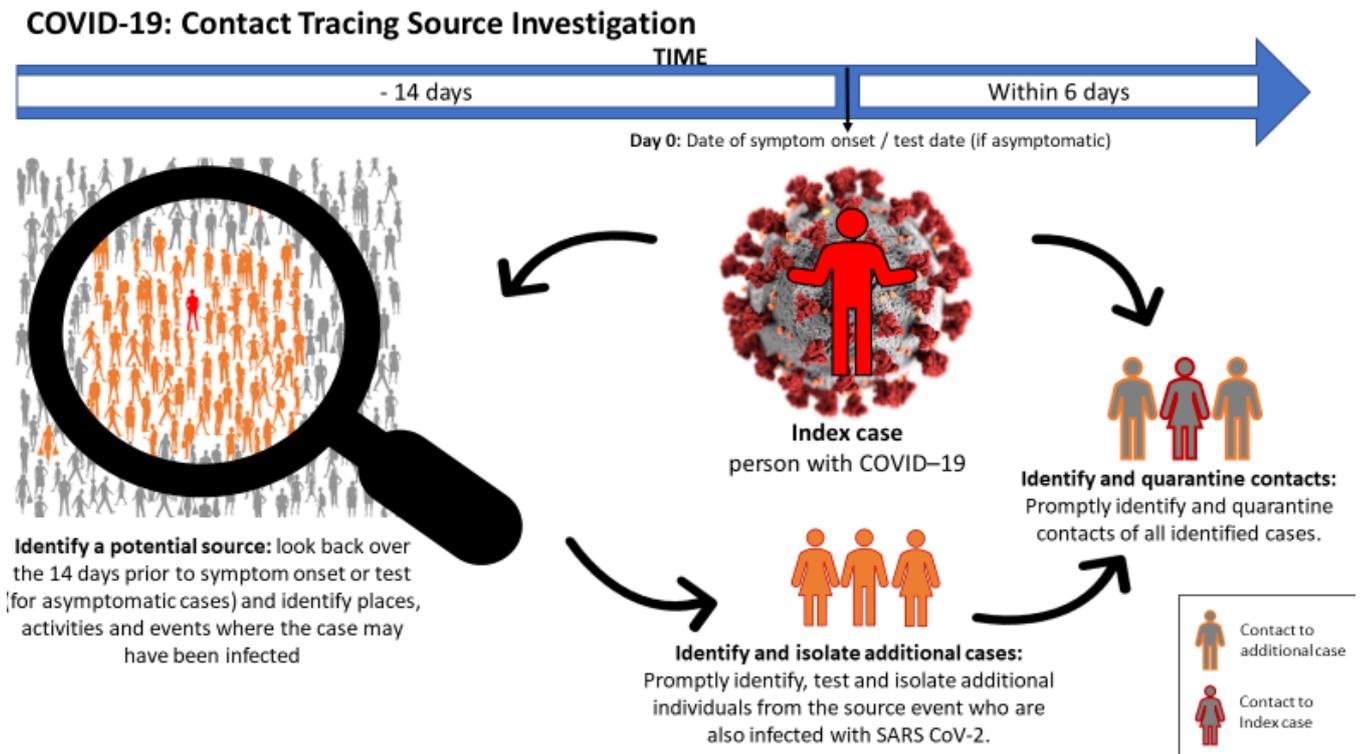
**If it is not possible to list, notify, and monitor all cases and contacts, consider the following adaptations:**

- ***When can source investigation be conducted?*** [Source investigation](#) (also known as “backward contact tracing”) facilitates case finding, by working through the network of interactions and activities of a person diagnosed with COVID-19, to identify potential sources of infection (e.g., people, places, events), often uncovering source cases or secondary cases who may be undiagnosed (See Figure 2). Due to this focus, source investigation is applicable throughout the pandemic. It is valuable when jurisdictions scale back on individual case investigation and prioritize prevention of outbreaks and clusters. Source investigation is also useful when cases decline significantly and the focus shifts to identify the remaining cases or sources of group transmission.

Investigators may ask infected persons if they attended any events or gatherings in the 14 days before symptom onset or specimen collection, prioritizing 2-7 days beforehand. If such events or gatherings are identified, it may be possible to identify others who attended the same events or gatherings. If other attendees have been diagnosed with SARS-CoV-2, the event can be identified as a potential source of infection. Once a cluster is identified through source investigation, others who were exposed to the cluster can be traced to quarantine or isolate them as appropriate. Standard case investigation and contact tracing can be pursued regardless of whether source investigation identifies a large event as a potential source of infection for a case of COVID-19. It should be noted that a source of infection may not be identifiable for every case, especially during periods of widespread community transmission.

- ***Can cases be prioritized for investigation?*** Data from case or laboratory reports may be used to [prioritize cases for investigation](#) by determining if an individual has been diagnosed within the [last six days](#); has the potential for transmission to many people or is part of an outbreak in a congregate setting; and are at risk for severe illness. Priority variables that can provide this information include date of symptom onset, occupation, place of residence, and medical history indicating presence of [underlying conditions](#). Date of symptom onset can facilitate identification of persons whose contacts may have recently been infected. Occupation may indicate whether the person spends time in a congregate setting and place of residence can facilitate identification of geographic clustering. Presence of underlying conditions can indicate people at risk of severe illness who may need linkage to home-based care and pulse oximetry services, field hospitals, or higher-level care.

Figure 2. Summary of source investigation



- **Can contacts be prioritized for elicitation and notification?** Similar to prioritization of cases, [prioritization of contacts](#) for elicitation and notification should be considered to maximize potential for reducing further spread of the virus. Contacts exposed to a case within the [prior 6 days](#) from the date of the case investigation interview offer a greater opportunity to prevent transmission with quarantine than contacts exposed greater than 6 days before the interview. Date of case investigation can facilitate the identification of these contacts. Contacts exposed in the household setting are at high risk of infection and should be prioritized for notification based on this time window. Persons exposed at group gatherings and those connected to an outbreak are at higher risk of infection and should also be prioritized for contact notification and monitoring.

Within these subsets of people, it may be possible to further prioritize contacts for elicitation by using exposure-based contact elicitation. The experiences of contact tracing programs suggest that many people are reluctant to share the names of their contacts. Cases may be put at ease and be more willing to provide the name of contacts if the case investigation focuses only on those with the highest transmission risk, that is, those most likely to have become infected. Case investigators can first ask about the number of people the case interacted with while infectious, then ask about the number of these interactions that occurred indoors, without masks, or for the longest amount of time. The case investigator can then ask for details about the people in these final categories. This approach can streamline the case investigation process as well as help contact tracing teams prioritize contacts for monitoring.

Lastly, people who are at increased risk for severe illness ([older adults](#), people with [certain medical conditions](#), and [people who may need to take extra precautions against COVID-19](#)) may not necessarily be at increased risk of transmission. However, if they are known to be contacts to a confirmed case, they should be informed of their exposure status and potentially monitored for infection.

- **Can monitoring of close contacts be prioritized?** If all cases and contacts are being identified and notified, but there is insufficient capacity to monitor all contacts, it may be necessary to prioritize contacts for follow-up. It will be important to discuss how contacts will be classified, which will be monitored, and whether there will be any prioritization by type of exposure or risk factors. In many settings, only close contacts are being monitored. Sample definitions for close contacts in the box below include CDC and WHO definitions. Monitoring close contacts should require fewer resources than monitoring all contacts. There are several approaches to consider:
  - Can contacts with access to internet/phones self-report, such that only the subset who report symptoms or fail to report daily can be followed up by public health officers?
  - Can contacts **at higher risk of becoming infected or having severe disease** (such as household members, older adults, and people with [certain underlying conditions](#)) be prioritized?
  - Can those who were previously infected within a certain period be deprioritized? Individuals who have recovered from a previous infection with SARS CoV2 within the last 3 months are [unlikely to become reinfected](#) and may not need to be considered contacts. These individuals should be tested only if they develop symptoms. Note that local emergence of SARS CoV-2 variants of concern may necessitate a review of this as natural immunity may not apply equally to all variants.
  - Can contacts **in high-risk settings** (e.g., healthcare personnel, correctional and detention facilities, densely populated urban settlements, refugee/internally displaced person (IDP) camps, nursing homes, migrant agricultural worker camps, and high-density workplaces) or areas with newly confirmed transmission be prioritized?
  - Can contacts be prioritized **by timing of exposure** (such as exposure to a case in the last six days)?

#### **CDC Contact Definition**

For COVID-19, a close contact is defined as any person who was within **2 meters**, or 6 feet, of an infected person for at least 15 minutes during a 24 hour period starting from 2 days before illness onset (or, for asymptomatic patients, 2 days before positive specimen collection) until the time the patient is isolated (or until the end of the infectious period if not isolated before then).<sup>2,3</sup>

#### **WHO Contact Definition:**

- A contact is defined as anyone with the following exposures to a COVID-19 case, from 2 days before to 10 days after<sup>4</sup> the case's onset of illness:
  - Face-to-face contact with a case within **1 meter** for  $\geq 15$  minutes
  - Direct physical contact with a COVID-19 case
  - Providing direct care for patients with COVID-19 disease without using proper personal protective equipment (PPE)
  - Other definitions, as indicated by local risk assessments
- If confirmed cases are asymptomatic, their contacts should be managed in the same way: anyone with an exposure period from 2 days before the case received a positive test result, to 10 days after.<sup>4</sup>

<sup>2</sup> <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing-comms.html>

<sup>3</sup> <https://www.cdc.gov/coronavirus/2019-ncov/hcp/duration-isolation.html>

<sup>4</sup> <https://www.who.int/publications/i/item/contact-tracing-in-the-context-of-covid-19>

**People who could potentially be defined as close contacts:**

- Household contacts living/sleeping/eating in the same home, or sexual partners of a case
- Healthcare workers who have had a breach in PPE or have not worn it while exposed to a case (either directly, with bodily fluids, or with a laboratory specimen)
- People in closed settings, such as long-term living facilities, and other high-risk congregate/closed settings (e.g., correctional/detention facilities, shelters, hostels, schools, migrant camps) where a case has been identified
- Known/identifiable contacts of a case in other group settings (places of worship, indoor workplaces, private social events)
- Passengers on an aircraft sitting within 2 seats (in any direction) of the case, travel companions, anyone providing care, or crew members working in the same section
- People who used other public or shared transportation with a case

- **Can higher-impact activities be prioritized?** Contact tracing involves several different activities that are not equivalent in terms of their anticipated yield or impact on mitigating transmission. Ideally, all of these activities are part of a robust contact tracing program. However, where resources are limited, governments may have to prioritize activities. If so, those ranked higher on the following list should be prioritized:
  1. Notification, isolation, and case and/or source investigation of cases with symptom onset or diagnosis within the last six days, to maximize potential for reducing further spread of the virus
  2. Notification and isolation of cases in institutional or congregate settings
  3. Notification and isolation of other cases (those not in institutional or congregate settings)
  4. Notification and quarantine of close contacts, with priority given to those contacts exposed within [6 days](#) of the case investigation interview to maximize potential for reducing further spread of the virus
  5. Notification of select other contacts at increased risk for severe illness.
  6. Notification and quarantine of all other contacts
  7. Monitoring of close contacts daily for 14 days
- **Can turnaround time for test results be reduced?** Ideally, testing capacity allows for rapid testing of all specimens. As the performance of antigen tests improve, especially for asymptomatic cases, it may be possible to increase use of these tests to reduce test turnaround time. It may also be advantageous to prioritize testing of suspect cases identified with recent symptom onset to maximize the opportunity to prevent further spread of the virus. This approach may have large implications for the number of contacts that need to be listed and followed, especially during influenza season and in areas with high levels of air pollution. Testing protocols should ensure that

specimens from symptomatic contacts or other people with COVID-19-like symptoms are prioritized, as well as those collected most recently.

- ***Can a household unit be traced together?*** Often, many of a contact's household members may also be contacts, or it may not be feasible to quarantine contacts away from other members of the household. Under this scenario, it may be more efficient to consider the household as a single unit such that one contact tracer is assigned to monitor all household members. It may be valuable to align the quarantine period for all household members. If the date of last contact with the case differs by a few days, consider use of the most recent date of contact with any household member. Ensure that the household has enough food, water, hygiene materials, and other essential goods for the entire quarantine period.
- ***Can the testing strategy for contacts be modified?*** Testing of contacts has large implications for laboratory as well as contact tracing resources. If resources permit, all [close contacts should be tested](#) for SARS-CoV-2. Where resources exist, testing should be performed as soon as symptoms develop for symptomatic contacts. Testing all close contacts regardless of symptoms may increase sensitivity of a surveillance system, but this approach requires high availability of testing personnel, supplies, PPE, and laboratory staff. If positive, the contact should begin isolating. If negative, contacts should continue to self-quarantine for a full 14 days after last exposure and follow all recommendations of jurisdictional public health authorities. [Options to reduce quarantine time](#) may include after 10 days from last exposure without testing, or after 7 days with a negative specimen collected and tested on or after day 5 (in both cases symptom monitoring should continue for 14 days). However, increased transmission from variant strains of SARS-CoV-2 may outweigh personal and community benefit of shortened quarantine periods, and local public health authorities must determine the best approach for their jurisdictions based on current scientific evidence.

## System Adaptations

**IDEALLY** all cases and contacts will be contacted directly by contact tracing program staff, either in person or by phone.

**Determine whether it is possible for contact tracing program staff to contact all cases and contacts directly or whether use of apps and other automation can be used ensure follow-up.** Community context needs to be considered when determining how to adapt the contact tracing system to best meet the community's needs. Are there adequate staff to visit or call all cases and contacts? If in-person visits are necessary (for some or all notifications) because of limited connectivity or cultural preferences, are resources sufficient to support transportation and any recommended personal protective equipment for staff? If phone calls are being used for some or all notifications, are there sufficient phones and phone credit? In answering these questions, consider what method of notification is preferred and most likely to be accepted by the local community, recognizing that different methods may be advisable for different sub-groups within a country and within different geographic areas. Regardless of contact tracing infrastructure and local epidemiological scenario, cases should be encouraged to self-notify household members and other close contacts of their positive test result and encourage the close contacts to follow local quarantine recommendations, and get tested if they develop symptoms.

***If it is not possible for public health officers to contact all cases and contacts directly either in person or by phone:***

- **Can case-driven notification or self-notification of contacts be used?** The experiences of contact tracing programs suggest that many people are hesitant to share the name of their contacts with case or source investigators. Cases may feel more at ease informing contacts on their own as opposed to providing information to an outside source. Case-driven notification can address these barriers by empowering cases to notify their contacts of their diagnosis.

Contact tracing programs can develop scripts to guide cases in notifying their contacts. Scripts can contain information to communicate the exposure, quarantine procedures, testing, and prevention measures. These scripts are given to all those who test for COVID-19 and can be given again upon return of positive test results. Individuals are instructed to use this script to inform close contacts of their status if they test positive. This process has been used with great success in people living with HIV.

If properly implemented, case-driven notification can drastically reduce the burden on public health programs and increase quarantine.

- **Can SMS, apps, or other technologies be used to support remote follow-up?** It may be more appropriate to use a contact tracing app, messaging software such as WhatsApp (text or video), or by SMS for some steps of the process than others (e.g., in-person contact for initial contact notification and then app/SMS for daily monitoring). This may allow contact tracing personnel to follow more contacts and limit their own exposure risks. However, human interaction is valuable for building trust and providing knowledge and resources to help people maintain quarantine. Both the importance as well as the cost/logistics of in-person interactions are context-specific and may vary within a country.
- **Is self-monitoring an option?** Is daily follow-up (either in person or remotely) of each contact necessary, or would it be acceptable to implement a self-reporting tool that allows contacts to self-report symptoms (or lack thereof) each day. Self-monitoring may be an option if the approach is culturally acceptable and the population has appropriate literacy levels and access to mobile phones or computers. Monitor uptake and completion of self-monitoring to inform effectiveness and need for modifications. Using this approach, a public health officer would still follow-up with contacts who report symptoms or fail to report symptoms or lack thereof. Such an approach would require a data system and data manager. There are SMS tools, apps, and other digital methods that allow contacts to self-monitor. Specific options are not listed here because of the rapidly changing landscape of tools.
- **Can digital tools be used to improve efficiency of other components of the contact tracing process?** Many software programs have been developed to improve the efficiency of case investigation and contact tracing, referred to as [case management tools in this overview of different considerations](#). Developed for the United States, it provides a useful summary of capabilities and purposes. These tools can automate many of the functions commonly done by public health professionals in addition to the self-monitoring functions noted above (e.g., anonymous notification of contacts of a potential exposure). They can also help make other processes like prioritization and assignment of contacts more efficient. In considering software options, consider the capacity of the ministry of health to maintain the system, capacity, and connectivity of staff (core and newly trained staff) to use the system, and capacity and connectivity of the end users. Privacy and cultural acceptability of varying levels of intrusion should also be considered for any adopted system.
- **Will proximity applications be adopted?** In addition to software to improve efficiency of public health activities, new apps have been piloted in select countries that use Bluetooth or GPS cell phone

technology to identify potential contacts (referred to as ‘proximity tracking’ in this [overview of different considerations](#)). These tools allow for automated notification of potential contacts who were in physical proximity of a case. Communities may respond differently to the use of proximity apps. Some may express concerns around geolocation or data privacy. Local context and concerns should be considered when evaluating various technologies for contact tracing.

These tools are new and are still subject to limitations: (1) they require widespread adoption of the app such that both the case and all contacts have the app downloaded and enabled; (2) they are thought to identify many false-positives (notifying people who would not meet the public health definition of a contact); (3) many data privacy and data integrity issues must be considered; and (4) they may increase the workload of public health officers. They notify a contact of potential exposure but do not replace the role of public health personnel for support, assistance, and monitoring throughout quarantine. In settings where there are concerns about ability to implement core contact tracing efforts (i.e., notification of all cases and close contacts), investigators may wish to deprioritize proximity tracking tools.

- ***Can digital tools be used to monitor workforce performance and support enhanced use of data?***  
Analysis and data use for workforce management as well as decision making can be challenging as the contact tracing systems expand. Systems may be needed to track progress in identifying, interviewing, and quarantining contacts as well as to monitor the performance of contact tracing staff. A contact tracing team supervisor may want to know how well their tracing team members are doing in daily follow-ups and track any issues for continuous quality improvement.

## Financial, Logistical, and Operational Adaptations

**IDEALLY**, financial, human, and logistical resources for contact tracing would be sufficient to allow public health agencies to enact all components of a robust contact tracing program without consideration of resource limitations.

**Evaluate whether it is possible to provide all financial, logistical, and operational support to the program envisioned, to map what resource gaps may already exist (or may be anticipated) to inform what is feasible within a jurisdiction.** Review your budget and other appropriated funds to evaluate what financial resources are available to support expanding contact tracing. Based on how contact tracing will work locally, determine what transportation, supplies (e.g., tablets, phones, computers) and other logistical support may be needed and evaluate whether these items are currently available or can be procured.

***If financial, logistical, and operational resources are insufficient, consider the following adaptations:***

- ***Can financial resources be reallocated or used more efficiently to support the contact tracing program?*** In parallel with considering which adaptations are feasible and appropriate, consider their costs—specifically, the logistical and operational costs to create and maintain a contact tracing database, provide transportation and supplies to contact tracing teams, train staff, print materials, host a physical space for training or making calls that allows physical distancing, and pay for supplies and social support services for isolated and quarantined people.

There are also considerable human resource costs for hiring, training, managing, transporting, and

paying a large number of staff. Given the scale of the effort, additional funding may be necessary. In addition, consider more efficient use of existing resources —servers used for routine surveillance; a call center hosted by the MoH; and staff, facilities, and technology that the Emergency Operations Center (EOC) or MoH already has on hand.

Because travel can present some of the highest expenses associated with contact tracing, consider assigning contract tracers to their home communities to minimize costs while also increasing acceptability and understanding of community contexts. Transitioning to remote methods of contact tracing (where appropriate, as discussed under ‘System Adaptations’ above) may also help reduce costs.

- ***Are sufficient logistical and operational support for contact tracers in place?*** Discuss ways to make sure case investigators and contact tracers, and isolated/quarantined people have the right supplies. Some jurisdictions may need to conduct in-person follow up, and other jurisdictions may not need or have the capacity to do so. For contact tracers doing in-person follow up, consider what transportation and supplies they may need. In general, contact tracers should practice physical distancing (staying 2 meters away from cases/contacts, including staying outside of the homes of cases/contacts—if indoors, increase ventilation by opening a window or door), wear cloth face coverings, and have enough soap and/or alcohol-based hand rub. Additional protective equipment may be considered but is not required if social distancing is practiced. For people doing remote (e.g., by phone) follow-up with cases and contacts, internet access and/or phone credit (and potentially a phone) for contacting people will likely be necessary. Use of paper forms and/or tablets should be reviewed. If paper forms are used, systems need to be in place to compile and archive the completed investigation forms. If electronic methods are used, systems need to be in place to ensure data security in transmitting and storing information.
- ***Are logistical and operational support for isolated and quarantined people in place to support the contact tracing program?*** Supplies for people under isolation or quarantine are important to a successful contact tracing program. Asking people to isolate or quarantine without providing related supportive social services will be ineffective. Appropriate levels of supplies should align with local jurisdictional recommendations regarding [options for reducing quarantine time](#). Consider providing the following [items](#) to cases in isolation: washable cloth face covering (or masks, as available), gloves, digital thermometer, [alcohol-based hand rub](#), soap, and household disinfectant, as well as COVID-19 health education materials (translated into the appropriate language) and instructions for cleaning and disinfecting the home.

If the full household is under isolation and/or quarantine or the person under isolation or quarantine lives alone, food, water, financial support, and other hygiene or sanitation tools may be needed. Review which of these will be directly provided by the government public health authority. Consider whether any can be provided in collaboration with local communities, civil society including faith-based organizations, or non-governmental organizations. In some contexts, these organizations may be positioned to donate this support, whereas in others it will be necessary for the government public health authority to fund these services, but local organizations may be able to get and deliver them.

Finally, consider whether locations for isolation and quarantine will be available for people who cannot safely isolate away from household members or who may live in institutional settings (e.g.,

prisons or homeless shelters). The appropriateness and feasibility of isolation and quarantine location will vary by context.

- **Can local organizations and networks support the government public health authority?** For some contacts, such as those linked to a religious gathering or place of employment, it may be appropriate to work with faith leaders, event organizers, or supervisors to support efforts to educate cases and contacts about COVID-19. Public health workers should still do the initial notification and contact tracing. However, these organizations may be able to provide social services and education. Such collaboration can help reduce the workload for contact tracers.

## Balancing Adaptations

Which adaptations are most appropriate will differ by jurisdiction depending on the local epidemiology and available resources, and may change over time as the pandemic progresses. Available evidence is insufficient to characterize the likely impact of any adaptation, or combination of adaptations, on transmission. Any of the adaptations described may impact the overall effectiveness of a program in interrupting transmission, though the impacts of each adaptation will vary. Evolving practices for case and source investigation, and contact tracing should be identified and evaluated as part of an ongoing process to assess their potential benefit, use, and impact on transmission.

Certain adaptations may have a greater impact on the resource demands on a contact tracing program. Select adaptations are anticipated to have the greatest impact on resource requirements: (1) Deciding to trace all *high-risk* contacts (rather than all contacts) will likely dramatically reduce the total number of contacts requiring tracing. (2) Deciding to focus on *notification* of contacts, and therefore deprioritizing ongoing monitoring will save resources. Deprioritizing may mean allowing for self-monitoring (potentially supported by technology), allowing for follow-up monitoring by phone or text message, reducing the frequency or duration of follow-up, or determining it is fully infeasible with available resources. (3) Deciding to utilize case-driven contact notification or self-notification of contacts. If cases are coached to notify their own contacts either at the point of testing or when being notified of their test results, this can reduce the workload for the contact tracing team. Each of these various options will likely have different epidemiologic as well as resource implications.

## Monitoring and Evaluation

Assuming a scale-up of contact tracing together with other mitigation efforts is sufficient to control an epidemic, how does a program or country know whether its adaptations are warranted or effective? Interruption of transmission requires that all steps in the process – from when an index case becomes infectious through to when their contacts and their source contacts are successfully quarantined for the required timeframe – happen efficiently and effectively. Each step is an important link in the chain. As this document focuses on case identification, contact notification, and quarantine of contacts, the indicators will focus on those same steps (noted in orange in the figure below). Separate indicators will be needed for the other steps. [Key indicators](#) include impact, process (staffing, case and contact assignments, interview timeliness), and outcome (contacts notified and quarantined, contacts tested) level indicators.



\*note on the figure: case should isolate at time of specimen collection, not in first orange rectangle.

Research is ongoing about which indicators best reveal whether contact tracing is effective at stopping or limiting the spread of COVID-19. The indicators below have been used in response to other large-scale outbreaks to help measure aspects of a contact tracing program: whether contacts are not only known and registered, but also notified, quarantined, and followed or monitored. The goal of a successful contact-tracing program is to ensure new cases come from registered contacts. Target percentages are not included here due to the current lack of evidence specifically from COVID-19 on which to base these.

Level/Indicator	Definition
<p><b>Process Indicators</b></p> <p><b>Staffing –</b> # and % of staff trained on case investigation</p> <p># and % of staff trained on contact tracing</p> <p><b>Case Assignment -</b> Mean # of case investigations assigned per case investigator during a given period (defined by program guidelines (e.g., 14 days); alternative option to calculate median</p> <p><b>Interview Timeliness -</b> Mean # of days from case assignment to interview during a given period [period defined by program guidelines (e.g., 14 days); alternative option to calculate median]</p>	<p>Numerator: # of staff trained on case investigation or contact tracing. Denominator: Total # of staff to be trained on case investigation (might change as program progresses).</p> <p>Numerator: Total # of case investigations assigned in a given period. Denominator: # of case investigators in a given period.</p> <p>Numerator: Sum of the # of days from case assignment to interview during a given period. Denominator: # of cases interviewed during a given period.</p>
<p><b>Outcome Indicators</b></p> <p><b>Contacts Notified -</b> # and % of contacts notified [refers to notifying (e.g., in-person, by phone, SMS) a contact, providing quarantine instructions, and facilitating access to social support services</p> <p><b>Contacts Quarantined -</b></p>	<p>Numerator: # contacts notified. Denominator: Total # contacts reported/ listed.</p> <p>Numerator: # of contacts reporting completing full quarantine period. Denominator: Total # of contacts with follow-up initiated.</p> <p>Numerator: # of contacts tested per program guidelines. Denominator: # contacts with follow-up initiated.</p>

<p>% contacts reporting completing full quarantine period* *Per program guidelines (e.g., 14 days)</p> <p><b>Contact Testing -</b> % of contacts tested for SARS-CoV-2 per program guidelines<sup>5,6</sup></p>	
<p><b>Impact Indicator</b></p> <p># and % of new COVID-19 cases arising from registered contacts</p>	<p>Numerator: # new cases who were registered contacts in a given period.</p> <p>Denominator: # new cases in a given period.</p>

## ANNEX: COVID-19 Contact Tracing Resources and Tools

### 1. Contact Tracing Training Resources

- WHO GO Training on Contact Tracing and Case Finding:
  - o [\(36\) WHO:GO Training - Case finding and contact tracing - Module 4.2 - YouTube](#)
- Public Health Foundation TRAIN: COVID -19 Training Resources:
  - o [http://www.phf.org/resourcestools/Pages/Coronavirus\\_Disease\\_2019\\_COVID\\_19\\_Training.aspx](http://www.phf.org/resourcestools/Pages/Coronavirus_Disease_2019_COVID_19_Training.aspx)
- John Hopkins University - COVID-19 Contact Tracing Training:
  - o <https://www.coursera.org/learn/covid-19-contact-tracing?edocomorp=covid-19-contact-tracing>
- World Health Organization (WHO) - GO Training: Case Finding & Contact Tracing:
  - o [https://www.youtube.com/watch?time\\_continue=6&v=ez1poNReLLA&feature=emb\\_logo](https://www.youtube.com/watch?time_continue=6&v=ez1poNReLLA&feature=emb_logo)
- Association of State and Local Health Officials: Making Contact: A Training for COVID-19 Contact Tracers:
  - o <https://learn.astho.org/p/ContactTracer>

<sup>5</sup> Centers for Disease Control and Prevention. Evaluating Case Investigation and Contact Tracing Success. Retrieved 28 Aug 2020, from: <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/evaluating-success.html>.

<sup>6</sup> 4. Centers for Disease Control and Prevention. ELC Performance Measures Guidance for Project E: Enhancing Detection Retrieved 28 Aug 2020, from: <https://vital.ent.box.com/s/fmpabl5nezdr732amokblgmcffp0r6uz>

- Africa CDC Webinar: Why case investigation and contact tracing is important in the management of COVID-19
  - o <https://africacdc.org/video/why-case-investigation-and-contact-tracing-is-important-in-the-management-of-covid-19/>
- Washington State Department of Health: Contact Investigation Training:
  - o <https://www.ncsddc.org/wp-content/uploads/2020/03/FINAL-COVID19-Contact-Training-03112020.pdf>

## 2. Contact Tracing Guidance and Tools

- WHO Contact Tracing in the Context of COVID-19:
  - o <https://www.who.int/publications/i/item/contact-tracing-in-the-context-of-covid-19>
- CDC Training Case Investigators and Contact Tracers:
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/training-investigators.html>
- CDC Investigating a COVID-19 Case:
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/investigating-covid-19-case.html>
- CDC Contact Tracing:
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/contact-tracing.html>
- CDC Notification of Exposure: A Contact Tracer's Guide for COVID-19
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/notification-of-exposure.html>
- Africa CDC: PACT Tracing
  - o <https://africacdc.org/download/partnership-to-accelerate-covid-19-testing-pact-in-africa/>
- Africa CDC COVID-19 Contact Tracing Protocol for African Union Staff
  - o <https://africacdc.org/download/covid-19-contact-tracing-protocol-for-african-union-staff/>
- Africa CDC: Guidance on Contact Tracing for COVID-19 Pandemic:
  - o <https://africacdc.org/download/guidance-on-contact-tracing-for-covid-19-pandemic/>
- WHO GOARN COVID-19 Knowledge Hub
  - o <https://extranet.who.int/goarn/COVID19Hub>

## 3. Workforce Scale-up

- CDC Scaling Up Staffing Roles in Case Investigation and Contact Tracing
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/scaling-staff.html>
- CDC Training Case Investigators and Contact Tracers
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/training-investigators.html>
- CDC COVID-19 Sample Training Plans for Contact Tracers, Case Investigators, and Supervisors
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/index.html>

## 4. Workforce Calculators

- CDC COVIDTracer:
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/COVIDTracerTools.html>

- George Washington University Contact Tracing Workforce Estimator
  - o [https://www.gwhwi.org/uploads/4/3/3/5/43358451/contact\\_tracing\\_brief\\_05.05.20.pdf](https://www.gwhwi.org/uploads/4/3/3/5/43358451/contact_tracing_brief_05.05.20.pdf)
  - o <https://www.gwhwi.org/estimator-613404.html>
- Prevent Pandemics Contact Tracing Workforce Estimator
  - o <https://preventepidemics.org/covid19/resources/contact-tracing-staffing-calculator/>

## 5. Finance, logistics and operational support

- WHO Operational Planning Guidelines to Support Country Preparedness and Response: Pillar 3
  - o [https://www.who.int/docs/default-source/coronaviruse/covid-19-sprp-operational-planning-guidelines-to-support-country-preparedness-and-response-\(22may20\).pdf?sfvrsn=d7b81758\\_2&download=true](https://www.who.int/docs/default-source/coronaviruse/covid-19-sprp-operational-planning-guidelines-to-support-country-preparedness-and-response-(22may20).pdf?sfvrsn=d7b81758_2&download=true)
- ECDC Resource estimation for contact tracing, quarantine and monitoring activities for COVID-19 cases in the EU/EEA2:
  - o <https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-resources-for-contact-tracing-2-March-2020.pdf>

## 6. Digital tools

- WHO Digital tools for COVID-19 contact tracing:
  - o [https://www.who.int/publications/i/item/WHO-2019-nCoV-Contact\\_Tracing-Tools\\_Annex-2020.1](https://www.who.int/publications/i/item/WHO-2019-nCoV-Contact_Tracing-Tools_Annex-2020.1)
- WHO Introduction to Go.Data: Field Data Collection, Chains of Transmission and Contact Follow-up
  - o <https://openwho.org/courses/godata-en>
- CDC Digital Contact Tracing Tools
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/digital-contact-tracing-tools.html>

## 7. Data Use

- CDC Data Management for Assigning and Managing Investigations:
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/data-management.html>
- JHU Digital Contact Tracing for Pandemic Response: Ethics and Governance Guidance
  - o <https://muse.jhu.edu/book/75831>

## 8. Monitoring and Evaluation

- CDC Analyze Contact Tracing Encounters for Continuous Quality Improvement:
  - o <https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/continuous-quality-improvement.html>

## 9. Other Mitigation Measures

- CDC Hierarchy of Controls:
  - o <https://www.cdc.gov/niosh/topics/hierarchy/>
- BRIDGE: Stacking best practices:
  - o <https://www.bridgemi.com/guest-commentary/opinion-stacking-best-practices-help-michiganders-safely-return-work>
- WHO Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19):

- [https://www.who.int/publications/i/item/considerations-for-quarantine-of-individuals-in-the-context-of-containment-for-coronavirus-disease-\(covid-19\)](https://www.who.int/publications/i/item/considerations-for-quarantine-of-individuals-in-the-context-of-containment-for-coronavirus-disease-(covid-19))
- CDC Living in Shared Housing:
  - <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/shared-housing/index.html>
- CDC Households Living in Close Quarters - How to Protect Those That Are Most Vulnerable:
  - <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/living-in-close-quarters.html>
- JHU How families and roommates can effectively self-quarantine, self-isolate:
  - <https://hub.jhu.edu/2020/03/23/how-to-self-quarantine-self-isolate/>
- American Medical Association: Ethical Use of Quarantine & Isolation

<https://www.ama-assn.org/delivering-care/ethics/ethical-use-quarantine-isolation>