Interim CSTE and APHL Strategic Framework for SARS-CoV-2 Infection and COVID-19 Surveillance: Priorities and Approaches for State, Territorial, Local, and Tribal Public Health Agencies

Executive Summary

The Council of State and Territorial Epidemiologists (CSTE) and Association of Public Health Laboratories (APHL) support development of an interim national strategic framework to further guide and focus SARS-CoV-2 infection and COVID-19 surveillance at state, territorial, local, and tribal (STLT) health departments. This framework provides a strategy for current, near, and medium-term data needs given current resources, to inform public health policy and direct prevention measures, and to reduce the inequitable impacts of the pandemic. Intermittent waves of increased SARS-CoV-2 transmission are expected as vaccines and prior infections do not result in long-term immunity from infection, and the virus will continue to evolve with new variants emerging over time.

As we have shifted away from universal case investigation and contact tracing for individual cases[1], surveillance methods need to be adjusted to better meet current needs. The Centers for Disease Control and Prevention (CDC) disease burden estimates (through September 2021) indicate only one in four cases of SARS-CoV-2 infection were identified through traditional methods of disease surveillance[2]. More recent data from a CDC seroprevalence study indicate high prior infection rates among the U.S. population, particularly after circulation of the Omicron variant. Many of these infections were not captured by traditional methods of case surveillance given the proportion of asymptomatic, not diagnosed, or not reported SARS-CoV-2 infections[3]. These surveillance challenges are not unique to COVID-19. Historically for influenza, due to the volume of cases and use of point-of-care tests, STLTs use an array of surveillance methods to monitor influenza and supplement with other data sources such as hospitalization data and sentinel surveillance. Similarly, it is important to enhance SARS-CoV-2 infection surveillance beyond percent positivity and case incidence rates, which are influenced by individual care-seeking behaviors, testing practices such as screening of asymptomatic persons, and increased use of at-home tests which are generally not reported to public health. While COVID-19 surveillance methods must evolve, STLTs may continue to monitor these metrics with an understanding of their limitations. Additionally, there is a need to improve and modernize percent positivity surveillance through more robust methods and sentinel networks, similar to monitoring of other respiratory viruses.

STLT public health staff have worked tirelessly to provide data for public health action in realms ranging from epidemiological case-based surveillance for SARS-CoV-2 infection to ensuring availability of laboratory SARS-CoV-2 testing, treatment, vaccines, personal protective equipment, healthcare access, supply chain management, and beyond.

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1 *Public Health Agencies Transitioning Away from Universal Case Investigation and Contact Tracing for Individual Cases of COVID-19 (January 24, 2022): https://cdn.ymaws.com/www.cste.org/resource/resmgr/covid-19/4e509e47-08ec-4e93-a7be-f301.pdf.*

2 *CDC website: Estimated COVID-19 Burden: https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/burden.html#whycdcestimates.*

3 *Clarke KE, Jones JM, Deng Y, et al. Seroprevalence of Infection-Induced SARS-CoV-2 Antibodies — United States, September 2021–February 2022. MMWR Morb Mortal Wkly Rep 2022;71:606-608. DOI: http://dx.doi.org/10.15585/mmwr.mm7117e3*

While each of these realms are critical aspects of the COVID-19 pandemic response, this document aims to provide a strategic approach to: tracking SARS-CoV-2 infections and evaluating COVID-19 across the range of severity of illnesses (e.g., infection, hospitalizations, and deaths); monitoring spread and responding to outbreaks among vulnerable populations; conducting and advancing genomic surveillance; and sharing of these data accompanied by adaptive risk communication. *(See Figure A for a comparison of the changes proposed in this strategic framework versus the initial surveillance approaches used since the start of the pandemic.)*

General principles that guide the advancement of this strategic framework for SARS-CoV-2 infection and COVID-19 surveillance include:

- No single metric should drive public health actions, and each must be considered in context with other factors.
- Surveillance strategies may be adapted to meet jurisdictional needs and available resources during different COVID-19 Community Levels (e.g., time periods with widespread community transmission may require different approaches than periods with less SARS-CoV-2 transmission). Additionally, the level of severity or immune escape of any new variants may warrant modification of surveillance approaches.
- Sustainability and flexibility of long-term surveillance approaches should be achieved by building on existing capabilities (with special emphasis on

BOX 1: Addressing Health Equity in all Aspects of SARS-CoV-2 Infection and COVID-19 Surveillance

- Improving the data quality of public health data sources, particularly with regard to race, ethnicity, gender, and residential address, must be prioritized and adequately resourced to identify and address inequities. See CSTE's report titled, *"Addressing Gaps In Public Health Reporting of Race and Ethnicity Data for COVID-19: Findings and Recommendations Among 45 State and Local Health Departments,"*[4] which identifies high-level factors impacting STLT health departments' ability to obtain meaningful race and ethnicity data for COVID-19 and provides recommendations and potential solutions to improve gaps in public health reporting of these critical demographic data.
- Ability to assess trends across populations (e.g., age, race, ethnicity, and geography) will be dependent on overall data modernization and enhanced surveillance efforts that have been supported and implemented at each jurisdiction.
- It is important to assess whether suggested interim and future surveillance strategies will affect STLT health departments' ability to assess inequity and respond equitably (i.e., what equity data is lost or gained and how is representativeness impacted).
- Data on occupation, industry, and workplace are essential in assessing and addressing health equity given employment patterns and historical lack of inclusion of people from racial and ethnic minority groups[5] in certain sectors of the workforce. As universal case investigation and contact tracing is scaled back, other methods to obtain these data should be considered and prioritized to ensure the data are still collected in a systematic manner. Investment is needed to ensure a representative sample of cases receive more detailed investigation to capture these meaningful variables.
- Race, ethnicity, and relevant data points must be evaluated as testing practices evolve to monitor access to SARS-CoV-2 testing and potential disparities in laboratory-reported case surveillance.
- Lack of inclusion or limiting race, ethnicity, and gender choices in public health data systems affects the extent to which the burden of disease in certain communities can be assessed and should be addressed nationally.
- Different modes of public health outreach and communication must be considered for specific populations including those with limited English proficiency, living in rural locations or in tribal nations, without internet access, who have blindness or visual impairment, who are deaf or hard of hearing, or have disabilities, among others.
- Funded partnerships with organizations committed to health equity can ensure data are collected, analyzed, and disseminated in meaningful ways.

4 *CSTE Addressing Gaps in Public Health Reporting of Race and Ethnicity Data for COVID-19: Findings and Recommendations Among 45 State and Local Health Departments: https://preparedness.cste.org/wp-content/uploads/2022/04/RaceEthnicityData_FINAL.pdf*

5 *The term "people from racial and ethnic minority groups" includes people of color with a wide variety of upbringings, accomplishments, backgrounds, and experiences, who are commonly impacted by social determinants of health in a negative and inequitable way.*

automated electronic laboratory reporting [ELR], emergency department [ED] and urgent care syndromic surveillance for COVID-19-like illness [CLI], and genomic surveillance), expanding and improving electronic case reporting (eCR)[6], and sentinel surveillance systems that include more active case ascertainment and investigation, and shifting away from metrics dependent primarily on universal individual case investigations.

- SARS-CoV-2 infection and COVID-19 surveillance measures must be implemented in coordination with COVID-19 vaccine uptake tracking to identify populations most vulnerable to future surges.
- Enhanced focus on health equity is a key component in each of the stated surveillance goals as improved data are needed to inform public health action on the disparate impacts of COVID-19 (see **Box 1**).
- Data from these surveillance methods could potentially be used and augmented with modeling efforts where public health jurisdictions have resources to enhance internal modeling capacity or support academic partnerships, including in coordination with the new CDC Center for Forecasting and Outbreak Analytics.

Surveillance Goals and Methods

These recommendations require a combination of core surveillance approaches and methods requiring specialized investigation at sentinel sites (see **Box 2**). Each jurisdiction will implement surveillance methods tailored to their needs, and not all approaches may be needed or possible in every jurisdiction. The methods below are some of the approaches that may be used by STLTs to achieve the following five goals:

CSTE SARS-CoV-2 Infection and COVID-19 Surveillance Goals for State, Territorial, Local, and Tribal Public Health Agencies

1. Track SARS-CoV-2 infection trends
2. Evaluate severity of COVID-19
3. Monitor spread and detect and respond to SARS-CoV-2 infection outbreaks in vulnerable populations
4. Conduct and advance SARS-CoV-2 genomic surveillance
5. Share surveillance data and adapt risk communication

1. TRACK SARS-COV-2 INFECTION TRENDS

Surveillance for SARS-CoV-2 infection should primarily focus on monitoring trends over time using consistent and stable data sources, including the following:

- **SARS-CoV-2 Infection Case Surveillance:** ELR of positive SARS-CoV-2 nucleic acid amplification tests (NAAT) and antigen tests as specified in CSTE's *Update to the Standardized Surveillance Case Definition and National Notification for SARS-CoV-2 Infection* should be used to identify cases, follow trends, and provide data on populations being diagnosed by geographic area and demographic characteristics (e.g., age, sex, race, and ethnicity). eCR should be expanded and can be used to complement case ascertainment by ELR. Data can also be evaluated over time to assess risk of reinfection. Case data can be matched with other datasets, where available, to provide more complete demographic data (e.g., race and ethnicity) and additional clinical and epidemiologic information (e.g., pregnancy status). Data collected about each case would be limited to those data provided with the electronic reports (ELRs or eCRs) or available through matching to other electronically available data sets. Given ELRs are often lacking complete demographic information (especially race and ethnicity) these data will largely be missing. Additional efforts are needed to improve the laboratory order process to ensure these data are provided to laboratories at the time of test order and specimen submission. Gathering full individual case details requires case investigations by telephone interviews and/or medical chart review, and jurisdictions able and interested in doing this may consider using a sampling approach or targeting vulnerable populations.
- **ED and Urgent Care Visit Trend Monitoring:** Trends in ED and urgent care visits for COVID-like illness (CLI) can be monitored through syndromic surveillance systems using chief complaint and discharge diagnoses codes. Syndromic

6 *Electronic case reporting (eCR) is the automated, real-time exchange of case report information between electronic health records and public health agencies. CDC eCR Fact Sheet: https://www.cdc.gov/ecr/docs/eCR-Fact-Sheet-508.pdf*

BOX 2: Sentinel and Enhanced Surveillance

Sentinel surveillance at select sites are options for enhanced case investigation or special studies that may not be possible in all jurisdictions, especially without additional resources. Aims and approaches include:

Evaluate severity of COVID-19

- Enhanced surveillance and special studies are needed to augment core surveillance data and collect detailed data on risk factors, vaccine effectiveness, severity, mortality, and for special populations. These can be done in enhanced surveillance networks (e.g., CDC's VISION Network, COVID-19-Associated Hospitalization Surveillance Network (COVID-NET[7]).
- CDC's COVID-NET system should be leveraged for participating jurisdictions (which includes approximately 10% of the U.S. population) for enhanced surveillance and special studies on persons who are hospitalized, including evaluation of risk factors for hospitalization, severe disease, ICU admission, ventilation, other complications, and death, as well as by demographic, geographic, vaccination, variant, and prior infection status. Special studies can also be performed to monitor impact of early treatment on COVID-19-associated hospitalization, severity, and length of stay. Additional federal funding is essential to broaden the breadth and depth of COVID-NET, including supporting additional sites to enhance representativeness of the findings, improve response to emerging variants, and provide resources for additional evaluations.

Improve understanding of medically attended, milder SARS-CoV-2 infection

- Improved and broadened outpatient surveillance for COVID-19 and influenza at sentinel locations such as clinics, emergency departments, and urgent care centers, as a supplementary approach in jurisdictions with resources, can provide additional clinical, epidemiologic, and variant information on medically attended, milder disease. This would require the provision of additional staff and funding to include a SARS-CoV-2 testing component or a broadening to a holistic approach to track SARS-CoV-2, influenza, and other respiratory pathogens. Sentinel surveillance can provide valuable percent positivity data to monitor epidemiological trends and contribute to genomic surveillance. Sentinel surveillance can ensure high quality data for variables such as race, ethnicity, occupation, industry, and workplace.

Expand understanding of at-home testing through sentinel surveillance or special studies

- In order to understand the meaning of public health data sources for community transmission levels, evaluations of at-home testing are needed. Through sentinel surveillance or special studies, at-home testing use, percent positivity, and early test-to-treat access and impact can be evaluated. These data can inform STLT and national estimates of community level transmission through adjustments made to available public health data streams.

Evaluate testing and early treatment for high-risk individuals

- Sentinel sites or academic partnerships should be leveraged to understand the timeliness and impact of early testing and therapeutics to improve outcomes among those at high risk of severe COVID-19. Additionally, special studies should evaluate equity in access and disparities in outcomes of test-to-treat approaches.

Enhance surveillance for post-COVID-19 conditions (PCC), also known as 'long COVID', and Multisystem Inflammatory Syndrome in Children (MIS-C)

- This surveillance should be performed through a combination of sentinel sites, surveillance networks, registries, EHR evaluations, and academic partnerships. This multifaceted approach would ensure robust data to further understand these conditions over time and across variants, as the pandemic evolves.

It would be advantageous in all jurisdictions to have enhanced surveillance capacity for both a subset of milder medically attended illnesses and COVID-19-associated hospitalizations to better understand novel variants and their public health consequences. This long-term U.S. public health system goal should also encompass surveillance for other respiratory pathogens of public health consequence.

7 https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covid-net/purpose-methods.html

surveillance data, including from the CDC National Syndromic Surveillance Program (NSSP), are effective for situational awareness, monitoring trends and assessing changes in severity of illness (of those presenting for care at an ED), and can provide early warning signals from EDs to public health which may be apparent before laboratory-based case surveillance indicates an increase in severity of illnesses. Additionally, linkages between syndromic surveillance data and SARS-CoV-2 ELR data can help determine which patients had laboratory-confirmed SARS-CoV-2 infection, where identifiable syndromic data are available, and where there is adequate public health authority. This approach can assist STLTs in differentiating SARS-CoV-2 from other circulating respiratory viruses such as influenza.

- **Additional surveillance methods *(if requisite resources available)*:**
  - » Wastewater surveillance: STLTs can leverage wastewater surveillance in participating jurisdictions as an early warning system of increasing SARS-CoV-2 infection trends, especially during periods of lower COVID-19 disease activity. This can be a useful tool, but will require continued investment, standardization, and evaluation to understand the public health implications, limitations, and how to message the findings to the public.
  - » Secondary analysis and matching to immunization information systems (IIS): As jurisdictions are able, SARS-CoV-2 infection case surveillance data can be matched with IIS to monitor trends by vaccination status. To improve these data, regular bidirectional exchanges of IIS between jurisdictions should be encouraged and facilitated.

2. EVALUATE SEVERITY OF COVID-19

Surveillance for COVID-19 should include approaches to monitor the severity of COVID-19, including by tracking the proportion of laboratory-reported cases of SARS-CoV-2 infection with COVID-19-associated hospitalizations and mortality. Sentinel and enhanced surveillance should also be used to understand the clinical spectrum, risk factors, disparities, and other evaluations of COVID-19 and PCCs.

Case-level Classification of COVID-19-associated Hospitalization

For incident case-level classification of COVID-19-associated hospitalization (see CSTE's *Interim Guidance for Public Health Surveillance Programs for Incident Case Classification of COVID-19-associated Hospitalizations*), STLTs should select core surveillance methods based on availability, resources, and which methods meet their needs. Not all the approaches outlined below may be needed or possible in every jurisdiction. STLT surveillance for COVID-19-associated hospitalizations generally includes three main approaches: 1) leveraging syndromic surveillance systems to track trends in new admissions through the use of ED disposition (admission to the hospital), 2) obtaining hospitalization information through data systems for cases detected by SARS-CoV-2 infection case surveillance systems (line-level data), and 3) reporting directly from hospitals to STLTs on individual-level COVID-19-associated hospitalizations. Line-level data provide the richest epidemiologic data, but timely and complete data are not available in all jurisdictions. Therefore, given current resources, multiple modalities may be used and will vary across jurisdictions. It is essential that trends across populations are evaluated (e.g., by age, race, ethnicity, and geography), regardless of the chosen method.

- **Leveraging Syndromic Surveillance Systems to Track Trends in ED Disposition (Admission to the Hospital):** Syndromic surveillance systems in EDs can be further used—when disposition status is available—to monitor trends in new admissions to the hospital. Because most patients with COVID-19-associated hospitalizations first present for care via the ED rather than as a direct admission, the ED disposition status can be used as an effective proxy to determine the number of new daily hospital admissions for CLI or, where identifiers are available, with associated laboratory-confirmed SARS-CoV-2 infection. However, the total number of persons hospitalized (daily census) for COVID-19 would not be captured. Evaluation of the completeness of ED disposition status and data quality improvements may be necessary. An advantage of the system is that it provides timely data on hospitalizations with valuable data on patient residence (zip code), age, sex, race, and ethnicity.
- **Obtaining Hospitalization Information through Data Systems for Cases Detected by SARS-CoV-2 Infection Case Surveillance Systems:** ELR can be complemented by eCR or matched with other datasets (e.g., health information exchanges [HIE]) to determine hospitalization status. Additional clinical information (e.g., pregnancy status, intensive

care unit [ICU] admission) can be obtained through eCR or by matching with other data sources. Public health case investigation information may also be used, when available. The expansion of eCR across jurisdictions and healthcare settings is a key near- and medium-term goal to advance public health response capabilities and could provide hospitalization status at the time of report. Investments in data modernization and improved public health infrastructure are required to provide hospitalization status through eCR and ELR matching with other datasets (HIE and syndromic surveillance systems), and a high-quality standard methodology for identifying COVID-19-associated hospitalization is needed to allow comparisons across jurisdictions.

- **Reporting Directly from Hospitals to STLTs on Individual-level COVID-19-associated Hospitalizations:** Direct reporting of individuals hospitalized with COVID-19 based on admission ICD-10 coding, laboratory results, or other methodologies, from hospitals to STLTs may be used. Methods should be determined by individual jurisdictions, but automated electronic methods are preferable. For jurisdictions that do not have syndromic surveillance in place, or access to HIEs or eCR, consider collection of a limited data set for those hospitalized with COVID-19, including demographic data, date of hospitalization, and zip code of patient residence. This process can be labor intensive for hospitals and public health and must be performed in a comprehensive and representative manner. Alternatively, surveillance of COVID-19-associated hospitalizations could occur in limited geographic areas (or facilities) or for a sample of the population, population of interests (e.g., the very young) or unusual presentations (e.g., very severe presentations, including MIS-C). An advantage of direct hospital reporting is the ability to provide the total number of COVID-19-associated hospitalizations as a daily census rather than the use of ED discharge disposition or case-level hospitalization matching, which only provides the total number of new admissions per day.
- **Additional Surveillance Methods (if Requisite Resources Available):**
  - » COVID-19-associated hospitalization data can be regularly matched with IIS, ELR, and genomic data, where available, to monitor trends in hospitalizations by vaccination status, prior infection, and variant.
  - » Cases of MIS-C may be included in COVID-19-associated hospitalization numbers depending on laboratory findings (approximately half of MIS-C cases have SARS-CoV-2 detected on NAAT at admission and some may have had a recently ELR-identified SARS-CoV-2 infection), however, MIS-C reporting and surveillance is performed separately based on a voluntary clinical syndrome-based public health reporting system. See the CSTE Standardized Case Definition for MIS-C and the CDC Data Tracker for data on MIS-C nationally. Given the challenges of syndrome-based reporting, use of eCR has been an effective tool in jurisdictions where implemented in capturing and rapidly reporting MIS-C cases to public health.

Federally mandated COVID-19 hospital reporting through the Unified Hospital Data system (formerly known as HHS Protect) provides information on daily hospitalization trends and healthcare capacity. However, these data reported by hospitals to the federal government are limited to aggregate data on the number of COVID-19 hospitalized cases per day and are not able to be matched with COVID-19 case data collected by STLTs to assess the proportion of individuals that become hospitalized following infection, nor to assess prior infection or vaccination rates. Additionally, data are not available by patient residence, limiting the ability to calculate hospitalization rates by geographic areas and limiting our understanding of and ability to respond to disparities.

Case-level Classification of COVID-19-associated Death

It is essential to continue to count mortality associated with COVID-19, including tracking which populations are bearing the highest burden. (see CSTE's *Revised COVID-19-associated Death Classification Guidance for Public Health Programs*). Public health agencies use information from laboratory and provider reports, public health case investigations, and death certificates to better understand COVID-19-associated deaths. Vital records and the National Center for Health Statistics (NCHS) compile official data regarding causes of death based on information entered on death certificates. Additionally, it is important to leverage CDC's COVID-NET system for participating jurisdictions to enhance surveillance on demographic, geographic, vaccine, prior infection status, and other risk factors associated with COVID-19 associated mortality. Future funding is critical to support deeper analyses and expand the breadth and depth of enhanced surveillance activities such as COVID-NET.

Sentinel and Enhanced Surveillance to Understand the Clinical Spectrum, Risk Factors, Disparities, and other Evaluations of COVID-19 and Post-COVID-19 Conditions

Sentinel and enhanced surveillance approaches are critical to further an understanding of the severity of COVID-19, as well as extent of medically attended, milder SARS-CoV-2 infections, at-home SARS-CoV-2 testing, test and early treatment, and PCC, among other areas of evaluation (see **Box 2**).

3. MONITOR SPREAD AND DETECT AND RESPOND TO SARS-COV-2 OUTBREAKS IN VULNERABLE POPULATIONS

STLTs should prioritize the detection and response to SARS-CoV-2 infection outbreaks in vulnerable populations or where there are concerning clinical or epidemiologic characteristics identified.

- Direct reporting of outbreaks by healthcare and congregate care settings with high-risk residential populations (e.g., long-term care facilities, correctional facilities, homeless shelters, group homes for people with disabilities) to STLT health departments is essential and will allow for prioritization of STLT response activities.
- Health departments should also expand the ability to implement systems to identify residential outbreaks by using automated algorithms that identify cases at the same residential address using geocoding methods as well as through matching case addresses to known facility addresses to identify cases occurring in high-risk facilities or facilities with vulnerable populations.
- Disparities in high-risk setting outbreaks should guide prioritization of outbreak response to address COVID-19 inequities.
- Jurisdictions may track outbreaks in schools or implement school-based SARS-CoV-2 infection surveillance systems. (see CSTE's *Revised COVID-19 K-12 School Surveillance Guidance for Identification and Classification of Outbreaks*)
- Outbreak definitions, thresholds for investigation and mitigation measures, and parameters for when to report to public health vary depending on the location and at-risk individuals involved, and require regular review and revision. Outbreak response approaches may depend on the level of SARS-CoV-2 transmission in the community, amount of vaccine and infection-induced immunity in the population, and presence of any variants of concern (VOC).
- Outbreak response and management should ensure infection control precautions are in place, provide access to testing, treatment, and vaccination, and other mitigation measures as appropriate for the setting.

4. CONDUCT AND ADVANCE SARS-COV-2 GENOMIC SURVEILLANCE

It is essential to sustain and advance SARS-CoV-2 genomic surveillance for rapid identification, monitoring, and epidemiologic and virologic characterization of new variants that may have the potential to impact severity of disease and reduce the effectiveness of prevention, control, and therapeutic measures. Although National SARS-CoV-2 Strain Surveillance (NS3) has been established, there is a need for local or regional representative variant data to monitor currently circulating viruses and the capacity to link the findings with clinical and epidemiologic data at the national, state, and local levels to better understand the public health and clinical implications of any new variants. Recommended approaches include:

- **Expansion of Public Health Genomic Surveillance Capacity and Expertise:** Genomic surveillance infrastructure and capacity should be maintained and advanced at all public health laboratories (PHLs). An understanding of variant circulation and public health impact in jurisdictions is necessary to support public health response. STLT health departments and PHLs should implement and adapt APHL's *SARS-CoV-2 Genetic Surveillance Recommendations for State, Tribal, Local, or Territorial Public Health Agencies* to their jurisdiction, including considerations regarding the extent of SARS-CoV-2 positive specimens that should be sequenced to track trends, monitor proportions of circulating VOCs, identify emergence of new variants, and sample specimens ideally representative of the demographic and geographic diversity of cases within their jurisdiction. Additionally, STLT health departments and PHLs must have the

resources and expertise to support genomic analyses for high-risk outbreak investigations and to characterize unusual or severe cases or cases of epidemiologic concern. Clinical laboratories serve a valuable role in genomic surveillance, thereby allowing PHLs and STLT health departments to ensure appropriate sampling for jurisdictions, focus capacity on the evaluation of outbreaks and high-risk scenarios, and further understanding of the public health impact of the data. Additionally, jurisdictional involvement can improve timeliness of sequencing and analysis of sequence data which is essential to inform mitigation measures. Increased funding is needed to maintain PHL core genomic surveillance and bioinformatics capability to conduct SARS-CoV-2 sequencing and enhance expertise while leading the jurisdiction's genomic surveillance efforts.

- **Advancement of Laboratory-Epidemiologic Linkages and Analyses:** Linkages between genomic surveillance and epidemiologic data are required to understand how variants are affecting the population, including variant growth advantage, measures of transmissibility, vaccine or immune escape, clinical severity, effect on different populations (e.g., children, people from racial and ethnic minority groups), presentation with different symptoms, evasion of detection methods, and evasion from effects or resistance to available COVID-19 therapeutics. Resources are required for jurisdictions to develop representative, integrated laboratory and epidemiologic data systems and analytic processes to more rapidly understand the public health impact of variants. CDC's COVID-NET system should be leveraged for participating jurisdictions to enhance genomic surveillance with better case surveillance linkage and special studies.
- **Coordination with Clinical and Academic Laboratories:** Identifiable variant data from clinical and academic laboratories should be reported to STLT health departments, in addition to federal reporting, as it is important for regional and local surveillance. Reporting identifiable variant data to public health allows matching to SARS-CoV-2 infection case surveillance, IIS, COVID-19-associated hospitalization data, mortality data, and other datasets and variables which can improve our understanding of variant impact. Initiatives such as CDC's Pathogen Genomics Centers of Excellence formalize partnerships between academia and public health and could be used as models to be replicated in other areas. Additionally, federal support is needed for STLT health departments to implement protocols to assure sustainable submission of residual specimens from clinical laboratories to the PHL for genomic sequencing when prevalence is low, as PCR testing continues to decline, and from certain geographic areas.
- **Expansion of Wastewater Genomic Surveillance:** Genomic surveillance in wastewater may supplement clinical genomic surveillance for community-level variant trends or may be used to assist in focusing on any areas of concern for clinical specimen genomic sequencing. Genomic surveillance in wastewater can help detect the presence of an emerging VOC if collection sites are present in community locations and if results are available in a timely manner. Investment is required for evaluations to better understand the potential role, standardization, and impact of wastewater genomic surveillance on public health action and community outcomes.

5. SHARE SURVEILLANCE DATA AND ADAPT RISK COMMUNICATION

STLT health departments must continue to regularly provide surveillance data to their communities, while adapting risk communication to the evolving nature of the pandemic and ensuring a focus on the disparate impacts of COVID-19 and health equity. These aims can be achieved through:

- Prior to any significant changes in COVID-19 surveillance, messaging should engage the public and stakeholders to ensure transparency, understanding, and trust between the community and public health.
- STLT COVID-19 case surveillance data should ideally be presented by event date—the earliest possible date associated with the case, which is often symptom onset date or specimen collection date—when available. When unavailable, case surveillance may use the report date to public health jurisdictions, consistent with general public health strategies. This is important to assess true transmission patterns and trends within communities. Presenting counts by date of posting on a public data dashboard has resulted in data anomalies such as apparent increases in a geographic area that were not true increases. There may be utility in representing COVID-19 case surveillance data in multiple ways—by symptom onset date, specimen collection date, or report date—depending on available data and data analysis aims. However, these dates are not always available on all cases. Ultimately, public health should aim to use a consistent and standardized approach across jurisdictions for case surveillance data dashboards and not use presentation of aggregate data based on dates when case numbers are posted on public dashboards.

- A transition from daily to weekly reporting of COVID-19 surveillance data on jurisdictional websites or dashboards, from health departments to CDC, and on the CDC Data Tracker can monitor the key trends in COVID-19 surveillance and helps inform public health decision making. Core SARS-CoV-2 surveillance inputs to health departments will continue to be observed daily by public health jurisdictional staff to allow for timely public health action, while public reporting will transition to a weekly cadence. Select data which require enhanced surveillance should be reported at less frequent intervals, such as vaccine effectiveness data and other special studies.
- Risk communication should adapt to reflect the current state of the pandemic (e.g., if SARS-CoV-2 incidence declines or has less severe impact on the population with increasing infection and vaccine-induced immunity or if new variants are identified with unknown or new risk to the population). Messaging to compare COVID-19 risk to other routinely circulating respiratory pathogens (e.g., influenza), can contextualize risk of hospitalization and death from COVID-19.
- Surveys should be conducted by STLT public health agencies to evaluate public education efforts and impact, including knowledge, motivators, and perceptions. Surveys should also be conducted in high-risk communities to inform outreach, education, and interventions.

Sustaining and improving STLT public health agencies' communication and public reporting will require continued funding for digital platform improvements and an increase of staff dedicated to maintaining accessible data dashboards and supporting data sharing with local community partners.

These interim SARS-CoV-2 infection and COVID-19 surveillance objectives and priorities will need to be re-assessed on a regular basis given the evolution of testing strategies, likely continued emergence of new SARS-CoV-2 variants, and increasing population immunity over time. As COVID-19 continues to affect the U.S., broader approaches to surveillance for respiratory viral pathogens are needed. To implement these surveillance goals and methods nationally, sustained and increased investments for data modernization of the public health surveillance systems and the public health workforce at the federal and STLT levels are essential for streamlined, accurate, and effective surveillance and response for COVID-19, as well as for future emerging infectious disease threats.

NOTE: This document will undergo review and revision yearly through 2024.

Figure A.

PRIOR CORE COVID-19 SURVEILLANCE ACTIVITIES
(2020 – early 2022)

- Track individual laboratory-based SARS-CoV-2 infection case counts, incidence, and percent positivity
- Monitor hospitalizations and healthcare capacity through aggregate direct reporting
- Universal case investigation and contact tracing
- Perform genomic surveillance for SARS-CoV-2 variants
- Daily dashboard public updates

UPDATED INTERIM CSTE/APHL STRATEGIC FRAMEWORK FOR COVID-19 SURVEILLANCE

Track SARS-CoV-2 infection trends

- Electronic laboratory reporting (ELR)
- Wastewater surveillance
- Syndromic surveillance
- Sentinel surveillance

Evaluate severity of COVID-19

- COVID-19-associated hospitalization surveillance through syndromic surveillance, electronic case reporting (eCR), health information exchanges (HIE), or other automated mechanisms
- COVID-19-associated mortality surveillance
- Sentinel and enhanced surveillance to evaluate the severity of COVID-19
- Multisystem inflammatory syndrome in children (MIS-C) surveillance
- Post-COVID-19 conditions (PCC) monitoring and evaluation

Monitor spread and detect and respond to SARS-CoV-2 outbreaks in vulnerable populations

- Outbreak detection through automated algorithms and direct reporting
- Prioritization of high-risk residential populations

Conduct and advance SARS-CoV-2 genomic surveillance

- Expansion of public health genomic surveillance capacity and expertise
- Advancement of laboratory-epidemiologic linkages and analyses
- Coordination with clinical and academic laboratories
- Expansion of wastewater genomic surveillance

Share surveillance data and adapt risk communication

- Messaging surveillance changes to ensure transparency, public understanding, and to foster trust in public health
- Transition to weekly public reporting of COVID-19 surveillance data
- Risk communication and context to reflect the current state of the pandemic