Case Investigation and Contact Tracing for COVID-19 in the Era of Vaccines

Innovative Strategies in the US

INTRODUCTION

Over the coming months, as cases decrease, the risk of variants persists, and substantial new federal dollars become available, case investigation and contact tracing (CI/CT) are likely to become increasingly important.

This phase of the pandemic response provides a unique opportunity to evaluate the strengths of existing CI/CT programs and retool interventions in light of vaccines, new variants, expanded testing capacities, and lessons learned over the past year. To improve the effectiveness of CI/CT, programs must be:

Fast: Eliminate delays in diagnosis and reporting by maximizing use of rapid testing and real-time investigation

Comprehensive: Investigate cases, variants, clusters and outbreaks with "forwards" and "backwards" tracing to find the source of clusters and stop spread

Supportive: Rebrand "contact tracing" as "Covid Support Services" and make the services offered so appealing and appropriate that patients from all high-risk groups participate.

REBRANDING

During early rollout of COVID-19 response in the U.S., politicization of the role of public health and high levels of resistance to contact tracing created an unsupportive environment for the intervention. With an intense focus on ensuring isolation of index cases and quarantine of contacts, CI/CT was often viewed as a punitive measure rather than a supportive intervention. At this new stage in the evolution of the pandemic, renaming the intervention may be one way to encourage cases and contacts to engage with the health department. Case investigation and contact tracing provide linkages to other services and resources, such as referrals to testing, vaccination, medical care, isolation and quarantine support and other social services. Use of alternative titles for Case Investigators and Contact Tracers—such as "COVID Resource Coordinator," "COVID Care Specialist" or "Community Outreach Specialist"—has been adopted in jurisdictions including Connecticut and Massachusetts. While there is currently no formal move to make this change nationally, use of these, or similar terms may better describe the breadth of the services offered through CI/CT. Cases and contacts may feel that public health staff are there not only to elicit and notify close contacts, but to help them and their contacts navigate the many complexities of a COVID-19 diagnosis, rather than to just "investigate" or "trace" them. To follow through with that promise, health departments need to dedicate resources to isolation and quarantine support and ensure that staff are familiar with available resources and actively refer index cases and contacts to the social, medical and support services they need.

VACCINE

Jurisdictions are struggling to equitably deliver COVID-19 vaccines to the most vulnerable populations across the U.S., including older adults, people from racial and ethnic minority groups, people living in poverty, incarcerated populations and people with limited access to technology. Once the Advisory Committee on Immunization Practice's (ACIP) recommended priority groups (i.e., health care personnel, frontline essential workers, older adults) have been fully vaccinated and vaccines become more widely available, the general population, including the working-age adults who are largely driving transmission, will become eligible for vaccination. During this phase it may be difficult to prioritize within those larger groups and manage public demand. Case investigation and contact tracing could play an important role in ensuring that vaccines are targeting the most at-risk populations and maximizing the potential to lower transmission. Vaccine distribution can overlap with CI/CT in two key ways:

Prioritization: CI/CT case management databases contain robust information about high-risk individuals identified in previous investigations. This data could be used to identify and enroll the most at-risk individuals for vaccination, including those with a previous COVID-19 exposure who remain uninfected and persons previously diagnosed with COVID-19 who are at risk of re-infection, such as essential workers, people living in crowded conditions or congregate settings, and those who were infected early in the pandemic who may have waning natural immunity. Additionally, vaccines could be distributed at venues or facilities that have been identified in outbreak investigations. These strategies would support more equitable vaccine distribution by directing outreach to people previously identified as vulnerable to COVID-19 infection to prevent transmission and improve health outcomes. As health departments struggle with index cases refusing to participate in the case investigation interview and identify their close contacts, priority access to vaccination may be an important incentive to participate in the process.

Vaccination of CI/CT Staff: As health departments begin vaccinating CI/CT staff (as indicated in phase 1b of ACIP's recommendations), there are new opportunities to engage with the community for case investigation and contact tracing efforts. As case numbers decline, vaccine, coupled with use of personal protective equipment (PPE), could facilitate a more field-based model of CI/CT service delivery that aligns with the intervention strategies employed for investigation of other infectious diseases such as tuberculosis, sexually transmitted infections and HIV. The methods used by Disease Intervention Specialists (DIS) and Public Health Nurses for investigation of infectious diseases have proven to be effective in locating people quickly, referring them to the testing and treatment they need and preventing disease complications and transmission. Because CI/CT for COVID-19 has been delivered largely telephonically, it has not achieved the same success. Delivering CI/CT services in person can strengthen the acceptance and effectiveness of the intervention and help reach vulnerable populations.

COMMUNITY-BASED CI/CT

Once vaccinated, CI/CT staff could have a stronger presence in the community and identify new opportunities to deliver real-time case investigation and contact tracing services. Health departments could consider expanding the reach of CI/CT and target those that have been disproportionately impacted by COVID-19 based on local epidemiology. CI/CT programs can also review case management data to determine how to best prioritize delivery of community-based CI/CT. Priority groups for community-based CI/CT could be identified based on geographic distribution of cases, vaccine distribution (i.e., vaccine "deserts") or social vulnerability. Programs may also choose to prioritize people who are hard to reach, including those without a working telephone number, people experiencing homelessness and people who need additional support services to complete isolation and quarantine. CI/CT staff could deliver items such as cleaning supplies, masks and food boxes, and conduct

case investigation interviews or complete exposure notifications during home visits. Home visits could also be an important strategy to reengage cases and contacts in daily symptom monitoring, particularly if they are at high risk of developing severe disease. Lastly, CI/CT staff could assist eligible people to sign up for a vaccine appointment during the home visit. This community-based model would ensure that the most vulnerable populations are receiving the support services that they need to successfully complete isolation and quarantine and enhance the timeliness and effectiveness of CI/CT. The community-based model will be most feasible when caseloads become more manageable because it requires more intensive efforts than telephonic CI/CT.

TESTING CONSIDERATIONS

Point-of-care testing (i.e., rapid antigen tests and rapid molecular tests) are powerful tools for facilitating earlier diagnosis of COVID-19 and eliminating delays (e.g., specimen transport times, laboratory turn-around times, reporting to health departments) that compromise the **effectiveness** of contact tracing. By partnering with testing providers offering point-of-care testing, CI/CT staff could provide on-site case investigation and contact tracing services at the time of diagnosis. Counseling people with COVID-19 at the time they receive their positive result would facilitate immediate isolation of index cases and rapid notification, testing and quarantine of close contacts.

Contact tracing **guidance** from the Centers for Disease Control and Prevention (CDC) recommends testing all close contacts of confirmed and probable COVID-19 patients. Point-of-care testing of close contacts could be performed per **CDC guidelines** in a variety of settings, including congregate settings (e.g., jails, long term care facilities, shelters, dormitories), K–12 schools, outreach testing events and home visits. While conducting home visits to reach index cases and contacts, CI/CT staff could provide rapid antigen testing to household members and other close contacts, providing enhanced access to testing for persons who may otherwise have trouble accessing testing services due to issues with transportation, testing availability, childcare needs or illness.

Another strategy to ensure timely testing of close contacts could be to notify them telephonically and immediately refer them for point-of-care testing at a community testing center, even making them a same day appointment at the nearest testing site. Rapid testing of contacts would facilitate same-day isolation of those who are infected and allow for immediate case investigation and elicitation of close contacts who need to be quarantined.

In addition to point-of-care test technologies, home-based tests are becoming more widely available and could be a useful tool in managing diagnosis of close contacts. Health departments could consider distributing home-based test kits to index cases to provide to their household contacts with careful counseling about the most appropriate timing for their use based on exposure dates. Health departments must also be prepared for some community members to choose home-based testing in lieu of clinical testing services, and develop a process for voluntary self-reporting of positive results to allow for surveillance and CI/CT.

Developing a reporting process that easily connects infected people to CI/CT staff will facilitate timely follow-up. It will also be important to develop community messaging on the most appropriate uses of these tests and how to consult health departments for guidance.

DATA FOR DECISION-MAKING

At this stage of the COVID-19 response, health departments can display their epidemiologic and vaccine data on public-facing data dashboards and utilize the data for programmatic decision-making. Large amounts of data are

being collected in surveillance and CI/CT databases that can be used to guide service delivery and improve the effectiveness of the response. Geospatial analysis of epidemiologic and case investigation data, in combination with CDC's Social Vulnerability Index and other publicly available data sources, can enable identification of high-risk geographic areas or populations for targeted intervention. Some innovative uses of data for decision-making include:

- **Clusters and outbreaks:** Ongoing review and mapping of epidemiologic data can assist health departments in early identification of "hotspots" or areas with rapidly growing transmission, and facilitate real-time response with testing, CI/CT, vaccine and communications campaigns.

- **Vaccine distribution:** Geospatial and vulnerability mapping can highlight locations in the community with a high burden of disease and vulnerable populations for enhanced vaccine distribution and targeted community education. CI/CT data can identify at-risk individuals who can be prioritized for vaccines.

- **Testing:** Identification of "testing deserts" (areas of the community with high case numbers and limited testing resources) can be identified for targeted community testing events, distribution of home-based testing kits and community-based testing of close contacts by CI/CT staff.

- **CI/CT quality improvement:** A review of CI/CT data could identify which geographic areas or populations are least likely to participate in CI/CT by reviewing CI/CT outcomes data, refusal rates and contact index (the number of contacts elicited per interview). Health departments could conduct focus groups to determine reasons for low participation, develop targeted community engagement and communications campaigns or incentivize participation in CI/CT to increase participation, particularly in vulnerable populations that may benefit the most from individual-level intervention.

K-12 SCHOOLS

According to CDC's Interim Guidance for Case Investigation and Contact Tracing in K-12 Schools, case investigation and contact tracing are essential interventions for safe reopening of schools, along with other mitigation strategies. Health departments and school districts can maximize their resources by working together on CI/CT and responding quickly to reported cases. This will reduce the risk of COVID- 19 transmission in schools and help avoid large-scale outbreaks, school closures and interrupted learning.

In districts without a full CI/CT program in schools, health departments can take the lead in investigating cases while schools can assist with contact tracing. Developing a strong collaboration prior to school re- opening will foster enhanced cooperation, timely reporting and a coordinated response. If keeping K-12 schools open is a community priority, health departments can choose to divert a portion of their CI/CT workforce to supporting schools. Health departments can develop specialized teams of CI/CT staff dedicated to investigation of school-related cases. This team will be familiar with COVID-19 response plans, contact tracing protocols and local school district policies. As relationships between school and CI/CT staff solidify, coordination will be strengthened. Health departments may even consider embedding vaccinated CI/CT staff within schools to facilitate real-time case investigation, contact tracing, surveillance, reporting and testing of contacts and suspected cases.

VARIANTS AND BREAKTHROUGH CASES

Emergence of new variants of SARS-CoV-2 poses a threat to COVID-19 control in the US and globally. The Center for Health Security recommends prioritizing cases of variants of concern for CI/CT. Investigation helps elucidate secondary attack rates, transmission settings and other epidemiological parameters to understand public health

impact of new variants even if genomic sequencing results are delayed by long laboratory turn-around times. Until sequencing is more widely available in the US, enhanced case investigation of identified variant cases will be essential to understanding variant cases and their impact on disease transmission, vaccine efficacy and clinical outcomes. During the case investigation interview, CI/CT staff can identify possible variant cases—such as cases reporting international travel or exposure to someone who travelled internationally—to be actively referred for genetic sequencing, guiding the identification of variant cases beyond routine genomic surveillance. With continued emphasis on increasing laboratory capacity, sequencing should become more widely available and allow for more rapid investigation and isolation of variant cases and quarantine of exposed contacts. Health departments can begin developing processes for enhanced case investigation of variants now in anticipation of more widespread transmission and identification in the future.

In addition to investigation of known variant cases, it is important to prioritize enhanced case investigation of breakthrough cases reported in vaccinated people. With limited access to genomic sequencing, it may not always be possible to know whether these cases can be attributed to a variant of concern. Understanding the extent, epidemiology and clinical outcomes of breakthrough cases in vaccinated people is an important tool for ongoing understanding of the effectiveness of vaccination against SARS-CoV-2. Adding a data field to existing case investigation data systems to collect vaccination status on all cases will allow for meaningful evaluation and analysis of the impact of breakthrough cases.

CLUSTERS AND OUTBREAKS

Investigation of clusters ("cluster busting") and outbreaks will continue to be an important control strategy, even as more of the U.S. population is vaccinated and case numbers continue to decline. In communities where transmission levels are controlled with vaccine and mitigation measures, investigation of clusters and outbreaks of COVID-19—particularly in congregate settings, workplaces, schools and other venues—can help to identify transmission-related behaviors and elevate opportunities for outreach to high-incidence areas or groups for coordinated public health intervention (i.e., vaccines, communications campaigns, testing, isolation/quarantine supports). Health departments can continue to dedicate CI/CT resources to investigating outbreaks and clusters, including source investigation ("backwards tracing") to identify the "upstream" source cases that may have exposed and infected a high number of individuals. They can also continue to refer high-risk individuals identified during investigations for vaccination. Source investigation has been very successful where only sporadic clusters and cases have arisen—for example, in Japan—and may serve well as a model for U.S. jurisdictions going forward.

STAFFING CONSIDERATIONS

Training: In the early stages of the pandemic response there was an urgent need to establish CI/CT programs quickly and at a large scale. Many CI/CT staff were hired into newly-created positions within health departments or contracted agencies. Introductory training for case investigators and contact tracers (e.g., those available through ASTHO, Johns Hopkins University) was limited and abbreviated to ensure that programs could be deployed as quickly as possible. While available trainings sufficiently laid the groundwork for a basic understanding of COVID-19 and principles of contact tracing, most did not address the complexities of how to respond to cases and contacts who were resistant or refused to participate, or those with complex psychosocial needs. Many health departments have faced high rates of refusal, eliciting few contacts for each interview and compromising the overall effectiveness of the intervention. At this stage in the pandemic, it is important to invest in the CI/CT workforce by providing additional skills-based training on enhanced interview techniques, motivational interviewing, and cultural sensitivity

to maximize the effectiveness of contact tracing overall. Prior to initiating community-based CI/CT, staff should be provided with adequate training on correct use of PPE, de- escalation techniques, field safety and CPR. Contact tracing cannot be effective if it is not delivered effectively. Training resources for case investigators and contact tracers can be found on the CDC website.

Recruitment: Because COVID-19 has had disproportionate impacts on people from racial and ethnic minority groups, it is important that health departments make an effort to recruit CI/CT staff at all levels that are members of those communities. Advertising CI/CT positions locally in areas of high incidence, sharing job announcements with community-based organizations and posting advertisements in languages other than English are good ways to recruit a diverse CI/CT workforce that understands the people with whom they work and can build strong relationships for the promotion of CI/CT in vulnerable communities.

Contracted CI/CT: Due to high case numbers and the complexities of program development, many health departments have elected to contract CI/CT services from third parties. If health departments are using an external contractor, it is important that they ensure consistent and high-quality staff training, quality improvement and recruitment strategies that promote diversity and reflect at-risk communities. Contractors need to be held accountable to high standards of service delivery to ensure community acceptance and culturally appropriate intervention to improve effectiveness of CI/CT and protect vulnerable populations.

CONCLUSION

Now is the time to consider how Covid Support Services can be adapted for maximum effectiveness. Programs that are fast, comprehensive and supportive can help to control transmission and respond quickly to spikes in cases. Case investigation and contact tracing will continue to be an important public health tool for long-term control of COVID-19 and other diseases in the United States. These innovative approaches can bolster CI/CT and ensure that it is delivered to the communities at highest risk in a culturally sensitive and relevant way. Based on the desired outcomes (Table), health departments can use some or all of these strategies to shape their programs for the next phase of the pandemic, or can use these strategies to inform and develop their own innovative approaches.

Table. CI/CT Strategies by Area of Innovation and Objective

Objective	Strategies by Area of Innovation
Increase access to CI/CT services	**Rebranding** → Use terms like "COVID Care Specialist" instead of Case Investigator/ Contact Tracer **Community-Based CI/CT** → Vaccinated CI/CT staff conduct home visits to interview cases and notify contacts → Vaccinated CI/CT staff provide on-site investigation at high-risk venues and testing sites **Testing Considerations** → Develop processes for voluntary self-reporting of positive at-home test results **Data for Decision-Making** → Use CI/CT data to identify priority groups for community-based intervention → Geospatial analysis of case data, social vulnerability index and other publicly available data sources for targeted service delivery
Improve Completeness and Timeliness	**Community-Based CI/CT** → CI/CT staff provide on-site investigation at testing sites and during home visits **Vaccine** → Vaccinate CI/CT Staff to facilitate real-time CI/CT in community settings such as testing venues and home visits **K-12 Schools** → Develop a collaboration with school districts to facilitate timely reporting, investigation and contact tracing of all cases associated with schools → Develop a dedicated team of CI/CT staff to investigate school cases; consider embedding in schools
Increase the number of contacts that are tested	**Community-Based CI/CT** → CI/CT staff rapid test contacts during home visits and in other high-risk venues (e.g., schools, jails, shelters) **Testing Considerations** → Provide at-home tests to index cases to distribute to close contacts → CI/CT staff make testing appointments for contacts at the time of notification **K-12 Schools** → Collaborate with school districts to implement a contact tracing program that includes testing of exposed staff and students
Increase number of cases that complete isolation and contacts that complete quarantine	**Community-Based CI/CT** → CI/CT staff deliver isolation/quarantine supports during home visit (e.g., masks, cleaning supplies, food boxes, educational materials) **Testing Considerations** → Develop processes for voluntary self-reporting of positive at-home test results to facilitate access to CI/CT services
Improve Vaccine Access and Equity	**Community-Based CI/CT** → CI/CT staff help enroll people for vaccine appointments while doing home visit **Data for Decision-Making** → Use CI/CT database to identify priority groups or individuals for vaccine → Use epidemiologic and CI/CT data to identify priority groups for targeted vaccine distribution **Clusters and Outbreaks** → Target individuals, venues or geographic areas identified during outbreak investigation for vaccine
Improve Community Engagement	**Rebranding** → Use terms like "COVID Care Specialist" instead of Case Investigator/Contact Tracer **Staffing Considerations** → Recruit and retain CI/CT staff from communities that are disproportionately impacted
Quality Improvement of CI/CT Services	**Data for Decision-Making** → Review CI/CT data (e.g., outcomes, refusals, contact index) to identify areas for quality improvement by geographic region or demographic characteristics **Staffing Considerations** → Provide skills-based training to CI/CT staff on enhanced interviewing techniques, motivational interviewing, and cultural sensitivity → Ensure high standards of service delivery by third-party contractors
Monitor Transmission Dynamics	**Data for Decision Making** → Use epidemiologic and case data with mapping to identify locations for targeted testing services → Use information on where spread is occurring to change policies and prevent future spread **Variants and Breakthrough Cases** → Conduct enhanced case investigation interview on variants and breakthrough cases to understand epidemiology → Refer specimen for genomic sequencing for cases identified during CI/CT as possible variants **Clusters and Outbreaks** → Conduct source investigation ("backwards tracing") to identify clusters and outbreaks