ASPE REPORT

Surging the Public Health Workforce: Lessons Learned from the COVID-19 Response at State, Tribal, Local, and Territorial Public Health Agencies

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By
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Office of the Assistant Secretary for Planning and Evaluation

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Abbreviations

ASTHO = Association of State and Territorial Health Officials

CDC = Centers for Disease Control and Prevention

CEFO = Career Epidemiology Field Officer program

COVID-19 = coronavirus disease 2019

CBO = community-based organization

CSTE = Council of State and Territorial Epidemiologists

EIS = Epidemic Intelligence Service fellowship program

FTE = full-time equivalent position

MRC = Medical Reserve Corps

NACCHO = National Association of County and City Health Officials

PHAP = Public Health Associate Program

PHEP = Public Health Emergency Preparedness cooperative agreement

PH-WINS = Public Health Workforce Interest and Needs Survey

STLT = state, tribal, local, and territorial

Executive Summary

The governmental public health workforce in the United States performs a wide range of essential duties (including activities known as foundational public health services) to improve the health of the communities it serves. During public health emergencies such as the coronavirus disease 2019 (COVID-19) pandemic, people rely on the public health workforce to expand rapidly to respond to emerging threats while maintaining other foundational public health services. Despite its critical role in supporting the health of communities, the governmental public health workforce has been chronically under-resourced; in fact, a study conducted by the de Beaumont Foundation (2021a) estimated that the workforce did not have the capacity to deliver core public health services for more than a decade leading up to the COVID-19 pandemic. Furthermore, the governmental public health workforce has been understudied, in part, because of its complex infrastructure, which spans more than 3,000 state, tribal, local, and territorial (STLT) public health agencies that vary in governance structure, size, population needs, and capabilities. As a result, there is limited visibility into the number and type of staff hired during the COVID-19 pandemic as well as the range of strategies and supports that STLT public health agencies used to surge the public health workforce during the pandemic.

To identify lessons learned from the COVID-19 pandemic, the Office of the Assistant Secretary for Planning and Evaluation contracted with Mathematica to examine (1) the size and composition of the public health workforce at STLT public health agencies before and during the pandemic, (2) strategies and supports used by STLT public health agencies to surge the governmental public health workforce during the pandemic, and (3) lessons learned and recommendations for directing investments in the STLT public health workforce to prepare for future pandemics. Mathematica conducted a targeted literature scan focused on quantitative data on the STLT public health workforce and 27 semistructured key informant interviews with state and local health officials, federal government officials, and other workforce experts involved directly or indirectly in surge staffing. In this white paper, we summarize findings across the literature and interview data.

Size and composition of the workforce before and during the COVID-19 pandemic

The literature suggests that there were roughly 200,000 state and local public health workers in 2019 and that the workforce was already significantly understaffed and in decline (Kumar et al. 2022). One study estimated that state and local public health agencies needed another 80,000 full-time equivalent positions to provide foundational public health services prior to the pandemic (de Beaumont Foundation 2021b). Beginning in 2020, the COVID-19 pandemic exacerbated the gaps in the STLT public health workforce, although it is not yet clear how the size of the national workforce changed during the pandemic. Many STLT public health agencies hired staff to fill gaps, with one study estimating that local public health agencies hired 53,600 employees from March 2020 to March 2021 (NACCHO 2022). Staff departures also rose, however, with one study estimating that half the state and local public health workforce departed from 2017 to 2021 because of deferred retirement, burnout and mental health challenges, and other job opportunities (Leider et al. 2023). Findings from our key informant interviews supported the literature: most interviewees from STLT public health agencies noted that their agencies

increased hiring in the first one-to-two years of the pandemic, but, by 2023, they believed the number of full-time equivalent positions had returned to pre-pandemic levels because of staff departures.

Surge strategies and supports

STLT public health agencies used a variety of strategies and supports to surge their workforce during the COVID-19 pandemic. Interviewees most frequently discussed the following strategies: working with staffing agencies to hire contract staff, leveraging the CDC Foundation COVID-19 Corps (which placed staff funded through the Foundation in STLT public health agencies), seeking support from Medical Reserve Corps volunteers, and partnering with universities, community-based organizations, and other organizations. Below, we list key themes that emerged during interviews.

- The most effective surge strategies allowed STLT public health agencies to bypass slow hiring processes within their agency to get immediate help from qualified staff and volunteers (for example, CDC Foundation COVID-19 Corps and Medical Reserve Corps).
- It was harder to fill specialized public health and emergency management roles, such as epidemiologists, data analysts, or health communications specialists, than roles that had fewer education and training requirements. Partnerships with universities, the CDC Foundation, and public health institutes (that is, non-profit organizations focused on advancing public health practice), offered effective solutions.
- Small- and medium-sized local health departments did not have access to select strategies and supports for surging the workforce (for example, CDC Foundation COVID-19 Corps and some funding opportunities) that were available to states and large local public health agencies.
- STLT public health agencies recognized a need for a surged workforce with an equity focus, cultural humility, and lived experience, so they leveraged community-based organization partners to fill this need.
- Interviewees felt that strategies to surge the public health workforce during public health emergencies are important, but they should not replace investments in staff who provide foundational public health services.

Lessons learned and recommendations

Experiences surging the governmental public health workforce during the COVID-19 pandemic highlighted successful strategies and important lessons for future pandemics. It will be critical to explore how to sustain and reactivate these strategies through funding, ongoing partnerships, and coordinated emergency planning at the STLT and national level. It is also important to consider ways to build the baseline governmental public health workforce through pathways into public health (including pipeline programs) and sustained funding, so that STLT public health agencies have the capacity needed to quickly respond and surge the workforce during emergencies. Based on study findings, we identified the following recommendations for federal agencies, STLT public health agencies, and other public health organizations:

For federal agencies:

- Work towards sustainability and plan for future needs of successful national programs such as MRC and contractual support for initiatives such as CDC Foundation's COVID-19 Corps.
- Consider mechanisms such as funding, technical assistance, and peer learning opportunities to enable public health institutes to effectively provide surge support to STLT public health agencies during emergencies.
- Consider options to support the expansion of pipeline programs, such as the Public Health Associate Program, Career Epidemiology Field Officer program, Preparedness Field Assignee program, and Public Health AmeriCorps, to "build the bench" for the SLTL public health workforce.
- Explore options for providing funding to STLT public health agencies (during public health emergencies and at baseline), focusing on flexible, sustained funding opportunities that make it easier for STLT health agencies to hire staff on a long-term basis and build a career in governmental public health.
- Consider ways to encourage state spending on public health to increase investments in the public health workforce and infrastructure.
- Support improvements in STLT governmental hiring practices through promulgation of best practices and provision of technical assistance to states.
- Support efforts to improve recruitment and retention of a skilled and diverse STLT public health workforce through policies such as student loan repayment.

For STLT public health agencies:

- Establish mechanisms to surge the workforce as part of ongoing emergency preparedness and response planning.
- Continue to leverage partnerships with CBOs, universities, and health systems to help prepare for future pandemics, support ongoing efforts to promote health equity, and expose students to the public health field
- Strengthen partnerships with public health institutes, which provided critical staffing, planning, and training supports to STLT public health agencies.
- Share best practices for recruiting and retaining public health staff, including strategies for promoting long-term career growth and working with other governmental agencies to improve pay and benefits for the public health workforce.

For organizations partnering with public health agencies:

- Continue to study the effectiveness of surge strategies and consider options for improving or scaling up efforts during public health emergencies.
- Develop resources to support emergency preparedness and planning for future pandemics, such as surge planning playbooks and workforce planning tools.
- Seek opportunities to directly engage local public health agencies in surge staffing strategies.
- Pursue additional research enumerating the national public health workforce on a frequent basis.

I. Overview

The governmental public health workforce in the United States performs a wide range of activities, including essential duties (known as foundational public health services), to improve the health and well-being of the communities it serves.[1] During public health emergencies such as pandemic brought on by coronavirus disease 2019 (COVID-19), people rely on the public health workforce to be able to expand rapidly to respond to emerging threats while maintaining foundational public health services.

Despite noteworthy attempts to quantify the governmental public health workforce in the United States, there is no comprehensive data source to monitor the size and composition of the workforce. Enumeration attempts have been hindered by the complexity of the U.S. governmental public health infrastructure, which spans more than 2,800 local health departments, 51 health departments in each state plus the District of Columbia, eight territorial or freely associated state public health agencies, the entities that have public health authority for members of the 574 federally recognized American Indian/Alaska Native tribes, and hundreds of district and regional offices (Kumar et al. 2022; CDC 2023a). These state, tribal, local, and territorial (STLT) public health agencies vary in governance structure, size, population needs, and reporting capabilities, making it difficult to collect consistent data on number of employees and roles nationwide.

Study Definitions

STLT governmental public health workforce: Staff (including direct employees and contractual staff), volunteers, and other personnel who supported public health efforts in STLT public health agencies' jurisdictions. This includes staff hired by STLT public health agencies, federal personnel deployed to jurisdictions, fellows and trainees, staff from partner organizations, and personnel placed in STLT public health agencies through organizations such as the CDC Foundation.

Surge strategies: Approaches that STLT public health agencies used to increase their workforce during COVID-19. Examples include CDC Foundation staff placements, partnering with other organizations, working with staffing agencies, and leveraging Medical Reserve Corp volunteers. We discuss these strategies in detail in Section III.2.

Surge supports: Funding, tools, and technical assistance designed to help STLT public health agencies address staffing challenges and implement surge strategies. We discuss these supports in detail in Section III.3.

[1] Foundational public health services cover seven foundational capabilities (that is, cross-cutting skills needed to support basic public health programs) and five foundational areas (that is, topic-specific programs aimed at improving the health of communities). Foundational capabilities include emergency preparedness and response, assessment/surveillance, policy development and support, communications, community partnership development, organizational administrative competencies, and accountability/performance management. Foundational areas include communicable disease control, chronic disease and injury prevention, environmental public health, maternal and child health, and access to and linkage with clinical care. More information is available at https://phnci.org/transformation/fphs.

Nationally representative data on the governmental public health workforce suggest that the workforce was significantly under-staffed to deliver core public health services for more than a decade leading up to the COVID-19 pandemic (Leider et al. 2022; Merrill et al. 2003; Sellers et al. 2019). For example, a study conducted by the de Beaumont Foundation (2021) estimated that another 80,000 full-time equivalent (FTE) positions were needed at state and local public health agencies to deliver foundational public health services *before* factoring in the COVID-19 pandemic.

The COVID-19 pandemic exacerbated the staffing challenges that the governmental public health workforce faced. As the demands on the public health workforce increased dramatically to control the spread of COVID-19, staff were reassigned from their normal roles to focus on pandemic response, further reducing the number of staff dedicated to core public health services.

There is a lack of visibility into the number and type of staff hired during the COVID-19 pandemic, and limited efforts to describe the range of strategies and supports that STLT public health agencies used to surge the public health workforce during that time. Due to staffing and time constraints, fewer STLT public health agencies had the capacity to respond to surveys or other efforts to quantify or describe changes to workforce during the pandemic. As a result, there is relatively limited information on the size of the governmental public health workforce during the pandemic, with most literature focusing on descriptions of burnout and intimidation or personal threats to safety. Additionally, although programs and organizations such as the CDC Foundation and Medical Reserve Corps (MRC) are increasingly sharing lessons learned from their efforts to support the pandemic workforce surge, (Medical Reserve Corps 2021; Buchdahl 2023) the existing literature does not synthesize, compare, or contrast these strategies. The same is true for supports intended to bolster the governmental public health workforce's capability to respond to the pandemic, such as federal funding, training, and technical assistance to STLT public health agencies.

Meanwhile, the federal government is making substantial investments in the governmental public health workforce. Through the American Rescue Plan Act and the Centers for Disease Control and Prevention's (CDC's) grant, Strengthening U.S. Public Health Infrastructure, Workforce, and Data Systems (OE22-203), the federal government has invested about $8.5 billion (Congressional Research Services 2021; CDC 2023b). After years of underinvestment in public health, this represents a promising opportunity to strengthen the capacity of the public health workforce and prepare for future pandemics.

In response to the sparse information on the STLT public health workforce during the COVID-19 pandemic, the Office of the Assistant Secretary for Planning and Evaluation (ASPE), part of the U.S. Department of Health and Human Services, funded this study. The study explored the existing literature on the size and composition of the governmental public health workforce at STLT public health agencies before and during the COVID-19 pandemic as well as strategies and supports used by STLT public health agencies to surge the public health workforce during the pandemic. This study focuses on governmental public health, but there are also many organizations outside of STLT governments that addressed the COVID-19 pandemic and contribute to the public's health; understanding the workforce at these organizations was beyond the scope of this study. Appendix A lists the full set of research questions. To address the research questions, the study team conducted an environmental scan; a

targeted literature review; and 27 semistructured key informant interviews with state and local health officials, federal government officials, and other workforce experts involved directly or indirectly in surge staffing. Appendix B describes the study methods in detail.

This white paper presents findings on the following:

- **The status of the public health workforce** at STLT public health agencies before and during the COVID-19 pandemic (Section II)
- **Strategies and supports that STLT public health agencies used** to surge the STLT public health workforce during the COVID-19 pandemic (Section III)
- **Lessons learned and suggestions** for directing investments in the STLT public health workforce to prepare for future pandemics (Section IV)

II. The Status of the Public Health Workforce

Here, we summarize national data sources that describe the STLT public health workforce (Section II.1), describe the size and characteristics of the STLT public health workforce before the COVID-19 pandemic (Section II.2), and highlight changes to the size and characteristics of the STLT public health workforce during the COVID-19 pandemic (Section II.3). We primarily present findings from the targeted literature scan and supplement these findings with qualitative data from the key informant interviews.

Key Estimates from the Literature

- **200,000 state and local public health workers** were part of the workforce in 2019 (Kumar et al. 2022).
- **80,000 more FTEs** were needed at state and local public health agencies to deliver foundational public health services leading up to the COVID-19 pandemic (de Beaumont Foundation 2021).
- **53,600 local health department employees** were hired nationally from March 2020 to March 2021 (NACCHO 2022).
- **46 percent of the state and local public health workforce** was estimated to have departed from 2017 to 2021 (Leider et al. 2023).

II.1. Data sources describing the STLT public health workforce

Few national data sources provide information about the STLT public health workforce. Because there is no standardized system to classify staff by roles and expertise, and because of difficulties collecting and standardizing data across jurisdictions, information on the size and composition of the STLT public health workforce has historically been limited (Sumaya 2012). Most efforts to enumerate or describe the public health workforce use one of five sources: the Public Health Workforce Interest and Needs Survey (PH-WINS), National Association of County and City Health Officials (NACCHO) National Profile of Local Health Departments, the NACCHO Forces of Change Survey, Association of State and Territorial Health Officials (ASTHO) Profile of State and Territorial Public Health, or the New York State Association of County Health Officials Enumeration Survey. Exhibit II.1 has more information about these data sources.

Although helpful for providing insight into the STLT public health workforce, these data sources have noteworthy limitations, such as low response rates, infrequent data collection, and lack of tribal and territorial respondents. Low response rates are a challenge, especially for PH-WINS and the Forces of Change survey, both of which include respondents from small local health departments in the survey sample. The NACCHO and ASTHO Profiles have relatively higher response rates (61 percent and 98 percent, respectively, in 2019). Typically fielded every two to three years, the most recent NACCHO and ASTHO Profiles are from 2019 and cannot be used to assess changes in the public health workforce during the COVID-19 pandemic. Furthermore, these data sources have historically excluded tribal public health agencies and, to a lesser extent, territorial public health agencies, so they provide an incomplete picture of the STLT public health workforce.

Exhibit II.1. Data sources used to describe the STLT public health workforce

Data source (Data collection organization)	Data collection years	Description	Limitations
Public Health Workforce Interest and Needs Survey (PH-WINS) (de Beaumont Foundation and ASTHO)	2014, 2017, 2021	Collects data from a nationally representative sample of workers in state and local public health agencies (de Beaumont n.d.).	• Excludes tribal and territorial public health agencies • Low response rate: the 2021 response rate was 35 percent (44,732 out of 137,446 state and local public health workers) (de Beaumont 2021b)
National Profiles of Local Health Departments (NACCHO)	1989, 1992, 1996, 2005, 2008, 2010, 2016, 2019	Questionnaire is distributed to local health departments nationwide (n = 2,459). The overall response rate in 2019 was 61 percent (1,496 local health departments out of 2,459 in the study population) (NACCHO 2020).	• No data collection during the pandemic • Substantial item-level non-response because of the burden of responding to the survey and difficulty providing data on some topics (for example, finances)
Forces of Change Survey (NACCHO)	2014, 2015, 2017, 2018, 2020	Collects data from a random sample of local health departments (905 out of about 2,400 local health departments were included in the sample in 2020). Focuses on emerging topics in public health (NACCHO 2022).	• Low response rate (2020 response rate was 24 percent) • The sample excludes local health departments in Rhode Island and Florida
New York State Association of County Health Officials (NYSACHO) 2021 enumeration survey (NYSACHO)	2021	Distributed to all 58 local health departments in New York, of which 52 (89.7 percent) responded. Questions are designed to enable longitudinal comparison from 2019 to 2021 (Michaels et al. 2022).	• Lack of generalizability; only provides workforce data for local health departments in New York state • Potential inconsistencies in reporting across local health departments because of unclear definitions of employee types
Profile of State and Territorial Public Health (ASTHO)	2007, 2010, 2012, 2016, 2019	Collects data from 50 states, the District of Columbia, and the eight U.S. territories and freely associated states. In 2019, 58 out of 59 states and territories responded. (ASTHO n.d.)	• No data collection during the pandemic

ASTHO = Association of State and Territorial Health Officials; NACCHO = National Association of County and City Health Officials; NYSACHO = New York State Association of County Health Officials.

II.2. The public health workforce before the COVID-19 pandemic

The state and local public health workforce shrunk in the decade leading up to the COVID-19 pandemic. Using data from the ASTHO and NACCHO profile surveys, Leider et al. (2022) estimated that state and local public health workforce declined by more than 15 percent from 2008 to 2019, decreasing from 246,000 to 206,000 employees. Of the roughly 200,000 state and local public health employees in 2019, about one-quarter- were employed by state public health agencies, and the other three-quarters

were employed by local public health agencies. Furthermore, the state and local public health workforce lacked diversity. Based on PH-WINS 2017, most of the public health workforce was non-Hispanic White (Leider et al. 2023).

One study estimated that the state and local public health workforce needed 80,000 more FTE positions to deliver foundational public health services, including basic emergency preparedness and response capabilities. To assess gaps in the workforce, the de Beaumont Foundation (2021) used survey data from the ASTHO and NACCHO Profiles and PH-WINS, as well as in-depth data from a sample of 170 local health departments and three state health departments collected in 2020 before the start of the COVID-19 public health emergency in the United States. The study estimated that state and local health departments needed to hire at least 80,000 more FTEs—an increase of almost 80 percent—to provide a minimum set of public health services to the nation. This included an 80 percent increase in the number of FTEs at state health departments (from 31,000 to 57,000 FTEs) and a 70 percent increase (from 72,500 to 126,500 FTEs) at local health departments. Among foundational areas, chronic disease and injury prevention were in the greatest need of additional FTEs. The literature described stagnant funding and inefficient hiring processes leaving STLT public health agencies struggling to attract talent to serve their communities (Alfonso et al. 2021; Gebbie et al. 2002; Sellers et al. 2019).

Most interviewees echoed these sentiments, noting that the public health workforce was understaffed and under-resourced before the COVID-19 pandemic. Interviewees said that the areas that lagged the most were nursing, roles that required higher levels of education or training (for example, epidemiology and disease investigative services), data management, and health equity. Interviewees who worked closely with STLT public health agencies highlighted that small local public health agencies tended to be the most understaffed and under-resourced.

II.3. Changes to the public health workforce during the COVID-19 pandemic

Although we do not know the net changes to the size of the STLT public health workforce during the COVID-19 pandemic, rates of hiring and staff departure were high. As Exhibit II.1 shows, New York attempted to enumerate the public health workforce at local public health agencies during the pandemic. The study found that the net count of FTEs remained relatively stable from 2019 to 2021, increasing by only 1.7 percent (Michaels et al. 2022). These findings are limited to New York, however, and are not generalizable to local public health agencies in other states or regions or other types of public health agencies (for example, state, tribal, territorial). A study of local public health agencies nationwide using NACCHO's 2020 Forces of Change Survey estimated that local health departments hired 53,600 employees from March 2020 to March 2021, with a mean of 1.8 new employees per 10,000 people in the jurisdiction (NACCHO 2022). The study did not, however, collect data on staff departures to estimate net change in the local public health agency public health workforce. STLT public health agencies that participated in interviews offered a more nuanced perspective. Although most interviewees noted that new hires exceeded departures in the first one-to-two years of the pandemic, a few said that staff departures spiked in 2022 and 2023 and guessed that the count of FTEs in 2023 is similar to pre-pandemic levels.

Staffing Changes at Public Health Agencies During the COVID-19 Pandemic

Interviewees from local public health agencies shared data and anecdotes about how their agencies' workforce changed during COVID-19. For example:

- **One interviewee described a 40 percent increase** in FTEs from 120 FTEs pre-COVID to 170 FTEs at the height of the pandemic (in roughly 2020 and 2021).
- Another interviewee described **a 25 percent increase in their agency's workforce** from 2,000 FTEs to 2,500 FTEs.
- A third interviewee described a **100 percent increase in their agency's workforce** from 600 FTEs to 1,200 FTEs during 2020.

Notably, each interviewee said that these levels dropped substantially in 2022 and 2023 as employees' contracts ended and staff retired or quit, bringing the number of FTEs closer to pre-pandemic levels.

Most pandemic-related hiring occurred in 2020 and focused on contact tracers. Although the hiring surge continued through 2022, one study drawing on PH-WINS data suggests the proportion of newly hired staff at state and local public health agencies peaked from July 2020 to September 2020, with about 80 percent of pandemic-related hiring complete by March 2021 (McCullough and Robins 2023). Interviewees generally agreed that most hiring was done in the first year of the pandemic, noting that this early hiring was primarily for contact tracers and their supervisors. After eight or nine months, hiring efforts shifted to skilled staff such as epidemiologists, data experts, and communications specialists. A couple interviewees noted that additional hiring waves occurred during vaccine roll-out in late 2020 and 2021 and during the Omicron wave in late 2021 and early 2022.

The proportion of contractual and temporary staff at STLT public health agencies increased during the COVID-19 pandemic. One study using PH-WINS data from Big Cities Health Coalition members (that is, 35 of the largest local public health agencies serving at least 500,000 people) estimated that, from 2017 to 2021, temporary and contract workers increased their share of the public health workforce in big city public health agencies from 5 percent to 14 percent (Juliano et al. 2023). In the New York study, the count of full-time, part time, and seasonal FTEs declined from 2019 to 2021 (by 26 percent, 9 percent, and 45 percent, respectively), but the number of contractual FTEs increased from 13.7 in 2019 to 1,686 in 2021 (Michaels et al. 2022). Interviewees overwhelming reported hiring contractual and temporary staff to respond to the pandemic. All but one STLT public health agency interviewee noted that most of their new hires during the COVID-19 pandemic were contract staff, mainly because it was easier and quicker to hire contractual staff than to directly hire new employees.

The roles of public health workers shifted during the pandemic, with most employees being reassigned to roles supporting the pandemic response. Using PH-WINS data to assess reassignment at state and local public health agencies, one study estimated that nearly three-quarters of public health workers were reassigned to work on the pandemic response and that reassignment rates were higher at smaller agencies (for example, at local versus state public health agencies and at medium versus large local public health agencies) (Hare Bork et al. 2022). Similarly, on the NACCHO 2020 Forces of Change survey, 80.5 percent of local health departments reported that they reassigned existing staff from their regular duties to the agency's COVID-19 pandemic response (NACCHO 2022). Relatedly, all STLT public health agencies that participated in interviews reported that their agency relied heavily on

reassignment. Interviewees noted that they typically reassigned staff from areas such as crisis management, health promotion and education, and environmental health to work on contact tracing, case management, procurement, isolation and quarantine efforts, vaccination events, and COVID-19 data entry. Reassignment periods were originally envisioned as lasting a few weeks, but they often went on for months or even years, contributing to staff burnout and job dissatisfaction. An interviewee that works closely with STLT public health agencies reinforced the PH-WINS finding, sharing that the smallest local public health agencies had to reassign the most staff to meet the demands of the COVID-19 pandemic.

Meanwhile, staff departed the STLT public health workforce at alarming rates during the pandemic. Using PH-WINS data, Leider et al. (2023) estimated that half of the state and local workforce departed from 2017 to 2021, with young staff (age 35 and younger) and staff with short tenure (five years or fewer) most likely to have departed. Departures extend to more tenured employees as well: from March 2020 to February 2022, journalists from the *New York Times* identified more than 500 public health leaders who left their positions, resulting in a significant loss of executive leadership and experience (Baker and Ivory 2022). Several interviewees highlighted the rise in staff departures in 2022 and 2023, noting that many employees "stuck it out" through the worst of the pandemic but departed the workforce in alarming numbers as the public health emergency ended, either because of deferred retirements, burnout, or opportunities with higher pay and better benefits. It is also unclear how many staff newly hired during the COVID-19 pandemic will stay in their positions. In November 2022, the CDC Foundation estimated that 80 percent of public health professionals who were placed in state and local health departments through the foundation will leave, while only 20 percent (about 800 of 4,000) will continue to staff their jurisdictions on a longer-term basis (Weber 2022).

> *"COVID 19 just further exacerbated the huge cracks in the foundation of the infrastructure of public health."*
>
> *– STLT public health expert*

Now that the public health emergency has ended, challenges with hiring and retention persist. In the literature and interviews, the most common barriers to hiring and retaining talent at STLT public health agencies include lack of sustained public health funding, burnout or high workload, low salaries and lack of advancement opportunities, slow or inflexible hiring mechanisms, and lack of diversity in the workforce (Leider et al. 2021; Bogaert et al. 2023; Yeager et al. 2023; Juliano et al. 2023). Although STLT public health agency interviewees were proud of their agencies' efforts to surge the workforce, they also expressed concerns about hiring and retaining enough staff to support foundational public health areas, which includes the ongoing response to the COVID-19 pandemic and planning for future emergencies.

III. Strategies and Supports to Surge the Workforce

STLT public health agencies used a variety of strategies and supports to surge the capacity of their workforce during the COVID-19 pandemic. Exhibit III.1 categorizes and lists common surge strategies and supports.

Exhibit III.1. Strategies and supports to surge the STLT public health workforce

Surge strategies

- The CDC Foundation COVID-19 Corps
- Staff placements through fellowship programs
- Deployment of CDC employees to STLT public health agencies
- Deployment of personnel to public health agencies from other federally funded programs
  - National Guard
  - Medical Reserve Corps
  - Public Health AmeriCorps
- Partnerships with the following to surge staffing or deliver public health interventions:
  - Universities
  - Community-based organizations
  - Hospitals and health systems
  - Public health institutes
- Leveraging existing staff and hiring mechanisms
  - Reassignment
  - Contracting with staffing agencies

Surge supports

- Federal funding
- Workforce planning tools
- Workforce/administrative planning data
- Other supports
  - Peer-learning opportunities
  - Training for the surged workforce
  - Technical assistance

CDC = Centers for Disease Control and Prevention; STLT = state, tribal, local, and territorial.

Here, we describe specific strategies (Section III.1) and supports (Section III.2), along with challenges, successes, perceptions of effectiveness, and other insights, and then we summarize findings across strategies and supports (Section III.3). A table summarizing the successes and challenges of each strategy is available in Appendix Exhibit C.1.

III.1. Surge strategies used during the COVID-19 pandemic

III.1.A. The CDC Foundation COVID-19 Corps

Successes: The CDC Foundation quickly hired and placed highly qualified candidates at no cost to STLT public health agencies.

Challenges: The CDC Foundation COVID-19 Corps staff were often paid higher salaries than STLT public health agency staff, creating some tension. The CDC Foundation generally did not provide direct support to medium and small local public health agencies.

Through a combination of CDC funding and private funding, the CDC Foundation directly hired, managed, and paid staff who were placed in STLT agencies nationwide (either in person or remotely) to support the COVID-19 pandemic response. The CDC Foundation is an independent nonprofit organization created by Congress. It leverages federal grant, philanthropic, and private funding to

support CDC's mission and advance public health (CDC Foundation n.d.). At the outset of the COVID-19 pandemic, the CDC Foundation developed the COVID-19 Corps to place temporary staff in STLT public health agencies at no cost to the public health agency. The CDC Foundation's COVID-19 pandemic response was based in part on a prior surge staffing effort for the opioid response, during which the CDC Foundation hired 60 public health analysts and deployed them to STLT public health agencies across the US (Tolchinsky 2022). The COVID-19 Corps workforce surge provided similar support on a larger scale, working with 100 STLT public health agencies to fill roughly 4,000 roles including epidemiologists, contact tracers, case investigators, data scientists, communication specialists, public health nurses, program managers, IT specialists, and others (Perling 2022). When temporary contracts ended, many STLT public health agencies continued to use the CDC Foundation as a hiring authority for positions funded by the STLT public health agency.

Many STLT public health agency interviewees had COVID-19 Corps staff at their agencies during the pandemic and shared overwhelmingly positive feedback about the support they received. Interviewees noted that the CDC Foundation was able to hire more quickly than STLT public health agencies because of its competitive pay, benefits, and wide network. STLT public health agency interviewees also appreciated receiving staff at no cost to the public health agency, which reduced challenges with restrictive or limited budgets. Furthermore, the CDC Foundation aimed to recruit staff whose racial, ethnic, and cultural backgrounds aligned with the communities they were going to serve, which improved cultural responsiveness. Many positions were remote, which also allowed the CDC Foundation to recruit people from outside of states and jurisdictions with specialized skills. Because of the success of the program, some STLT public health agencies found ways to permanently hire CDC Foundation staff. A CDC Foundation publication noted that about 20 percent of the temporary staff hired to support the COVID-19 pandemic response stayed on in permanent positions (Buchdahl n.d.).

> *"CDC Foundation was great at finding really smart people. Even though they were temporary staff, we would place them in pretty high positions on the data or epi[demiology] side because they were just high performing."*
>
> – Interviewee from an STLT public health agency

Although the program was successful overall, several interviewees described challenges related to the differences in salaries between STLT and CDC Foundation COVID-19 Corps staff as well as local public health agencies' access to support from these staff. The CDC Foundation sometimes had difficulty recruiting specialized roles that STLT public health agencies needed, such as epidemiologists. With funding from CDC, the Foundation overcame this challenge by providing competitive pay and benefits to recruit top talent. However, this often meant exceeding compensation offered at STLT public health agencies for similar roles, leading to tensions between staff. One interviewee noted that some STLT health public agencies were able to address this issue by raising salaries for their regular employees. Others had difficulty hiring CDC Foundation COVID-19 Corps staff on a permanent basis because they could not offer salaries as competitive as the CDC Foundation. Another challenge was supporting small and medium-sized local health departments. The CDC Foundation primarily placed staff in states, territories, tribes, and big city local public health agencies, but smaller local public health agencies were

not able to benefit from the CDC Foundation placements. This was particularly true in decentralized states in which state agencies operate separately from local agencies. As evidence of this challenge, nearly all of the interviewees from local public health agencies noted that they did not receive support from the CDC Foundation COVID-19 Corps.

Other foundations operated programs similar to the CDC Foundation's COVID-19 Corps. Although the CDC Foundation's staffing program was the largest and most frequently discussed program by interviewees, one interviewee from an STLT public health agency leveraged similar support from the Bill and Melinda Gates Foundation and found it helpful.

III.1.B. Staff placements through fellowship programs

Successes: Fellows filled key roles at no cost to STLT public health agencies.

Challenges: STLT public health agencies often had difficulty retaining fellows in permanent positions.

Fellowship programs helped to fill key roles at STLT public health agencies during the COVID-19 pandemic (at no cost to the agencies), but retaining fellows in permanent positions was a challenge. A few STLT public health agencies described leveraging staff from the federally funded pipeline and fellowship programs that place recent graduates in STLT public health agencies (see the call-out box). STLT agencies valued the support from the fellows and noted that they filled critical roles in the COVID-19 pandemic response. For example, one agency said Public Health Associate Program fellows "did everything the communicable disease staff did, and more." Another interviewee described filling a key epidemiologist role with a Council of State and Territorial Epidemiologists fellow. Interviewees generally shared positive perceptions of these programs but described challenges retaining fellows as full-time staff. An interviewee noted that, nationally, only eight percent of Epidemic Intelligence Service graduates go on to work at STLT agencies.

Pipeline and Fellowship Programs used by STLT Public Health Agencies

CDC's Public Health Associate Program (PHAP): Two-year training program that places recent graduates of bachelors and master's programs related to public health in STLT public health agencies to support emergency preparedness and response, evaluation, program planning, and other activities. A total of 295 fellows participated in the 2019-2021 and 2020-2022 PHAP cohorts (CDC 2023c).

CDC's Epidemic Intelligence Service (EIS): Two-year training program that places recent medical, veterinary, or nursing school graduates or graduates of doctoral programs at CDC or in STLT public health agencies to investigate and respond to disease outbreaks and other emergent public health threats. In 2020, 60 EIS fellows participated in the program (22 in STLT agencies), and 70 fellows participated in 2021 (22 in STLT agencies) (CDC 2023d).

Council of State and Territorial Epidemiologists (CSTE) Applied Epidemiology Fellowship: Two-year training program funded through CDC and HRSA that places recent graduates of master's or doctoral programs in epidemiology in STLT public health agencies. Data on the number of Applied Epidemiology fellows during the COVID-19 pandemic were not available.

III.1.C. Deployment of CDC employees to STLT public health agencies

Successes: CDC staff filled key roles in STLT public health agencies in critical areas such as epidemiology and provided valuable expertise.

Challenges: Some STLT public health agencies requested more deployed staff than CDC could provide.

The CDC deployed full-time CDC employees to support STLT public health agencies in areas such as epidemiological investigations and data. In the first six months of the pandemic, CDC deployed more than 700 of its employees to provide in-person assistance to 55 STLT public health agencies responding to the COVID-19 pandemic (Dirlikov et al. 2020). The most common areas that that CDC employees supported were epidemiologic investigations, infection prevention and control in health care settings, health communications, community mitigation, and occupational safety and health. Some of the programs the CDC used to deploy staff to STLT public health agencies included the following:

- **Preparedness Field Assignees Program**. The Preparedness Field Assignees program places CDC-hired staff in STLT public health agencies for two-year assignments to support public health preparedness planning and response efforts (CDC 2023e). Currently, there are 25 Preparedness Field Assignees in the field, and, in 2023, the program will recruit an additional 10 new assignees (CDC n.d.).
- **Career Epidemiology Field Officers (CEFO) Program**. CEFOs are epidemiologists with experience in surveillance, epidemiology, preparedness, research, training, and policy development (CDC 2023g). CDC recruits, hires, and places the CEFOs in jurisdictions that receive funding through the CDC's Public Health Emergency Preparedness (PHEP) cooperative agreement. An interviewee shared that, as of spring 2023, there were 50 CEFOs in 47 jurisdictions.

Staff deployed from CDC provided valuable support to state and territorial public health agencies, but agencies could have benefitted from more support. Interviewees noted that a key benefit of Preparedness Field Assignees, CEFOs, and other CDC staff deployments is that it is typically easier for CDC to hire these staff and place them in STLT public health agencies than for STLT public health agencies to hire them directly. This is because the higher salaries offered by CDC and the wider network of qualified candidates available to CDC. One interviewee also cited program limitations on the number of staff that the CDC can hire on behalf of jurisdictions. Some jurisdictions requested more deployed staff than CDC could provide through these programs. In addition, jurisdictions typically apply for a CEFO using funding from the CDC's PHEP cooperative agreement to fund the position. As a result, public health agencies with the fewest resources typically did not have a CEFO placed in their agency because they used their PHEP funding to maintain basic public health capabilities. The interviewee shared that CDC has since expanded the CEFO program to guarantee a CEFO to every state, territorial, and large local jurisdiction directly funded by the PHEP cooperative agreement.

III.1.D. Deployment of personnel to public health agencies from other federally funded programs

STLT public health agencies commonly reported using personnel deployed from federally funded programs such as the National Guard, MRC, and Public Health AmeriCorps to surge their governmental public health workforce. Less commonly, STLT public health agencies also reported receiving support from the National Disaster Medical System and Federal Emergency Management Agency. While STLT public health agencies did not report using the U.S. Public Health Service (USPHS) Commissioned Corps, the USPHS Commissioned Corps' medical, health and engineering professionals fight disease, conduct research, and care for patients in underserved communities across the nation and were deployed in support of COVID-19 response-and-recovery efforts during the pandemic (USPHS, n.d.). Here, we describe how STLT public health agencies leveraged a few of these programs to surge their workforce during the COVID-19 pandemic.

National Guard

Successes: National Guard was particularly helpful for filling logistical roles (for example, setting up tents at vaccination and testing sites).

Challenges: Many members did not have public health experience and struggled with some public health–related activities. Some STLT public health agencies felt uncomfortable placing uniformed National Guard members in certain communities. National Guard members were deployed for an undefined length of time, making it hard for STLT public health agencies to plan and strategize.

State and territorial public health agencies valued support from the National Guard to set up vaccination and testing sites, transport specimens, and support other roles, as needed. The National Guard is a state-based military force that provides trained units to states, territories, and the District of Columbia. Several STLT public health agencies shared that, during the pandemic, National Guard personnel were particularly helpful for logistical roles, such as setting up tents at vaccination and testing sites, staffing traffic control, providing security, and transporting specimens to and from collection sites. At the height of the pandemic, an estimated 40,000 National Guard personnel were deployed to states and territories to support the COVID-19 pandemic response (FEMA, n.d.). One STLT public health agency shared that the National Guard personnel were flexible and used to playing different roles to support changing needs.

Challenges working with the National Guard included their lack of public health training, uniformed presence, and undefined timelines for providing support. A few STLT public health agency interviewees said that, because National Guard personnel did not have public health experience, they struggled with some public health–related activities, such as accurately collecting and entering COVID-19 and demographic data in immunization records, adhering to confidentiality protocols, and operating with cultural humility. In addition, a few STLT public health agencies did not want to have uniformed personnel at vaccination or testing events because of concerns that it could be disconcerting for refugee communities or community members who are undocumented. An STLT public health agency also shared

that there was a lack of clarity around how long the National Guard could provide support, making it challenging to strategize the best way to leverage National Guard personnel.

Medical Reserve Corps (MRC)

Successes: MRC volunteers are typically local, so they don't need to travel and are known and trusted by the community. Agencies can use existing systems to conduct background checks and train MRC volunteers.

Challenges: Systems for supporting MRC volunteers to cross state lines, including vetting processes, housing, and liability protections could be strengthened.

Volunteers organized through the MRC provided useful support, especially to small local public health agencies. The MRC is a national network of locally organized volunteers who seek to improve the health and safety of their communities, and it includes volunteers with various skills, including medical, public health, safety, logistics, and communication. The Administration for Strategic Preparedness and Response operates the MRC and provides funding to build and maintain its emergency response and health equity capabilities. Currently, the MRC has about 300,000 volunteers, which increased by about 140,000 during the pandemic, and 800 MRC units nationwide. During the pandemic, more than 500 MRC units in 48 states, the District of Columbia, Puerto Rico, American Samoa, and the Northern Mariana Islands contributed to contact tracing and call center efforts (Administration for Strategic Preparedness and Response n.d.). The MRC has 10 regional liaisons who provide technical assistance to states on how to recruit, train, and deploy MRC volunteers. States also have state coordinators who collaborate with regional liaisons, local unit leaders, and state-level partners. A few interviewees from STLT public health agencies said that local MRC volunteers were particularly helpful because they did not have to travel and were known and trusted by community members. Another noted that it was easy to leverage MRC volunteers because they could leverage MRC systems to conduct background checks and train MRC volunteers rapidly.

Deploying MRC volunteers across state lines was sometimes challenging to manage and volunteer availability was inconsistent. One interviewee said that systems for supporting public health volunteers to cross state lines, including systems for vetting and tracking volunteers of for providing housing and reimbursements for travel, could be strengthened. Although the Emergency Management Assistance Compact (EMAC) supports volunteers to cross state lines in emergencies (for example, by recognizing medical licenses from volunteers' home states in the state they are deployed), this interviewee noted that having a public health–specific EMAC might be more effective. Another interviewee described that strengthened tort and claims liability protections for medical volunteers serving across state lines could also be helpful. Additionally, a STLT public health agency said that relying on MRC volunteers was challenging at times because MRC volunteer availability was inconsistent.

> *"The challenging part was consistency: knowing we'd have consistent people that were trained and able to do the work."*
> *– STLT public health agency interviewee*

Public Health AmeriCorps

Successes: Public Health AmeriCorps is a promising approach to support STLT public health agencies' efforts to advance health equity and encourage young people to pursue careers or degrees in public health. It aims to place more than 4,000 members in 100 state and local organizations (including some public health agencies) in its first year in operation.

Challenges: Public Health AmeriCorps was implemented in 2021, so it was not available to support the STLT public health workforce surge at the outset of the COVID-19 pandemic.

Public Health AmeriCorps was introduced after the height of the COVID-19 pandemic, but interviewees noted its promise in encouraging younger people to pursue public health careers and its ability to support future pandemics. Public Health AmeriCorps is a new program established in 2021 through a CDC grant to support public health needs in state and local public health settings and advance more equitable health outcomes (AmeriCorps 2021). Health departments apply for competitive funding and can use the funds to hire and train people to work in the health department in roles related to health education and training; community outreach and engagement; system navigation, referrals, and linkage to care; and research, data collection, analysis, and assessments (CDC 2023g). In its first year of funding, the program provided nearly $70 million to 82 state and local organizations (CDC 2023g). In 2023, more than 100 grantees (including some state and local public health agencies) received Public Health AmeriCorps funding, totaling more than $90 million, with the goal of recruiting around 4,000 AmeriCorps members (AmeriCorps n.d.). Although none of the STLT public health agency interviewees reported using Public Health AmeriCorps to surge the workforce during the pandemic, other interviewees who work closely with STLT public health agencies shared positive feedback on the program, noting that the program encourages young people to pursue public health careers or degrees.

III.1.E. Partnerships to surge staffing or deliver public health interventions

Partnerships played a critical role in expanding staff capacity and building trusted relationships with communities to support the COVID-19 pandemic response. STLT public health agencies partnered with universities, community-based organizations (CBOs), public health institutes, hospitals and health systems, and other organizations to surge the public health workforce and deliver public health interventions.

Partnerships with universities

Successes: Student volunteers filled multiple roles and brought new energy to the workforce.

Challenges: Regulations limited the use of students in some settings (for example, nursing students were not authorized to administer vaccines). There was frequent turnover among student volunteers because of school schedules.

Many STLT public health agencies partnered or contracted with universities to surge the workforce. Most commonly, interviewees reported using student volunteers to support contact tracing, staff

vaccine sites, and analyze data. A few STLT public health agency interviewees contracted with universities to fill physician or laboratory roles or to oversee contact tracing. One STLT public health agency repurposed a memorandum of understanding with a university to shift the goals of the partnership away from research on other bacterial diseases in the community to focus on COVID-19 testing and response. The literature similarly describes approaches to using student volunteers and staff and highlights STLT public health agencies' collaboration with university partners to develop contact tracing training resources (Pogreba Brown et al. 2021; Toney et al. 2021; Woodard et al. 2022).

Several STLT public health agencies shared positive feedback about using university partnerships to bolster the public health workforce. For example, a few interviewees described how student volunteers brought new energy to the workforce. In another case, a public health agency partnered with a university that had longstanding relationships in a medically underserved community, making it easier to reach this community with information about COVID-19 vaccination.

Only a few interviewees noted challenges with university partnerships. One STLT agency said that regulations prevented nursing students from filling some roles such as administering vaccines, and another described frequent turnover and the need for constant training because of school schedules. In addition, one STLT agency felt that some university faculty and staff had difficulty transitioning from academia to a practice setting in local government.

Partnerships with CBOs

Successes: CBOs have trusted relationships in communities, which were valuable to STLT public health agencies during the COVID-19 pandemic. They are also effective at promoting health equity.

Challenges: The interviews identified no challenges.

Several STLT public health agencies partnered with CBOs to support contact tracing and vaccination in populations hardest hit by COVID-19 and advance health equity in the COVID-19 response. The literature highlights how STLT public health agencies partnered with CBOs to fill gaps in the public health workforce. For example, the city of Chicago and the Chicago Department of Public Health created grants for 31 CBOs to identify 500 community members for the health department to hire as contact tracers and supervisors (University of Illinois Chicago 2020). Similarly, the Oregon Health Authority released a grant program for CBOs to support state and local health departments' efforts to educate communities about COVID-19, engage community health workers in contact tracing efforts, and provide wrap-around services to people in quarantine or isolation (Oregon Health Authority n.d.). CDC's Partnering for Vaccine Equity Program provided funding to more than 200 CBOs (and other organizations) to support community-level efforts to improve COVID-19 and flu vaccinations. It is unknown, but possible that some of these CBOs may have formally partnered with their respective STLT public health agencies (CDC 2023h). Interviewees also valued CBOs as partners with trusted relationships in communities and noted that CBOs were particularly effective in reaching communities with information about COVID-19 vaccination. One interviewee described working with CBOs to address health equity in the COVID-19 response and planned to continue these partnerships to address equity issues and engage communities in future emergency response efforts.

Partnerships with hospitals and health systems

Successes: Hospital- and clinic-run COVID-19 testing and vaccination clinics were a critical resource in some communities.

Challenges: Some hospitals and health systems were too overburdened to be effective partners. Funding opportunities often went to hospitals to respond to the COVID-19 pandemic, without funding for public health agencies to partner and provide support.

The literature suggests the importance of partnerships with primary care providers to support health equity and address vaccine hesitancy in the COVID-19 pandemic response. For example, one study found that people in communities experiencing racism or harm from medical institutions often did not trust health care systems as a whole, but they did trust individual primary care providers (Lorvick et al. 2021). Initially, COVID-19 vaccination efforts focused on distribution through mass vaccination sites or hospitals, but there was later recognition of the critical role that primary care providers can play in supporting the vaccination workforce and building trust in communities (Aggarwal et al. 2023; CDC 2021). Although interviewees did not discuss partnerships with primary care providers in depth, one STLT public health agency mentioned partnering with Federally Qualified Health Centers to support vaccination and testing.

Although there is limited literature exploring hospital and public health partnerships, several STLT public health agency interviewees described their partnerships with hospitals to support COVID-19 testing and vaccination. Hospitals and health systems were often funded directly to address the COVID-19 pandemic and support testing and vaccination. However, there is limited literature exploring the extent to which these hospitals and health systems partnered with STLT public health agencies for these efforts. A few interviewees described partnerships with hospitals. In one case, hospitals staffed their own vaccination clinic with hospital staff and communicated regular updates to the health department. Hospital partnerships generally worked well, but one interviewee in a rural area mentioned that they had tried to establish a vaccination clinic with a hospital, but hospital staff were overburdened and did not have the capacity to support the clinic. A local public health agency interviewee also expressed frustration that funding often went directly to hospitals or large pharmacies to support COVID-19 vaccination, without

> *"What we had happen early and often in COVID is that from the federal level to the state level, there was this absolute need to put all hands on deck and to get everyone involved in fighting the pandemic. And there was much focus on that, including hospital systems and pharmacies...with a total and insulting disregard for the trained public health workforce in the local health department...we at the local public health level were training and teaching our federally qualified health centers, our local hospitals and our CVS and Walgreens pharmacies how to do what we knew how to do. They got the money to do it. We did not."*
>
> *– STLT public health agency interviewee*

recognition of the role that local public health agencies could play.

Partnerships with public health institutes

Successes: Public health institutes hired staff rapidly on behalf of STLT public health agencies, had trusted relationships with communities, and helped train the surged workforce.

Challenges: The interviews identified no challenges.

A few interviewees highlighted public health institutes as useful partners for surging the public health workforce and for training staff and managing the COVID-19 pandemic response. Public health institutes are non-profit organizations that belong to a National Network of Public Health Institutes focused on addressing public health issues in communities across the United States (National Network of Public Health Institutes 2023). As interviewees described, some public health institutes hired staff on behalf of state public health agencies, allowing those agencies to bypass slower government hiring processes. One interviewee noted that public health institutes also provided public health training for the surged workforce and had specialized knowledge of public health emergency management that allowed them to work alongside public health agencies to manage the COVID-19 pandemic response. One example of a successful public health institute partnership was the Institute for Public Health Innovation's partnership with the Fairfax County Health Department in Virginia. As part of this effort, the Institute for Public Health Innovation hired 800 people for the health department, including investigators, contact tracers, community health workers, epidemiologists, data and environmental health specialists, and supervisors and managers (Kocsis et al. 2022).

III.1.F. Leveraging existing staff and hiring mechanisms

In addition to using new strategies to surge the governmental public health workforce, STLT public health agencies relied on existing staff and hiring mechanisms to respond to the COVID-19 pandemic. Most commonly, they reassigned staff from their typical roles or programs to focus on aspects of the COVID-19 pandemic response. STLT public health agencies also increased their reliance on third-party agencies to identify and recruit staff to place in their agency through contracts.

Reassignment

Successes: Reassignment provided immediate support for emerging needs such as contact tracing and case management.

Challenges: Reassignment contributed to burnout and staff departures, funding restrictions made it difficult to reassign some staff, and it left other programs or initiatives (not directly related to COVID-19) understaffed.

All STLT public health agencies that participated in interviews said they reassigned staff to meet the demands of the pandemic, but interviewees described numerous challenges. As described in Section II, these included the following:

- **Some staff were unable to be reassigned because of restrictions in the way they were funded.** A few STLT public health agency interviewees shared that certain funding sources did not allow them to reassign certain staff to support COVID-19 pandemic response efforts. For example, one STLT public health agency was unable to reassign staff supporting its Diabetes Prevention Program to pandemic response even though the Diabetes Prevention Program's worksites were closed because of the pandemic.
- **Core public health areas suffered.** When STLT public health agencies reassigned staff to the COVID-19 pandemic response, their other public health programs, such as health promotion, became understaffed.
- **Staff were reassigned to roles that did not align with their skill sets and training.** Several STLT public health agencies noted that it was difficult to align staff member's salaries and existing skills to new roles related to the COVID-19 pandemic. For example, one interviewee noted that a finance professional who had previously spent most of their time working in spreadsheets was reassigned to work in a position interacting with community members. Another interviewee describing having non-supervisory staff fill supervisory roles without changing their compensation. Interviewees said these scenarios contributed to increased job dissatisfaction among the STLT workforce.

> *"Half the people from the chronic disease [program] were doing contact tracing. It had absolutely nothing to do with their work and they needed pretty significant support."*
> *– STLT public health agency interviewee*

- **Reassignment contribued to staff burnout and challenges with retention.** As noted in Section II, the reassignments often continued for months and contributed to burnout.

Contracting with staffing agencies

Successes: Contracting with staffing agencies is effective for quickly hiring large numbers of staff, such as contact tracers. It allowed STLT public health agencies to budget at the contract level rather than for individual staff.

Challenges: Establishing new contracts with staffing agencies can be complicated and expensive. Reliance on contractual staff contributes to turnover and issues with retention as employees seek permanent positions with better job security.

Nearly all STLT public health agencies that participated in interviews reported contracting with staffing agencies, and most said that they were effective at quickly hiring staff. Interviewees noted that staffing agencies were most often used to hire contact tracers, but they also helped fill other roles including nurses, epidemiologists, health educators, procurement staff, project managers, and IT staff. STLT public health agencies said that staffing agencies were able to quickly hire large numbers of staff, allowing them to focus on responding to the COVID-19 pandemic. Several key informants also shared that staffing agencies simplified the budgeting processes for STLT public health agencies because they only needed to budget for the contract instead of budgeting for specific staff. Another STLT public health

agency shared that some contract staff brought valuable experience and were subsequently hired permanently.

Even though staffing agencies were, as one key informant noted, "integral to the response," STLT public health agencies noted challenges with this hiring strategy. For example, a few interviewees shared that staffing agencies were less effective at hiring nurses and master's-level employees such as epidemiologists and data specialists. Several interviewees highlighted that, initially, it can be difficult to establish contracts with staffing agencies because of administrative challenges, such as needing to establish multiple new contracts with staffing agencies, the high cost of contracting with staffing agencies, and lack of mechanisms to track staff across contracts. Two interviewees mentioned that the U.S. General Services Administration's Multiple Award Schedule program was introduced to address some of these challenges with contracting, but they noted that it was not available until midway through the pandemic. Under the Multiple Award Schedule program, the General Services Administration establishes long-term contracts at pre-negotiated prices, and federal, state, and local agencies can quickly select from qualified vendors to purchase specific services and supports (U.S. General Services Administration 2022). Although none of the people we interviewed in the STLT public health agencies described using this mechanism to hire staff, it is possible that their agency did so without their knowledge.

Many interviewees highlighted the challenges associated with the temporary nature of most contract positions. One STLT public health agency noted that it was inefficient to invest in staff members' training only to have to let them go at the end of their contract. Another agency shared that it can be challenging to scale operations down when staff members' contracts end. Across interviewees, most noted that the basic structure of having so many public health roles filled by contracted staff contributes to turnover as workers seek permanent positions with greater job security.

III.2. Surge supports that STLT public health agencies used during the COVID-19 pandemic

Next, we describe supports that STLT public health agencies relied on to fund surge strategies, train the surged workforce, and plan their COVID-19 pandemic response.

III.2.A. Federal funding

Successes: Federal funding is critically important for hiring staff to respond to the pandemic. Flexible funding opportunities such as CDC's Infrastructure grant helped STLT public health agencies respond and hire staff as they saw fit.

Challenges: Most funding is provided over short (three to five year) intervals, making it hard to create and retain permanent, long-term positions. Lack of flexibility in some funding opportunities makes it challenging to use money to meet the agency's most pressing needs. Small- and medium-sized STLT public health agencies do not have direct access to most federal funding opportunities.

STLT public health agencies used various sources of federal funding to support their COVID-19 pandemic response efforts. These sources (summarized in Appendix Exhibit C.2) most commonly included CDC's Strengthening the U.S. Public Health Infrastructure, Workforce, and Data Systems Grant; the Coronavirus State and Local Fiscal Recovery Funds program authorized through the American Rescue Plan Act; CDC's Public Health Preparedness cooperative agreement; and others described in Appendix C.2.

Several STLT public health agencies said federal funding was critical to their ability to quickly hire and build their public health workforce. Interviewees who work closely with STLT public health agencies noted that funding was most helpful for STLT public health agencies when it was flexible and distributed through larger funding opportunities (rather than across multiple small programs).

Although federal funding was critical to STLT public health agencies' response efforts, agencies described challenges with the lack of flexibility and short-term nature of some funding opportunities. One STLT public health agency interviewee noted that the "urgency with which the money was provided" made it difficult to use funds in the allotted time. Several other interviewees questioned the long-term impact of funds and what their jurisdiction would do after the federal funding ended. STLT public health agencies also noted that categorical federal funding makes it difficult to pivot when new needs arise during an emergency. One STLT public health agency was unable to use staff hired under the emergency order to conduct other disease investigations even though they experienced a hepatitis outbreak among people experiencing homelessness in their community. Federal funds also have more laborious reporting requirements than other funding sources. For example, an STLT public health agency said that, when partnering with CBOs for immunization and testing activities, it chose to use "local dollars" instead of federal funds because many CBOs did not have the infrastructure to meet federal reporting requirements.

> *"It's going to take a longstanding investment. A five-year investment isn't going to cut it."*
>
> *– Interviewee from a public health organization*

Several interviewees said that requiring federal funding to go through or get approved by the state before becoming available to local health departments decreased its effectiveness. This process limited the amount of time local health departments had to use the funds. It also reduced the funds

available as states often "take a cut." This process also gave states the authority to determine where and how the funds should be spent. Not all the STLT public health agencies we interviewed faced this issue, however, because CDC expanded the number of jurisdictions that it funded directly during the COVID-19 pandemic. One interviewee from a larger local public health agency described benefitting from this change, noting that it helped the agency respond quickly rather than wait for funds to funnel through the state.

Funders were aware of these challenges and are actively exploring solutions. For example, the CDC Moving Forward Summary Report (CDC 2022a) details strategies to reduce the burden on STLT public health agencies receiving federal funding and make it easier for them to use funds. Examples include simplifying grant management systems for applicants and awardees and ensuring that funding opportunities allow flexibilities to respond to emerging public health issues at the national or local level. One interviewee suggested that it might be more effective for federal funders to provide funding through partners, such as the CDC Foundation and other nonprofits, that might provide more flexibility than direct contracts through federal agencies.

III.2.B. Workforce planning tools

Successes: The Council of State and Territorial Epidemiologists' epidemiology capacity assessment tool and the de Beaumont Foundation's workforce calculator were helpful for some STLT public health agencies.

Challenges: Few workforce planning tools are available, and there is limited awareness of existing tools among STLT public health agency staff.

A few organizations developed resources to support STLT public health agencies in workforce planning. The de Beaumont Foundation and partners developed a Public Health Workforce Calculator that allows state and local public health agencies to gauge how many staff they need for the foundational public health service areas. The calculator, however, is only intended for use by health departments that have populations smaller than 500,000 people and health departments in states with a decentralized governance structure, where local health departments hire staff (PHNCI n.d.). Another interviewee shared that the Center for Public Health Systems provides technical assistance to STLT public health agencies on topics such as how to conduct community health needs assessments.

STLT public health agencies that participated in interviews generally did not know of or use workforce planning tools before or during the pandemic. One STLT public health agency interviewee said that it did not have a specific workforce strategy at the beginning of the pandemic and its goal was simply to hire as many staff as possible. Ultimately, the STLT public health agency conducted a workforce analysis using the Council of State and Territorial Epidemiologists' epidemiology capacity assessment tool and developed an organization chart to define specific staff and teams' span of control. Another STLT public health agency interviewee said that although it did not use any tools to estimate workforce needs during the pandemic, it is now conducting a foundational capabilities gap analysis to identify its capabilities and gaps. Two other STLT public health agency interviewees shared that they would appreciate workforce planning tools to use in the future.

III.2.C. Workforce/administrative planning data

Successes: A few STLT public health agencies used creative approaches to track their workforce.

Challenges: Existing workforce data are fragmented. The high volume of volunteers and temporary staff made it challenging for STLT public health agencies to track the workforce during COVID-19

Most STLT public health agency interviewees described challenges tracking their workforce. For example, one STLT public health agency interviewee shared that it had "bits and pieces" of data. One staff member was responsible for maintaining a roster of all employees in spreadsheets, but the high volume of temporary positions and volunteers made it challenging. Another agency shared that, during the pandemic, the agency "didn't have time to think about [the] level of analysis" required for surge planning. One STLT public health agency said that although the agency does not have an accurate count of the number or FTEs of public health staff it employs across contracts, it is currently using CDC funding to clarify this information.

III.2.D. Other surge supports

Successes: Trainings for the surged workforce and peer-learning collaboratives (through federal agencies, public health organizations, and other groups) supported STLT public health agencies' ability to surge the workforce.

Challenges: The interviews identified no challenges.

Federal agencies and public health organizations provided STLT public health agencies with peer-learning and technical assistance opportunities related to surging the workforce and trainings for new and surged staff. A few interviewees said that STLT public health agencies frequently engaged in forums for sharing lessons learned during the COVID-19 pandemic, including the Big City Health Coalition's Workforce Commissioners Meeting, NACCHO convenings, and meetings with other STLT agencies organized by state public health associations. Some interviewees also described CDC's public health workforce development trainings, including trainings designed for onboarding new staff to public health roles and focused on topics such as emergency preparedness and health equity. One interviewee mentioned that several STLT and federal public health agencies use trainings available through CDC TRAIN, an online platform in which federal agencies and grantees have shared more than 1,000 trainings on various public health topics (CDC Train n.d.), to onboard new staff. CDC also provided additional supports for surge staffing and emergency response to STLT public health agencies that received PHEP cooperative agreement funding, including health department liaison officers who served as connectors between STLT public health agencies and CDC, technical assistance on emergency response planning, and access to learning communities. Although health department liaison officers were previously only in place during emergency response, key informants believed they were effective, so CDC will be hiring health department liaison officers permanently.

The literature highlighted the Importance of policy supports to allow flexibility in hiring. For example, the Federal Public Readiness and Emergency Preparedness Act expanded the vaccination workforce by

extending legal liability protections to pharmacists, dentists, midwives, and other health professionals. Nearly a dozen states enacted similar laws to expand providers' scope of practice to administer COVID-19 vaccines (Davis and Evans 2021).

III.3. Key takeaways from surging and supporting the public health workforce during the COVID-19 pandemic

Although each STLT public health agency used a different combination of strategies and supports to surge its public health workforce, interviews revealed some common successes. They also highlighted challenges and lessons learned related to hiring for specific roles, working with local public health agencies, and supporting equity in emergency response.

The most effective surge strategies allowed STLT public health agencies to bypass slow hiring processes in their agency to get immediate help from qualified staff and volunteers. These strategies (for example, using the CDC Foundation COVID-19 Corps, partnerships, and large volunteer programs such as the MRC) helped STLT public health agencies surge the workforce quickly, often at no cost, and filled gaps while STLT public health agencies were waiting for government approval of new positions or funding streams. STLT public health agencies also used fellowship and pipeline programs such as the Public Health Associate Program, the Epidemic Intelligence Service, and Public Health AmeriCorps on a smaller scale. If expanded, these programs have similar potential to surge the workforce during future emergencies and to build interest in public health careers among future generations.

It was harder to fill specialized public health and emergency management roles than roles that had fewer education and training requirements, but partnerships with universities, public health institutes, and the CDC Foundation offered effective solutions. Although programs such as the MRC and National Guard were generally effective at "getting boots on the ground" according to interviewees, these organizations did not always have the volunteers or staff STLT public health agencies needed to fill specialized positions such as epidemiologists, data analysts, or managers. Similarly, staffing agencies were generally viewed as helpful for recruiting contact tracers and staff to serve in temporary positions but were often less effective for recruiting and hiring people to fill roles that required higher levels of education and training. Universities and public health institutes, in contrast, were able to leverage deep expertise in public health, emergency management, nursing, or medicine to support STLT public health agencies during the COVID-19 pandemic. The CDC Foundation also recruited and hired for skilled positions in part by offering higher pay and benefits to attract talent.

Small and medium-sized local health departments tended to have fewer options for surging the workforce than states and large local public health agencies. Several interviewees from small and medium-sized local public health agencies voiced frustrations with a lack of support for local public health agencies, most notably regarding accessing federal funds and CDC Foundation COVID-19 Corps staff. Federal funds to support the COVID-19 pandemic response workforce were often channeled to states, territories, and large local public health agencies, and recipients were not always transparent about how the funds were subsequently allocated.

STLT public health agencies recognized a need for a workforce with an equity focus, cultural humility, and lived experience, and CBO partners often filled this need. Addressing the COVID-19 pandemic

required outreach and engagement with communities hardest hit by the pandemic, often those that were historically oppressed by government entities and mistrustful toward the government. Strategies that employed uniformed government personnel, such as National Guard members, were not always culturally responsive and could present challenges for reaching these populations. STLT public health agencies found that working with CBOs helped to fill gaps in the workforce, as CBOs often had lived experience and longstanding relationships in communities and could serve as trusted messengers. They could also play critical roles as thought partners with STLT public health agencies to ensure the COVID-19 pandemic response was equity focused.

Interviewees felt that strategies to surge the public health workforce during public health emergencies are important but should not replace investments in foundational public health staff and competencies. Most interviewees noted that surge strategies and supports played a critical role in public health agencies' ability to respond to the COVID-19 pandemic, but nearly all of these interviewees said that these strategies are not a replacement for long-term investments in STLT public health agencies. Tribal public health agencies also emphasized the historic underfunding of the Indian Health Service and lack of support for tribal public health in particular.

> *"Public health has been so woefully underfunded for such a long time and that became clear during COVID. And so, we had all this money thrown at us that we had to try to use and get out the door and hire new people on and a lot of that is coming to an end. My fear is that we're going to go back... to where we were pre-COVID…we won't have the infrastructure that we need to be able to respond."*
>
> *– STLT public health agency interviewee*

IV. Lessons Learned and Recommendations

The findings from this study offer valuable insights into surge strategies and supports used during the COVID-19 pandemic but have some important limitations. First, because the study was exploratory, we only conducted 27 key informant interviews. We attempted to identify key informants with diverse perspectives (see Appendix B), but the findings are not exhaustive and are not representative of all public health officials and experts. Both the literature search and key informant interviews included limited data from tribal public health organizations and territorial health departments. Further data collection is needed with these important groups to better understand their experiences surging the workforce during the COVID-19 pandemic. The key informant interview sample also consisted only of leaders from federal and STLT public health agencies and other organizations involved in surging the workforce; it did not include the perspectives of STLT public health workers in non-leadership roles who were reassigned or were hired to surge the workforce during the COVID-19 pandemic. These workers are likely to have insights into the successes and challenges of the surge strategies that were not captured in our data collection efforts. Additionally, interviews were limited to 60 minutes or less. As a result, we were not able to collect detailed data on all surge strategies and supports, such as the role that partnerships played in surging the workforce. Despite these limitations, the recurring themes that emerged during interviews offer a glimpse into successes of surging the workforce during the COVID-19 pandemic and illuminate areas for improvement. Below, we highlight these lessons learned and recommendations.

The STLT public health workforce was understaffed and underfunded leading up to the COVID-19 pandemic, and the pandemic exacerbated these challenges. The pandemic revealed that public health agencies lacked staff working in foundational public health areas, which include preparedness and response, as well as organizational supports such as human resources, finance and procurement, IT, and data management. Interviewees overwhelmingly noted that STLT public health agencies need ongoing funding and resources to hire and retain these critical staff so that they can prepare for and effectively surge the workforce during future public health emergencies.

The pandemic also revealed that most STLT public health agencies did not have a strategy in place for surging the workforce. Inefficient government hiring systems that require multiple levels of approval and extended timelines made it difficult for STLT public health agencies to hire staff quickly. Agencies relied on reassigning their staff for months on end (and, often, in roles that were not aligned with their skill set) until they were able to get contracts and other agreements in place to onboard workers and volunteers. This contributed to burnout and job dissatisfaction for employees and further decreased STLT public health agencies' capacity to provide foundational public health services. Interviewees highlighted the importance of having an emergency response plan in place at STLT public health agencies, including having agreements with staffing agencies, public health institutes, and other organizations to surge the workforce. Interviewees noted that additional resources, such as surge planning playbooks, could help agencies make emergency preparedness plans. They also suggested that cross-training staff in emergency preparedness—as well as instituting federal requirements for agency staff to be trained in emergency response as part of funding opportunities such as CDC's PHEP cooperative agreement—would further promote emergency readiness.

Coordinated national efforts to surge the workforce are essential to support STLT public health agencies' response to future public health emergencies. STLT public health agencies relied on staff and volunteers from national organizations such as CDC Foundation's COVID-19 Corps and MRC to fill key roles during the COVID-19 pandemic, and interviewees suggested that these programs receive investments to support their expansion and ensure they can be activated quickly for future public health emergencies. A few interviewees noted that STLT public health agencies and organizations directly involved in the COVID-19 pandemic workforce surge should consider maintaining relationships with staff and volunteers who were deployed during the pandemic to support future emergency response efforts.

Many STLT public health agencies leveraged partnerships with CBOs, universities, public health institutes, health systems, and other organizations during the COVID-19 pandemic, presenting promising opportunities for future collaboration. Agencies said these partnerships helped them deliver essential public health services, promote health equity, and train staff and volunteers. STLT public health agencies should consider options for maintaining and expanding these partnerships as they build their foundational capabilities and prepare for future pandemics, and federal agencies should continue to seek opportunities to provide funding and technical assistance to STLT public health agencies in this area. Given the frustration that interviewees expressed about funding flowing to hospitals without recognition of local health departments, future research could explore and share best practices for funding and establishing hospital-public health partnerships, as well as the challenges, successes, and promising strategies for building partnerships between STLT health agencies and other entities to surge the workforce.

STLT public health agencies need flexible ongoing funding so they can fill vacancies and provide foundational public health services, better positioning them to respond to future pandemics.

> *"The biggest challenge and frustration with respect to [federal funding] for public health is, we wait until the emergency is upon us to start throwing money at it. And then, we're scrambling to try to figure out how do we implement these dollars as effectively and efficiently as we can, rather than investing in a system that has the ability to expand and adjust and reassign staff."*
>
> - Interviewee

Interviewees emphasized that funding for the public health workforce must be flexible to enable STLT public health agencies to hire staff and invest in priority areas. Flexibility is also critical so staff can pivot to address emerging public health issues. Interviewees appreciated the flexibility of CDC's Workforce and Infrastructure grant, but they noted the importance of sustainable long-term funding and highlighted fundamental flaws in the current approach to public health funding, which relies on short-term grants and cooperative agreements for specific projects. Specifically, STLT interviewees said that they hire staff for specific grants or cooperative agreements, but, when the funding ends, they need to find new funding streams to retain staff or else let staff go, which is inefficient and deters staff from pursuing long-term careers. Another interviewee said that awarding large sums of time-limited funding to STLT public health agencies at the start of the COVID-19 pandemic was not ideal because agencies did not have time to strategize on the best way to use the funds and were left in a position to spend as quickly as they could. Distributing

funding over a longer period of time would have allowed agencies to make sustainable staffing changes. Another interviewee suggested that increases in public health funding should not just fall on the federal government but should instead be shared with states (for example, by establishing federal matching programs like they do for other government programs).

Agencies and organizations that provide funding or staffing resources should consider ways to directly fund and engage local public health agencies. Nearly all the local public health agencies in the study said that direct federal funding for local public health would be helpful. It might not be feasible for the federal government to manage grants to such a large number of funding recipients, but it could explore options for expanding direct funding opportunities to more jurisdictions, providing direct communication or CDC liaisons to local jurisdictions, or encouraging states to increase transparency about how federal public health funding is distributed. Similarly, medium and small local public health agencies, which were on average the most understaffed leading up to the pandemic, described feeling left out of opportunities such as CDC Foundation staff placements. Organizations that supported the workforce surge could consider options for expanding their reach to more medium- and small-sized local public health agencies in the future.

Looking ahead, the public health field needs to consider ways to attract and retain skilled and diverse talent to support foundational public health services including emergency preparedness and response. With more than half of the STLT public health workforce expected to retire or quit by 2025 if current trends continue (Leider et al. 2023), interviewees said that it is critical to consider new ways to recruit people with important skill sets (such as skills in public health data and informatics) and retain talent. Interviewees noted that higher salaries, reimbursement for continued education, and loan repayments are helpful for retaining staff but difficult to provide because most public health funding is categorical and short-term (which keeps many staff roles tied to specific grants) and there are multiple layers of government involved in approving staff salary. Many interviewees highlighted the importance of pipeline programs such as the Public Health Associate Program and Public Health AmeriCorps and suggested expanding these programs so they can "build the bench" for the STLT public health workforce and infuse public health agencies with new staff on an ongoing basis. Interviewees also described the importance of opportunities for advancement, increased diversity in the workplace, and support for mental health as factors that affect retention.

> *"A lot of these issues within public health infrastructure [low pay, difficulty competing with private sector] are larger government problems. Most public health departments don't have the authority to change how much they pay people. But I think it's indicative of a larger institutional problem in this country. And that's the work that needs to be done."*
>
> *– Interviewee*

Interviewees highlighted areas for future research and resource development. Regular national data on the public health workforce is lacking, so many interviewees suggested using funding to enumerate and understand workforce needs on a frequent (for example, annual) basis. One interviewee said that establishing standard occupation codes for public health workers would also support enumeration.

Interviewees also requested guidance for succession planning and workforce planning tools, standardized job descriptions or specifications that could be adapted by STLT public health agencies to recruit staff, and federal guidelines for public health staffing to guide hiring. They also said that more exploration of how centralized, decentralized, or hybrid state public health governance structure influences state and local agencies' ability to surge the workforce would help in planning and preparing for future pandemics, as state governance structure might affect the types of resources, strategies, and supports available to local agencies.

Recommendations for federal policy, STLT public health agencies, and their partners

Experiences surging the governmental public health workforce during the COVID-19 pandemic highlighted successful strategies and important lessons for future pandemics. It will be critical to explore how to sustain and reactivate these strategies through funding, ongoing partnerships, and coordinated emergency planning at the STLT and national level. It is also important to consider ways to build the baseline governmental public health workforce through pathways into public health (including pipeline programs) and sustained funding, so that STLT public health agencies have the capacity needed to quickly respond and surge the workforce during emergencies. Based on study findings, we identified the following recommendations for federal agencies, STLT public health agencies, and other public health organizations.

For federal policy

- **Work towards sustainability and plan for future needs of national programs** such as the Medical Reserve Corps and contractual support for initiatives such as the CDC Foundation's COVID-19 Corps
- **Consider mechanisms such as funding, technical assistance, and peer learning opportunities to enable public health institutes to effectively provide surge support** to STLT public health agencies during emergencies
- **Consider options to support the expansion of pipeline programs,** such as the Public Health Associate Program, Career Epidemiology Field Officer program, Preparedness Field Assignee program, and Public Health AmeriCorps, to "build the bench" for the STLT public health workforce
- **Explore options for providing funding to STLT public health agencies (during public health emergencies and at baseline) that maximize:**
  - **Flexible funding opportunities** instead of categorical funding with stringent rules
  - **Sustained levels of funding** to move away from the current cycles of federal funding that make it hard to retain staff
  - **Fewer and larger funding opportunities** instead of splitting funds across programs, which can be difficult to manage
  - **Directly funding** a larger number of local public health agencies
- **Consider ways to encourage state spending on public health** (for example, matching programs)
- **Support improvements in STLT governmental hiring practices** through promulgation of best practices and provision of technical assistance to states
- **Support efforts to improve recruitment and retention of STLT public health staff** through policies such as federal student loan repayment

For STLT public health agencies

- **Establish mechanisms to surge the workforce** as part of ongoing emergency preparedness and response planning
- **Continue leveraging partnerships with CBOs, universities, and health systems** to help prepare for future pandemics, support ongoing efforts to promote health equity, and expose students to the public health field
- **Strengthen partnerships with public health institutes,** which provided critical staffing, planning, and training support to STLT public health agencies
- **Share best practices for recruiting and retaining public health staff,** including strategies for promoting long-term career growth and working with other governmental agencies to improve pay and benefits for the public health workforce

For organizations partnering with public health agencies

- **Continue to study the effectiveness of surge strategies** and consider options for improving or scaling up efforts for future pandemics
- **Develop resources** to support emergency preparedness and planning for future pandemics, such as surge planning playbooks and workforce planning tools
- **Seek opportunities to directly engage local public health agencies** in surge staffing strategies
- **Pursue additional research** enumerating the national public health workforce on a frequent basis

CBOs = community-based organizations; STLT = state, tribal, local, and territorial

References

Administration for Strategic Preparedness and Response. "The Medical Reserve Corps." n.d. https://aspr.hhs.gov/MRC/Pages/index.aspx. Accessed August 12, 2023.

Administration for Strategic Preparedness and Response. "ASPR Awards $50 Million from the American Rescue Plan to Strengthen the Medical Reserve Corps." June 8, 2023. https://aspr.hhs.gov/newsroom/Pages/MRC-STTRONG-June2023.aspx. Accessed July 28, 2023.

Aggarwal, M., K.M. Kokorelias, R.H. Glazier, A. Katz, J.E. Shiers-Hanley, and R.E.G. Upshur. "What is the Role of Primary Care in the COVID-19 Vaccine Roll-Out and the Barriers and Facilitators to an Equitable Vaccine Roll-Out? A Rapid Scoping Review of Nine Jurisdictions." *BMJ Open*, vol. 13, no. 4, 2023.

Alfonso, Y. Natalia, Jonathon P. Leider, Beth Resnick, J. Mac McCullough, and David Bishai. "US Public Health Neglected: Flat or Declining Spending Left States Ill Equipped to Respond to COVID-19." *Health Affairs*, vol. 40, no. 4, 2021, pp. 664–671.

AmeriCorps. "2023 Public Health AmeriCorps." n.d. https://americorps.gov/funded-grants/public-health-americorps. Accessed July 28, 2023.

AmeriCorps. "White House Announces $400 Million for Public Health AmeriCorps." May 13, 2021. https://americorps.gov/newsroom/press-release/white-house-announces-400-million-public-health-americorps. Accessed July 28, 2023.

Association of State and Territorial Health Officials (ASTHO). "ASTHO Profile of State and Territorial Public Health: Profile Dashboard Technical Notes." n.d. https://www.astho.org/globalassets/pdf/profile/astho-dashboard-technical-notes.pdf.

Baker, Mike, and Danielle Ivory. "Why Public Health Is in Crisis: Threats, Departures, New Laws." *New York Times,* October 20, 2021. https://www.nytimes.com/2021/10/18/us/coronavirus-public-health.html.

Bogaert, K., G. Papillon, K. Wyche Etheridge, M. Plescia, M. Gambatese, J.L. Pearsol, and A. Mason. "Seven Years, 3 Surveys, a Changed World: The State Public Health Workforce 2014-2021" *Journal of Public Health Management and Practice*, vol. 29, suppl. 1, 2023, pp. S14–s21.

Buchdahl, H. "Living History: How an Emergency COVID-19 Workforce Was Born." CDC Foundation blog, n.d. https://www.cdcfoundation.org/stories/living-and-making-history-covid-19-pandemic-surge-staff. Accessed April 6, 2023.

Centers for Disease Control and Prevention (CDC). "Preparedness Field Assignee Program." n.d. https://www.cdc.gov/orr/readiness/fieldstaff_services/pfa/docs/PFA-Fact-Sheet_Updated-3-2023.pdf. Accessed July 28, 2023.

CDC. “Expanding COVID-19 Vaccine Distribution to Primary Care Providers to Address Disparities in Immunization.” 2021. https://www.cdc.gov/vaccines/covid-19/downloads/Guide-for-Jurisdictions-on-PCP-COVID-19-Vaccination.pdf. Accessed August 10, 2023.

CDC. “CDC Moving Forward Summary Report.” 2022a. https://www.cdc.gov/about/organization/cdc-moving-forward-summary-report.html. Accessed August 10, 2023.

CDC. “ELC Funding Overview.” 2022b. https://www.cdc.gov/elc/funding/index.html. Accessed July 28, 2023.

CDC. “Tribes and Indian Organizations.” https://www.cdc.gov/tribal/tribes-organizations-health/tribal_groups.html. 2023a. Accessed July 30, 2023.

CDC. “Public Health Infrastructure Grant.” 2023b. https://www.cdc.gov/infrastructure/phig/program-overview.html. Access July 24, 2023.

CDC. “Where do Associates Work?” 2023c. https://www.cdc.gov/phap/meet_associates/assignments.html. Accessed August 31, 2023.

CDC. “Epidemic Intelligence Service, Annual Update.” 2023d. https://www.cdc.gov/eis/about/annual-update.html. Accessed August 31, 2023.

CDC. “Preparedness Field Assignee Program.” 2023e. https://www.cdc.gov/orr/readiness/fieldstaff_services/pfa/index.htm. Accessed July 28, 2023.

CDC. “Emergency Preparedness Field Staff.” 2023f. https://www.cdc.gov/orr/readiness/fieldstaff_services/index.htm. Accessed July 28, 2023.

CDC. “Public Health AmeriCorps.” 2023g. https://www.cdc.gov/workforce/resources/americorps.html. Accessed July 28, 2023.

CDC. “Partnering for Vaccine Equity: Partner Network Interactive Map.” 2023h. https://www.cdc.gov/vaccines/health-equity/interactive-partner-network-map.html. Accessed August 8, 2023.

CDC. “Grant Overview.” 2023i. https://www.cdc.gov/infrastructure/phig/program-overview.html. Accessed July 28, 2023.

CDC. “Public Health Emergency Preparedness Program and Guidance.” 2023j. https://www.cdc.gov/orr/readiness/phep/index.htm. Accessed July 28, 2023.

CDC Foundation. “CDC Foundation Sets Up Surge Staff for Success.” n.d. https://www.cdcfoundation.org/stories/cdc-foundation-sets-surge-staff-success. July 28, 2023.

CDC Train. “Welcome to CDC Train.” n.d. https://www.train.org/cdctrain/welcome. Accessed July 28, 2023.

Congressional Research Services. “American Rescue Plan Act of 2021 (P.L. 117-2): Public Health, Medical Supply Chain, Health Services, and Related Provisions.” July 2021. https://crsreports.congress.gov/product/pdf/R/R46834. Accessed July 24, 2023.

Davis, M., and A. Evans. “Who are the Vaccinators? A Look at the Vaccination Workforce.” Association of State and Territorial Health Officials blog, April 21, 2021. https://www.astho.org/communications/blog/a-look-at-the-vaccination-workforce/.

de Beaumont Foundation. “Staffing Up: Workforce Levels Needed to Provide Basic Public Health Services for All Americans.” 2021a. https://debeaumont.org/wp-content/uploads/2021/10/Staffing-Up-FINAL.pdf. Accessed April 6, 2023.

de Beaumont Foundation and Association of State and Territorial Health Officials. “Public Health Workforce Interest and Needs Survey, 2021 Summary Report: National Governmental Public Health Workforce.” 2021b. https://debeaumont.org/wp-content/uploads/2022/11/National_2021_PH-WINS_Summary_Report.pdf. Accessed April 6, 2023.

de Beaumont Foundation. ”What is PH-WINS?” n.d. https://debeaumont.org/phwins/what-is-phwins/. Accessed July 23, 2023.

U.S. Department of Treasury. “Coronavirus State and Local Fiscal Recovery Funds.” n.d. https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/state-and-local-fiscal-recovery-funds. Accessed July 28, 2023.

U.S. Department of Treasury. “Coronavirus State and Local Fiscal Recovery Funds.” April 2022. https://home.treasury.gov/system/files/136/21.027-SLFRF-2022-Compliance-Supplement.pdf. Accessed August 9, 2023.

Dirlikov, E., E. Fechter-Leggett, S.L. Thorne, C.M. Worrell, J.C. Smith-Grant, J. Chang, A.M. Oster, et al. “CDC COVID-19 State, Tribal, Local, and Territorial Response Team. CDC Deployments to State, Tribal, Local, and Territorial Health Departments for COVID-19 Emergency Public Health Response—- United States, January 21-July 25, 2020.” Morbidity and Mortality Weekly Report, vol. 69, no. 39, October 2020.

FEMA. “Transition of National Guard Activations for COVID-19 Response Activities.” n.d. https://www.fema.gov/fact-sheet/transition-national-guard-activations-covid-19-response-activities. Accessed August 9, 2023.

Gebbie, G., J. Merrill, and H. Tilson. “The Public Health Workforce.” *Health Affairs*, vol. 21, no. 6, 2002.

U.S. General Services Administration. “GSA Multiple Award Schedule.” 2022. https://www.gsa.gov/buy-through-us/purchasing-programs/gsa-multiple-award-schedule. Accessed July 28, 2023.

Hare Bork, R., M. Robins, K. Schaffer, J.P. Leider, and B.C. Castrucci. "Workplace Perceptions and Experiences Related to COVID-19 Response Efforts Among Public Health Workers—Public Health Workforce Interests and Needs Survey, United States, September 2021-January 2022” *Morbidity and Mortality Weekly Report*, vol. 71, no. 29, 2022, pp. 920–924.

Juliano, C., K. Schaffer, and M. Gambatese. "Recovery and Resiliency in 29 Big Cities: Results From the 2021 Public Health Workforce Interests and Needs Survey." *Journal of Public Health Management and Practice*, vol. 29, suppl. 1, 2023, pp. s22–s34.

Kocsis, S.W., A.R. Rosler, J. Marshall, and A. Totten. "Learning From COVID-19: Reimagining Public-Private Partnerships in Public Health." Miliken Institute Center for Public Health, 2022. https://milkeninstitute.org/sites/default/files/2022-02/Learning%20from%20COVID%20v2.8.22-2.pdf.

Kumar, P., K. Lurie, and R. Parthasarathy. "Building the US Public-Health Workforce of the Future." February 2022. https://www.mckinsey.com/industries/public-and-social-sector/our-insights/building-the-us-public-health-workforce-of-the-future. Accessed April 6, 2023.

Leider, J.P., F. Coronado, K. Bogaert, and K. Sellers. "A Multilevel Workforce Study on Drivers of Turnover and Training Needs in State Health Departments: Do Leadership and Staff Agree" *Journal of Public Health Management and Practice*, vol. 27, no. 1, 2021, pp. 30–37.

Leider, J.P., J.M. McCullough, S.R. Singh, A. Sieger, M. Robins, J.S. Fisher, P. Kuehnert, and B.C. Castrucci. "Staffing Up and Sustaining the Public Health Workforce" *Journal of Public Health Management and Practice*, vol. 29, no. 3, 2022, e100–e107.

Leider, J.P., V.A. Yeager, C. Kirkland, H. Krasna, R. Hare Bork, and B. Resnick. "The State of the US Public Health Workforce: Ongoing Challenges and Future Directions" *Annual Review of Public Health*, vol. 44, 2023, pp. 323–341.

Lorvick, J., J. Hemberg, and M. Comfort. "Promoting COVID-19 Vaccination Equity." Harvard Medical School Primary Care Review, March 18, 2021. https://info.primarycare.hms.harvard.edu/review/promoting-covid-19-vaccination-equity.

McCullough, J.M., and M. Robins. "The Opportunity Cost of COVID for Public Health Practice: COVID-19 Pandemic Response Work and Lost Foundational Areas of Public Health Work." *Journal of Public Health Management and Practice*, vol. 29, no. 1, February 2023.

Medical Reserve Corps. "A Network Created for this Moment: How the Medical Reserve Corps Has Met the Challenges of the COVID-19 Pandemic." Assistant Secretary for Preparedness and Response, Department of Health and Human Services, 2021. https://www.phe.gov/mrc/Documents/MRC-COVID19-Report-12Apr2021-508.pdf.

Merrill, Jacqueline, R. Btoush, M. Gupta, K. Gebbie. "A history of public health workforce enumeration." *Journal of Public Health Management and Practice*, vol. 9, no. 6, 2003.

Michaels, I., S. Pirani, M. Fleming, M.M. Arana, E. D'Angelo, C. Dyer-Drobnack, M. DiManno, S. Ravenhall, and C.T. Gloria. "Enumeration of the Public Health Workforce in New York State: Workforce Changes in the Wake of COVID-19." *International Journal of Environmental Research and Public Health,* vol. 19, no. 20, 2022.

National Association of County and City Health Officials (NACCHO). "2019 National Profile of Local Health Departments." 2020. https://www.naccho.org/uploads/downloadable-resources/Programs/Public-Health-Infrastructure/NACCHO_2019_Profile_final.pdf. Accessed April 6, 2023.

NACCHO. "Medical Reserve Corps 2020 Operational Readiness Awards Final Report." August 2021. https://www.naccho.org/uploads/header-images/public-health-preparedness/2020-ORA-Final-Report.pdf. Accessed July 28, 2023.

NACCHO. "2020 Forces of Change: The COVID-19 Edition." 2022. https://www.naccho.org/uploads/downloadable-resources/2020-Forces-of-Change-The-COVID-19-Edition.pdf. Accessed April 6, 2023.

National Network of Public Health Institutes (NNPHI). "Network Engagement." 2023. https://nnphi.org/network-engagement/. Accessed July 28, 2023.

Oregon Health Authority. "COVID-19 Funding for Community-Based Organizations." n.d. https://www. https://www.oregon.gov/oha/PH/ABOUT/Pages/Community-Engagement.aspx. Accessed September 20, 2023.

Perling, T. "Workforce/Vaccine Initiative Bolsters Health Departments Across the Nation in COVID-19 Response." CDC Foundation blog, October 14, 2022. https://www.cdcfoundation.org/blog/workforcevaccine-initiative-bolsters-health-departments-across-nation-covid-19-response.

PHNCI. "How to Use the Public Health Workforce Calculator." n.d. https://phnci.org/transformation/workforce-calculator. Accessed July 30, 2023

Pogreba Brown, K., E. Austhof, A.M. Rosa Hernández, Caitlyn McFadden, Kylie Boyd, Jayati Sharma, Sarah Battaglia, Alexandra Shilen, and Kelly M. Heslin. "Training and Incorporating Students in SARS-CoV-2 Case Investigations and Contact Tracing." *Public Health Reports*, vol. 136, no. 2, 2021.

U.S. Public Health Service. "Who we are." n.d. https://www.usphs.gov/. Accessed September 19, 2023.

Sellers, K., J.P. Leider, E. Gould, B.C. Castrucci, A. Beck, K. Bogaert, F. Coronado, et al. "The State of the US Governmental Public Health Workforce, 2014-2017." *American Journal of Public Health,* vol. 109, no. 5, 2019.

Sumaya, Ciro. "Enumeration and Composition of the Public Health Workforce: Challenges and Strategies." *American Journal of Public Health*, vol. 102, no. 2012, pp. 469–474.

Tolchinsky, A. "CDC Foundation Advances Overdose Response Strategy with Nationwide Support." CDC Foundation blog, July 13, 2022. https://www.cdcfoundation.org/pr/2022/overdose-response-strategy-nationwide-support.

Toney, D., M. Pentella, E. Blank, and S. Becker. “Creating a Blueprint for the Future: Lessons Learned from Public Health Laboratories in the COVID-19 Response.” *Journal of Public Health Management and Practice*, vol. 27, suppl. 1, 2021, s101–s105.

University of Illinois Chicago. “Community-Based Organizations Selected to Create Contact Tracing Corps.” School of Public Health, September 14, 2020. https://publichealth.uic.edu/news-stories/community-based-organizations-selected-to-create-contact-tracing-corps/.

Weber, L. “Thousands of Experts Hired to Aid Public Health Departments Are Losing Their Jobs.” Frontline blog, November 2022. https://www.bigcitieshealth.org/public-health-jobs-disappearing/.

Woodard, L., W. Liaw, O.E. Adepoju, S. Prabhu, M. Chae, O. Matuk-Villazon, and B.M. Beech. “Evaluating a Contact Tracing Course: How Universities Can Develop the Public Health Workforce.” *Journal of American College Health*, 2022.

Yeager, V.A., E.R. Madsen, and K. Schaffer. “Qualitative Insights from Governmental Public Health Employees About Experiences Serving During the COVID-19 Pandemic, PH WINS 2021.” *Journal of Public Health Management and Practice*, vol. 29, suppl. 1, 2023, pp. s73–s86.

Appendix A. Research Questions

This study addressed the following research questions:

1. What was the baseline status (numbers, roles, competencies) of the STLT public health workforce before the pandemic? What were the gaps?
2. What was the status of the public health workforce during the peak of the pandemic? How many new staff were engaged, and of what type? To what extent were staff reassigned from their existing roles to roles within the COVID-19 response (either part or full-time)?
3. What strategies or mechanisms were used by STLT public heatlh agencies to surge the public health workforce?
    a. Which were most effective and efficient?
    b. What barriers to hiring did these mechanisms help overcome, and how?
    c. Which strategies were most suitable for specific types of staff?
    d. Why were certain mechanisms more effective in certain jurisdictions?
    e. Were there any pipeline strategies already in place that were able to deliver new staff? Were there any pipeline strategies newly put into place during the COVID-19 response that were able to deliver new staff?
4. Were any forecasting or workforce models or surge planning handbooks used and how were they helpful, if at all? What data were used to inform hiring decisions? How did the lack of robust data hinder effective hiring?
5. What are the lessons learned from staffing during the COVID-19 pandemic that will inform (1) federal and state or local strategies for effective use of current investments in the public health workforce and (2) planning for workforce surge for future pandemics? Specifically, what resources (such as toolkits, planning guides, and models), programs, and partnerships can the U.S. government provide that will support state and local preparedness for a future pandemic and staffing surges during a pandemic?

Appendix B. Methods

The study included a targeted literature review and 27 semistructured interviews. Here, we describe our study methods.

Literature review

We conducted a targeted literature review in March and April 2023. The primary goal of the literature review was to address the research questions related to the status of the public health workforce before and during the COVID-19 pandemic (RQs 1 and 2), but we also reviewed literature about surge strategies to inform key informant interview data collection (described below).

We identified peer-reviewed and gray literature for the environmental scan by searching PubMed, public health agencies' websites, and Google. We used the following approaches to identify relevant literature, which we organized in EndNote:

1. **Searched PubMed for peer-reviewed journal articles:** We conducted a PubMed search using the following search terms:

   ((public health[ti] OR health depart[ti]) OR "public health"[ti:~2] OR "health department"[ti:~3]) AND (job[ti] OR jobs[ti] OR worker*[ti] OR workforce[ti] OR working[ti] OR work[ti] OR employ*[ti] OR staff[ti] OR staffing[ti] OR contract*[ti] OR career*[ti] OR professional*[ti] OR graduat*[ti] OR personnel[ti] OR labor*[ti]))*

   We identified these search terms by reviewing a subset of relevant literature. We restricted the PubMed search to articles published from 2020 to 2023 to focus on findings during the COVID-19 pandemic. We further reviewed abstracts returned in this search and excluded articles that met the following criteria:

   - Focused on countries other than the United States
   - Did not describe workforce issues (for example, articles with "employees" in the title that discussed a cohort of employees' experiences with vaccination)
   - Did not focus on building the public health workforce (for example, we included articles that focused on internships, graduate, and pipeline programs, workforce forecasting, and surging the workforce, but we did not include articles focused solely on trainings provided to public health professionals)
   - Focused on burnout or the mental health of the public health workforce during the COVID-19 pandemic in the absence of quantitative data on rates of staff departure (though we included in our review articles that discussed reasons for departures in conjunction with quantitative data)
2. **Searched resource pages on websites of key public health agencies and organizations:** We conducted focused searches on the websites of key public health agencies to identify relevant publications and data quantifying the public health workforce before and during the COVID-19 pandemic. These included the following:
   - CDC's page

- The Association for State and Territorial Health Officials' homepage, using a search for "workforce"
- The National Association of City and County Health Officials' Workforce Development and Training page
- Tribal epidemiology center webpages for information on the tribal public health workforce
- The Health Resources and Services Administration's page
- The Public Health National Center for Innovations page
- The Public Health Foundation page, including information on the Council on Linkages between Public Health and Academia
- The Big Cities Health Coalition page, including information on emergency preparedness and response
- The Administration for Strategic Preparedness and Response homepage, using a search for "workforce"
- The National Network of Public Health Institutes, including the organization's resource directory
- The de Beaumont Foundation page, including the resources section
- The CDC Foundation page, using a search for "workforce"
- The Association of Schools and Programs of Public Health page, with a search for "workforce"

3. **Conducted additional Google searches:** We conducted broad searches in Google for "US public health workforce" and "US public health workforce 2020 – 2023" and skimmed for relevant gray literature that was not uncovered in previous searches. Although we used the inclusion and exclusion criteria above to inform which articles we selected, we did not systematically apply these criteria to each article returned in the search.

Initial PubMed searches for peer-reviewed literature returned 768 articles. After applying exclusion criteria, we identified 52 articles to include in the full-text review. Our searches for gray literature on Google and relevant public health agency websites yielded 61 publications.

In total, we closely reviewed 113 pieces of peer-reviewed and gray literature. We extracted information from the literature related to the public health workforce during the peak of the COVID-19 pandemic as well as the strategies or mechanisms used to surge the public health workforce during the pandemic. We also identified gaps in the information that we used to develop interview guides for the key informant interviews. Key findings from the literature review are available in Section II, although we cite relevant sources throughout the white paper.

Key informant interviews

To address the research questions about surge strategies (RQ3), workforce planning tools (RQ4), and recommendations for future pandemics (RQ5), we conducted 27 semistructured interviews with key informants (KIs) from May 15, 2023, to June 30, 2023. We received expedited approval from HML Institutional Review Board on May 8, 2023.

To select key informants for the interviews, Mathematica collaborated with ASPE, who also reached out to stakeholder organizations. We identified 27 potential KIs and 15 alternates. We categorized KIs into three groups: (1) STLT public health officials (9 interviews), (2) leaders from federal agencies and organizations that were directly involved in surge staffing (10 interviews), and (3) public health workforce experts from organizations that were indirectly involved in surge staffing (8 interviews). The 9 interviews with STLT public health officials included a small but varied sample. The KIs represented public health agencies from 8 of the 10 Health and Human Services geographic regions and included all four levels of public health agency (state, tribal, local, and territorial). The sub-set of KIs from local public health agencies included officials representing small jurisdictions (serving fewer than 50,000 people), medium-sized jurisdictions (serving 50,000 to 500,000 people) and large jurisdiction (serving more than 500,000 people), as well as a mix of urban and rural jurisdictions. Across the 27 interviews, all KIs were in leadership positions. Tenure ranged from less than one year to more than 10 years.

Beginning in mid-May 2023, Mathematica reached out to potential KIs by email and phone using approved templates and scripts. For each potential KI, we attempted three emails and up to two phone calls. Potential KIs from three organizations did not respond to our outreach efforts so we replaced them with alternates in the same categories. We used warm hand-offs from colleagues at ASPE and internal Mathematica colleagues to facilitate completion of the interviews. In addition, we offered flexible scheduling and offered to reduce the length of interviews from 60 to 30 minutes for potential KIs that voiced concerns about time constraints.

Four experienced Mathematica team members interviewed the KIs by phone using three unique interview guides tailored to the three categories of KIs. Interviewers used semistructured interviewing techniques to collect rich details from KIs, adapting the order of topics and questions, as needed. All interviewers completed a training on the interview guides and a refresher training on semistructured interviewing best practices before beginning the interviews.

Interviewers requested consent from KIs to audio record the interviews and then transcribed them. The team of four coded the transcripts in NVivo using a codebook that aligns with the research questions and surge strategies and supports (Exhibit B.1). The team summarized coded data segments in a matrix with one row per KI and one column per code. We reviewed the matrix vertically (to assess findings from individual KIs) and horizontally (to assess themes across KIs) to identify themes and key takeaways. Unless otherwise noted, the interview themes included in the white paper represent the viewpoint of at least three key informants. We used descriptors such as “a few” (three to five key informants), “most” (more than half of key informants), and “nearly all” (more than 90 percent of key informants) to describe the number of key informants that reported a given theme.

Exhibit B.1. Qualitative codebook for the KI interviews

Code	Description
1.1 Baseline status and gaps in workforce roles or competencies before the COVID-19 pandemic	Provides on overall description of the public health workforce before the COVID-19 pandemic and/or notes a specific workforce need or gap before the COVID-19 pandemic.
2.1 COVID-19 pandemic staff gained or departed	Provides an anecdotal or numerical description of the number and types of staff or volunteers that were hired or that departed during the COVID-19 pandemic, and the timing of when staff were hired or departed.
2.2 COVID-19 pandemic gaps in workforce roles or competencies	Notes a specific workforce need or gap during the COVID-19 pandemic. Describes how workforce needs changed with COVID-19 or notes that the needs pre-pandemic were exacerbated during the COVID-19 pandemic.
2.3 Staff reassignment	Describes the number or types of staff that were re-assigned during the COVID pandemic and/or describes the implications of staff re-assignment.
2.4 Staff retention	Describes challenges or successes with retaining staff during the COVID-19 pandemic.
3.01 Third-party or staffing agency	Describes using a third party, such as a temp agency or staffing agency, to surge staff for temporary or contract positions. Excludes contract staff paid/recruited through CDC Foundation (code to CDC-F) or public health institutes (code to partnerships with other orgs).
3.02 Placement of fellows	Describes a strategy that places fellows directly in public health agencies, at no cost to the health department (for example, PHAP, EIS, CSTE fellows).
3.03 CDC Foundation	Describes the CDC Foundation's efforts to support surge staffing.
3.04 Medical Reserve Corps	Describes use of the Medical Reserve Corps to support the public health workforce.
3.05 Public Health AmeriCorps	Describes use of Public Health AmeriCorps to surge the public health workforce.
3.06 Partnerships with CBOs	Describes a strategy related to partnerships with CBO to surge the workforce.
3.07 Partnerships with universities	Describes a strategy related to partnerships with a university (including with faculty and/or students) to surge the workforce.
3.08 Partnerships with other organizations	Describes a strategy related to partnerships with a private sector or health care organization partner, public health institutes, or other partners.
3.09 Federal funding	Describes how federal funding was used and/or allocated to support surging the workforce.
3.10 National Guard	Describes a strategy related to working with the National Guard to surge the workforce.
3.11 Other strategy	Describes a strategy that does not fall into the above buckets.
3.12 General perceptions	Does not mention a specific workforce surge strategy but provides general thoughts on strategies overall, such as "each state used different strategies" or "no strategies were effective for hiring data staff."
3.13 Challenge with strategy	Describes a challenge developing or implementing a particular strategy. Describes why a particular strategy was ineffective for the participant's organization. Double-code with a strategy code (3.01 – 3.12).
3.14 Success with strategy	Describes factors that helped facilitate the success of a particular strategy. Describes why a strategy was effective for the participant's organization. Double-code with a strategy code (3.01 – 3.12)
4.1 Surge forecasting or planning models	Describes surge forecasting or planning models, gaps in available models, types of models that would have been useful to support surge planning, or any model currently in development to support planning for future pandemics.
4.2 Data for surge planning	Describes types of data to support surge planning.
5.1 Federal recommendations	Provides specific recommendations or lessons learned for federal agencies to better support the public health workforce surge in future pandemics. This could include supports, investments, changes to policy, or other suggestions/recommendations.

Code	Description
5.2 STLT recommendations	Provides specific recommendations for state, tribal, local, and territorial public health agencies to implement to support the public health workforce surge in future pandemics.
5.3 Other organization recommendations	Provides specific recommendations or lessons learned for other organizations to better support the public health workforce surge in future pandemics.
5.4 General or unspecified lessons learned	A respondent shares general recommendations or lessons learned for the field of public health to prepare for future pandemics.
5.5 Involvement in future workforce surge	Describes which agencies or partners should be involved in the workforce surge in future pandemics and how.

CBO = community-based organization; CSTE = Council of State and Territorial Epidemiologists; EIS = Epidemic Intelligence Service; PHAP = Public Health Associate Program

Appendix C. Summary Tables

Exhibit C.1. Summary of surge strategies and supports during the COVID-19 pandemic

Strategy	Successes	Challenges
The CDC Foundation's COVID-19 Corps	• Program was newly and quickly implemented during the COVID-19 pandemic • Quickly hired and placed highly qualified candidates at no cost to STLT public health agencies	• The CDC Foundation COVID-19 Corps staff were often paid higher salaries than STLT public health agency staff, creating tension • Primarily supported states, territories, tribes, and big city local health jurisdictions; smaller local public health agencies did not always get to benefit from this resource
Staff placements through fellowship programs	• Fellows filled key roles at no cost to STLT public health agencies	• STLT public health agencies often had difficulty retaining fellows in permanent positions
Deployment of CDC employees to STLT public health agencies	• Filled key roles in STLT public health agencies • CDC offered higher salaries than most STLTs could, leading to better success with recruitment	• Some jurisdictions have asked CDC to hire and deploy more staff than it is currently able to through these programs
Deployment of personnel to public health agencies from other federally funded programs	<u>Public Health AmeriCorps</u> • Promising approach to support STLT public health agencies' efforts to advance equitable health and encourage young people to pursue careers or degrees in public health • Funding for the second year of the program will support more than 4,000 members <u>MRC</u> • Local MRC volunteers don't need to travel and are known and trusted by the community • The national MRC network has systems in place to conduct background checks and train MRC volunteers <u>National Guard</u> • Particularly helpful for logistical roles, such as setting up tents at vaccination and testing sites	<u>Public Health AmeriCorps</u> • Implemented in 2021, so it was not available to support the STLT workforce surge at the outset of the COVID-19 pandemic <u>Medical Reserve Corps</u> • Volunteers might not always be licensed to practice in the state they are deployed <u>National Guard</u> • Deployed for undefined length of time • Mostly consists of younger staff who did not have public health experience and had difficulties performing public health–related activities • Uniformed personnel could be concerning for refugee communities or community members who are undocumented

Strategy	Successes	Challenges
Partnerships to surge staffing or deliver public health interventions	Partnerships with universities • Student volunteers filled multiple roles and brought new energy to the workforce Partnerships with CBOs • CBOs have trusted relationships in communities • Effective in reaching underserved communities and promoting health equity Partnerships with hospitals and health systems • Hospital-run COVID-19 testing and vaccination clinics were a critical resource in some communities Partnerships with public health institutes • Hired staff rapidly on behalf of STLT public health agencies • Had trusted relationships with communities • Helped train the surged workforce	Partnerships with universities • Regulations limited use of students in some settings (for example, nursing students were not authorized to administer vaccines) • Frequent turnover among student volunteers because of school schedules Partnerships with CBOs • No challenges identified in interviews Partnerships with hospitals and health systems • Some hospitals were too overburdened to be effective partners • Health systems received funding to respond to the COVID-19 pandemic, without clearly establishing opportunities for public health agencies to partner and provide support Partnerships with public health institutes • Less effective when public health institute staff were not integrated in supervisory and management roles in the STLT public health agency
Leveraging existing staff and hiring mechanisms	Reassignment • Provided immediate support for emerging needs such as contact tracing, case management, and so on Contracting with staffing agencies • Effective for quickly hiring large numbers of staff, such as contact tracers • Allows STLT public health agencies to budget at the contract level rather than for individuals	Reassignment • Contributed to burnout and staff departures • Funding restrictions can make it difficult to reassign some staff • Can leave other programs or initiatives (not directly related to the COVID-19 pandemic) understaffed • Reassigning staff to roles that use their skill set is difficult Contracting with staffing agencies • Establishing contracts with third-party agencies can be challenging and expensive • It is inefficient hiring and training contract staff who leave after their contract term ends
Federal funding	• Critically important for hiring staff to respond to the pandemic • Flexible funding opportunities (for example, CDC's Infrastructure grant) helped STLT agencies respond and hire staff as they saw fit	• Funding is provided in short intervals, making it hard to create and retain permanent long-term positions • Lack of flexibility in some funding opportunities makes it challenging to use money to meet the agency's most pressing needs • Small and medium-sized STLT public health agencies do not have direct access to most federal funding opportunities
Workforce planning tools	• The CSTE's epidemiology capacity assessment tool and the de Beaumont Foundation's workforce calculator were helpful for some STLT public health agencies	• STLT public health agencies noted a lack of useful workforce planning tools
Workforce/administrative planning data	• A few STLT public health agencies used creative approaches to track their workforce	• Existing workforce data are fragmented • The high volume of volunteers and temporary staff made it challenging to track the workforce

Strategy	Successes	Challenges
Other supports	• Trainings for the surged workforce and peer-learning collaboratives (through federal agencies, public health organizations, and other groups) supported STLT public health agencies' ability to surge the workforce	• The interviews identified no challenges

CBO = community-based organization; CDC = Centers for Disease Control and Prevention; MRC = Medical Reserve Corps; STLT = state, tribal, local, and territorial.

Exhibit C.2. Federal funding sources that STLT public health agencies commonly used during COVID-19

Federal funding source	Description	Funding recipients
CDC's Strengthening U.S. Public Health Infrastructure, Workforce, and Data Systems Grant[a]	• Expected to award $4.5 billion over five years to help U.S. health departments promote and protect health in their communities • The grant funding became available on June 23, 2022	107 jurisdictions (50 states, eight U.S. territories, and 48 large local public health agencies); three national partners that support the work
CDC's Public Health Emergency Preparedness cooperative agreement[b]	• Provided $650 million in funding for emergency response from July 1, 2023, to June 30, 2024 • Funds about 3,000 FTEs hired through STLT public health agencies	62 jurisdictions (50 states, four cities, and eight U.S. territories and freely associated states)
Coronavirus State and Local Fiscal Recovery Funds program (American Rescue Plan Act)[c, d]	• Authorized by the American Rescue Plan Act, provides $350 billion to STLT governments to support their response to and recovery from COVID-19 from March 2021 through December 2024	More than 30,000 recipient governments, including states, tribal governments, territories, and local governments
CDC's Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases Cooperative Agreement[e]	• Provides annual funding to prevent and respond to infectious disease outbreaks, bolster laboratory and epidemiologic capacity, maintain and enhance health information systems, and foster cross-cutting solutions to address public health needs • Awarded about $350 million for fiscal year 2022	64 state, large local, and U.S. territory and affiliate health departments.
American Rescue Plan Act funding for MRC,[f] administered through the MRC STRONG grant	• Provided $100 million to the MRC, of which MRC awarded $50 million to states and jurisdictions through the MRC STRONG grant • Grant funding first became available in March 2023	33 states and jurisdictions
The Operational Readiness Awards [g]	• The National Association of County and City Health Officials distributed 202 awards in 2020, totaling $1.1 million; 174 awards in 2021, totaling $1.56 million; and 120 awards in 2022, totaling $1.025 million • Intended to build the operational readiness capabilities of MRC volunteers and units to meet the emergency preparedness and response needs of their local, regional, or statewide stakeholders	202 MRC units in 2020; 174 MRC units in 2021; 120 MRC units in 2022

Notes: Large localities are cities serving a population of 400,000 or more and counties serving a population of 2,000,000 or more based on the 2020 U.S. Census.

CDC = Centers for Disease Control and Prevention; FTE = full-time equivalent; MRC = Medical Reserve Corps; STLT = state, tribal, local, and territorial; STRONG = State, Territory and Tribal Nations, Representative Organizations for Next Generation.

[a] CDC 2023i.
[b] CDC. 2023j.
[c] U.S. Department of Treasury n.d.
[d] U.S. Department of Treasury 2022.
[e] CDC. 2022b.
[f] Administration for Strategic Preparedness and Response 2023.
[g] NACCHO 2021.