



## **Combatting COVID-19 In California's Diverse Communities: A Community-Based COVID-19 Case-Tracing Corps**

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### **Introduction**

There is an emerging consensus that case identification, contact-tracing, and case isolation are crucial components in efforts to gradually “open up” jurisdictions, i.e. enabling them to resume pre-pandemic business and social life. At the same time, it is generally acknowledged that the current public health system, stretched thin in responding to the immediate, urgent, need to track COVID-19 prevalence, ramp up testing, and respond to crises, does not have adequate capacity to meet either immediate or long-term case-tracing objectives.

Beyond the general issues of staffing and broad organizational capacity to conduct the level of case-tracing needed to permit systematic opening-up of counties, states, and regions of the U.S., there needs to be focused attention to the demands of case-tracing in communities with linguistically and culturally diverse populations. California is the paradigm case of such a state.

Design features of concern in crafting such an initiative to function effectively throughout California include:

- Staffing to reach each of California's diverse communities and sub-groups which are linguistically and culturally diverse and resistant to communication with “outsiders”
- An initiative that can efficiently integrate case tracing, advice, and provide help in securing temporary housing for self-isolation or self-quarantine as needed
- Mobilizing the data collection workforce in a way that moves forward with high-quality contact-tracing very rapidly while maintaining needed confidentiality

This working paper urges creation of a California Community-Based COVID-19 Contact-Tracing Corps to rapidly and effectively conduct case-tracing in communities that may be distrustful of outsiders. It also discusses the possibility that such a Community-Based Case-Tracing Corps could also take on an expanded role in coordinated efforts to combat the pandemic, well beyond the traditional implementation of contact-tracing in public health.

This paper builds on the framework discussed in reports by former FDA Commissioner Scott Gottlieb and his colleagues, referenced by Gov. Newsom in recent conferences, and draws on the



recent literature about challenges in successful case-tracing, and on discussions with advocates and health professionals with experience working in low-income immigrant communities. Re-imagining and expanding the roles that members of such a Corps might play in combatting COVID-19 can enhance California’s strategic response—especially by filling the critical role of reaching out to and communicating with low-income immigrant households at very high risk of burgeoning COVID-19 infection--due to working in “essential businesses” such as agriculture and health care and living in overcrowded living situations.<sup>1</sup>

It is reasonable to expect that contact-tracing will need to be an especially important element California’s efforts in light of the good news that the state’s success in “flattening the curve” has lowered the spread of infections, saved lives, but resulted in levels of SARS-CoV-2 infection way below those needed for herd immunity.<sup>2</sup>

But contact tracing is not necessarily easy or straightforward in diverse communities.

There remain huge challenges in rapidly creating that capacity and achieving those goals. Of course, reliable and available testing is one challenge, but another surely is to design, develop and deploy efficient and effective contact-tracing/case-finding system, with the ability to rapidly yield results—a strand in Governor Newsom’s over-arching strategy to combat the COVID-19 pandemic crafted to work optimally in diverse California communities..

### **Need for Community-Based Contract Tracing and Potential for Enhanced Impact**

Former FDA Commissioner Scott Gottlieb and his colleagues at the American Enterprise Institute and the Duke University Margolis Center for Health Policy—the recognized experts on “reopening” as the pandemic is suppressed—have stressed the need for an evidenced-based, disciplined strategy. Their strategy – or “roadmap” - insists that “opening up” needs to be systematic and evidence-based—based on states ‘(and probably county-level jurisdictions’) and being able to meet scientifically-determined criteria for moving forward.<sup>3</sup>

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<sup>1</sup> Nationally, about one-third of farmworker households are crowded. In some areas of California such as Monterey and Santa Cruz counties, 93% of farmworkers live in crowded housing and one-third in extremely crowded housing. See Ed Kissam, “Why Special Help To Farmworker Families In Crowded Housing Is So Important As Part of Overall Strategy to Suppress COVID-19”, WKF Fund Working Paper, April 7, 2020.

<sup>2</sup> California’s reported prevalence of # of COVID-19 cases/100K population showed 88 COVID-19 cases per 100K population at the state level. Estimates of undetected COVID19 cases range from 50% to 80% undetected. Even if one looks at the highest estimate to estimate actual infection rate (as distinguished from reports of confirmed cases) is very far below a level at which herd  $R_{eff}$  is lowered by herd immunity.

<sup>3</sup> The original plan, “National Coronavirus Response: Roadmap for Reopening” (American Enterprise Institute, March 28, 2020) was detailed and specific. The original plan articulated by Scott Gottlieb and his colleagues has, however, been replaced by a subsequent official roadmap (“Opening Up America Again”) which is notable in that the specific criteria originally articulated have been re-framed into vague generalities that will allow relatively arbitrary determinations by governors regarding “opening up”.



However, there is very fragile national leadership on COVID-19 response and even if the nation eventually goes the right way, it will move forward too slowly. California needs to have its own plan and operational strategy. Reliance on automated mobile phone-based technology to identify an infected individual's contacts is also being considered—but has a number of limitations and is, at this point, simply a design concept.

All COVID-19 epidemiological models are clear in stating that “opening up” in order to resume business and social interaction after a jurisdiction has been successful in “squashing the curve”, i.e. achieving a basic reproduction rate ( $R_0$ ) well below 1. To achieve this, and the steepest downward slope in newly-identified cases, will require a systematic process of evolving intervention that includes contact-tracing in addition to easy access to PCR-based diagnostic testing, and antibody-based testing to determine actual prevalence.

The epidemiological models are also clear that there will be secondary waves of COVID-19 resurgence in hard-to-predict “hot spots” and that a crucial objective will be rapid case identification, contact-tracing, and intervention so that new cases will rapidly self-isolate and persons who have been in close contact with an infected person will self-quarantine and that those with more infrequent and/or not such close contact will, at the very least, be particularly vigilant for COVID-like symptoms.<sup>4</sup>

A grassroots-based “people’s contract-tracing Corps” will be able to respond faster and do a better job in eliciting information about contacts/possible exposures than other possible organizational entities. The contemporary reality that the “hot spots” for COVID-19 re-emergence will actually be in vulnerable, low-income populations living in crowded housing; and among ‘essential’ workers.

Consequently, there is an urgent need to recruit a contact-tracing workforce that is ethnically and linguistically diverse—because contact-tracing will not be effective unless contact-tracers can rapidly establish rapport with infected individuals, reliably elicit thorough details about their contacts during the period in which they were presumed to be contagious (both the pre-symptomatic period of about 5 days and the period during which they were symptomatic).<sup>5</sup>

Ideally, a California Community-Based COVID-19 Contact-Tracing Corps would be diverse not simply in terms of language and cultural competency but, also, include workers drawn from diverse sociological sub-groups within each ethnic population.

These might, for example, include: young community activists prepared to gain the trust of their peers and communicate effectively with them, middle-aged locally well-known community

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<sup>4</sup> Speed is crucial because one of the components of the basic reproduction rate in an epidemic is the duration during which an infected person is in close contact with others.

<sup>5</sup> Very recent papers suggest that SARS-CoV-2 infected individuals may have peak infectivity immediately before and soon after they become symptomatic, with infectivity actually decreasing during the course of their illness.



activists, Chicanos/Chicanas and, also, Mexican and Central American immigrants from indigenous communities (e.g. Mix teco/as, Zapoteco/as, Kanjobal, Mam), African-American church leaders, and youth program counselors/leaders, Hmong elders, DACA recipients, and other immigrant community members under-employed or unemployed due to COVID-19 disruption.

The most effective contact-tracing Corps will be one composed of community activists who have visibility and are trusted due to their having had a track record of community service and engagement. Technical training to assure the integrity and reliability of case identification, case-tracing, data collection, reporting and adherence to protocols to safeguard privacy is, of course, crucial. But this technical competency can be developed rapidly.

The optimal strategy is not to attempt to train “mainstream” health professionals to communicate effectively with communities they are not part of but, instead, to give priority to training community members to be “barefoot public health researchers”.

### **Building on Traditional Case-Tracing Model To Create a More Comprehensive Initiative**

The traditional public health contact-tracing efforts can and should be enhanced and expanded. A Duke University expert report very practically summarizes the optimal initiative as including the following strand of linked activities:<sup>6</sup>

1. **Rapid Response: Capacity for Isolation, Contact Tracing, and Quarantine**
  1. a) *The capacity to isolate new cases and trace, test, and quarantine contacts rapidly*
  2. b) *The capacity to treat new COVID-19 cases effectively, at home or in a hospital*

The approach recommended by these experts recognizes that contact-tracing is not an isolated endeavor but that it must be linked to organizational capacity to intervene so as to rapidly isolate new cases, as well as to trace, test, and quarantine their close contacts.

This implies that California’s case-tracing efforts should also include case management workers—to rapidly assist isolate newly-infected individuals in finding temporary lodging for self-isolation and to rapidly quarantine their contacts as well. This sort of comprehensive initiative could and should also include enhanced COVID-19 health education and recruitment of outreach workers to assure a representative population sample for assessing COVID-19 prevalence since refusals can lead to sample bias that undermines the reliability of surveillance findings.

It will also be useful to draw on case-tracers’ communication with infected individuals and their contacts to elicit from them insights about contexts in their workplaces, day-to-day social

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<sup>6</sup> Mark McClellan et al, “A National COVID-19 Surveillance System: Achieving Containment”, Duke University Margolis Center for Health Policy, April 7, 2020.



interactions, and home life where social distancing is particularly likely to fail and where the risk of SARS-CoV-2 transmission is particularly high. Examples might be, for example, the small local grocery store which lets in people without masks, congregations of workers waiting to receive their weekly check from a farm labor contractor, or lunch break areas with little shade. The community-based contact-tracer may well be the only person who finds out about these distinctive contexts where the likelihood of close contacts can be ameliorated. By being able to incorporate their understanding of the dynamics of community life into their case-tracing work, locally-knowledgeable case-tracers will be able to more rapidly elicit a finely-textured map of an infected individual's contacts, including information on type, closeness, frequency of contacts.

### ***Case Management as an Integral Component of Contact-Tracing***

Self-isolation or quarantine is challenging in low-income communities of immigrants and native-born individuals working in low-wage essential businesses. The widely-reported difficulties faced by hospital personnel exposed to infection who responsibly decide to isolate themselves from their families are serious—but these challenges are still more serious for low-wage workers who lack savings. Many heavily-exposed medical personnel have moved to live in hotel accommodations. But the challenges faced in mitigating within-household SARS-CoV-2 transmission within crowded low-income households cannot be overcome except with navigation and intervention to provide alternative temporary living quarters to those who need them.

Low-income crowded households where a household member is infected will need help so that the individual ill with COVID-19 can rapidly find safe living accommodations where their condition can be monitored in case it worsens.<sup>7</sup> And, in these households, it will also be necessary to assist potentially-infected family or household members who need to self-quarantine. This is not to imply these families are inept – far from it. Resolving multiple problems related to self-isolation or self-quarantine is not easy for families that lack the financial resources to secure quarters for effective quarantine or isolation and lack the experience and/or English-language skills to navigate the bureaucratic maze for getting into temporary lodging.

Several very recent papers have suggested that a very high proportion of COVID-19 cases are unobserved. Some unobserved cases may be individuals who were symptomatic, who experienced relatively mild illness, but could not get access to PCR testing. There is reason to believe that this is a particular problem in immigrant households who have been unable to access testing.<sup>8</sup> Diligent, culturally-attuned case-tracers can quite probably increase identification and isolation of both the marginally-symptomatic and the presumed but unconfirmed cases.

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<sup>7</sup> Recent research suggests that COVID-19 infectivity may be highest immediately before and immediately after symptoms appear. Therefore, minimizing delay in actually self-isolating can make a significant contribution to decreasing in-home transmission in crowded households.

<sup>8</sup> Securing COVID-19 testing has in many areas required referral by a physician. However, a high proportion of farmworkers (30%), for example, have not visited a primary health care provider during the 2 years before they were interviewed by National Agricultural Worker Survey interviewers (Gabbard, Western Migrant Stream



### ***Piggybacking Enhanced COVID-19 Health Education and Problem-Solving Advice Onto The Community-Based Contact-Tracing Initiative***

Ideally, California’s contact-tracing initiative will need not only to rapidly and definitively identify the contacts of confirmed COVID-19 cases but, also, engage in outreach to identify the contacts of unconfirmed but potential/presumed COVID-19 cases. This outreach provides an opportunity for flexible, highly-effective health education delivery in the course of the case-tracing outreach.

An important reason why such health education is necessary is that the standard “generic” core messaging of CDC messaging cannot effectively mitigate transmission in crowded households. For example, the standard guidance regarding in-home self-isolation is infeasible for crowded households so health education outreach will only be effective if it goes beyond the formal, official information provided in fact sheets, pamphlets, or online web pages to assist low-income families in actually coming up with effective “self-isolation” or “self-quarantine” plans.

The experience in both outreach as part of community organizing efforts, including for example, voter registration and promotion of census participation, and, also, in field research as part of survey and/or ethnographic research in immigrant and farmworker communities, is that the greatest portion of costs stem from the efforts needed to establish contact with hard-to-reach individuals. Once contact is established, engaging in additional communication is relatively cheap and can actually reduce the perceived “burden” of standard survey response. It is optimal for case-tracers to be prepared to answer some of the questions from the persons they contact and refer them to knowledgeable professionals for answering others.

### ***The California COVID-19 Community Corps Workforce Should be Used to Improve Sample Representativeness in Population Screening to Determine COVID-19 Prevalence***

There is currently a great deal of concern about the reliability of antibody-based testing due to recent reports of problems with both test specificity and test sensitivity. However, a still more critical and neglected requirement for eventual reliance on serological testing as a key element in opening up areas of the country is that it is essential to assure a representative sample and, quite arguably, to over-sample some sub-populations in order to permit adequate analysis of patterns of prevalence among sub-populations. This is, of course, a well-known problem in clinical trial research.

Standard “cookie-cutter” online or phone survey approaches are suspect when used as the basis for recruiting volunteers for testing from immigrant and other low-income minority households.<sup>9</sup>

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presentation, February, 2020). This, presumably, leads to challenges in securing a provisional COVID-19 diagnosis and access to testing in areas where testing is limited. In other cases, testing may be available but not nearby, making access difficult for those without transportation

<sup>9</sup> Extensive research on differential undercount in the decennial census (Kissam 2017; Kissam, Quezada, and Intili 2018, Kissam 2019) shows, for example, that reliance on administrative records as a sampling frame would generate a sample that seriously under-represented immigrants and Native Americans. Online surveys are



Iceland recently reported success in a national population screening effort to determine prevalence of COVID-19 (despite the problems inherent in relying on PCR-based testing for that purpose).<sup>10</sup> It is possible that their sample was, in fact, representative given the homogeneity and small size of Iceland's population. However, in the case of California's population diversity, there is a pressing need for very effective support in implementing sampling plans so as to avoid sample bias, well beyond those used in Iceland, in order to assure sample representativeness.

There is some evidence, for example, that local prevalence may be much higher in some sorts of communities and neighborhoods than others.<sup>11</sup> For example, the reported prevalence of COVID-19 is extremely low in Madera and Merced counties in comparison to other counties in the San Joaquin Valley such as Kern and Tulare. Culturally-sensitive case-tracing will be needed to detect these variations and rapidly suppress "hot spots" of re-emergence in community contexts with higher-than-average levels of undetected/unreported infection.

California's eventual population screening will need to minimize refusals by distrustful individuals who are part of the random sample—especially those in mixed-status households. Arguably, a California COVID-19 Community Corps workforce can, in addition to case-tracing in low-income minority communities also serve as a cadre supporting surveillance by successfully convincing survey respondents in the population sample to participate (which will, presumably, involve some significant level of engagement to actually get a blood sample drawn for an antibody test).

### **Conclusion: Building A Community-Based Case-Tracing Corps**

Contact-tracing is labor-intensive and moving ultra-rapidly is key. It can be assumed that each infected person infects about 3 additional people during the period they are infectious.<sup>12</sup>

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especially problematic because so few low-income households have in-home online access. In an environment where undocumented immigrants are constantly concerned about "the gaze of surveillance", extraordinary steps to build trust with interviewers is crucial to minimize refusals and to assure sample representativeness.

<sup>10</sup> "Spread of SARS-CoV-2 in the Icelandic Population", NEJM, April 14, 2020  
<https://www.nejm.org/doi/full/10.1056/NEJMoa2006100>

<sup>11</sup> The constraints on the reliability of tabulations of PCR-based testing in conditions when access to testing is not universally available EW well-understood. However, even given these distortions in estimates of the prevalence of COVID-19 in different communities throughout California.

<sup>12</sup> There is a wide range of estimates of  $R_0$  for SARS-CoV-2 because of inherent data problems (e.g. proportion of unobserved cases, variations in criteria for reporting cases). There is, also, consensus that the real-time reproduction rate in the COVID-19 pandemic varies from one national/social/community context to another. I assume that the COVID-19 reproduction rate in low-income communities where crowded housing is prevalent and where high proportions of adults are working in "essential businesses", e.g. farmworker communities, is higher than elsewhere in California. At the same time, California's aggressive efforts in social distancing have decreased the component of  $R_0$  stemming from infection in the course of random social contacts.



Creating consortia based at community/migrant health centers (FQHC's) is an attractive way to rapidly build the organizational capacity and labor force needed. California already has an extensive network of experienced community-based health care outreach workers among the community/migrant health centers, the FQHC's. They can provide an initial platform for launching community-based case-tracing.

*Promotora/es* at the community clinics could be quickly and reliably trained to take on the additional responsibilities of COVID-19 contact tracing, case identification health education, and case management in moving infected or exposed individuals into isolation or quarantine. The Johns Hopkins report and other experts have stated that, although medically-trained personnel are now being used for contact tracing, lay people can be successfully and rapidly trained to fulfill these roles. A person with a high-school education, if well-trained, diligent, good in communicating, and computer/database literate, could fill this sort of role well.

It deserves note that California has already invested very heavily in community-based outreach networks to promote Census 2020 participation. The plan was for these networks to do outreach that included both phone banking and door-to-door canvassing. The door-to-door canvassing activities were seriously constrained by the March 18, shelter-in-place mandate but the phone banking efforts are still underway. These provides a supplemental organizational platform for recruiting potential case-tracers.

In the San Joaquin Valley, for example, the Sierra Health Foundation has drawn on these networks to serve as intermediaries in getting philanthropy-funded assistance to low-income immigrant and non-immigrant households affected by the pandemic. These organizational networks—that are already in place--are another platform for jumpstarting a California Community-Based COVID-19 Case-Tracing Corps.

There are still other potential organizational and institutional resources for California to draw on in recruiting case-tracers who have the language and cultural competency to rapidly and effectively conduct case-tracing in minority and immigrant communities in California. For example, in agricultural regions of the state Migrant Education staff (including both professional counselors and paraprofessionals) and Migrant Headstart staff represent a workforce of experienced individuals communicating routinely with families who are not easily reached by outsiders.

### ***Staffing Level for A California Community-Based COVID-19 Contract-Tracing Corps***

There is some information to provide us a ballpark estimate of the labor force needed to do contact-tracing in California. In Wuhan, a city of about 11 million, there were 180 teams of about 5 people each who did contact tracing: 9,000 contact-tracers.



Massachusetts, with a very high ratio of confirmed cases/ to population (550 cases/100K population) is reportedly seeking to recruit 1,000 case tracers for a state population of 7 million.

Because California appears to have a lower prevalence of COVID-19 than was the case in Wuhan or presently the case in Massachusetts (i.e. about 81 cases/100K population), the state might require fewer case-tracers per capita than in these other areas.

If California were to plan contact-tracing labor force size more or less in line with Massachusetts perhaps a workforce of 5,700 might be necessary. But COVID-19 prevalence is only about one-seventh of that in Massachusetts so it might be possible to go forward with fewer contact-tracers.

On the other hand, if California's contact-tracing ends up being focused primarily in "hot spots" of resurgence in low-income communities, COVID-19 might be more prevalent in those areas than statewide. For example, review of reports of confirmed COVID-19 cases in farmworker areas of Riverside County suggest that these small, rural communities have a prevalence twice as high as in the county as a whole (even though access to PCR testing is probably more difficult in these communities).<sup>13</sup> Recent reports from farmworker areas of Washington State (Yakima and Chelan counties) show that COVID-19 "hotspots" may develop very rapidly in communities where low-wage immigrant workers are employed in the essential business of agriculture.<sup>14</sup>

If California went forward to implement a "comprehensive" Community-Based Contact-Tracing Corps initiative that includes, as recommended here, case management support to actually move infected individuals in crowded households into case isolation rapidly, health education discussion in the course of contact-tracing, and additional assignments in recruiting participants for surveillance via serologic testing, this would imply the need for a higher contract-tracer/population ratio.

I suggest that, as an initial goal, California should seek to recruit about 7,000 community-based case-tracing staff to supplement the current case-tracing workforce in the existing public health system. Technical training could be accomplished in less than a week.

Experiencing conducting field research in relying on community-based interviewers in low-income communities suggests that a relatively high supervisor-interviewer ration is a useful investment in increasing productivity and data quality. Similar principles apply to quality assurance and efficiency in contact-tracing. Assuming a supervisor/case-tracer ratio of about 1:20 the staffing might, then, include a core of perhaps 350 supervisors with extensive experience in the local communities their teams work in and 6,800 case-tracers.

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<sup>13</sup> Ed Kissam review of April 19<sup>th</sup> Riverside County Department of Public Health tabulation of confirmed COVID-19 cases for cities and unincorporated areas.

<sup>14</sup> On April 16, more than one-third of the 200 confirmed cases in Yakima County were farmworkers.



## ***Timeline***

Reducing the real-time COVID-19 reproduction rate in California to 1 simply achieves the goal of “flattening the curve”. It does not do anything to move the state toward “opening up” since it only implies a steady state of cases. Even if  $R_0$  is reduced to 0.5 in the California context, for example, it will take months to get to the point where there are few enough current COVID-19 cases that full-fledged “opening up” is viable. Community-based contact tracing can accelerate that timeline by focusing on “hot spots” in low-income communities with concentrations of immigrant and racial/ethnic minorities.

It has not been reported publicly what level of contact-tracing California’s county health programs are conducting. Daily tabulations of pending determinations in various counties suggest they are seriously backlogged. However, whatever level of data-gathering is currently feasible, it is clear is that the sooner contact-tracing can be ramped up the more rapidly  $R_0$  can be reduced. Ideally community-based contact-tracing can begin to make a greater contribution to decreasing prevalence of COVID-19 and suppressing the initial wave of the pandemic even before the state (or some sub-regions of the state) “open up”.

After California begins to “open up”, there seems to be no likelihood that the state will reach the point of herd immunity before a vaccine is developed. Therefore, it is likely that a California Community-Based COVID-19 Case-Tracing Corps would need to be in place for at least 18 months, although the workforce size could be allowed to decrease based on monitoring of COVID-19 prevalence since that is the key factor in determining case-tracing workload.

Consequently, efforts to share lessons learned in the course of deploying the sort of enhanced contact-tracing and case isolation used to effectively reach low-income minority and immigrant communities will provide valuable input to ongoing work to refine the initial approaches being used. If California moves forward to implement its overall “opening up” strategy as part of a Pacific Seaboard regional effort, together with Oregon and Washington, provisions for inter-state exchange of insights, problem-solving, and peer technical assistance would also be helpful.

## **Selected References**

Ellen Barry, “An Army of Virus Tracers Takes Shape in Massachusetts”, New York Times, April 17, 2020 <https://www.nytimes.com/2020/04/16/us/coronavirus-massachusetts-contact-tracing.html>

Delamater PL, Street EJ, Leslie TF, Yang Y, Jacobsen KH. Complexity of the Basic Reproduction Number ( $R_0$ ). *Emerg Infect Dis.* 2019;25(1):1-4. <https://dx.doi.org/10.3201/eid2501.171901>

Stephen Engelberg, Caroline Chen, and Sebastian Rotella, “Coronavirus Advice From Abroad: 7 Lessons America’s Governors”, Pro Publica, April 18, 2020.



<https://www.propublica.org/article/coronavirus-advice-from-abroad-7-lessons-american-governors-should-not-ignore-as-they-reopen-their-economies>

Richard Florida, “The Geography of Coronavirus”, CityLab, April 3, 2020.

Dan Frosch and Joshua Jamerson, “Coronavirus Contact-Tracing Teams Grow, as States Hope to Reopen”, Wall Street Journal, April 20, 2020.

Scott Gottlieb, MD; Caitlin Rivers, PhD, MPH; Mark B. McClellan, MD, PhD; Lauren Silvis, JD; Crystal Watson, DrPh, MPH “National coronavirus response: A road map to reopening”, March 29, 2020 <https://www.aei.org/wp-content/uploads/2020/03/National-Coronavirus-Response-a-Road-Map-to-Recovering-2.pdf>

Gudbjartsson, D, et al., “Spread of SARS-CoV-2 in the Icelandic Population”, New England Journal of Medicine, April 14, 2020

Mark McClellan, Scott Gottlieb, Farzad Mostashari, Caitlin Rivers, and Lauren Silvis, “A National COVID-19 Surveillance System: Achieving Containment”, Margolis Center for Health Policy, Duke University, April 7, 2020.

Office of the Governor, “Governor Newsom Announces California Health Corps, a Major Initiative to Expand Health Care Workforce to Fight COVID-19”, March 29, 2020 <https://www.gov.ca.gov/2020/03/30/governor-newsom-announces-california-health-corps-a-major-initiative-to-expand-health-care-workforce-to-fight-covid-19/>

Sanche S, Lin YT, Xu C, Romero-Severson E, Hengartner N, Ke R. High contagiousness and rapid spread of severe acute respiratory syndrome coronavirus 2. *Emerg Infect Dis.* 2020 Jul [date cited]. <https://doi.org/10.3201/eid2607.200282>

Watson, C., et al, “A National Plan To Enable Comprehensive COVID-19 Case Finding and Contact Tracing in the U.S.”, Johns Hopkins Center for Health Security”, April, 2020 [http://www.centerforhealthsecurity.org/our-work/pubs\\_archive/pubs-pdfs/2020/a-national-plan-to-enable-comprehensive-COVID-19-case-finding-and-contact-tracing-in-the-US.pdf](http://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2020/a-national-plan-to-enable-comprehensive-COVID-19-case-finding-and-contact-tracing-in-the-US.pdf)

Wei WE, Li Z, Chiew CJ, Yong SE, Toh MP, Lee VJ. Presymptomatic Transmission of SARS-CoV-2 — Singapore, January 23–March 16, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:411–415. DOI: <http://dx.doi.org/10.15585/mmwr.mm6914e1>