



Integrating Primary Care and Public Health to Save Lives and Improve Practice During Public Health Crises: Lessons from COVID-19

December 2021



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

**Center for
Health Security**

Authors

Tener Goodwin Veenema, PhD, MPH, MS, RN, FAAN
Contributing Scholar, Johns Hopkins Center for Health Security

Eric Toner, MD
Senior Scholar, Johns Hopkins Center for Health Security

Richard Waldhorn, MD
Contributing Scholar, Johns Hopkins Center for Health Security

Amesh A. Adalja, MD
Senior Scholar, Johns Hopkins Center for Health Security

Amanda Kobokovich, MPH
Managing Senior Analyst, Johns Hopkins Center for Health Security

Elena Martin, MPH
Analyst, Johns Hopkins Center for Health Security

Anita Cicero, JD
Deputy Director, Johns Hopkins Center for Health Security

Acknowledgments

The authors gratefully acknowledge Co-Director Dr. Rebecca Etz and Deputy Director Sarah Rohrs Reves of the Larry A. Green Center for Advancing Primary Care for the Public Good for sharing their knowledge and for their help in surveying primary care practitioners on their experiences working with public health during the pandemic. We also gratefully acknowledge our reviewers Dr. Lloyd Michener, Ann Greiner, Wendy McWeeny, Raquel Mazon Jeffers, and Maddie Taylor. We would like to thank Julia Cizek, Kathleen Fox, and Margaret Miller for their design, editing, and publication support. This report was made possible through the generous support of the Morris-Singer Foundation.

Suggested Citation: Veenema TG, Waldhorn R, Toner E, Kobokovich A, Cicero A. *Integrating Primary Care and Public Health to Save Lives and Improve Practice During Public Health Crises: Lessons from COVID-19*. Baltimore, MD: Johns Hopkins Center for Health Security; 2021.

© 2021 The Johns Hopkins University. All rights reserved.

Contents

- Executive Summary iv
- Introduction.....1
- Methods3
 - Literature Review..... 3
 - Key Informant Interviews..... 3
- Findings5
 - Review of the Existing Literature 5
 - Thematic Analysis of Key Informant Interviews..... 11
- Discussion.....20
 - Our Findings Are Consistent with National Survey Data..... 20
 - Policy Changes Are Needed to Strengthen Collaboration and Improve Future Pandemic Response 23
- Recommendations.....29
 - Near-Term Recommendations 29
 - Longer-Term Recommendations 30
- References32
- Appendix A. Structured Search Strategy39
- Appendix B. Questions for Public Health Interviews41
- Appendix C. Questions for Primary Care/Community-Based Interviews43
- Appendix D. Research Activities44
- Appendix E. Key Informant Interviewees45

Executive Summary

As of September 2021, mortality in the United States due to the SARS-CoV-2 virus had exceeded the death toll from the 1918 influenza pandemic. COVID-19 was the ultimate test of healthcare and public health capacity and capability across the United States. From its acute onset and throughout its extended duration, the COVID-19 pandemic has overwhelmed hospitals, disrupted businesses, and caused lasting economic harm. It has also illuminated and exploited major vulnerabilities within the US healthcare and public health systems. The impact of the pandemic on hospitals, and to a lesser extent on public health departments, has been explored elsewhere, but relatively little has been written about the impact on primary care services. Operating largely in silos and chronically underfunded disciplines, primary care providers and public health practitioners in the United States have struggled to respond to the numerous waves of the pandemic, which have caused high levels of morbidity and mortality and jeopardized health systems in communities across the country, especially those that are most vulnerable. It is crucial that the lessons learned from the COVID-19 pandemic must be shared.

To explore the degree of collaboration that has occurred among primary care and public health providers during the pandemic to date, we used a mixed-method, rapid-cycle approach, which included a literature review and key informant interviews. We interviewed primary care providers at family medicine and general internal medicine practices in integrated health systems and federally qualified health centers, personnel at the National Association of Community Health Centers, and state and local public health officials across several states about COVID-19 activities and lessons learned.

The findings of this study demonstrate that the failure to bring primary care providers into a frontline role as responders, alongside public health, resulted in many missed opportunities to provide better quality care, faster testing, more effective contact tracing, greater acceptance of vaccination, and better communication with patients. Participants in this study further indicated that better integration of primary care, public health, and community-based organizations could have provided greater support for the public health response, thereby easing the burden on overstretched public health personnel; and could have accessed primary care's reach to amplify public health messaging. If these coordinated activities had been effectively implemented, they could have saved lives and reduced the health, economic, and societal impact of the pandemic in the United States.

This study reveals the extraordinary burden primary care and public health faced in meeting the demands created by a rapidly evolving severe pandemic, while simultaneously attempting to address the normal healthcare needs of existing patients and families. The level of preparedness to respond swiftly and effectively to the COVID-19 pandemic varied widely across public health and primary care organizations. In the key informant interviews, we found that the most productive collaborations during the COVID-19 response tended to be extensions of preexisting relationships

between public health and primary care personnel or “test and treat” and other disease management models. Workforce flexibility and adaptability and the expansion of telehealth services were also central themes in these interviews. Federally qualified health centers played a critical role and pivoted quickly and effectively to provide both primary care and public health interventions during the COVID-19 pandemic, particularly those that serve higher-risk populations.

The data and themes described in this report clearly indicate that the COVID-19 pandemic must be a catalyst for change. The landscape of primary care in the United States is rapidly evolving; many traditional practices are being acquired by integrated health systems and for-profit companies and other practices are abandoning traditional fee-for-service reimbursement models in favor of various forms of capitation or prepayment. In light of these changes, now may be an opportune time to encourage better alignment and collaboration with public health.

Recognizing that high-quality primary care is the foundation of a healthcare system and that a robust public health system is the bedrock for healthy communities, we conclude that action is needed to address the barriers that exist between primary care and public health and to correct misalignment across systems. A new transformative vision is needed where public health is central to the delivery of healthcare in the US and where local primary care, public health, and community networks are strengthened and expanded. While payment reform is critical, action will be required by primary care and public health leadership and policymakers to build and sustain a thriving, resilient, integrated primary care, public health, and community sectors capable of optimizing health outcomes during future pandemics and large-scale public health emergencies. We make the following key recommendations:

- **Colocate primary care and public health services** to benefit population-level health and facilitate active collaboration.
- **Primary care societies must align their efforts with public health in a unified voice** to drive congressional action in order to ensure that the disastrous response to the COVID-19 pandemic is not repeated.
- **Craft efforts to support, protect, and sustain the primary care and public health workforces** to drive integration across disciplines.
- Public health “moves at the speed of trust” and people trust their primary care providers and community-based organizations; therefore, primary care and public health collaborative partnerships with strong ties to their community organizations should **enhance health systems surge capacity, extend public health disease containment interventions, and position the United States for improved response to future pandemic.**

Introduction

The COVID-19 pandemic has revealed deep chasms within an already fragmented US healthcare system resulting in significant excess mortality and morbidity and an inability to contain a rapidly escalating pandemic. With more than 791,600 Americans dead as of December 8, 2021, COVID-19—driven by the Delta and Omicron variants—continues to spread in a fourth consecutive wave pummeling an overburdened and misaligned healthcare system.¹ People living in poverty with crowded living and working conditions, poor access to healthcare, and high rates of chronic health conditions have been particularly vulnerable.² Language barriers, mistrust of medical and civic authorities, and systemic racism exacerbate this vulnerability.

While a number of factors contributing to the country's vulnerabilities and collective underperformance during this pandemic have been noted, including the underresourced public health infrastructure, disparate social factors and inequities, and failures in national leadership, few have recognized that the chronic underfunding of primary care in the United States has significantly exacerbated our challenges and further handicapped the country from mitigating the impacts of the worst infectious disease outbreak in over a century.

COVID-19 has stressed fragmented and underperforming US healthcare and public health systems to the limits of their capacity. The United States already ranked the highest of well-resourced countries in infant mortality rates, highest in obesity, and ranked among the shortest life span.³ Allocating only 5% to 7% of its total spending on primary care, the United States lags well behind high-income countries that average 14% of total spending on primary care.⁴

In this report, we examine both primary care and public health. Family medicine, general internal medicine, and pediatric practices comprise the field of primary care. Primary care is provided in private offices, hospital-based outpatient clinics, urgent or convenient care centers, and federally qualified health centers (FQHCs). Primary care is the first point of contact for most people, representing the “front door” of the healthcare system. Public health is the broad network of federal, state, and local entities with legal responsibility and authority for protecting the health and wellbeing of population.⁵ Traditionally, public health focuses on the health of populations whereas primary care focuses on the health of individual patients ([Table 1](#)).⁶

Table 1. Differences Between Primary Care and Public Health⁶

Primary Care	Public Health
Individual patient focus	Population focus
Diagnosis and treatment emphasis	Prevention or response emphasis
Clinical sciences essential to professional training	Clinical sciences peripheral to professional training
Private sector basis	Public sector basis

This project sought to explore the intersection of public health and adult primary care practice during the COVID-19 pandemic. Pediatric primary care was excluded because for most of the data collection period of this research project children rarely manifested serious symptoms from the virus. The aim of the project was to identify the types of public health and primary care integrative activities necessary to improve our response to COVID-19 and for future public health emergencies. We identified and analyzed these activities by focusing on the complexities constraining public health response to COVID-19 from a broad community perspective including how primary care services and the primary care workforce adapted to the pandemic. We strove to describe ways that intentionally and more effectively leverage partnerships between public health and primary care that would support a more effective response to the next major outbreak.

Methods

We used a mixed-method, rapid-cycle approach, which included a literature review and semistructured key informant interviews, to explore the degree of collaboration that has occurred among public health and primary care during the COVID-19 pandemic to date.

Literature Review

A scoping review was performed to identify existing peer-reviewed and grey literature that detail the components and extent of collaboration between primary care and public health entities and professionals on infectious disease programs. Due to this project's primary interest in leveraging partnerships in the COVID-19 pandemic, literature discussing collaboration for chronic diseases and other noninfectious conditions were excluded from this review. We identified peer-reviewed literature from databases, including PubMed, Web of Knowledge, and Google Scholar, and grey literature from Google searches. The literature search strategy, including search terms and *a priori* inclusion and exclusion criteria, is detailed in [Appendix A](#), including the desired publication time range. After the initial screening stage, 64 articles underwent additional quality review screening to assess relevance for final eligibility into study. A total of 14 articles were excluded because they only mentioned primary care or public health or did not describe collaboration, coordination, or communication between the 2 groups. Ultimately, 50 articles were included in the final scoping review. Thematic analysis of the articles revealed common areas of work, factors related to successful collaboration, and barriers to effective collaboration.

Key Informant Interviews

The team conducted semistructured key informant interviews remotely with 32 subject matter experts to explore interprofessional collaboration between public health and primary care entities during the COVID-19 pandemic. Participants were identified based on their current or previous positions in a leadership role in primary care or public health. For this project, primary care was defined broadly to include all outpatient nonemergency general medical care regardless of the practice setting. Primary care included family medicine and general internal medicine practices in hospital-based outpatient clinics, FQHCs ([Box 1](#)), and other community health centers; specialty care was excluded. We used snowball sampling of participants during the course of the semistructured interviews to identify other interviewees. Subject matter experts were invited to participate using a formal recruitment letter via email and oral consent was obtained at the beginning of the interview process.

The 32 semistructured interviews took place via Zoom virtual conferencing system between October 2020 and June 2021 and lasted between 30 minutes to 1 hour. The team interviewed primary care providers at family medicine and general internal medicine practices in integrated health systems, FQHCs, personnel at the National Association of Community Health Centers, and state and local public health officials

across several states were interviewed about current COVID-19 activities and lessons learned related to successful collaboration. Two similar interview instruments were developed to guide the interviews: one for primary care experts and one for public health experts. The interview instruments acted as a general guide to the conversations, and additional questions were posed based on differences in participant knowledge and experience with the subject and our understanding as the project evolved. Interviewees were asked about preparedness for COVID-19, response by primary care to the challenges of COVID-19 on practice and workforce, the extent and nature of collaborations between public health and primary care, and their conclusions and recommendations that would support future response and collaborations. The interview guides and list of participants can be found in Appendixes [B](#), [C](#), [D](#), and [E](#).

Analysis of the transcribed interview content was conducted using NVivo version 11 (QSR International, Burlington, MA) qualitative analysis software. Following preliminary review of the transcriptions and team notes, the research team created a codebook to capture themes that emerged from the interviews. The team then conducted a secondary review to finalize an official codebook. All transcribed interviews were then coded according to the established codebook and themes were analyzed. Thematic analysis of the key informant interviews revealed the most common public health–primary care interactions as well as the barriers and challenges in the integration of primary care and public health services in response to the COVID-19 pandemic.

Johns Hopkins Bloomberg School of Public Health Institutional Review Board granted exempt status for this study (IRB00267770).

Box 1. Federally Qualified Health Centers^{7,8}

- FQHCs are community-based healthcare providers that receive funds from the Health Resources and Services Administration (HRSA) Health Center Program to provide primary care services in underserved areas.
- The program includes community health centers, migrant health centers, health care for the homeless, and health centers for residents of public housing.
- Services are provided regardless of patients' ability to pay and are charged using a sliding fee scale.
- HRSA funds nearly 1,400 health centers with more than 13,500 service delivery sites in every US state, US territory, and the District of Columbia. In 2020, more than 255,000 full-time staff served nearly 29 million patients. Health centers serve 1 in 11 people across the country.
- Rural and urban health centers across the nation quickly adapted to the needs of their patients, with almost all offering virtual primary healthcare services. In 2020, health centers provided over 28.5 million virtual visits, approximately 6,000% more than in 2019.
- Beginning in February 2021, HRSA and the US Centers for Disease Control and Prevention launched the Health Center COVID-19 Vaccine Program to provide a direct supply of COVID-19 vaccines to health centers.

Findings

Review of the Existing Literature

Landmark Reports Regarding Primary Care in the United States

To accurately characterize the intersection of primary care and public health during the COVID-19 pandemic, it is helpful to highlight sentinel reports in the evolution of primary care in the United States, that “Medicine is always the child of its time and cannot escape being influenced and shaped by contemporary ideas and social trends.”⁹

Family Medicine as a specialty emerged in the 1960s as 3 independent and important documents were published: The Millis Report, The Folsom Report, and the Willard Report. *The Millis Commission: The Citizens Commission on Graduate Medical Education* was a report requested by the American Medical Association (AMA) to study Family Medicine.¹⁰ The report called for: “A physician who focuses not upon individual organs and systems but upon the whole man, who lives in a complex setting [...] knows that diagnosis or treatment of a part often overlooks major causative factors and therapeutic opportunities.” *The Folsom Report: The National Commission of Community Health Services*, published the work of a commission established by the American Public Health Association and the National Health Council.¹¹ The report stated: “Every individual should have a personal physician who is the central point for integration and continuity of all medical services to his patient. Such physician will emphasize the practice of preventive medicine. [...] He will be aware of the many and varied social, emotional and environmental factors that influence the health of his patient and his family. [...] His concern will be for the patient as a whole, and his relationship with the patient must be a continuity one.” *The Willard Committee: An Ad Hoc Committee on Education for Family Practice* was the report of a committee appointed by the AMA Council on Medical Education to study family medicine training and stated: “The American public does want and need large numbers of qualified Family Physicians.”¹² The Willard Report also states: “the whole man lives in a complex social setting, and that diagnosis and treatment of a part, as if it existed in isolation, often overlooks major causative factors and therapeutic opportunities.”

Historically, these reports combined to create a mandate at the time for a subspecialty of medicine focused upon the “patient as a whole.” A patient-centric focus is the historical perspective of primary care, while the public health focus is to “do the greatest good for the greatest number.” The degree of separation between the patient-centered focus and the public health focus has been reduced in recent years, for example, the patient-centered medical home concept includes efforts to address social determinants of health, upstream etiologies of health problems, and overall population health. These differences may have potentially contributed to fundamental philosophical difficulties in the integration of the 2 fields of practice that would be required during COVID-19.

The landmark Folsom report, published in 1967 and updated in 2012,¹¹ proposed a policy blueprint for systematic implementation of integrated, community health services—both public health and primary care—that would meet the unique needs of every community. The original report proposed a broad vision of improved provision of community health services, improvements in housing and transportation, and enhancements of urban and rural life, issues still relevant to the United States today. In describing its recommendations, the Folsom report called for the planning, organization, and delivery of community services based upon the concept of a “community of solution.” The “community of solution” approach recognized that complex organizational, political, and bureaucratic structures impede the ability to effectively deliver services. This approach continues to hold value when addressing the myriad of complexities currently constraining the US healthcare and public health system response to the COVID-19 pandemic.

In a position paper published in December 2020, the American Academy of Family Physicians (AAFP) urged its members to become more aware of the value and importance of, and movement toward integrating primary care with public health. Recognizing the role that family physicians play in this integration they urged all national, state, federal, and private sector institutions to partner with primary care and public health entities to ensure a more integrated care delivery system that improves population health. AAFP stated that “bold initiatives throughout the health sector are necessary for successful integration.”¹³ Taken collectively, the “community of solutions” and the AAFP position paper confirm the importance of increasing integration of primary care and public health as part of improving community health services, resilience, and preparedness for a pandemic.

Precedents for Collaboration Between Public Health and Primary Care

A review of literature revealed that collaboration between public health and primary care during the COVID-19 pandemic was frequently built upon existing program infrastructure that lent itself to developing response initiatives. Several papers explicitly mentioned “test-to-care” or “test and treat”-type models, describing this process as a way for health departments and care providers to engage with each other.¹⁴⁻¹⁶ An example of this model is found in screening higher-risk populations for HIV infection and ensuring linkage to rapid and ongoing treatment of individuals who test positive in order to reduce secondary transmission of HIV to others and thus promote the public good. In cases like this, primary care providers and/or community-based organizations work with the health department to provide additional services and support—such as conducting needs assessments, providing health education, and offering links to wraparound services—following referral/treatment.^{14,17}

In the HIV “test and treat” or “treat all” models, many collaborations between public health and primary care involved strengthening the HIV continuum-of-care and sexual health screening.¹⁸ Partnerships included providing on-the-job training for public health practitioners on care referrals, increasing data sharing, and coordinating

testing opportunities between both sectors.^{15,16,19} Data sharing and integration was key to allowing public health departments to access patient files for follow up. Increases in referrals, uptake of preexposure prophylaxis, and longitudinal continuation of treatment were all outcomes of various studies that described these collaborations.^{15,16,20} Neither public health surveillance nor clinical record management on their own was able to see the same rates of follow-up as when both aspects were integrated.

Influenza programs are another example of a functional “test and treat” model that have required public health and primary care professionals to collaborate based on aligned goals and established ways to interact. In the literature, influenza-focused public health and primary care collaborations included professional education on disease identification, vaccine uptake and education initiatives, and seasonal surveillance.²¹ One paper described innovations in diagnostic testing whereby the primary care provider administered the test, the test was read in a machine that was connected to the internet, and the result was automatically sent to the health department (deidentified except for patient age).²² Collaborations also included a dual approach to encourage people to receive the flu vaccine through both healthcare provider visits and through health departments calls. Programs such as the Diabetes Prevention Program and those programs focused upon improving maternal health equity offer similar opportunities.²³

While literature on public health and primary care collaborations for COVID-19 is still emerging, several papers discussed how such partnerships during the pandemic successfully converted existing structures from other public health programs and applied them to COVID-19 response in a short span of time.^{24,25} In the context of COVID-19 and based on lessons learned from HIV, tuberculosis, and influenza, health departments carried out COVID-19 testing, provided community education on COVID-19, and coordinated personal protective equipment (PPE) and grocery delivery services to those in isolation.^{14,26,27} Healthcare providers then augmented existing public health services by providing various symptom and needs assessments for people in isolation. For both HIV and COVID-19, timely testing, a system of patient-centered care, health system revamping (including via telemedicine), means of identifying and addressing social disparities, and managing political denial or patchwork responses are all needed.^{26,28} Contact tracing efforts, influenced by tuberculosis programs, have utilized community health workers knowledge and relationships.²⁹ Community health centers and community health workers can be carefully integrated into all collaborative efforts between public health and primary care in order to address issues in inequity and problems with delivery of services.

Components of Successful Collaborations

There is an extensive literature on the importance of collaboration between the public health and primary care components of the healthcare system. In 2012, the authors of the Institute of Medicine report *Primary Care and Public Health: Exploring Integration to Improve Population Health*⁶ concluded that “the integration of primary care and public health could enhance the capacity of both sectors to carry out their respective missions

and link with other stakeholders to catalyze a collaborative, intersectoral movement toward improved population health.” A report from Canada³⁰ summarizes the importance of collaboration between public health and primary care, suggesting that clinical data and observations obtained in primary care settings can be a source of data on important public health issues. Similarly, public health assessment of community and population health risks and can inform primary care practitioners of things to look for in patients in clinical settings.

The literature suggests that successful public health and primary care collaborations require strong ties to community partners and organizations. In fact, strong ties with community partners and organizations are necessary to enhance the reach of any public health–primary care collaborative initiative outside of the capabilities of public health and primary care alone.^{20,21} Several articles emphasized the importance of relationships with mental health, social services, and community-based organizations and stakeholders that can leverage their community ties to bring more people into contact with public health and primary care initiatives.^{19,27,31} The healthcare paradigm is increasingly shifting to address the social drivers of health, but it should not be up to healthcare systems or public health authorities to undertake this work alone.³² These local community-based organizations and social service and mental health providers with deep knowledge of the community and established trust should be brought to the table at the early planning stages of collaborative work in order to maximize potential health outcomes.^{33,34}

Rural settings were frequently identified as areas in which public health–primary care collaborations had the most engagement and stood to gain the most from partnerships. Urban providers were less open to active, equal collaboration and had less experience working with urban health departments.³⁵ Even though resources were more limited and populations were less concentrated, public health and primary care partners in rural areas found ways to collaborate and were frequently successful in working together.³⁶ These rural providers, by necessity, were more likely to have established relationships with their public health counterparts that already provided a strong basis for creating more formal collaborations.^{35,37,38} These collaborations often take place in the form of joint community health assessments where the local health department and local primary care providers are able to maximize their resources to pull together a comprehensive look at their community’s health.

The literature often highlighted the importance of established interprofessional relationships, ideally at both the personal level (coordinator to coordinator) and the institutional level (organization to organization), between public health and primary care partners.³⁹⁻⁴¹ At the personal level, preexisting working relationships between public health and primary care representatives prior to the inception of the joint program contributed to more effective and regular communication.⁴² Previous connections between organizations, but not necessarily between the personnel involved, also provided a stronger foundation upon which the new collaboration could be built.⁴³ Taken together, existing knowledge of organizational structures, team responsibilities,

and individuals can allow public health and primary care partners to expedite the beginning stages of a potential partnership and maintain those connections throughout the program.

Successful public health and primary care collaborations have also included formal, documented program structures characterizing the duties and expectations of each partner.^{41,44-46} When each partner is clear on their responsibilities and how those responsibilities contribute to the programmatic goals, there is less risk of duplicating efforts or gaps in program delivery. Additionally, identifying common goals and synergizing workplace culture between public health and primary care partners can help streamline collaborative processes and make the program more sustainable in the long term.^{13,39,47,48} When there are fewer areas of discord between partners, more effort can be placed on maintaining an effective public health and primary care collaboration.⁴⁹ However, if institutional goals are not aligned in the areas of interest, public health and primary care organizations might need to find different areas of collaborative interest that would harmonize the missions of each partner.

Barriers to Effective and Lasting Collaboration

Funding instability, lack of funding, and privacy issues were the most cited barriers to developing and maintaining a successful public health and primary care collaboration.⁵⁰⁻⁵³ With resource constraints, both before and during COVID-19, public health departments and primary care providers have been already struggling to fulfill all of their strategic goals and aspirational goals. Sharing or divesting funds to focus on a new collaboration is not feasible for many organizations that otherwise might be inclined to explore areas of common interest. Additionally, funding for highly specific public health and primary care collaborations may not be renewed after a short period of common effort because health outcomes may not immediately show improvement. Long-term investment in public health and primary care collaborations is required to see substantial gains in many areas of common interest.⁵⁴ However, even the immediate outcome of better communication between these 2 traditionally disparate systems can potentially be considered as successful investment of resources.^{38,55,56}

The lack of funding is also a product of the lack of policies enabling or supporting these collaborations. The Affordable Care Act was the most frequently cited policy that enabled discussion between public health and primary care, especially for performing community health assessments.^{31,38,57} While community health assessments are valuable tools and bring partners together, they are not sufficient to support collaborative programs that can enact more targeted health interventions. Policies that might support public health and primary care collaborations include the modification of reimbursement structures for testing, the creation of dedicated collaborative teams at state or local health departments, or the development of incentives for collaborative programs between primary care and public health.^{55,58,59} The literature also suggests that institutional policies should be amended to include more interprofessional training and education initiatives to inform public health practitioners and primary care providers

on where their professions overlap.^{47,52,58,60} Increased knowledge of how public health and primary care can collaborate with each other could bridge critical gaps that have prevented public health and primary care collaborations from being initiated.⁶¹

Privacy concerns and data ownership were also commonly cited as reasons that attempted collaborations were not successful or why they were never initiated in the first place. The sharing of potentially identifiable health information is accompanied by strict privacy protection laws which, while important, lack simple mechanisms to allow for data sharing between collaborative partners.^{59,62} Furthermore, the harmonized systems and technologies that allow such data sharing are also lacking across public health and primary care institutions, with the exception of a few program-specific systems such as FluView or the Influenza-like Illness Surveillance Network.⁶³ Data that could be shared between collaborative partners also need to be standardized in order to streamline data analysis.⁶⁴ There is great potential for public health and primary care collaborations to improve population health whereby public health could conduct near real-time analysis of health data collected by primary care providers.¹⁶ Therefore, data sharing structures with considerations for privacy laws, clear data ownership at each phase, and streamlined data collection and reporting procedures are all critical elements of successful public health and primary care collaborations.

The Landscape for Primary Care is Rapidly Shifting

While consolidation of primary care practices has been occurring for several years, this trend accelerated during the COVID-19 pandemic. According to a report issued by the Physicians Advocacy Initiative,⁶⁵ between 2019 and 2021, about 20,900 primary care practices were acquired by hospitals or corporate entities (eg, payors or private equity), almost half of these purchases were made during COVID-19. As of January 1, 2021, nearly half of all primary care practices were owned by hospitals and corporations and 70% of physicians were employed by these entities. This sudden increase in hospital- and corporate-owned practices triggered the Federal Trade Commission to investigate primary care physician practice consolidation and its impact on market competition. The devastating financial burden imposed early in the pandemic rendered many primary care practices “fiscally underwater” and vulnerable to opportunistic corporations. The downhill implications of these purchases on access, health equity and affordability, and the ability to integrate with public health may be significant.^{66,67} As much of primary care outside of community health centers is now wholly owned by an organization where profit and revenue targets may drive the delivery of care, the United States moves closer to a 2-tier system and diminishing incentives to better integrate with public health.

On May 4, 2021, the National Academy of Sciences, Engineering, and Medicine (NASEM) released a report, *Implementing High-quality Primary Care: Rebuilding the Foundation of Health Care*, the findings of which were consistent with our investigation and served to inform our final report.⁵ The NASEM committee described 5 implementation objectives to strengthen and make high-quality primary care available to all people living in the

United States. These objectives include: (1) ensuring payment reform for primary care teams to care for people, as opposed to physicians to deliver services; (2) ensuring access to high-quality primary care is available to every individual and family in every community; (3) training primary care teams where people live and work; (4) designing information technology that serves the patient, family, and the interprofessional care team; and (5) ensuring that high-quality primary care is implemented in the United States. The report specifically calls for the secretary of health and human services to establish a secretary's council on primary care to achieve the vision of high-quality primary care captured in the committee's definition. The report acknowledges that while evidence shows what is needed to achieve high-quality primary care for all, primary care lacks a unified voice advocating for change. The absence of a unified voice contributed to the inability to better integrate with public health during COVID-19. With that said, a concerted effort to establish a council specific to primary care and to develop a scorecard to track progress in boosting state and national primary care infrastructure investment in revitalizing primary care is necessary if health equity is to be achieved and primary care and public health integration is to occur.⁶⁸

Thematic Analysis of Key Informant Interviews

The following section reflects our analysis of the most salient themes that emerged from the key informant interviews.

Prepandemic Planning Was Important

The COVID-19 pandemic has been a severe challenge for chronically underfunded public health agencies across the United States. Interviewees expressed that both primary care and public health services were severely challenged during the pandemic, resulting in missed opportunities to detect cases through testing individuals and tracing their contacts, communicate effectively to the public, and vaccinate hard-to-reach populations. Early in the pandemic, primary care providers experienced:

- Deferral of routine services
- Reticence of patients to seek care for non-COVID-19 conditions, which led to marked decreases in patient volumes and resulting financial strain
- Staffing shortages due to lockdowns, illness, fear of contagion at work, and severe staffing needs in hospitals
- Shift to remote care telehealth connections
- A surge in symptom screening, referral for testing, and monitoring of prehospital COVID-19 patients
- A surge in posthospitalization care of recovering COVID-19 patients

Small, unaffiliated primary care providers are critical components of the healthcare system and yet they are often invisible and without connections to the public health

system. For small practices with some affiliation with larger healthcare systems, getting access to PPE and other resources, such as educational materials, was substantially easier than for truly unaffiliated practices. Interviewees from larger health systems also noted the ability to alleviate bottlenecks in capacity throughout the pandemic by calling providers from practices with greater availability or by sending patients to facilities with greater capacity.

At the same time, public health officials struggled with the extraordinary burden of testing, contact tracing, data collection, disease and syndromic surveillance, and communications to the public and to primary care practitioners while public health scientists, officials, and the fundamental tenets of disease control were challenged and often ignored by political leaders. Interviewees expressed that the demands placed upon the public health infrastructure has been severe and unrelenting during the COVID-19 pandemic and that the need for testing, quarantine/isolation, and vaccination pushed response capacity to the brink. Interviewees reported that they believed that chronic public health and primary care underfunding and reduced investment in needed public health infrastructure over the past 3 decades fundamentally limited the ability to respond to COVID-19. This, combined with the status of an already fragmented US healthcare system when the pandemic first hit, led to a diminished response capability that worsened as case numbers rose and resources dwindled.

Public health and primary care organizations that had preexisting preparedness plans that could be adapted during the pandemic performed better than those that did not. Organizations with preparedness plans in place were able to rely upon them at the beginning of the pandemic when official guidance was lacking. However, interviewees commented that even the best plans did not stand up to the sheer magnitude of the workload generated by the COVID-19 pandemic. Adaptation was a theme that arose across interviews, from adapting previous pandemic influenza plans to fit the context of COVID-19 to adapting to a healthcare working environment featuring a new dangerous pathogen without adequate supplies. Primary care interviewees identified the lack of PPE and preexisting infection control measures as shortcomings. Practices had to identify sources of PPE and rapidly train staff in order to ensure workforce safety and avoid delays in care. Unfortunately, lack of preparedness resulted in some practices needing to shut down operations for the safety of staff and patients.

The most productive collaborations tended to be extensions of preexisting relationships between public health and primary care. Primary care practitioners or organizations with previously established regular interactions/communication with departments of public health were able to leverage those relationships to quickly mobilize additional resources and personnel when it was needed during the pandemic. As state and local health departments became increasingly overwhelmed, important, but often underutilized, roles for primary care providers emerged in support of the public health response. Examples include:

- Serving as a trusted source of accurate, timely public health education, information, and communication
- Promoting nonpharmaceutical interventions to limit disease transmission, such as masking, physical distancing, and hand hygiene
- Establishing protocols for monitoring of their patients under home isolation or quarantine
- Augmenting public health contact tracing efforts using trained medical assistants and office personnel supervised by primary care physicians and nurse practitioners
- Engaging early in the vaccine prioritization and administration process
- Answering questions and providing care to vaccinated patients experiencing potential side effects
- Expanding telehealth capabilities to include more effective linkages with urgent care, radiology, laboratory, and pharmacy providers
- Expanding existing services to meet emerging and urgent patient need, including mental health services and connections to community-based services, including food banks and shelters

A limitation that was broadly reported from the public health perspective was the inability to identify and contact primary care practices in their jurisdictions. Beyond the large healthcare/hospital systems, it was far more difficult for public health to identify independently owned practices. There were particular concerns from public health about small primary care practices “falling through the cracks”—meaning that their existence might not be known to public health—leading to the small practices’ lack of access to important guideline information, PPE, and COVID-19 vaccine. To overcome this challenge, interviewees suggested that a unified registry of medical practices and licensed healthcare providers in these jurisdictions would facilitate more productive communication and provide an important preparedness mechanism that can be tapped during a public health emergency, such as the COVID-19 pandemic.

Primary Care’s COVID-19 Response Was Diverse and Flexible

Primary care providers functioned as extensions of public health. Whether formally, through collaboration with public health, or informally, out of desire to provide high-quality care for their patients and communities, many interviewees reported they have functioned as extensions of the public health workforce during the COVID-19 pandemic. A shared value expressed by many interviewees from primary care organizations was an unwavering commitment to their patients and communities. During the pandemic, this manifested as assuming duties for which there was little or no compensation. Interviewees from large clinics or healthcare organizations commonly echoed a feeling of “community responsibility” to use their organizational strengths to provide assistance to local public health departments, that were struggling to meet the demands.

Some primary care clinics took on traditional public health functions, such as providing quarantine and isolation guidance, ensuring access to food/housing for individuals in isolation, and providing COVID-19 testing for community members, in addition to their own patient load. The cost of providing services was not always reimbursed; therefore, primary care practices with significant revenue from prospective payment systems fared better than practices using a mostly fee-for-service model.

COVID-19 required primary care practices to innovate in order to continue to serve their patients and communities. The COVID-19 pandemic required primary care practitioners to address a question that was, in many cases, unanticipated and fundamentally challenging: “How [can we] simultaneously adapt to the increased demand for medical care for people sick with COVID-19 while maintaining care for patients with chronic conditions who are now too fearful to seek in person care?” Telehealth, following the expansion of reimbursement mechanisms to include telemedicine visits, was reported to have been universally implemented and was cited as one of the most helpful innovations and one of the main ways that primary care providers were able to remain afloat despite the economic consequences of the pandemic. The ability to pivot quickly and shift care to telehealth was critical to maintaining continuity of operations during the pandemic. Primary care practices with previously established mechanisms for telehealth or that had just begun incorporating telehealth into their normal operations were particularly successful at making the change to majority telehealth operations and were well positioned to meet the healthcare needs of their patients. Primary care practices that had to rapidly adopt telehealth at the onset of the pandemic were at a disadvantage.

Once the Centers for Medicare & Medicaid Services (CMS) allowed states to reimburse providers for telehealth and audio visits for Medicare patients, experts noted that access of primary care services into vulnerable populations was greatly expanded. Interviewees said policies that incorporate pay parity for telehealth and audio into traditional healthcare funding packages would both expand healthcare access during nonpandemic times and allow for uninterrupted health services during a pandemic scenario. Interviewees called for permanent federal support and financing for telehealth services.

Spotlight: Test and Treat in COVID-19

MedStar Health established several testing centers throughout the DC-Maryland-Virginia area to assist their broad patient-base in obtaining COVID-19 tests. In addition to providing testing, MedStar also conducted regular follow-up with patients who tested for COVID-19 in their home setting via telehealth visits, particularly for those who were on the cusp of requiring hospitalization.

Follow-up with patients was done with telehealth. An initial video or audio visit was used to screen and refer patients to testing centers and follow up visits were also done by telehealth unless the patient was referred to an emergency department for evaluation.

Telehealth presented some unexpected advantages as well, such as the ability to involve a workforce that otherwise would have been unavailable due to constraints of the pandemic. Medical professionals with preexisting health conditions that excluded them from working in person during the pandemic, or parents with new childcare responsibilities due to remote education, were able to keep working.⁶⁹

Interviewees said that a variety of adaptation strategies were implemented by primary care practices throughout the course of the pandemic to preserve the ability to provide care to patients and communities while also responding to the pandemic. While many primary care practices were in lockdown and staff were unable to work in the office or clinic setting, mobile testing units were an intervention adopted across several jurisdictions as a strategy to reach higher-risk, higher-vulnerability populations. During a time when travel via public transportation was limited, interviewees described that one of the best strategies to encourage and facilitate testing was to bring testing to the communities in need. One innovative approach reported was the use of a mobile van to conduct COVID-19 testing in neighborhoods with little or no access, while integrating the provision of pediatric and women’s health primary care services, such as routine immunizations and prenatal care, in the same mobile visit. Others also described mobile units being used to maintain the continuum of care for school-aged children who had previously relied on these units to obtain nutritional care and medication for chronic conditions. Bringing services directly to patients who needed them helped to overcome social barriers to care such as logistics of scheduling appointments, conflicts with work responsibilities, and lack of transportation to and from offices.

Practices that provided flexibility to their workforce and adapted quickly to changing circumstances were most successful at maintaining quality of care and supporting the public health response. Adaptations were constantly being made to best accommodate emerging needs and respond to fluctuations in COVID-19 caseloads. Many healthcare professionals found themselves pivoting into new roles in order to support operations and increased demand during the pandemic. One interviewee, for example, described a clinical structure their practice adopted wherein all patients experiencing respiratory symptoms were diverted into a dedicated respiratory clinic space that was segregated from other patients and staff. This clinic model is an example of a primary care practice embracing infection control principles that allowed them to provide care while protecting the safety of patients and staff.

FQHCs pivoted quickly and effectively to provide both primary care and public health interventions, particularly those with high risk/ high vulnerability populations.

Often, relationships between patients and clinicians in FQHCs translated into a deep trust that was critical to ensuring access to testing, quarantine/isolation, and presently vaccination during the COVID-19 response. It has been well documented that COVID-19 has disproportionately impacted low-income individuals and communities of color ([Box 2](#)). FQHCs serving these communities acted quickly to reach out and engage with patients to ensure the needs of these communities were being met. FQHCs were ideally positioned to identify COVID-19 health champions/advocates, such as trusted healthcare providers or community groups, as a way to ensure information was reaching those who needed it and in a culturally appropriate manner. Additional federal funding provided support to FQHCs to expand their interventions.

Box 2. Who FQHCs Serve⁷⁰

According to HRSA, 1 in 11 people across the United States rely on FQHCs for care including 3.5 million publicly housed patients, 1.4 million homeless patients, 1 million agricultural workers, and more than 355,000 veterans. Although FQHCs are an essential part of healthcare, they still face some challenges.

Major Barriers Impeded Serving Communities During COVID-19

Significant financial barriers faced by primary care reduced their ability to fully serve patients and communities. A fundamental barrier experienced almost universally across primary care was a lack of financial and personnel resources. Innovation and creativity were required primarily because the needs of patients and communities were so great, yet the resources available to serve them were so few. Historically, national, regional, and private sector investment in primary care has been low and declining.⁷¹⁻⁷³ Interviewees repeatedly commented about primary care being systematically undervalued in the United States across the past decades. Currently, the predominate reimbursement structure for primary care centers is a fee-for-service model that does not adequately compensate for counseling, prevention, longitudinal, and comprehensive team-based care. While community health centers, including FQHCs, may qualify for federal Section 330 grants, these funds account for only an average of 16% (10% to 37%) of centers' revenues.^{74,75} Interviewees stated that independent small practices are particularly vulnerable because they lack leverage with insurance companies when contracting for reimbursement and lack the capital to invest in upgrading information technology systems, which has resulted in the consolidation or closing of primary care practices.

Current estimates are that less than 50% of the American population has established care with a primary care professional.⁴ While primary care has embraced advances such as the patient-centered medical home and the Affordable Care Act payment schemes, these have been insufficient in redesigning the reimbursement landscape. The fee-for-service model does not offer the flexibility or the investment necessary to adopt innovative and creative efforts to address social determinants, public health interventions on the part of primary care-like testing, contact tracing support, counseling about quarantine, or to integrate behavioral health and oral health. In order to finance these activities, several interviewees reported the innovative use of discretionary funding from federal grants among FQHCs. As an example, programs such as the COVID-19 Coverage Assistance Fund provide reimbursement to healthcare practices providing COVID-19 vaccinations at a rate of \$40 per dose administered.

Primary care's ability to serve communities was hindered by rapidly changing and inconstant guidance. Several interviewees commented on rapidly changing and often conflicting guidance from federal and state authorities. The intertwining of politics and the pandemic—to the detriment of clinical and public health practice—was a common theme in the interviews, with interviewees stating that political figures at all levels sometimes muddied the waters when communicating health policy changes. It was difficult for public health authorities and primary care providers to disentangle the messages being delivered and to remain current with suggested and mandated changes, especially those relevant to clinical practice. The lack of transparency in top-down communications and decisionmaking made it difficult to keep track of the best ways to serve the community.

Maintaining safety of patients and healthcare professionals has been imperative during the COVID-19 pandemic. Especially in the first few months when cases were rapidly rising, it was difficult for primary care practices to respond to guidance updates in a climate of limited resources, shortages in PPE, and fear of the virus. Just-in-time training and education for healthcare professionals was a necessary component of maintaining safety but slowed the response.

A commonly experienced challenge among primary care practices was discordance between capacity and public health guidance. For example, in many cases, individuals concerned they were exposed to COVID-19 were directed to contact their primary care health professional for testing. Unfortunately, most practices did not have access to testing materials or the laboratory capacity to process tests. Considering that testing was the cornerstone of the US COVID-19 response, primary care practices took on the role of directing patients to available testing when they had such information. A similar challenge has been availability of vaccines and vaccination sites. For healthcare professionals who are unaffiliated with large hospital systems, identifying and obtaining the vaccine has been difficult. Likewise, patients who qualified for the COVID-19 vaccine reached out to their primary care clinicians seeking information on getting the vaccine. Due to infrastructure limitations, such as inability to maintain the required ultra-cold chain for the mRNA vaccines, most offices were not equipped to administer the vaccine. Unlike routine vaccines, primary care practices could not order COVID-19 vaccines through distributors. They needed to acquire vaccines via hospitals or health systems. FQHCs were an exception to this, as the federal government provided vaccine directly to those health centers.

Inexperience working with enhanced infection control measures and the lack of visibility into the medical supply chain limited the ability of public health and primary care to respond to COVID-19 surges. Healthcare facilities and public health departments across the country experienced shortages of PPE and other supplies and equipment. While, to some extent, these shortages were an inevitable result of the rapid surges in cases, interviewees expressed that public health departments and primary care practices did not receive adequate information or supplies from the federal government in the early stages of the pandemic. Lack of coordination between primary care and public health hindered the adequate supply and distribution of PPE. There were significant uncertainties about when, how, or how much essential PPE and other supplies might arrive from the Strategic National Stockpile and other supply chain sources. Furthermore, personnel in primary care settings had little or no training and experience in using anything other than very basic PPE. The proper procedures for use of respirators and for putting on and removing (donning/doffing) PPE was not something that many healthcare personnel had ever been trained in. These unfamiliar procedures greatly slowed the ability to care for patients.

Collaboration Was Limited Between Primary Care and Public Health

The degree and success of collaboration between public health and primary care varied widely. Interviewees said that the COVID-19 pandemic presented an unprecedented challenge that stretched public health and healthcare capacity to their limits, requiring an “all hands on deck” approach, and that collaboration between primary care and public health was ideally needed. However, the degree of collaboration varied from almost none to working together very closely. Interviewees reported many examples of overlap between primary care and public health services ranging from communicable disease control to maternal child health initiatives. Before the pandemic, coordination related to these issues often took the form of communication, both directly between local and state public health departments and healthcare partners and indirectly through the provision of public health guidance to primary care settings. But many primary care providers were not involved in these collaborations. Some interviewees said that they had had very little personal interaction with their local or state health department. During the COVID-19 pandemic, some primary care practices and public health departments collaborated quite successfully while others had little or no interaction. Some primary care settings ended up providing public health functions to ensure the safety of their patients. These functions included activities such as testing for COVID-19, providing counseling and guidance for quarantine/isolation, and locating social service supports such as food and housing. Sometimes this was done at the behest of overwhelmed health departments, and sometimes it was done independently to fill a void. The intersection between economic welfare and health became abundantly clear as marginalized communities were disproportionately impacted by the pandemic. Often FQHCs or other primary care settings served as the only source to engage with individuals and communities to make sure information and resources were available where they were needed.

Lack of shared communications platforms hindered integration of public health and primary care. While some members of primary care practices and FQHCs reported collaborative relationships with public health, others reported little to no communication or coordination with them. Interviewees stated that a lack of interoperability of information systems and data sharing among primary care and public health systems in the United States significantly hindered collaboration and integration of services. The lack of a formal mechanism to facilitate information sharing across the system resulted in blind spots for both. Early in the pandemic, primary care practices were concerned as they saw that cases were rising, but were unaware of the distribution of cases even within their own communities. From the public health perspective, there was a lack of awareness of the needs of patients presenting to their primary care health providers. Sometimes information about what was occurring in the primary care setting was learned through the personal relationships between a physician and an individual working at the health department. Interviewees reported that bidirectional information exchanges with privacy protections to share public health primary care data would facilitate continuity of care across patients and populations. Currently, the in-house biostatistical capabilities in public health departments and

large amounts of health data being collected by primary care providers are not being utilized to their fullest potential. By sharing data and using each partner's strengths, interviewees thought careful and targeted analyses on population health could be conducted for the benefit of all. One example of this is New York City Department of Health Primary Care Information Project, which assists New York City-based practices, independently owned community health centers, and hospital ambulatory sites with adopting and implementing health information systems, quality improvement, and practice transformation initiatives. The project partnered with organizations and physicians throughout New York City to support the city's health goals related to prevention and primary care, facilitate connections between communities and clinical resources, educate on the adoption and use of information systems, adapt data and health information to facilitate improvements in patient care and healthcare, and translate federal, state, and local policies and programs into actions (eg, Meaningful Use, Patient-Centered Medical Home, Advanced Primary Care).⁷⁶

The Public Health and Primary Care Relationship Should Be Reenvisioned

There are benefits for better interactions between public health and primary care.

Interviewees were asked about how to improve public health and primary care going forward. They frequently mentioned the need to rethink how public health and primary care interact with one another, now and in the future. Individual health and population health are inseparable and new vision for public health and primary care integration that puts public health in the center could be transformative and impact health outcomes. Improving the partnerships between public health and primary care should include initiating and supporting consistent bidirectional communication, facilitating service and workforce flexibility, and leveraging the strengths and balancing the weaknesses of each entity. Interviewees also stressed the importance of incorporating community partners, such as community-based organizations, into a 3-pronged local collaboration. This might be done, for example, by including community partners on the boards of health centers. In addition, they stressed the need to incorporate mental and behavioral health into both public health and primary care missions. The COVID-19 experience, they said, has demonstrated that protecting health must include protecting and strengthening mental health services.

Discussion

As public health struggled to respond to the COVID-19 pandemic with activities such as testing, contact tracing, surveillance, and patient communications, other traditional public health functions, such as routine vaccination and disease screening, were suspended or cancelled. At the same time, multiple social and workforce factors and operational adaptations affected primary care practices' capacity and capabilities to meet the additional demands of the pandemic. Family medicine and general internal medicine practices in hospital-based outpatient clinics and FQHCs, pivoted to virtual means of rendering care. Additionally, physicians, nurses and nurse practitioners, physician assistants, community health workers, and other healthcare personnel who support primary care practices took on new care provision responsibilities traditionally considered within the realm of public health. While this was extremely important, most primary care practices could have done more if they had had better connections with public health departments and their communities prior to the onset of the pandemic and if they had been better leveraged to provide vaccine administration earlier on.

Our Findings Are Consistent with National Survey Data

Beginning in March 2020, amidst the significant challenges posed to primary care by the COVID-19 pandemic, the Larry A. Green Center in Richmond, Virginia, in partnership with the Primary Care Collaborative and 3rd Conversation, began nationally distributing a series of surveys designed to characterize impacts to primary care.⁷⁷ As of August 2021, 31 sets of surveys had been completed and analyzed. The only one of its kind, this set of surveys uses a convenience sample of primary care providers. Overall, the surveys have captured multiple impacts (eg, financial, mental health burden) of the pandemic upon primary care practices and encapsulated a variety of topics, such as vaccine distribution, facility capacity, and telehealth usage. The Green Center survey data are consistent with the evidence shared by this study's key informant interviews.

According to the Green Center survey conducted July 9 to 13, 2021, among a national sample of 702 respondents from primary care settings, 24% of respondents noted persistent severe or near-severe levels of strain on practices due to the pandemic and 38% reported experiencing difficulties related to patient volume and staffing.⁷⁷ While this is an improvement from the very severe levels of strain measured earlier in the pandemic, it shows that primary care practices and their workforce are still experiencing challenges that influence day-to-day operations. Approximately 40% of the respondents expressed concern that primary care will not exist within 5 years, and about 20% indicated that they will likely leave primary care profession within 3 years.

In the setting of decreased confidence in the future of primary care as a profession and an environment of near constant challenge posed by the COVID-19 pandemic, the July survey respondents were asked how policymakers and the current administration could help improve the healthcare delivery system for primary care. Almost half (46%) agreed that primary care must be financed in such a way that it is not in direct competition

with specialty care.⁷⁷ When asked about payment structure, the same percentage endorsed moving away from a majority fee-for-service model. This in the context of 56% of respondents supporting the notion that primary care must be protected as a “common good” and be available to anyone regardless of their ability to pay. These primary care clinician views are consistent with the recommendations in the recent National Academies of Science, Engineering, and Medicine report on primary care.⁵

Vaccination rollout is one area in which primary care providers found themselves reaching out to their local public health departments, with ranging levels of success, to obtain the help that they are seeking. In the January 15 to 19, 2021, Green Center survey (1,112 respondents),⁷⁷ almost two-thirds (67%) of the surveyed providers reported that they were working with public health authorities in some capacity. However, of those, only some were actively collaborating (26%) or actively communicating (7%) with public health authorities, while the rest were only intermittently in contact. Of the providers who did not report working with public health, 17% stated that public health agencies were either too overwhelmed or underresourced to provide additional support while 12% reported that they tried to contact public health authorities for assistance but were not successful in establishing contact. These observations from our key information interviews underscore the general disconnect between primary care and public health and an underutilization of resources that each partner potentially could offer the other.

Encouragingly, in the April 9 to 13, 2021 Green Survey (627 respondents), potential areas of integration appears to be growing between these 2 previously disparate groups, with 42% of providers reporting newly established connections with public health since the beginning of the COVID-19 pandemic. Moving forward, policymakers and organizational leaders should harness this momentum and invest in new and innovative ways to encourage collaboration between primary care and public health.

Primary care is an underutilized resource in pandemic response, especially considering the trust that patients have in their doctors. A valuable lesson emerging from COVID-19 is the trust that the general public holds in healthcare providers compared to public health authorities. A common experience among our primary care interviewees was the extent to which patients looked to their providers for up-to-date information on the pandemic as opposed to looking to public health authorities for the information. When primary care providers had good communication with public health, this was a much easier task than their counterparts who had little to no communication with public health. Still, the high levels of trust in healthcare providers have presented unique opportunities to enhance response to contact tracing efforts, testing efforts, and vaccination campaign outreach. It has been particularly important to reach underserved populations through these mechanisms because of preexisting levels of distrust in government or lack of insight into the public health system. As vaccination programs continue to struggle to reach populations with high levels of distrust, it is even more imperative to closely involve primary care providers in the planning and rollout stages, rather than simply dropping vaccine doses off at their clinics. Participants spoke about practitioners having little insight into the vaccine allocation and rollout

process but being thrust into the primary position of administering doses after vaccine administration efforts had been underway for months via mass vaccination sites and retail pharmacies. With missed opportunities for communication between public health and primary care, vaccination campaigns cannot reach their highest possible potential. More work needs to be done to improve the visibility of and trust in public health in order to operationalize critical response measures to COVID-19 and in future health emergencies.

Public health–primary care partnerships for routine health problem should be fostered to create a foundation for collaborative response in a crisis well before the next public health emergency. Existing chronic disease prevention programs, such as the Diabetes Prevention Program, can help build and sustain primary care and public health functions, which can then be expanded as needed during epidemics or disasters.²³ Preexisting relationships between public health and primary care have the potential to make a substantial difference in the timeliness and quality of a response to emerging health threats, as has been seen in other health emergency contexts and during COVID-19. Knowing whom to call, what capabilities or capacity a partner may have, and how to work best together based on previous activities, as well as having the ability to share data bidirectionally, can expedite critical collaborative programs becoming available to the public. Interviewees identified preexisting relationships between large and small primary care organizations as an important takeaway from the COVID-19 response. They also emphasized the importance of creating systems to identify and communicate with small practices during and following COVID-19. Public health authorities with established connections to, or at least up-to-date lists of, small practices had an easier pathway to providing assistance and outreach. As all medical providers and offices are licensed through their respective states, public health departments could use this licensing data to reach out to independent practices as a way to establish ongoing relationships. Connections to these practices would allow public health authorities to provide information and vaccines, especially as COVID-19 vaccine campaigns are now trying to reach pockets of higher-risk populations with low trust in traditional public health.

Public health and primary care must work together to sustain preparedness work following the COVID-19 pandemic. Maintaining emergency preparedness funding and attention has historically been a challenge when day-to-day operations alone are all-consuming. However, investment and preparedness in health systems resilience appeared to make a significant difference during the COVID-19 response. Participants in the region primarily affected by Hurricane Sandy attributed some of the COVID-19 response success to after-action work following the hurricane. North Carolina built an infrastructure for public health, primary care, and community collaborations (NCCare360) around mental health services and social needs.⁷⁸ NCCare360 expanded dramatically during COVID-19 to all 100 North Carolina counties and is a model of how states can lead in supporting coordination. Similarly, Maryland previously invested in its primary care infrastructure through careful funding, strengthening, and coordinating measures. The Maryland Primary Care Program is a voluntary mechanism

for primary care providers to access additional funding and delivery support through coordination with the Maryland Department of Health within its Public Health Services department.⁷⁹ This mechanism enabled rapid and targeted outreach throughout COVID-19. The New York City Department of Health NYC Reach Primary Care Information project is an example of a dedicated effort of public health to reach out to primary care and improve the quality of information management systems and practice initiatives.⁸⁰

The COVID-19 pandemic has also illuminated just how large the preparedness and resilience gaps can be for vulnerable versus nonvulnerable populations. For example, the long-standing lack of preparedness in nursing homes and long-term care facilities was highlighted by the numerous outbreaks those facilities before and even after vaccines were available. The inability of cities to reach their underserved populations has also underscored the lack of preparedness and work done in this area. A common theme among interviewees was the need to rethink strategies on how to strengthen and interact with underserved higher-risk, higher-vulnerability populations. Closer collaboration between public health and primary care also cannot solve these problems, but because of the trust imbued in primary care providers and the authority granted public health, together they may be able to partially alleviate them.

Policy Changes Are Needed to Strengthen Collaboration and Improve Future Pandemic Response

Transitioning primary care's payment model would facilitate better continuity of care and allow for primary care to support public health's mission. According to the May 2021 National Academies of Science, Engineering, and Medicine report *Implementing High-Quality Primary Care: Rebuilding the Foundation of Health Care*, primary care is an essential common good.⁵ Interviewees outlined several possible policy interventions to strengthen relationships and collaboration between primary care and public health. The most common policy recommendations at the federal level pertained to financing primary care and public health. Both are chronically underfunded sectors that have been exceedingly strained during the COVID-19 pandemic. Current payment models constrain primary care's ability to optimize provision of care. As mentioned earlier, a commonly cited barrier to better pandemic surge capacity was the fee-for-service payment model that limited how healthcare providers could reasonably be expected to respond to COVID-19 within their patient populations. Some interviewees recommended moving away from the fee-for-service model into a value-based payment model in which providers could be appropriately compensated for a wider spectrum of services. The value-based payment model would also allow for easier collaboration between primary care and public health as both sectors attempt to address the social determinants of health. Interviewed experts mentioned the possibility of centralizing physical and mental healthcare under one roof, with value-based reimbursement being allocated for those services. In addition to centralizing care, funding should also be allocated toward supporting primary care connecting patients to community

services, such as housing and nutritional services, to close the loop on the continuity of care. Ensuring that patients can return to a healthy environment is important in relieving pressure on healthcare services and a valuable area for collaboration between public health and primary care. Understanding the creative ways in which healthcare centers and providers found to use their existing funding is helpful to designing new reimbursement strategies. Reallocation of healthcare dollars to public health and primary care can facilitate the local integration of primary care practices, health departments, and communities.

Public health must be the lead coordinating entity during large-scale health emergencies. Interviewees strongly expressed that state policymakers should strengthen and empower the role of public health as the coordinating entity during health emergencies, eliminating shifts of operational management to political leaders. Public health as a discipline has expertise with real-time surveillance of diseases and health systems capacity. Public health departments direct supplies, bring in reinforcements to test and contact trace, and can coordinate transfers of patients from facilities with least capacity to facilities with most capacity. By supporting the role of public health as the lead coordinating entity, states could engage in a more balanced pandemic response as opposed to experiencing areas with high need and low resources while other areas remain relatively untouched.

State laws and policies should be changed to foster disaster response. Interviewees commented on the importance of state policymakers removing some bureaucratic strain from healthcare providers to enable them to focus on the COVID-19 response. States should consider creating pandemic policies that allow for flexibility in licensing requirements, such as leniency in renewal dates and easy integration of out-of-state providers. These changes could assist with optimizing the healthcare workforce in primary care facilities during times of high patient surge. Interviewees also commented on the value of states allocating funding from the Coronavirus Aid, Relief, and Economic Security Act (CARES Act)⁸¹ for free COVID-19 testing, which relieved healthcare providers and public health partners from the burden of onerous reimbursement systems. States, in collaboration with each other and the federal government, could also create policies that improve integration and standardization of electronic health records and other health data surveillance systems that could provide a more complete picture of unfolding health emergencies to all relevant partners.

Federal policies should invest more in FQHCs. Interviewees called for robust federal support and guidance for strengthening public health–primary care collaboration. Such top-level leadership would make these collaborations a higher priority nationwide. One specific way to accomplish this goal would be to invest greater resources into FQHCs and outline ways that FQHCs and state/local health departments could collaborate to improve population health, such as testing, contact tracing, vaccinating, and providing resources to address the social determinates of health. A great deal of federal funding had been provided to healthcare facilities and public health agencies during the pandemic, and FQHCs did receive additional targeted funding related to the

COVID-19 pandemic. Other primary care practices and health facilities were eligible for reimbursement for losses that were incurred because of the pandemic. Those funds have been useful, but they do not address preparedness spending that would better mitigate losses due to future events.

Emerging coalitions that support the evolution of primary care should be expanded and emulated. Understanding the historical evolution of primary care from the 1960s to today can help us realize its potential capacity to integrate its activities with public health. Following decades of working in silos, the COVID-19 pandemic offers an opportunity to reunite and align the shared goals of public health and primary care.⁸² For example, currently the Resilient American Communities (RAC) coalition⁸³—a convergent network of individuals and US communities, with expertise in the challenges of emergent diseases, community disaster, environmental justice, and community resilience and redesign—is using a “grass-roots to grass-tops” approach to connecting community-based primary care with the COVID-19 public health response efforts. Recognizing that the COVID-19 pandemic is actually a “syndemic” within the United States, as there are significant variations in cases and deaths between communities, with adverse social determinants of health, misinformation, culture, and behavior playing critical roles, the RAC asserts that the response to the virus cannot be 1 dimensional but requires a “whole of society” platform. Supported by data and linked to similar communities, the RAC hyperlocal networks of trust are acting to identify people and groups at risk, providing balanced advice and messaging through trusted colleagues and sources and facilitating access to testing, supported isolation, care, and vaccines. Using their Medical and Public Health Information Sharing Environment service,⁸⁴ state and local practitioners can connect and communicate with each other across disciplines. By linking communities to each other and providing access to needed data and analytic support, RAC aims to build “vital conditions for health” and build lasting resilience and economic stability across their communities.

An example worthy of consideration is the primary care–behavioral health collaboration, Certified Community Behavioral Health Clinics (CCBHCs), a model of integrated care established by the Excellence in Mental Health and Addiction Act (the Excellence Act) in 2014, expanded in 2018, and reintroduced in 2021.^{85,86} These entities are nonprofit organizations or units of a local government behavioral health authority and are designed to provide a comprehensive range of mental health and substance use disorder services to vulnerable individuals. In return, CCBHCs receive an enhanced Medicaid reimbursement rate based on their anticipated costs of expanding services to meet the needs of these complex populations. CCBHCs must directly provide, or contract with partner organizations to provide, 9 types of services, with an emphasis on the provision of 24-hour crisis care, evidence-based practices, care coordination with local primary care and hospital partners, and integration with physical healthcare. CCBHCs are available to any individual in need of care, including people with serious mental illness, serious emotional disturbance, long-term chronic addiction, mild or moderate mental illness and substance use disorders, and complex health profiles.⁸⁷ These centers provide care regardless of ability to pay, caring for those who are

underserved; have low incomes; are insured, uninsured, or on Medicaid; and/or are active-duty military or veterans. CCBHC Medicaid rates include the cost of activities that have traditionally been near-impossible to reimburse yet play a critical role in behavioral health services. Additionally, CCBHC Medicaid rates include the cost of purchasing or upgrading electronic systems to support electronic information exchange. The Excellence Act prioritizes improving the adoption of technological innovations for care, including data collection, quality reporting, and other activities that bolster providers' ability to care for individuals with co-occurring substance use and mental health disorders. The process used by the Substance Abuse and Mental Health Services Administration and CMS to develop this model could be expanded include a public health component or applied to an integrated public health–primary care pilot with the help of the Centers for Disease Control and Prevention and HRSA.

Leaders in both public health and primary care entities should find sustainable ways to maintain or initiate communication, at a minimum, and collaboration, where possible, at the organizational level. Lack of communication and organizations not thinking to reach out to other partners were commonly cited barriers to effective collaboration. Leaders in both entities must take ownership in rethinking how public health and primary care can be greater allies to each other and create change from the top down. New organizational communication policies that enhance collaborative efforts and leverage the strengths of each entity will bring novel opportunities for health systems improvement.

Interdisciplinary training should be incorporated into workforce development on both sides, with financial incentives to participate in interdisciplinary work. The value of understanding functions and capabilities of public health cannot be understated for medical and nursing students entering the primary care workforce. During the pandemic, many practices reported being disconnected from their state/local public health department. Lack of previous interaction likely contributed to this disconnect, but the lack of knowledge on how public health could help primary care practices also likely prevented practices from reaching out for assistance. Medical and nursing school curriculums should incorporate public health training in order to create a new generation of healthcare providers with insight into and experience with public health activities. Both the Institute of Medicine⁸⁸ and the Liaison Committee of Medical Education⁸⁹ have called for the incorporation of public health topics in the medical school curriculum years ago. Still, knowledge and awareness of public health is not enough to ensure collaboration between public health and primary care in the future. Instead, federal and state initiatives should be created to fund and incentivize collaborative efforts between public health and primary care providers. Interviewees commented that both public health departments and primary care practices are generally operating at near-maximum capacity even under normal conditions that prevents active outreach to take on additional work. Tying funding to public health–primary care integration will help facilitate and enable both partners to engage in shared work together.

The financial reality of primary care has also disincentivized healthcare students from pursuing careers in primary care, favoring specialties with greater income potential. During COVID-19, issues related to healthcare staffing occupied both ends of the financial spectrum. On one end of the spectrum were outpatient practices, including primary care, that were financially struggling due to low patient volumes, and in many cases needing to furlough or lay off staff to avoid the practice declaring bankruptcy. At the other end of the spectrum were hospitals where previous staffing levels were insufficient to meet the increased needs of patients and additional staff support was needed in the form of temporary/traveling professionals or, in more dire situations, the national guard. Challenges were compounded by many healthcare professionals becoming infected by SARS-CoV-2 themselves. Strategic planning is needed to build and sustain a strong public health and primary care workforce for the future.⁹⁰

Colocation of primary care and public health services could benefit population-level health and facilitate active collaboration. Although obvious areas of overlap exist in the missions of public health and primary care, active collaborations between them are sporadic and borne of convenience, but policies could be enacted to make such collaborations more systemic. Although some discussions related to colocating behavioral health services and primary care have taken place, interviewees underscored the value of physically colocating primary care services with public health activities. This arrangement can already be observed in some smaller or more rural townships where public health and primary care practitioners share the same building out of convenience. While there may be some issues of scale for larger and more urban areas, the benefits of sharing the same building with colleagues from the other field are innumerable. Data sharing, patient referrals, and communications could all be improved between public health and primary care through colocation. One idea that arose from interviews was the possibility of colocating public health within FQHCs now that reimbursement-approved telehealth has alleviated some space needs within their existing facilities. The space that would have been used to fill patient waiting rooms could in theory be converted to usable space for public health authorities.

Health philanthropy could be a major accelerator for community-centric primary care–public health collaborations. In *New Insights on How Philanthropy Can Improve Community Health*,⁹¹ the authors note the role of philanthropy in driving enduring systems change needed to improve community health, wellbeing, and equity across the nation. They stated that “[t]he opportunities for philanthropy, especially health philanthropy, to improve community health, wellbeing, and equity are tremendous and still largely untapped. Many efforts across the country are working toward more equitable policies and practices—some are just starting, and others have long and rich histories in their communities.” Consider the potential power if primary care societies were to align with public health in a unified voice to drive congressional action in order to ensure that the disastrous response to the COVID-19 pandemic is not repeated. Health philanthropy could be a major accelerator for community-centric primary care and public health collaborations.⁹²

*Thriving Together: A Springboard for Equitable Recovery and Resilience in Communities Across America*⁹² highlights actions that communities, organizations, businesses, governments, and funders can take in the wake of COVID-19 and other related threats to our nation. It is a practical resource for helping America heal through the trauma of the pandemic and secure the vital conditions that all people and places need to thrive (ie, basic needs for health and safety, humane housing, meaningful work and wealth, lifelong learning, reliable transportation, sense of belonging, and civic muscle).

The report identifies 4 strategic imperatives: (1) affirm human dignity by establishing racial justice and full inclusion for all people as a daily, living reality; (2) strengthen sense of belonging and civic muscle by working across differences for the wellbeing of people and places, which in turn, unlocks abundant assets of people and places; (3) expand all of the interconnected vital conditions with local stewards taking the lead, beginning with people and places that are struggling and suffering; and (4) solidify new legacies for living together by renewing a civic, economic, social, emotional, and spiritual life.

Recommendations

From its acute onset and throughout its extended duration, the COVID-19 pandemic has illuminated and exploited major vulnerabilities within the US healthcare system, the most egregious of which were deficiencies in communication, collaboration, and coordination between primary care and public health. COVID-19 must be used as a catalyst for change. Recognizing that high-quality primary care is the foundation of a healthcare system and that a strong and robust public health system is the bedrock for healthy communities, rapid action is needed to address fundamental gaps that exist in primary care and public health and to correct misalignment across systems. This report identified the substantial challenges and barriers to the integration of primary care and public health activities during the pandemic response. We propose the following recommendations to strengthen primary care and public health, reduce the silos that exist between these systems and to improve health outcomes for all.

Near-Term Recommendations

- Federal and state agencies responsible for public health and primary care should audit their existing policies and funding mechanisms and realign them to support primary care and public health integration and enhance the functionality of both systems.
- HRSA should expand investments into FQHCs that drive both telehealth and colocation with public health. These investments should outline specific ways for FQHCs and state/local health departments to build upon successful programs to improve population health.
- CMS should require and hold accountable healthcare organizations to invest in community-based care and social services that facilitate integration of primary care and public health and improve the social drivers of health.
- The Patient-Centered Outcomes Research Institute, the CMS Innovation Center, and the Agency for Healthcare Research and Quality should drive innovation in primary care and public health models to improve community- and patient-centered care through the use of research, sharing of best practices, and funding mechanisms.
- State and local public health departments should intentionally expand their partnerships with primary care practices in order to leverage primary care's high levels of patient trust, which is needed to quickly disseminate and have accepted important public health messages. The Centers of Disease Control and Prevention should add this as a core competency of its public health emergency preparedness and response capabilities national standards, with the National Association of County and City Health Officials and the Association of State and Territorial Health Officers providing education and advocacy.⁹³

- Health philanthropy should be encouraged to become a major accelerator for community-centric primary care and public health collaborations.⁹²
- States and federal agencies should remove regulatory constraints on healthcare provider licensure and scope of practice during pandemics and other public health emergencies in order to support telehealth, mobilization, and deployment of healthcare workers across state lines.

Longer-Term Recommendations

- HRSA should establish a new federal public health–primary care collaboration and capacity partnership grant program to foster the development of local coalitions of public health departments, primary care providers, and community-based organization to focus on emergency preparedness. This would be analogous to the health care coalitions that are an essential element of the Office of the Assistant Secretary for Preparedness and Response Hospital Preparedness Program, which focuses on building coalitions of public health, hospitals, and emergency management to enhance health system’s surge capacity.^{94,95} Built with community input, these community coalitions should be encouraged and supported through sustainable funding mechanisms that require active local engagement and participation by both public health and primary care.
- The National Academy of Science, Engineering, and Medicine should seek funding for a study to propose a process for developing a national-, state-, and local-level data infrastructure for sharing information across public health and primary care. Epic, Cerner, Meditech, Allscripts, Athenahealth, and institutions with subject matter experts (eg, Google Health) should participate in developing ways of enhancing interoperability of information technology systems and exchange of critical health information.
- To address the lack of a national primary care provider database, states should provide healthcare provider data to the Office of the Assistant Secretary for Preparedness and Response to establish a unified national registry of medical practices and licensed healthcare providers to facilitate timely and relevant communication from federal authorities to healthcare providers and provide an important preparedness mechanism that can be accessed during a public health emergency, such as the COVID-19 pandemic.
- CMS, through direct graduate medical education and indirect medical education in conjunction with HRSA, should fund interprofessional education and training of the public health and primary care workforce—medicine, nursing and public health—to establish increased understanding and a precedent for team-based communication and collaboration.^{96,97} Academic programs to create and sustain a pipeline for the public health and primary care workforce with the knowledge, skills, and abilities to serve the needs of US communities during future infectious disease outbreaks should be expanded to accommodate physicians and nurses who wish to pursue a master’s degree in public health.

- Congress should provide sustainable investment to expand existing successful community-based models, such as the NC360 Program, that include integrated public health and primary care activities necessary to improve our response to future public health emergencies.⁷⁸
- Research organizations committed to primary care and public health integrations should undertake exploration of which agencies are best suited to spearhead, support, and be accountable for the recommendations in this report.

References

1. Johns Hopkins Coronavirus Resource Center. COVID-19 dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). Accessed October 20, 2021. <https://coronavirus.jhu.edu/map.html>
2. Chen JT, Krieger N. Revealing the unequal burden of COVID-19 by income race/ethnicity, and household crowding: US county vs. ZIP code analyses. *Harvard Center for Population and Development Studies Working Paper Series*. 2020;19(1). Accessed October 20, 2021. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/1266/2020/04/HCPDS_Volume-19_No_1_20_covid19_RevealingUnequalBurden_HCPDSWorkingPaper_04212020-1.pdf
3. Squires D, Anderson C. U.S. health care from a global perspective. The Commonwealth Fund. Published October 8, 2015. Accessed October 20, 2021. <https://www.commonwealthfund.org/publications/issue-briefs/2015/oct/us-health-care-global-perspective>
4. Jabbarpour Y, Greiner A, Jetty A, et al. *Investing in Primary Care: A State-Level Analysis*. Washington, DC: Patient-Centered Primary Care Collaborative and The Robert Graham Center; 2019. Accessed October 20, 2021. https://www.pcpcc.org/sites/default/files/resources/pcmh_evidence_report_2019_0.pdf
5. National Academies of Sciences, Engineering, and Medicine. *Implementing High-Quality Primary Care: Rebuilding the Foundation of Health Care*. Washington, DC: The National Academies Press; 2021. Accessed December 8, 2021. <https://doi.org/10.17226/25983>
6. Institute of Medicine. *Primary Care and Public Health: Exploring Integration to Improve Population Health*. Washington, DC: The National Academies Press; 2012. Accessed October 20, 2021. <https://doi.org/10.17226/13381>
7. Health Resources and Services Administration. Federally qualified health centers. Last reviewed May 2018. Accessed December 2, 2021. <https://www.hrsa.gov/opa/eligibility-and-registration/health-centers/fqhc/index.html>
8. Health Resources and Services Administration. Ensuring equity in COVID-19 vaccine distribution. Last reviewed May 2021. Accessed December 2, 2021. <https://www.hrsa.gov/coronavirus/health-center-program>
9. Stephens GG. The intellectual basis of family practice. *J Fam Pract*. 1975;2(6):423-428.
10. Citizens Commission of Graduate Medical Education. *The Graduate Education of Physicians: The Report of the Citizens Commission of Graduate Medical Education*. Chicago: American Medical Association; 1966. <https://www.aafpfoundation.org/content/dam/foundation/documents/who-we-are/cfhm/classicsfamilymedicine/GraduateEducationofPhysicians.pdf>
11. National Commission on Community Health Services. *Health Is a Community Affair*. Cambridge, MA: Harvard University Press; 2014. Accessed October 20, 2021. <https://doi.org/10.4159/harvard.9780674863385>
12. American Medical Association Council on Medical Education. *Meeting the Challenge of Family Practice: The Report of the Ad Hoc Committee on Education for Family Practice of the Council on Medical Education, American Medical Association*. Chicago: American Medical Association; 1966.

13. American Academy of Family Physicians. Integration of primary care and public health (position paper). Accessed October 21, 2021. <https://www.aafp.org/about/policies/all/integration-primary-care.html>
14. Kerkhoff AD, Sachdev D, Mizany S, et al. Evaluation of a novel community-based COVID-19 “Test-to-Care” model for low-income populations. *PLoS One*. 2020;15(10):e0239400.
18. Pinto RM, Witte SS, Filippone P, Choi CJ, Wall M. Interprofessional collaboration and on-the-job training improve access to HIV testing, HIV primary care, and pre-exposure prophylaxis (PrEP). *AIDS Educ Prev*. 2018;30(6):474-489.
19. Udeagu C, Huang J, Eason L, Pickett L. Health department-HIV clinic integration of data and human resources to re-engage out of care HIV-positive persons into clinical care in a New York City locale. *AIDS Care*. 2019;31(11):1420-1426.
15. Mera J, Vellozzi C, Hariri S, et al. Identification and clinical management of persons with chronic hepatitis c virus infection - Cherokee Nation, 2012-2015. *MMWR Morb Mortal Wkly Rep*. 2016;65(18):461-466.
16. Pinto RM, Choi CJ, Wall MM. Developing a scale to measure interprofessional collaboration in HIV prevention and care: implications for research on patient access and retention in the HIV continuum of care. *AIDS Educ Prev*. 2020;32(1):36-50.
17. Elkington KS, Robertson AA, Knight DK, et al. HIV/STI service delivery within juvenile community supervision agencies: a national survey of practices and approaches to moving high-risk youth through the HIV care cascade. *AIDS Patient Care STDs*. 2020;34(2):72-80.
20. Clement ME, Johnston BE, Eagle C, et al. Advancing the HIV pre-exposure prophylaxis continuum: a collaboration between a public health department and a federally qualified health center in the southern United States. *AIDS Patient Care STDs*. 2019;33(8):366-371.
21. Kempe A, Albright K, O’Leary S, et al. Effectiveness of primary care-public health collaborations in the delivery of influenza vaccine: a cluster-randomized pragmatic trial. *Prev Med*. 2014;69:110-116.
22. Temte JL, Barlow S, Schemmel A, et al. New method for real time influenza surveillance in primary care: a Wisconsin Research and Education Network (WREN) supported study. *J Am Board Fam Med*. 2017;30(5):615-623.
23. US Centers for Disease Control and Prevention. National Diabetes Prevention Program. Page last reviewed August 27, 2021. Accessed October 20, 2021. <https://www.cdc.gov/diabetes/prevention/index.html>
24. Cross KL, Johnson P, Allard BL, Shuman CJ. Clinical nurse specialists’ perceptions of transitioning into a rural community-based transitional care role. *J Nurs Adm*. 2020;50(9):456-461.
25. Krist AH, DeVoe JE, Cheng A, Ehrlich T, Jones SM. Redesigning primary care to address the COVID-19 pandemic in the midst of the pandemic. *Ann Fam Med*. 2020;18(4):349-354.
26. Deeds SA, Hagan SL, Geyer JR, et al. Leveraging an electronic health record note template to standardize screening and testing for COVID-19. *Healthc (Amst)*. 2020;8(3):100454.
27. Goldfield NI, Crittenden R, Fox D, McDonough J, Nichols L, Lee Rosenthal E. COVID-19 crisis creates opportunities for community-centered population health: community health workers at the center. *J Ambul Care Manage*. 2020;43(3):184-190.

28. Edelman EJ, Aoun-Barakat L, Villanueva M, Friedland G. Confronting another pandemic: lessons from HIV can inform our COVID-19 response. *AIDS Behav.* 2020;24(7):1977-1979.
29. Bellmunt JM, Caylà JA, Millet JP. Contact tracing in patients infected with SARS-CoV-2. The fundamental role of primary health care and public health. (Article in Spanish.) *Semerger.* 2020;46(suppl 1):55-64.
30. Valaitis R, Meagher-Stewart D, Martin-Misener R, Wong ST, MacDonald M, O'Mara L. Organizational factors influencing successful primary care and public health collaboration. *BMC Health Serv Res.* 2018;18(1):420.
31. Koh HK, Graham G, Glied SA. Reducing racial and ethnic disparities: the action plan from the Department of Health and Human Services. *Health Aff (Millwood).* 2011;30(10):1822-1829.
32. Sims J, Aboelata MJ. A system of prevention: applying a systems approach to public health. *Health Promot Pract.* 2019;20(4):476-482.
33. DeVoe JE, Likumahwa-Ackman S, Shannon J, Steiner Hayward E. Creating 21st-century laboratories and classrooms for improving population health: a call to action for academic medical centers. *Acad Med.* 2017;92(4):475-482.
34. Bernstein JA, Friedman C, Jacobson P, Rubin JC. Ensuring public health's future in a national-scale learning health system. *Am J Prev Med.* 2015;48(4):480-487.
35. Albright K, Saville A, Lockhart S, Racich KW, Beaty B, Kempe A. Provider attitudes toward public-private collaboration to improve immunization reminder/recall: a mixed-methods study. *Acad Pediatr.* 2014;14(1):62-70.
36. Department of Health and Human Services (HHS) Health Resources and Services Administration. *A Guide for Rural Health Care Collaboration and Coordination.* Rockville, MD: HHS; 2019. Accessed December 2, 2021. <https://www.hrsa.gov/sites/default/files/hrsa/ruralhealth/reports/HRSA-Rural-Collaboration-Guide.pdf>
37. Mays GP, Scutchfield FD. Improving public health system performance through multiorganizational partnerships. *Prev Chronic Dis.* 2010;7(6):A116.
38. Sampson G, Gearin KJM, Boe M. A rural local health department-hospital collaborative for a countywide community health assessment. *J Public Health Manag Pract.* 2015;21(1):23-30.
39. Piper CN, Plescia M, Keener SR, DeHaven M. The Mecklenburg County Interlocal Agreement: an 18-Year collaboration between medicine and public health. *J Public Health Manag Pract.* 2018;24(1):E1-E7.
40. Pratt R, Gyllstrom B, Gearin K, et al. Primary care and public health perspectives on integration at the local level: a multi-state study. *J Am Board Fam Med.* 2017;30(5):601-607.
41. Martin-Misener R, Valaitis R, Wong S, et al. A scoping literature review of collaboration between primary care and public health. *Prim Health Care Res Dev.* 2012;13:327-346.
42. Fowler KE, Forman J, Ameling JM, et al. Qualitative assessment of a state partner-facilitated health care-associated infection prevention national collaborative. *Ann Intern Med.* 2019;171(suppl 7):S75-S80.
43. Institute of Medicine. *Collaboration Between Hospitals and Public Health Agencies: Workshop Summary.* Washington, DC: The National Academies Press; 2016. Accessed October 29, 2020. <https://doi.org/10.17226/21755>

44. Gyllstrom E, Gearin K, Nease D, Bekemeier B, Pratt R. Measuring local public health and primary care collaboration: a practice-based research approach. *J Public Health Manag Pract*. 2019;25(4):382-389.
45. Taylor E, Bailit M, Dyer MB, Hacker K. Integrating public health and health care: getting beyond the theory. Robert Wood Johnson Foundation. Published March 2016. Accessed December 2, 2021. <https://www.shvs.org/wp-content/uploads/2016/03/SHVS-Bailit-Public-Health-Integration-March-2016.pdf>
46. Williams MD, Jean MC, Chen B, Molinari NAM, LeBlanc TT. Primary Care Emergency Preparedness Network, New York City, 2015: comparison of member and nonmember sites. *Am J Public Health*. 2017;107(suppl 2):S193-S198.
47. Pratt R, Gyllstrom B, Gearin K, et al. Identifying barriers to collaboration between primary care and public health: experiences at the local level. *Public Health Rep*. 2018;133(3):311-317.
48. Fiscella K. Improving the health of patients and communities: evolving practice-based research (PBR) and collaborations. *J Am Board Fam Med*. 2017;30(5):562-566.
49. Robert Wood Johnson Foundation. Public health and health care working together: Paul Kuehnert Q&A. Culture of Health Blog. Published November 20, 2012. Accessed December 8, 2021. http://www.rwjf.org/en/blogs/new-public-health/2012/11/public_health_andhe.html
50. Fleegler EW, Bottino CJ, Pikcilingis A, Baker B, Kistler E, Hassan A. Referral system collaboration between public health and medical systems: a population health case report. *NAM Perspectives Discussion Paper*. National Academies of Medicine. Published May 27, 2016. Accessed December 3, 2021. <https://doi.org/10.31478/201605f>
51. McCullough JM, Goodin K. Clinical data systems to support public health practice: a national survey of software and storage systems among local health departments. *J Public Health Manag Pract*. 2016;22(suppl 6):S18-S26.
52. McGinnis JM. Can public health and medicine partner in the public interest? *Health Aff (Millwood)*. 2006;25(4):1044-1052.
53. Sun X, Palm D, Grimm B, Chen L-W. Strengthening linkages between public health and health care in Nebraska. *Prev Chronic Dis*. 2019;16:E100.
54. Shaw JS, Norlin C, Gillespie RJ, Weissman M, McGrath J. The National Improvement Partnership Network: state-based partnerships that improve primary care quality. *Acad Pediatr*. 2013;13(6):S84-S94.
55. Sinsky C, Linzer M. Practice and policy reset post-COVID-19: reversion, transition, or transformation? *Health Aff (Millwood)*. 2020;39(8):1405-1411.
56. Institute of Medicine. *Collaboration Between Health Care and Public Health: Workshop in Brief*. Washington, DC: The National Academies Press; 2015. Accessed December 3, 2021. <https://doi.org/10.17226/21687>
57. Newman SJ, Ye J, Leep CJ, Hasbrouck L, Zometa C. Assessment of staffing, services, and partnerships of local health departments - United States, 2015. *MMWR Morb Mortal Wkly Rep*. 2016;65(25):646-649.
58. Kuo AA. Healthy partnership: policy urges more collaboration between pediatrics, public health. *AAP News*. Published October 29, 2020. Accessed December 8, 2021. <https://www.aappublications.org/news/2018/01/22/PublicHealth012218>

59. Whitsel LP, Wilbanks J, Huffman MD, Hall JL. The role of government in precision medicine, precision public health and the intersection with healthy living. *Prog Cardiovasc Dis*. 2019;62(1):50-54.
60. Fineberg HV. Public health and medicine: where the twain shall meet. *Am J Prev Med*. 2011;41(4 suppl 3):S149-S151.
61. Cybersecurity & Infrastructure Security Agency. Healthcare and public health sector. Accessed December 3, 2021. <https://www.cisa.gov/healthcare-and-public-health-sector>
62. Lurie N, Fremont A. Building bridges between health care and public health: a critical piece of the health reform infrastructure. *JAMA*. 2009;302(1):84-86.
63. US Centers for Disease Control and Prevention. U.S. influenza surveillance system: purpose and methods. Page last reviewed October 15, 2021. Accessed December 3, 2021. <https://www.cdc.gov/flu/weekly/overview.htm>
64. Bates DW. Health information technology and care coordination: the next big opportunity for informatics? *Yearb Med Inform*. 2015;10(1):11-14.
65. Physicians Advocacy Institute. COVID-19's impact on acquisitions of physician practices and physician employment 2019-2020. Published June 2021. Accessed October 20, 2021. http://www.physiciansadvocacyinstitute.org/Portals/0/assets/docs/Revised-6-8-21_PA-Physician-Employment-Study-2021-FINAL.pdf
66. Scheffler RM, Arnold DR, Whaley CM. Consolidation trends in California's health care system: impacts on ACA premiums and outpatient visit prices. *Health Aff (Millwood)*. 2018;37(9):1409-1416.
67. Schwartz K, Lopez E, Rae M, Neuman T. What we know about provider consolidation. Kaiser Family Foundation. Published September 2, 2020. Accessed October 20, 2021. <https://www.kff.org/health-costs/issue-brief/what-we-know-about-provider-consolidation/>
68. Grumbach K, Bodenheimer T, Cohen D, Phillips RL, Stange KC, Westfall JM. Revitalizing the U.S. primary care infrastructure. *N Engl J Med*. 2021;385(13):1156-1158.
69. Waitzberg R, Quentin W, Webb E, Glied S. The structure and financing of health care systems affected how providers coped with COVID-19. *Milbank Q*. 2021;99(2):542-564.
70. Health Resources and Services Administration Health Center Program. Health Center Program: impact and growth. Updated August 2021. Accessed December 8, 2021. <https://bphc.hrsa.gov/about/healthcenterprogram>
71. Kempfski A, Greiner A. *Primary Care Spending: High Stakes, Low Investment*. Washington, DC: Primary Care Collaborative; 2020. Accessed October 21, 2021. https://www.pcpcc.org/sites/default/files/resources/PCC_Primary_Care_Spending_2020.pdf
72. Reiff J, Brennan N, Fuglesten Biniek J. Primary care spending in the commercially insured population. *JAMA*. 2019;322(22):2244-2245.
73. Martin S, Phillips RL Jr, Petterson S, Levin Z, Bazemore AW. Primary care spending in the United States, 2002-2016. *JAMA Intern Med*. 2020;180(7):1019-1020.
74. Health Resources and Services Administration Health Center Program. Bureau of Primary Health Care. Accessed October 21, 2021. <https://bphc.hrsa.gov/>
75. Kaiser Family Foundation. Community health center revenues by payer source. Accessed October 21, 2021. <https://www.kff.org/other/state-indicator/community-health-center-revenues-by-payer-source/>

76. NYC Health. Primary Care Information Project. Accessed October 21, 2021. <https://www1.nyc.gov/site/doh/providers/resources/primary-care-information-project.page>
77. The Larry A. Green Center. Quick COVID-19 survey. Accessed October 21, 2021. <https://www.green-center.org/covid-survey>
78. NCCARE360. Building connections for a healthier North Carolina. Last updated December 1, 2021. Accessed December 3, 2021. <https://nccare360.org/>
79. Maryland Department of Health. Maryland Primary Care Program. Last updated June 2021. Accessed December 3, 2021. <https://health.maryland.gov/mdpcp/Pages/home.aspx>
80. NYC REACH. Welcome to NYC REACH. Accessed December 3, 2021. <https://nycreach.org/>
81. Coronavirus Aid, Relief, and Economic Security Act, HR 748, 116 Cong (2019-2020). <https://www.congress.gov/bill/116th-congress/house-bill/748>
82. Bourgeault IL, Chamberland-Rowe C, Simkin S. Co-developing an integrated primary care workforce planning approach at a regional level: overarching framework and guiding principles. *Hum Resour Health*. 2021;19(1):87.
83. Resilient American Communities. Accessed October 21, 2021. <https://resilientamericancommunities.org/>
84. Department of Homeland Security (DHS). DHS/CWMD/PIA – 001 Medical and Public Health Information Sharing Environment (MPHISE). Published July 30, 2020. Accessed December 8, 2021. <https://www.dhs.gov/publication/dhscwmdpia-001-medical-and-public-health-information-sharing-environment-mphise>
85. The National Council for Mental Wellbeing. CCBHC Success Center. Accessed October 21, 2021. <https://www.thenationalcouncil.org/ccbhc-success-center/ccbhcta-overview/>
86. The National Council for Mental Wellbeing. National Council commends reintroduction of the bipartisan Excellence in Mental Health and Addiction Treatment Act of 2021. Accessed October 21, 2021. <https://www.thenationalcouncil.org/press-releases/national-council-commends-reintroduction-of-the-bipartisan-excellence-in-mental-health-and-addiction-treatment-act-of-2021/>
87. The National Council for Mental Wellbeing. What is a CCBHC? Accessed October 21, 2021. https://www.thenationalcouncil.org/wp-content/uploads/2020/08/What_is_a_CCBHC_UPDATED_8-5-20.pdf?daf=375ateTbd56
88. Institute of Medicine. *Who Will Keep the Public Healthy?: Educating Public Health Professionals for the 21st Century*. Washington, DC: The National Academies Press; 2003. Accessed December 3, 2021. <https://doi.org/10.17226/10542>
89. St Onge JE, Cata AM, Horigian VE. Integration of public health in LCME accredited medical school in Florida: a survey based study. *Cureus*. 2019;11(7):e5213.
90. Donnellan J. BPC's health care leaders recommend steps to building a resilient public health system for the next pandemic. Bipartisan Policy Center. Published June 29, 2021. Accessed October 21, 2021. <https://bipartisanpolicy.org/press-release/bpcs-health-care-leaders-recommend-steps-to-building-a-resilient-public-health-system-for-the-next-pandemic/>
91. Aron L, Wójcik O, Mitchell F. New insights on how philanthropy can improve community health. *Health Affairs* blog. Published September 23, 2021. Accessed December 3, 2021. <https://www.healthaffairs.org/doi/10.1377/hblog20210921.1665/full/>

92. Thriving Together. We can thrive together. Accessed December 3, 2021. <https://thriving.us/>
93. US Centers for Disease Control and Prevention. Public health preparedness and response capabilities: national standards for state, local, tribal, and territorial public health. Page last reviewed January 25, 2021. Accessed December 3, 2021. <https://www.cdc.gov/cpr/readiness/capabilities.htm>
94. ASPR TRACIE. General overview of healthcare coalitions. Accessed December 3, 2021. <https://files.asprtracie.hhs.gov/documents/aspr-tracie-general-overview-hccs.pdf>
95. Public Health Emergency. Hospital Preparedness Program (HPP). Page last reviewed September 23, 2021. Accessed October 21, 2021. <https://www.phe.gov/Preparedness/planning/hpp/Pages/default.aspx>
96. Centers for Medicare & Medicaid Services. Indirect medical education (IME). Updated December 1, 2021. Accessed December 3, 2021. <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Indirect-Medical-Education-IME>
97. Centers for Medicare & Medicaid Services. Direct graduate medical education (DGME). Updated December 1, 2021. Accessed December 3, 2021. <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/DGME>

Appendix A. Structured Search Strategy

The scoping literature review used the search terms and parameters indicated in [Table A1](#) to find relevant peer-reviewed literature and reports. The resulting documents and articles were then included or excluded according to the criteria in [Table A2](#).

Table A1. Search Terms and Parameters for Scoping Review

Database	Component	Keywords	MeSH Terms
PubMed	Public health services and community health services	“Public Health Practice*”[tw] OR “Public Health Administration*”[tw] OR “Public Health Systems Research”[tw] OR “Community Health Service*”[tw] OR “Community Health Care”[tw] OR “Community Healthcare*”[tw]	“Public Health Practice” [mesh] OR “Public Health Administration” OR “Public Health Systems Research”[mesh] OR “Community Health Services”[mesh]
	Primary care services	“Primary Healthcare”[tw] OR “Primary Care”[tw]	“Primary Health Care”[mesh]
	Collaboration and cooperative behavior between entities	“Collaboration”[tw] OR “collaborating”[tw] OR “cooperative behavior*”[tw]	“Cooperative Behavior”[mesh]
	United States filter	<i>State name</i> [mh] OR <i>state name</i> [tiab] (same format for all 50 states and District of Columbia) <i>Selected large cities</i> : Chicago[tiab] OR New York City[tiab] OR Baltimore[tiab] OR Philadelphia[tiab] OR Boston[tiab] OR New Orleans[tiab] OR San Francisco[tiab] OR Los Angeles[tiab]	
	Time range: 1/1/2010 – 12/31/2020		
Web of Science	All components included	public health AND primary care AND collaboration	
	Refined by: Language (English), Countries/Regions (USA), Timespan (2010-2020)		
Google Scholar	All components included	“coordination between public health and healthcare” “collaboration between public health and healthcare”	
Google	All components included – grey literature search	“coordination between public health and healthcare” “collaboration between public health and healthcare”	

Table A2. A Priori Inclusion and Exclusion Criteria Used for Scoping Review

Inclusion	Exclusion
<ul style="list-style-type: none"> • Discusses collaboration/integration between primary care and public health • Community health partnerships • Infectious diseases (epidemic, outbreak, etc.) • Study based in United States • Study published between 2010 and 2020 	<ul style="list-style-type: none"> • Clinical trials • Collaboration on chronic diseases • Collaboration on mental health • Collaboration on cancer • International settings or systems • Clinician perspectives on disease/condition not relating back to public health • Public health perspectives on disease/condition not relating back to primary care

Appendix B. Questions for Public Health Interviews

Overarching/opening questions:

1. Please describe your interactions with primary care during the COVID-19 pandemic.
2. How would you characterize communications between primary care and public health during the COVID-19 response?

What were the challenges?:

3. What was/is your biggest public health challenge in responding to COVID-19?
4. Given workforce challenges, did primary care serve as an extension of the public health workforce during COVID-19 response in your location?
5. What are the main obstacles to the integration of primary care and public health during COVID-19 response?
6. Do you have political support in your location/jurisdiction for the integration of primary care and public health during the COVID-19 response?
7. Does the public health infrastructure in your community support integration with primary care?

What were the successes?:

8. What public health delivery innovations did you develop in response to COVID-19?
9. What has gone well during the response to COVID-19?
10. What CDC PHEP capabilities required you to interact with primary care during the COVID-19 response?
11. How important are pre-existing personal relationships between primary care and public health during COVID-19 response?
 - a. What role did the National Association of County and City Health Officials/ Association of State and Territorial Health Officials play in connecting primary care and public health in your location?
 - b. Did you interact with the Assistant Secretary for Preparedness and Response's COVID-19 Response Assistance Field Team (CRAFT) in your location? Did this facilitate integration with primary care?

What needs to happen in the future?:

12. What can be done to strengthen connections between primary care and public health during the COVID-19 pandemic?

13. What public policies contributed to or constrained the integration of primary care and public health during the COVID-19 response?
14. What practice changes have you made in terms of preparedness as a result of what you have experienced during the COVID-19 pandemic?
15. What policy changes have you made in terms of preparedness as a result of what you have experienced during the COVID-19 pandemic?
16. Describe your vision for public health and primary care for the next pandemic or emerging infectious disease outbreak?
 - a. What would it take to make this vision happen?

Appendix C. Questions for Primary Care/ Community-Based Interviews

Overarching/opening questions:

1. Please describe your interactions with state and local public health during COVID-19.
2. How would you characterize communications between primary care and public health during the COVID-19 response?

What were the challenges?:

3. What was/is your biggest challenge for your primary care practice or organization in responding to COVID-19?
4. Did your primary care practice augment the public health workforce during COVID-19 response in your location? Alternatively, were there ways in which public health supported workforce demands in your primary care practice organization?
5. What are the main obstacles to collaboration between primary care and public health during COVID-19 response?

What were the successes?:

6. What has gone well during the response to COVID-19?
7. What primary care delivery innovations did you develop in response to COVID-19?
 - a. Did any innovative practices augment state and local public health efforts?
 - a. Were new initiatives in your organization done in collaboration with public health?

What needs to happen in the future?:

8. What can be done to strengthen connections between primary care and public health during the COVID-19 pandemic?
9. What public policies contributed to or constrained the integration of primary care and public health during the COVID-19 response?
10. What *practice* changes have you made in terms of preparedness as a result of what you have experienced during the COVID-19 pandemic?
11. What *policy* changes have you made in terms of preparedness as a result of what you have experienced during the COVID-19 pandemic?
12. Describe your vision for public health and primary care for the next pandemic or emerging infectious disease outbreak?

Appendix D. Research Activities

The following research activities will inform a series of case studies that will be written up and shared as the project proceeds ([Table D1](#)).

Table D1. Research Activities

Research Questions	Research Activities
What community partnerships exist to develop and sustain community-tailored health programs at the local level aimed at matching local health needs with integrated primary and public health services?	<ul style="list-style-type: none"> • Complete a review of the literature on community health partnerships • Explore currently funded Centers for Disease Control and Prevention National Center for Chronic Disease Prevention and Health Promotion community health programs
What expanded activities in support of COVID-19 response could be promoted by the ongoing development of integrated comprehensive care practices, accessible for all groups in a community, through the creation of explicit partnerships with public health professionals and communities of solution?	<ul style="list-style-type: none"> • Conduct key informant interviews with primary care and public health providers
How can primary care providers engage community partnerships to coordinate with municipal authorities to design and build healthy living environments to include emergency isolation and quarantine facilities?	<ul style="list-style-type: none"> • Conduct key informant interviews with National Association of County and City Health Officials, Association of State and Territorial Health Officials, and national and state community health associations
How can primary care providers promote health literacy and provide accurate, timely public health education and information to empower individuals within communities of solution to be active participants in protecting their own health and the health of their communities during a pandemic?	<ul style="list-style-type: none"> • Conduct key informant interviews with primary care and public health providers
What changes in the constitution of the primary care workforce will be necessary to expand primary care activities during the COVID-19 pandemic to serve the needs of US communities?	<ul style="list-style-type: none"> • Conduct key informant interviews with primary care providers
How can primary care providers engage with patients and citizens to support a public health/population health volunteer network formed by communities of solutions to educate, motivate, and collaborate for strategic local, regional, and national scarce resource allocation informed by credible and actionable data?	<ul style="list-style-type: none"> • Conduct key informant interviews with primary care and public health providers
How can primary care providers take the lead in the development of interoperable health information technology and emerging data-sharing innovative networks that enable the flow of relevant knowledge (public health, environmental, educational, legal, etc.) to the communities of solution?	<ul style="list-style-type: none"> • Conduct key informant interviews with primary care and public health providers

Appendix E. Key Informant Interviewees

Table E1. Key Informant Interviewees

Name	Title	Organizational Affiliation
Andrea Fox, MD	Internist and Geriatrician	Squirrel Hill Health Center, Pittsburgh, Pennsylvania
Ann Griener, MCP	President and Chief Executive Officer	Primary Care Collaborative
Betsy Boyd Flynn, MA	Executive Director	Oregon Academy of Family Physicians
Brian Frank, MD	Assistant Professor of Family Medicine	Oregon Health and Science University; Family Medicine for America's Health
Cody Minks, MPH, MA, MEP	Emergency Preparedness Specialist	SSM Health
Liz Delasobera, MD	Emergency Medicine and Sports Medicine Physician	MedStar Health
Erin Yeagley (Athey), DNP, FNP-BC, RN, FAANP	Assistant Professor	George Washington University School of Nursing
Ethan Booker, MD, FACEP	Medical Director	MedStar Telehealth Innovation Center and MedStar eVisit
Margaret Flinter, PhD, APRN	Senior Vice President and Clinical Director of Community Health Center, Inc.	Weitzman Institute
A. Seiji Hayashi, MD, MPH, FAAP	Chief Transformation Officer and Medical Director	Mary's Center
Howard Haft, MD	Executive Director at Maryland Primary Care Program	Maryland Department of Health
Jack Westfall, MD, MPH	Director	Robert Graham Center for Policy Studies in Family Medicine and Primary Care
James Blumenstock	Senior Vice President for Pandemic Response and Recovery	Association of State and Territorial Health Officials
John Bernot, MD	President and Chief Medical Officer	Bravado Health
Laura Biesiadecki, MPH	Senior Director for Preparedness	National Association of County and City Health Officials
Leslie Wolcott, MA	Communications and Emergency Preparedness Coordinator	North Carolina Community Health Center Association
LuAnn Brink, PhD	Chief Epidemiologist	Allegheny County Health Department
Jim McDonald, MD, MPH	Chief Administrative Officer	Rhode Island Department of Health

Suzet McKinney, DrPH, MPH	Principal and Director of Life Sciences	Sterling Bay
Michael Fine, MD	Chief Health Strategist, Medical Director Beat COVID-19	Cities of Central Falls and Pawtucket Rhode Island
James Lloyd Michener, MD	Professor Emeritus in Family Medicine and Community Health	Duke University School of Medicine
Hang Pham-Singer, PharmD	Executive Director of Quality Improvement	New York City Department of Health and Mental Hygiene
Rebecca Etz, PhD	Co-Director	Larry A. Green Center
Janine Rethy, MD, MPH, IBCLC, FAAP, FABM	Division Chief, Community Pediatrics	MedStar Georgetown University Hospital
Cheri Rinehart	President and Chief Executive Officer	Pennsylvania Association of Community Health Centers
Rishi Sood, MPH	Executive Director of Health Care Access and Policy	New York City Department of Health and Mental Hygiene
Sergio Aguilar Gaxiola, MD, PhD	Director, UC Davis Center for Reducing Health Disparities	UC Davis Health
James Welsh, MD, MBA, MPH	Vice President of Primary Care Services	MedStar Georgetown University Hospital
Brendan Riley	Director of Health Policy	North Carolina Community Health Center Association
Onora Lien, MA	Executive Director	Northwest Healthcare Response Network
Elliot Smith, MD	Chief Clinical Officer	Butler Health System

**Johns Hopkins
Center for Health Security**

621 E. Pratt Street, Suite 210
Baltimore, MD 21202

Tel: 443-573-3304

Fax: 443-573-3305

centerhealthsecurity@jhu.edu
centerforhealthsecurity.org



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

**Center for
Health Security**