



The *Confronting COVID-19* briefs, produced by the *Program in Global Public Policy and Social Change (PGPPSC)* at Harvard Medical School, aim to inform the public about the country and the Commonwealth's efforts to mitigate the COVID-19 crisis. These briefs focus on the debates, challenges, and policy conundrums of the COVID-19 crisis. The initial briefs in this series regard the Massachusetts Contact Tracing Collaborative (CTC). Of note PGPPSC serves as a policy advisor to Partners in Health, a non-profit working for the Commonwealth as a consortium partner to implement its contact tracing program.

After a four week ramp up, Massachusetts formally [launched](#) its COVID-19 Contact Tracing [Collaborative](#) on May 1, 2020. The key objectives of the program were to first stabilize the number of new daily cases—flatten the epidemic curve—and then to decrease this rate by interrupting transmission chains. The audacious goal, the “mission impossible”, was to not only flatten the epidemic curve but bend it downward: to slow if not altogether halt spread of the virus in the community. To set the stage for our later briefs, we will begin with a summary the basic strategy, components, and metrics of a contact tracing program before we dive into the myriad of policy challenges related to this effort. First and foremost among them, the challenges of case finding and testing which we will address in our next brief: *The Case of the Missing Cases*.

What is the difference between contact tracing and other COVID-19 control strategies?

Contact tracing is a disease control strategy that requires both individual and community level interaction and engagement. It involves finding infected individuals, identifying those who have been exposed to them and preventing the infected and potentially infected from transmitting the disease onward. Contact tracing is distinct from other strategies, such as those that involve modifying environmental conditions or promoting behaviors that make disease transmission less likely generally. Social distancing, lockdowns, travel limitations, mask wearing, hand washing, and better ventilation of indoor spaces are examples of this group of approaches—all of which are interventions at the population or community level rather than specific individuals. On the other hand, therapeutics and prophylaxes that lessen the severity of disease course and decrease infected individuals' viral loads, making them less infectious, do focus on specific individuals, but do not necessarily involve community or population level engagement. There is broad agreement that all of these strategies need to be brought to bear on the COVID-19 crisis. The precise mix of investments in each one, however, are still hotly debated.

The strategy behind Mission Impossible

There are four inter-dependent and sequential activities that comprise the strategy of contact tracing. The four activities include case finding, contact locating, and supported quarantine and isolation.

Case finding: generally refers to testing individuals to identify those with active infections of SARS2CoV (the virus that causes COVID-19) that can be transmitted to others. Finding active cases is the critical first step upon which the rest of the contact tracing strategy depends. Currently, the major modality for identifying COVID-19 cases is through [nucleic acid tests](#) (also known as polymerase chain reaction or PCR testing). Nucleic acid testing involves collecting a sample from the patient and then testing the sample for viral genetic material unique to COVID-19. Other modalities

of case finding, such as using [chest CT scans](#), inflammatory markers in patients' blood, and symptom based diagnosis, have not been formally used to find COVID-19 cases in Massachusetts. However, since tests were in short supply during the first months of the outbreak, providers report simply telling symptomatic patients to assume they were positive for the disease and to isolate themselves from others at home. Successful case finding is the identification of all infected individuals in a population. *This can be assessed by comparing the number of identified cases to the number of estimated ones.*

Contact Locating: Contact locating refers to locating and monitoring people who have been exposed to an infected individual. Contact locating commences with an interview of an infected individual and working with them to remember everyone they have been in contact with during the period of time when they were infectious. With respect to COVID-19, the infectious [window](#) is estimated to be [2-5 days prior](#) to the onset of symptoms until 72 hours after resolution of fever and improvement in respiratory symptoms for a minimum of 10 days. Contact inclusion criteria differs across countries, but conservatively includes anyone who has [been within 6 feet](#) of an infected individual without a mask for longer than 15 minutes or less than 2 feet for 2 minutes. Successful contact locating involves identification and contact with every person who has been exposed to an infected individual. *A key goal of contact tracing is to make the time between identification of a new case to initial engagement with all of their contacts less than 24 hours.*

Supported Quarantine: Case identification and contact locating alone do nothing to stop outbreaks without accompanying interventions. Quarantine refers to the practice of keeping people who have been exposed separated from others and monitoring them for a period of time to see if they develop the disease. In the case of COVID-19 the incubation period—the time between exposure and development of the disease—is estimated to be 14 days. Research on quarantine adherence shows that people's ability to adhere to a period of quarantine depends on their ability to obtain supplies and food and maintain employment. Supporting people in quarantine with the resources and financial security they need to successfully complete quarantine is a critical element of a contact tracing program. Successful quarantines are those wherein individuals who become sick are rapidly identified and no transmission of disease to others occurs. *Time between symptom onset and confirmation of infection is one proxy measure to assess the effectiveness of the quarantine program, as is the percentage of people in quarantine who were able to avoid contact with others for the duration of the quarantine period. The ultimate measure of success, though, is the lack of transmission of disease from quarantined individuals to others.*

Supported Isolation: An infected person will be asked to isolate from all other individuals until 72 hours after resolution of fever, and for a minimum of 10 days. Similar to quarantine, infected individuals should not be in contact with any other person. The additional feature of isolation is that people who are infected may need medical care as their disease course progresses. *Successful isolation, like those of quarantine efforts, means the disease is not transmitted to others. Other quality measures include time to initial medical intervention for those who are in isolation.*

How do you know contact tracing is working?

In places where the goal has been to eliminate the virus, contact tracing programs have strived to identify every case and monitor every contact. Sophisticated contact tracing programs in South Korea, Taiwan, and India involve monitoring tens of thousands of contacts. In the US, the virus was

allowed to spread unchecked for months and the response has been a patchwork of local and state initiatives with no consensus on the overall objective. In Massachusetts, contact tracing has focused on more modest, if unstated goals: suppressing community transmission enough so health systems won't be overwhelmed and a moderate amount of economic and social activity can safely resume. This more realistic goal allows the contact tracing program to be less exacting than following every contact and case. One [model](#) predicts that even following 50% of symptomatic cases and 40% of contacts of those cases will keep case rates low enough to reopen the Massachusetts economy to some extent without a dramatic rise in cases.

Regardless of the goal, the critical metric to follow to assess the effectiveness of contact tracing is the percent of new infections that are identified from the pool of people who are contacts. If the contact tracing program is working perfectly, 100% of new cases should come from the pool of those known to have been exposed to the virus (i.e. those the contact tracing program has identified).

The Massachusetts Experience

In Massachusetts, the results of the CTC roll-out have revealed and highlight multiple complex policy issues related to each of the four elements of the program:

- 1) Case Finding: Massachusetts, like the other US states, continue to struggle significantly with respect to the first, critical step of contact tracing. Most estimates conclude we are only identifying 10-20% of the infectious cases in the Commonwealth. The next upcoming brief, ***The Case of the Missing Cases***, will focus on why this is, as well as potential opportunities and challenges the state has in growing its case finding capability.
- 2) Contact Tracing: the scope and scale of the US COVID-19 epidemic has prompted skepticism in some corners regarding how practical contact tracing will be, and efforts to develop communication technologies that allow for rapid scale up are being explored. The ***Human Touch versus High Touch brief*** will analyze these issues in more detail.
- 3) Supported Quarantine: giving people the support and resources they need to successfully quarantine for 14 days is an exacting exercise in equity. It is also costly. But more costly than not supporting inaction? In ***Taming COVID-19 through Quarantine: The Costs of Action versus Inaction*** we will examine what it takes to help people in quarantine.
- 4) Isolation: China and Italy both discovered they were unable to tame their outbreaks without offering infected people a place outside of their homes to isolate themselves. Massachusetts offered some opportunities in this regard, especially for vulnerable populations like people who are unhoused. However, when these facilities became too expensive to run, people were again discharged to the street. How to balance short term measures versus investing in resiliency is the topic of the upcoming ***Recovery versus Resiliency*** brief.

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