



# USING “TEST AND TRACE” TO FIGHT COVID-19 IN MASSACHUSETTS

*April 2020*

## **EXECUTIVE SUMMARY**

After the first, convulsive phase of the Covid-19 crisis has passed, states like Massachusetts will determine how to gradually restart the economy and safely reopen parts of social life. That means new strategies for disease containment and new rules of social interaction — at least until an effective treatment can be found.

Judging from the few countries that have managed to limit the spread of Covid, the most promising approach seems to involve aggressive contact tracing, or what’s sometimes called “test and trace.” In this approach, public health officials: a) test and isolate people with Covid, b) use low-tech interviews and high-tech apps to identify others who came in contact with Covid carriers, and c) communicate with these at-risk individuals to ensure they can safely quarantine, thus quashing local outbreaks before they can spread.

Massachusetts is already expanding its capacity for contact tracing, but the success of its program hinges on issues of timing, planning, and scale that are still being figured out. For this policy report, the Center for State Policy Analysis has synthesized the best evidence around test and trace: the known, the unknown, and the key decision-points facing policy-makers. We find that:

- Testing capacity in Massachusetts likely needs to increase from the current mark of 5,000-8,000 tests per day to 10,500-17,000 per day.
- Even modestly successful contact-tracing programs in other countries often involve invasive government activity, which may not be compatible with U.S. law, the established norms of American life, or modern partisanship.
- The fact that asymptomatic people can spread Covid-19 complicates the work of contact tracing — and puts a premium on speed. Using cell phone data could help quicken the process, but it raises serious concerns about privacy and surveillance.
- Coordination and centralization could be a challenge in Massachusetts, as contact tracing is typically handled by the 351 cities and towns.
- Choosing between voluntary and mandatory measures is fraught, as voluntary approaches may weaken compliance while mandatory moves can stoke resistance.
- Massachusetts also needs to prepare for potential failure, which means specifying triggers for when to return to lockdown. Even under a strict contact-tracing regime, living with Covid may involve periods of relative openness followed by [semi-regular shutdowns](#).

The sections that follow provide greater detail on these and other issues, including a summary of approaches in select countries, an assessment of the impediments to successful contact tracing, a discussion of the social and legal risks, and a list of questions Massachusetts needs to answer before lifting the current lockdown.

## HOW TEST AND TRACE WORKS ELSEWHERE

Most countries hit by Covid-19 have been forced into protracted lockdowns to prevent their health systems from being overrun. But an aggressive and well-prepared few seem to have fared better — though they, too, are still plagued by the disease.

Test and trace has been central to these relative success stories. But beyond the bare skeleton— isolate those who test positive for Covid-19, conduct interviews to figure out who else might have been exposed, and ensure that exposed individuals go into quarantine — there's a lot of country-to-country variation in how contact tracing has been implemented.<sup>1</sup> And it's important to appreciate just how vigorous and intrusive the process can be.

### **South Korea**

After an influx of cases in February, South Korea has managed to stop the kind of exponential case growth that closed down societies elsewhere. One factor has been its commitment to cheap, convenient testing — and a broad effort encouraging people to get tested.

But [South Korea's successful suppression](#) extends far beyond that. Patients who test positive for Covid are interviewed by contact tracers, who not only work with the patient's direct responses, but also collect GPS data from their cell phone and car — along with credit card records and security camera footage — in order to assemble a complete picture of recent movements.

Information about those movements is then [shared with the public](#) via an alert system, so that others who might have crossed paths with the infected individual can self-quarantine. Anyone found to have been in contact with the infected individual is expected to go into quarantine for two weeks, with a limited subsidy in case of lost wages. Those who break an official quarantine order need to wear a wristband tracker to ensure they don't leave their home.

Sharing detailed information about people's movements raises obvious privacy concerns, but [South Korean law](#) establishes a public “right to know” about the spread of infectious disease.

### **Singapore**

Lockdown has now come to Singapore, following months of successful suppression — after a cluster of new cases involving migrant workers. That Singapore has succumbed shows just how uncertain even the most zealous contact-tracing regimes can be.

Contact tracing is considered so vital in Singapore that it's often carried out in coordination with [police investigators](#), who partner with health workers on a wide-ranging, fast-moving process of interviewing patients, corroborating information, and ensuring that everyone exposed is tested, monitored, or quarantined. It is illegal for anyone to refuse cooperation with the police or to break quarantine.

Singapore also relies on a phone app called TraceTogether, which uses bluetooth to track close contact between users. When an individual is stricken with Covid, they can deliver an app-generated list of recent contacts to public health officials, speeding the effort to pinpoint, test, and quarantine at-risk citizens.

At the same time, information about where infections are occurring is shared with the public so others can avoid potential hot spots.

### **Taiwan**

To stop cases from entering the country in the first place, Taiwan has placed great emphasis on tracking travelers. Not only are arrivals from many countries asked to self-quarantine for 20 days, but the state has integrated its national health insurance database with its [immigration and customs information](#) to seamlessly trace potential cases across the border and into the health network.

Those ordered into quarantine are given government-issued cell phones to monitor compliance. Leaving your home — or turning off the phone —

triggers an alert that goes to police and local officials.

There are other examples one might cite — including China's mandatory cell-phone alert system or [Iceland's location-tracking app](#) — but these give a flavor of the strictures involved in some contact-tracing systems. And while you might attribute acceptance of these more intrusive policies to political and cultural differences in Asia, it may also reflect these countries' more recent — and less successful — response to earlier pathogens. South Korea altered its laws after their struggle with MERS, while Taiwan made changes after battles with SARS and swine flu.

## CONDITIONS FOR SUCCESS

By mining these examples of large-scale Covid contact tracing, and incorporating additional research on effective strategies, it's possible to identify some key conditions for success in Massachusetts, including those issues and choices that may determine our ability to ease the current lockdown and restart the state economy.

### Testing

Contact tracing only works when you can quickly identify infected patients, which requires tests that are cheap, plentiful, rapid, and reliable. The cheap part we have mainly accomplished, via government requirements that health insurers cover the cost of Covid testing. But concerns remain about the availability of tests, the high rate of [false negatives](#), and the fact that results can take days rather than hours.

Experts have been pushing for a massive increase in testing ever since the virus emerged. And while the number of tests in the United States has increased substantially — from a few thousand per day to roughly 150,000 per day — that is insufficient for a thoroughgoing tracking program.

One sign that we don't yet have enough tests is that nearly 20 percent of all tests nationally are

positive for the disease — and [in Massachusetts](#) the number is even higher, at roughly 25 percent. Such high rates suggest that we're only testing people who are very likely to have Covid (as opposed to all those who might have been exposed.) As a comparison, in South Korea less than 2 percent of tests are positive — which gives a sense of the scale and availability of testing.

Determining exactly how many tests are needed in the US is tricky — because it depends on how widespread Covid is — or rather how widespread it will be at the moment we decide to weaken the lockdowns and pursue aggressive contact tracing. The more widespread the virus, the more tests are required.

To put some numbers to this, a recent report from the American Enterprise Institute suggests that around 100,000 tests per day might have sufficed if we had launched a comprehensive test-and-trace program when the first cases arrived in the United States. But one lead author of that report [added on Twitter](#) that to start a comprehensive program in the coming months we might need something more like 600,000 tests per day. A separate estimate from the [Harvard Global Health Institute](#) suggests something similar — 500,000 to 700,000 per day — while [scientists in Germany](#) have called for 200,000 tests per day, which would translate into roughly 800,000 daily tests in the US, given our larger population.

Scaling down to Massachusetts, this means an aggressive contact-tracing approach — with enough tests for symptomatic individuals and those they may have exposed — would likely require between 10,500 and 17,000 tests per day, compared with the current rate of 5,000 to 8,000. And even these higher numbers will only suffice once the peak has passed and cases fall well below current levels.

What's more, tests would need to be more reliable so there is less [repeat testing](#), with rapid (ideally same-day) results and widespread availability, including at businesses, drive-through centers, and pop-ups.

### **Tracking Speed and Data Sharing**

A [recent analysis](#) in the journal *Science* found that Covid may move too fast for traditional tracking techniques like interviews and phone calls. Speed, they found, was the key to making contact tracing work, with success greatly hampered by any approach that required more than 24 hours to identify and quarantine contacts.

A [separate piece](#) — currently in preprint with *The Lancet* — also emphasized the importance of rapid response (less than three days, in this case) while offering this more general point: What makes Covid tracking uniquely difficult is that unlike SARS and MERS, there seems to be a relatively high degree of asymptomatic or pre-symptomatic transmission, though the exact extent of this is not fully understood. By the time you identify patients with symptoms, they might already have been spreading the disease for days. Speed helps to compensate for this difficulty, by ensuring that the contact-tracing mechanism doesn't add additional days of delay.

At the very least, ensuring a timely and rapid contact-tracing investigation will require a substantial increase in the public health workforce, from investigators making phone calls to data scientists tracking disease hot spots. This is especially important in those marginalized communities which seem to be disproportionately affected by the epidemic and where it's vital to have contact tracers who can work across languages. Requiring all residents to cooperate with contact tracers could also help avoid delays.

Massachusetts is already building a more robust workforce for test and trace, with operations underway and plans to hire up to 1,000 staff, though it's important that this effort be able to scale if the disease accelerates again in future.

One challenge will be to ensure smooth coordination between this central group and the local boards of health across our cities and towns, which traditionally do the legwork for most contact tracing. This town-led approach has the benefit of incorporating deep local knowledge and communi-

ty know-how, but it also creates substantial management and coordination problems that could become an operational hurdle if speed really is essential for success against Covid.

With the right data-sharing approach, it's also possible to turn the public as a whole into de facto public health workers. When South Korea releases details about the recent travels and activities of infected individuals, it allows citizens everywhere to see how the disease is moving and how that movement might intersect with their daily lives. Massachusetts could similarly provide detailed alerts and granular mapping of where cases are happening — without jeopardizing the identities of those affected.

### **Data Collection via Smartphone**

If traditional contact-tracing techniques prove too slow for Covid — even with an expanded public health workforce — it may be necessary to incorporate high-tech forms of data collection, as is done in South Korea and Singapore using cell phone apps. This way, public health systems can automate parts of the process, such as the alerts sent to individuals who might have been exposed.

However, using cell phone data for tracking and monitoring raises serious concerns about privacy and government power, which means that any such approach would benefit from careful selection of tools and rules that are genuinely effective, time-limited, minimally disruptive to existing norms, and broadly acceptable to the public.

Tech companies, academic experts, and watchdog groups have already begun developing apps and proposing regulatory safeguards, and for now attention seems to be focused on a variant of the Singapore app, which uses bluetooth to gauge when two users are in close proximity for an extended period of time. In the more privacy-protective versions of this approach — including one jointly announced by [Google and Apple](#) — each phone stores a ledger of recent contacts, encoded and indecipherable as a whole. When any one user tests positive for Covid, other users who've been in close proximity will get an alert, potentially

including information about the timeframe when the encounter happened, the place of contact, and instructions on how to get tested and whether to go into quarantine.

As yet unclear is whether U.S. public health authorities will have access to this data. Recall that in Singapore, officials can obtain a user's data once that person tests positive, which allows contact tracers to enforce quarantines, gather information about potential hot spots, and communicate directly with individuals who may have been exposed. This government-centered approach enables stricter enforcement and more comprehensive oversight—but it may also dissuade individuals from using the app in the first place.

It is possible to make the entire system decentralized and voluntary. In that scenario, any individual who tests positive for Covid would have to self-report through the app while users who receive alerts would decide on their own whether to get tested or commit to self-quarantine. Low compliance, on either front, could undermine the effectiveness of the whole test-and-trace program. Plus, the system would be open to spam and misuse without some kind of check on malicious users reporting fake test results and generating meaningless alerts that could shut businesses, close schools, or otherwise sow disruption.

### **Quarantine and Isolation**

Typically, when tracing cases of Covid the aim is to isolate infected individuals until they are no longer contagious and require those who were exposed to self-quarantine for 14 days (a full incubation period.) But 14 days is a long quarantine for someone who might never experience symptoms — especially when you factor in potentially lost wages, uncomfortable living arrangements, and other family needs.

If frustration with the 14-day quarantine drives individuals to drop out early, or refuse entirely, it may be imperative for the state to incentivize or mandate compliance, whether through wage subsidies, direct assistance for daily needs, alter-

nate quarantine-friendly housing, GPS monitoring, or other measures.<sup>2</sup>

Mandatory quarantine orders with GPS monitoring would be the most aggressive approach. And from a legal perspective, it's worth noting that individual towns, the department of public health, and the federal government all have well-established authority to [order and maintain quarantines](#) when necessary. With heightened use of state power, however, there is a risk that people might refuse to speak with contact tracers or otherwise participate in the public health system.

In terms of alternate housing, there are already some options for those who've tested positive and require isolation in a safe setting. Dorm or hotel-like facilities could also be made available to those who have been exposed and need a safer space for their 14-day quarantine — or want to avoid infecting their families or roommates. Additional safeguards would be needed to limit transmission inside such quarantine facilities, where there would be a mix of carriers and uninfected individuals.<sup>3</sup>

### **Regional Coordination**

Massachusetts [has joined with six other northeast states](#) — but not our northern New England neighbors — to coordinate post-lockdown approaches to managing Covid.

This regional approach makes operational sense, as the borders between states are quite porous and contact tracers could regularly find cases that cross state lines. Perhaps more important, this regional compact sends a signal about the fragility of the coming months, emphasizing the importance of cooperation and a “we’re in this together” approach to life-shaping decisions.

At the same time, the desire for coordination also highlights a key risk for states like Massachusetts, namely that some of our neighbors will choose not to cooperate, preferring to go their own way with what may be a looser or less effective approach to containing Covid. If that happens — and if the go-it-alone effort fails — nearby states could

become crucibles of new cases, whose trickle (or flood) into Massachusetts would undermine our efforts and force a new lockdown.

In such a situation, checkpoints and other border controls might prove necessary, though they might also run afoul of constitutional rules governing interstate commerce. As an example, [Rhode Island](#) began stopping cars with New York plates in late March, not to turn them away but to inform visitors from that area of the need to self-quarantine.<sup>4</sup>

### **Complementary Approaches**

Test and trace may form the core of our post-peak response to Covid-19, but it will work better if reinforced by other approaches and activities. As examples:

- Taking people's temperature in public settings like businesses, restaurants, and schools — either directly or via infrared camera. This won't identify asymptomatic or pre-symptomatic carriers but could reduce contagion and encourage testing among a subset of infected individuals. (While promoting the use of masks could have a similar benefit, it remains controversial and isn't appropriate for all situations, like eating in restaurants.)
- Once proven accurate and made more widely available, serological tests could identify those who have already recovered from Covid and might have some immunity. These potentially immune residents might travel more freely and provide essential services, but conferring too many special privileges could also create a perverse incentive for others to intentionally contract Covid.
- Vulnerable populations might be discouraged from resuming their normal routine until the test-and-trace approach is more fully proved. Senior shopping hours and other "safer" windows for the at-risk could continue.
- Random testing would provide additional information about immunity and community risk.

- Continued limits on large gatherings could limit super-spreading events.
- Businesses might pursue risk-limiting efforts like splitting employees into shifts, providing masks, and requiring regular hand washing or other sanitation breaks.
- Economic sectors could be opened in a phased way, with the safest and most vital returning first while less-urgent sites like bars and concert venues stay closed for longer.<sup>5</sup>
- Testing international travelers, or requiring immediate quarantine, would sever one potential source of reinfection.
- Reducing maximum capacity on transit, trains, and buses could help spread riders apart.

### **Legal and Social Challenges**

Public trust is essential to any effective test-and-trace program. For now, the public seems prepared to accept some personal sacrifices to fight off Covid-19. A [Harris poll](#) from late March found that 71 percent of Americans would willingly share their cell phone location data with authorities in order to get alerts about their risks. Mandatory health screenings at high-traffic public places like airports won 84 percent support.

Looking ahead, however, public buy-in is likely to depend on our actual experience of contact-tracing regimes. If people feel programs are being run sensibly, with reasonable trade-offs between safety and convenience, support may remain high. But if they start to feel that they're sacrificing too much — perhaps from an abundance of unpaid, protracted quarantines — or not getting meaningful information in return, that could change swiftly.

Partisanship could play a distorting role here as well, if one party or ideological group grows disenchanted with the program and starts discouraging participation. Already, [there is evidence](#) that Republicans engage in less social distancing than Democrats and foresee less personal and social risk from the disease. Recent days have even seen

[right-leaning protests](#) calling for an immediate end to the lockdown. However, Massachusetts would seem well-positioned to avoid the worst of this partisan fight, given the state's relatively unified political culture.

Legal and constitutional challenges may arise as well. Among other things, quarantines could raise due process issues, information collection by the government touches on First and [Fourth Amendment](#) concerns, and competing efforts among states and the federal government might bring fights over the Commerce Clause.

Voluntary measures are much less likely to trip constitutional concerns, but mandatory quarantine, compulsory use of a tracking app, or required cooperation with contact-tracing investigators could invite intervention by the courts. And the outcome of those cases would shape the effectiveness of any program.

At the state level, Massachusetts also has a statutory right to privacy more explicit than what's found in federal law. That opens another path for potential legal challenges, and could impinge on efforts to establish a common framework across the northeast region.

States eager to maintain control over their contact-tracing programs — without court intervention — might try to anticipate challenges and preemptively appease likely judicial concerns. For instance, they could:

- avoid feeling unduly constrained by past precedent — where that seems an unmanageable obstacle — as courts are likely to acknowledge the uniqueness of these times
- acknowledge the legitimacy of legal and constitutional concerns (i.e., don't pretend specific provisions don't apply but instead craft a response explaining why particular government actions should be allowed in current conditions)
- pursue strategies with broad support across political branches and among the public

- find approaches that count as “minimally invasive while still effective” and include protections to ensure they operate as planned
- institute sunset provisions, to clarify that these are temporary emergency measures rather than the start of a new era of government surveillance

### **Triggers for Implementation**

Given the high number of cases, and the preliminary nature of current planning, it seems clear that Massachusetts is not yet ready to end the current lockdown. Before we do, we should be able to answer “Yes” to the follow nine questions:

1. Is the initial spike in Covid cases well behind us, with sustained caseload reductions for at least 14 days?
2. Do we have enough capacity to quickly and accurately test every potentially infected person and all those they've recently spent time with? (10,500 to 17,000 per day?)
3. Are hospitals adequately supplied with protective and life-saving equipment, particularly ICU bed capacity, so that we can provide critical care in case of a second spike?
4. Do we have the public health workforce in place to quickly and comprehensively identify and alert those who've been exposed to infected individuals (within 1 to 2 days)? Are there well-established principles of coordination between individual towns and the state?
5. Is there a proven app we might leverage to increase the speed and scope of contact tracing, with a plan to ensure widespread adoption and proper use? And has the app been vetted for accuracy, maximal privacy-protection, and the appropriate trade-off between centralized and decentralized oversight?
6. Are we confident that quarantines will be voluntarily respected? If not, is there a plan to ensure necessary isolation and quarantine?

7. Have businesses, schools, airports, transit hubs, and other high-traffic sites made substantial operational changes to limit the risk of transmission?
8. Are neighboring states and regional partners equally prepared? If not, can we create a secure border or limit inflow from states with potential outbreaks?
9. Have we set clear conditions for when to return to a limited or large-scale shutdown — of towns, regions, or states — based on rising case numbers, untraceable sources, or overrun hospitals?

To be sure, this set of triggers sets a high hurdle for re-opening the economy. But absent these measures, the virus could once again spread beyond our capacity to control it.



## Acknowledgments

In assembling this report, the Center for State Policy Analysis was aided by a number of experts in public health and elsewhere. We'd like to acknowledge the guidance and scrutiny provided by:

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## Endnotes

<sup>1</sup>Depending on the availability and reliability of testing, it may also make sense to isolate individuals whose symptoms suggest likely infection with Covid-19. Note that isolation refers to the sequester of infected individuals; quarantine is the term for those who've been exposed.

<sup>2</sup>Massachusetts [has a rule](#) requiring that wage earners be partially compensated for lost wages, but the current maximum is set at \$2 per day.

<sup>3</sup>In the most stringent version, individuals with symptoms could be required to stay at a dedicated facility until while awaiting test results.

<sup>4</sup>There is some [preliminary research](#) suggesting that inflow controls can be vital to contact tracing efforts when resources are constrained.

<sup>5</sup>Several countries are already using this phased approach for reopening, including [Germany](#) and [Austria](#).