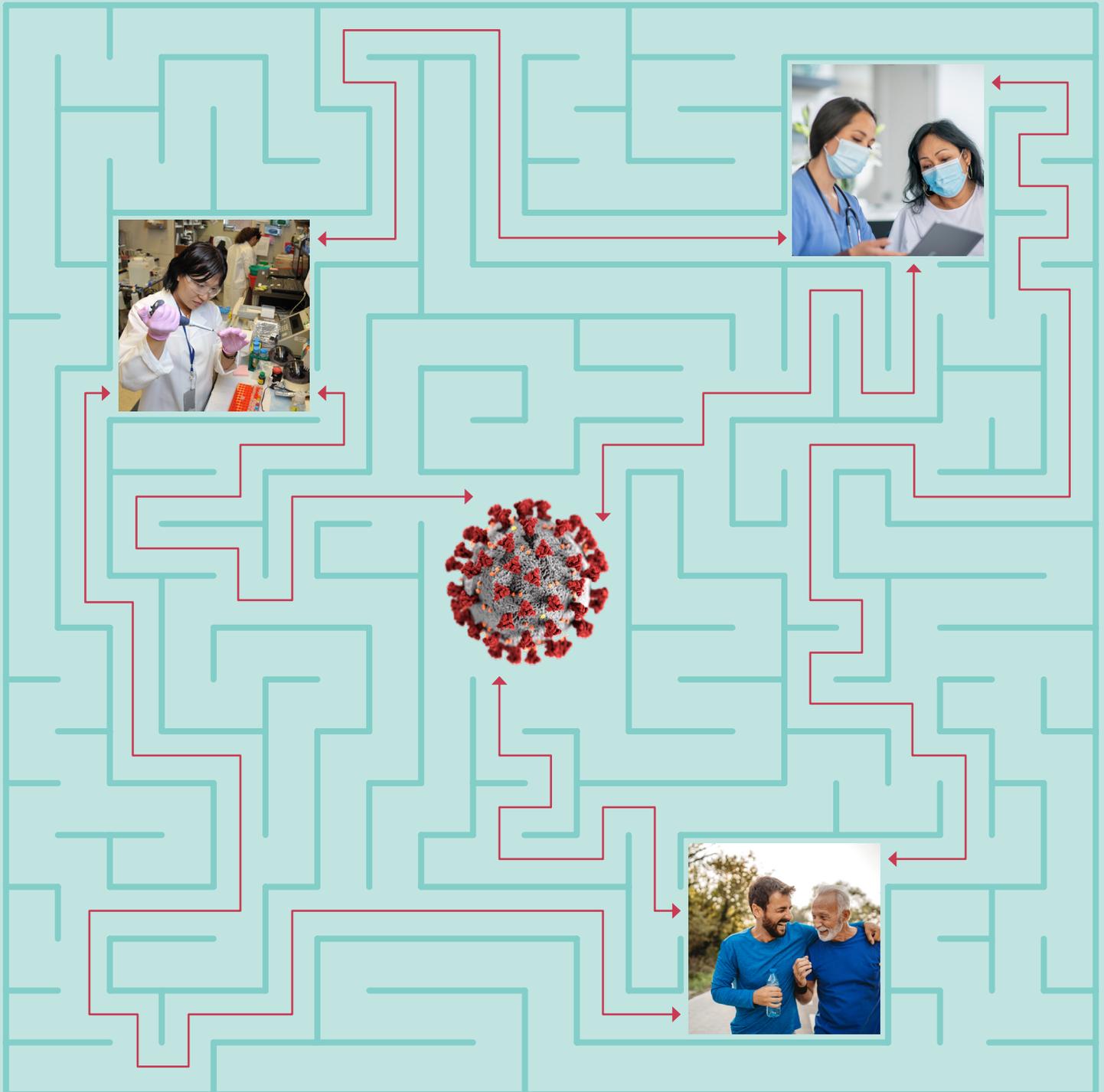


# Primary Care and COVID-19: It's Complicated

Leveraging Primary Care, Public Health, and Social Assets



October 2021

**Authors**

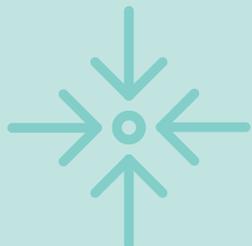
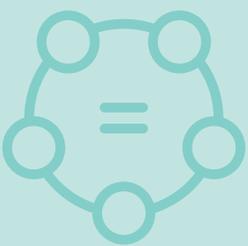
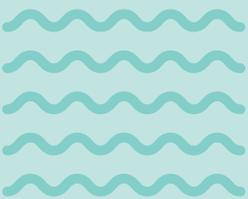
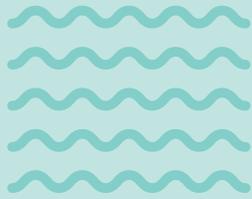
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# Dear Colleagues,

At this writing in September 2021, we are in the midst of a fourth COVID-19 surge, one fueled by the delta variant.

When we envisioned the Primary Care Collaborative's 2021 report with our partners at the Robert Graham Center, we believed that we would be on the other side of the pandemic. And while we are grateful for the efficacy of an array of COVID-19 vaccines and the embrace of them by *most* of the United States population, much work lies ahead to wrestle this pandemic to the ground.

The Primary Care Collaborative's 2021 Evidence Report examines community factors at the county level—starting with primary care but also including local public health and social assets—that we hypothesize can help mitigate the effects of this pandemic and other health emergencies.

The findings do show that after the vaccine was made widely available, in communities with the most robust primary care, the strongest public health infrastructure, and the fewest social vulnerabilities people were 42%

less likely to die from COVID-19 and 12% less likely to get infected with the virus, as compared to communities on the other end of the spectrum. Of course, these findings raise questions about both our level of investment in critical health infrastructure and whether we adequately leveraged existing infrastructure.

After all, one in 500 Americans has died from the virus, and the U.S. COVID-19 death toll accounts for nearly 20% of the world's deaths, despite the U.S. being just over 4% of the world's population.<sup>1</sup> These are particularly grim statistics against the backdrop of the U.S. having one of the earliest and most robust supply of vaccines.<sup>2</sup>

These wide disparities within the U.S. and as compared to other countries present a clarion call for re-building our health and healthcare systems differently so that they are protective against the next pandemic. The findings also suggest that primary care and public health need to reach beyond their silos and join forces to help communities to both build resistance against the next health emergency and better address stark inequities in care.



Kind regards,

A handwritten signature in black ink that reads "Ann C. Greiner".

Ann Greiner  
President and CEO  
Primary Care Collaborative

# Executive Summary

As the United States puts strategies in place to try to emerge from the COVID-19 pandemic, it is important to understand what health-system factors have contributed to communities' resilience and ability to mitigate COVID-19 incidence and mortality. The factors that were protective against COVID-19 must be strengthened as the U.S. rebuilds its health and public-health systems, prepares for the next pandemic, and addresses the widening health inequities that the pandemic laid bare.

*Primary Care and COVID-19: It's Complicated*, the Primary Care Collaborative's (PCC) 2021 Evidence Report, focuses predominantly on primary care as a key health-system factor to explain how differences in the robustness of primary care at the county level may relate to the mitigation of COVID-19. The report also considers other key factors in addition to primary care, such as the strength of local public-health infrastructure and the degree of social vulnerability at the county level. We examine the relationship between these factors and communities' ability to vaccinate their residents and keep them safe from getting infected and ultimately dying from the virus.

While federal and state health policy is important in responding to and recovering from a pandemic, the COVID-19 pandemic has taught us how important local factors—including community health systems, local policies related to masking, social gatherings and distancing, overall health of the community, extent of social vulnerabilities, and other factors—are in shaping a community's ability to respond to the biggest public health emergency of the last 100 years. Understanding the relationship between these key factors can inform decision-makers as they make choices about resource deployment (human and otherwise) and infrastructure investment intended to achieve better, more equitable population health outcomes.

## KEY FINDINGS

The PCC report examines these county-level factors:

- primary care access
- strength of public health
- degree of social vulnerability

to construct a new index: Community Health Index (CHI). This is the first analysis using this novel index, which was constructed by the Robert Graham Center for Policy Studies in Primary Care.

We used the CHI to examine relationships between county-level CHI—organized by quintiles (or five groups) based on their scores—and:

1. vaccination rates
2. incidence of COVID-19 infection before and after vaccines became available
3. COVID-19 deaths before and after vaccines became available

At the county level, we controlled for the proportion of the county population that was rural, percentage Black, and percentage Hispanic. All analyses were weighted by population size.

These factors were selected because research has demonstrated that access to primary care is essential to lowering rates of morbidity and mortality and that primary care bolstered by strong public-health infrastructure results in the more effective delivery of clinical services, increased access to care, and better clinical outcomes.<sup>3,4</sup> Finally, recent racial reckonings in the U.S. plus the COVID-19 pandemic have shone a bright light on health disparities for Black and Hispanic residents, the importance of equity to the health of a population, and how a pandemic can make inequities even worse. The combination of access to primary care, strong public health, and greater social assets should lead to improved health outcomes for an entire community.

Overall, our analysis found that counties with greater primary care access, more robust public health, and fewer social vulnerabilities—counties with the highest scores on the Community Health Index—had better COVID-19-related outcomes (incident and death).

These counties with the highest CHI (the top quintile) and the best COVID-19 outcomes represent 17% of the U.S. population. Counties that scored lowest on the Community Health Index (lowest quintile) had worse COVID-19-related outcomes (incident and death), representing 20% of the U.S. population. This association held across all five quintiles. In addition, as CHI scores increased, vaccination rates did as well. Those people in the highest CHI quintile are 26% more likely to be vaccinated than those living in the lowest CHI quintile.

After vaccines became available, COVID-19 incident and deaths fell across all U.S. counties as expected, but the rates did not fall equally. Residents of counties with higher CHI scores were advantaged over their counterparts in counties with lower CHI scores, with rates of COVID-19 falling more quickly in the highest CHI quintile versus the lowest after vaccination commenced. More specifically, if you live in the highest CHI county quintile, you were 12% less likely to get infected with COVID-19 after vaccines were made available and 42% less likely to die from the virus after vaccines were available as compared to your counterparts in the lowest CHI quintile.

Limitations of this analysis include county-level characteristics for which we did not have data and could not control. These factors include local policies such as masking mandates, social-distancing regulations, stay-at-home orders, and closures of businesses. Yet it makes logical sense that counties with stronger public health—a component of the CHI—also were more likely to have policies such as mask mandates and stay-at-home orders. The testing rate in each county was also not available, and it is possible that counties with higher COVID-19 case rates had higher testing rates. Yet the counties with higher COVID-19 incident rates had lower CHI scores and therefore less access to primary care and public health, making it less likely that their testing rates were higher.

## IMPLICATIONS

These results suggest that the three factors we examined are likely inter-related and mutually reinforcing; that is, counties that are less likely to have high rates of social vulnerabilities, which are major contributors to health inequities, are also counties with high access to primary care and more robust public-health infrastructure. Further, those living in communities with poor access to primary care and public health and with high social vulnerabilities are more vulnerable in terms of getting vaccinated, getting COVID-19, and dying from the virus.

Another important implication is vaccination matters. After vaccinations commenced, all counties, regardless of their CHI, had a drop not only in COVID-19 cases, but

also, most importantly, deaths. This is borne out in data that show that states that depended on vaccination as opposed to natural immunity had lower death rates<sup>5</sup> and more recent data that suggest the COVID-19 vaccine may have saved more than 100,000 lives in the U.S. alone.<sup>6</sup>

Clearly, while vaccines are a very important mitigating factor when it comes to COVID-19, they are not a silver bullet, particularly if communities lack access to the vaccine or patients chose not to get vaccinated. Low vaccine uptake creates the conditions for more COVID-19 variants, including the highly contagious delta variant, which at this writing (September 2021) is fueling a fourth wave of largely preventable hospitalizations and deaths. More specifically, between June and August 2021, close to 300,000 preventable hospitalizations occurred, costing the U.S. health system approximately \$5.7 billion.<sup>7</sup>

The differences in COVID-19 outcomes by CHI quintile after vaccines were made available show that other factors—primary care, public health, and fewer social vulnerabilities—are associated with keeping people from getting infected and dying from COVID-19. Consequently, counties that provided more primary care access, had stronger public-health infrastructure, and tended to have fewer health inequities (higher CHI) were better able to protect residents of the community from getting sick and ultimately dying from the virus.

The findings suggest that primary care and public-health leaders need to join forces to strengthen community resistance in advance of the next pandemic and to better address health inequities, with research beginning to emerge that in states and counties where primary care and public health had a more coordinated COVID-19 response outcomes were better.

Primary care alone could not educate the community on pandemic mitigation strategies, nor does it have the ability to put public health measures in place such as universal masking requirements and business closures. Public health could not tailor responses to individuals who have questions about the vaccine based on their clinical condition, nor could it manage patients who contracted the virus to ideally keep them out of the hospital and from dying. Communities that invest in primary care and public health likely have less social need, another important factor in COVID-19 mitigation. As leaders consider how to rebuild the nation's health and healthcare systems, they would be well advised to work across existing silos and to invest in and better integrate primary care and public health as key factors that contribute to pandemic preparedness and address the health inequities that the pandemic has exposed and further catalyzed.



**The findings suggest that primary care and public-health leaders need to join forces to strengthen community resistance in advance of the next pandemic and to better address health inequities, with research beginning to emerge that in states and counties where primary care and public health had a more coordinated COVID-19 response outcomes were better.**

## OTHER REPORT SECTIONS

The 2021 PCC Evidence Report also includes two other sections. The first provides the reader with additional context, and the third section explores emerging issues that may be the focus of a future PCC Evidence Report.

The first section of the report includes data on primary care trends, critical given how rapidly this sector has been evolving. More specifically, this section provides data about:

- the changing composition of the primary care workforce
- shifts in where primary care clinicians are practicing
- what types of primary care services are being provided by primary care clinicians and to whom

The third section of the report considers three emerging topics related to COVID-19 that could be the focus of PCC's 2022 Evidence Report. They include:

- the longer-term clinical impacts of the pandemic, including long-haul COVID-19
- the implications of healthcare consolidation spurred, in part, by COVID-19, particularly between primary care practices and other entities
- how primary care and public health may better integrate in the future to both mitigate the effects of a subsequent pandemic and address healthcare inequities

SECTION 1

# Primary Care Trends

Primary care is the largest and most widely distributed platform of care delivery in the United States and the only part of the health system in which more investment leads to better population health outcomes and more equitable care (NASEM).<sup>8, 9, 10, 11</sup> The primary care workforce continues to change in size, composition, geographic distribution, and scope of practice, perhaps more than other parts of the healthcare system.<sup>12, 13, 14, 15</sup> Understanding the current landscape and trends in who provides primary care, what services are provided, and who uses those services is important for population health and equity, implementation of innovative care delivery models and payment reform, as well as workforce planning. This section examines the trends in primary care delivery by answering the following questions:

1. Who provides primary care?
2. Where geographically do these clinicians provide primary care?
3. What types of services do primary care clinicians provide and to whom?

## METHODS

Pooled data from the 2002-2018 Medical Expenditure Panel Survey (MEPS) were used to examine the trends in use of healthcare services (acute, chronic, and preventive care) in ambulatory settings over time by physician (primary care and non-primary care) and nurse practitioners and physician assistants (all specialties). MEPS is administered by the Agency for Healthcare Research and Quality (AHRQ). MEPS provides national estimates of annual healthcare insurance coverage, healthcare service utilization, and healthcare expenditures of the U.S. civilian, non-institutionalized populations. MEPS collects data across five rounds extended over a two-and-a-half-year study period. 2018 is the latest available MEPS dataset. We used survey weights to get nationally representative estimates of healthcare service use. MEPS does not delineate specialty of nurse practitioners (NP), advanced practice registered nurses (APRN), or physician assistants (PA). Additionally, MEPS combines NPs and APRNs into one category called “NP/APRN.” Thus NP/APRN will be used throughout this section for consistency.

## RESULTS

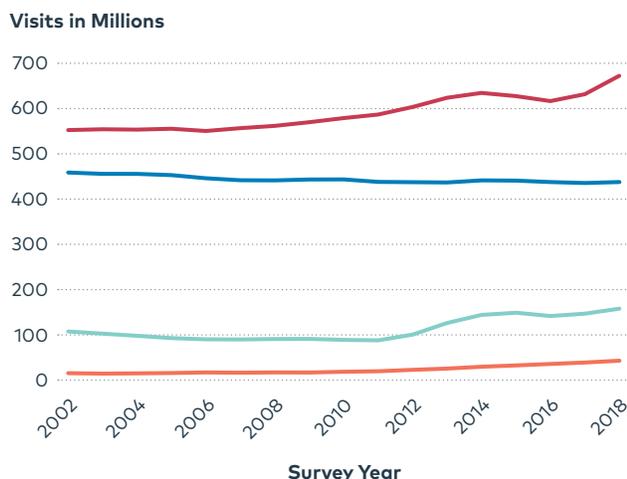
### Who provides primary care?

From 2002 to 2018, visits to primary care physicians (general pediatrics, general internal medicine, family medicine, and general practitioners) declined slightly, whereas visits to non-primary care physicians and nurse practitioners and physician assistants (NP/PA) increased. Because MEPS does not delineate what specialty NPs/PAs are working in, it is unclear if this rise is due to primary care visits or non-primary care visits (see Figure 1.1). Within primary care, visits to general internal medicine decreased over the time period studied, but visits to general pediatrics, family physicians, and geriatricians remained stable over time. Family physicians provided the highest number of office visits, ranging from 287.69 million in 2002 to 294.89 million visits in 2018. The estimates below reflect the population size and volume of visits (see Figure 1.2).

FIGURE 1.1

### Trends in Adult/Child Ambulatory Care Visits by Clinician Type

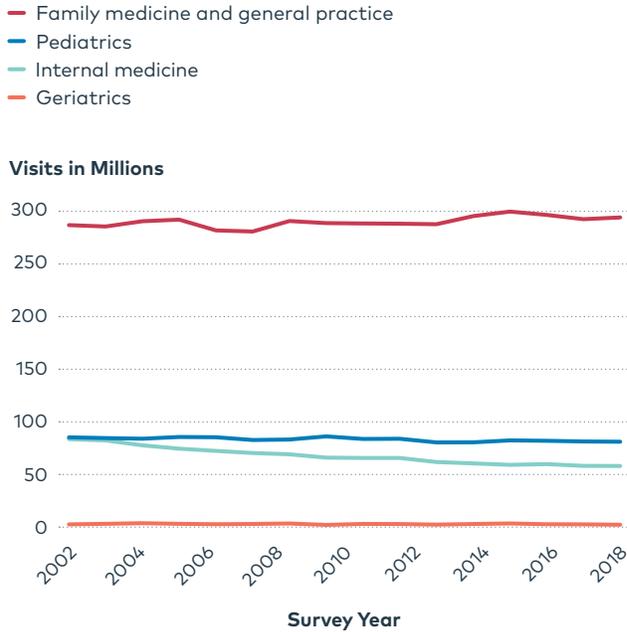
- Non-primary care physicians
- Primary care physicians
- Advanced-practice registered nurses (includes all specialties)
- Physician assistants (includes all specialties)



Source: Authors' analyses of 2002-2018 Medical Expenditure Panel Survey (weighted)

FIGURE 1.2

**Trends in Physician Office Visits by Primary Care Physician Specialty**



Source: Authors' analyses of 2002-2018 Medical Expenditure Panel Survey (weighted)

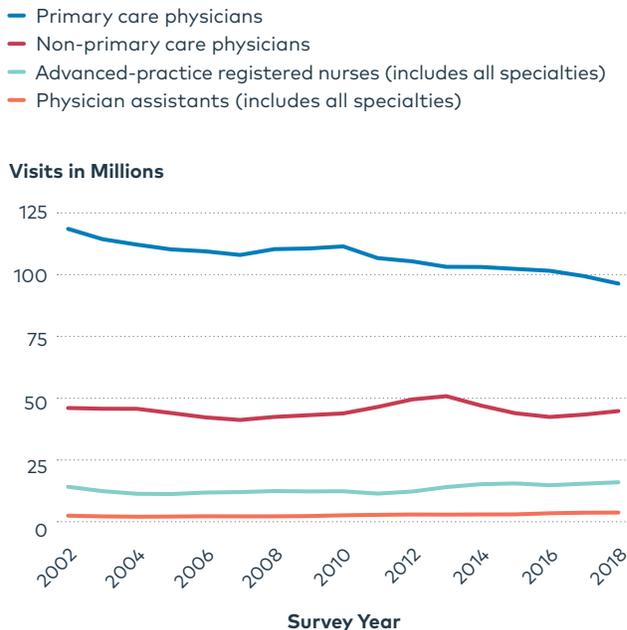
**What types of services does primary care provide and to whom?**

Some of the decline in visits to primary care physicians (PCPs) may be attributed to the decline in visits to general internists, yet trends in who is seeking care from PCPs versus non-PCPs may also explain the decline. Primary care provides many of the office visits (65%) to children, yet over time this number has fallen from 118.84 million visits in 2002 to 95.91 million visits in 2018 (see Figure 1.3). On the other hand, a majority of the office visits (52%) for patients older than 65 were to non-primary care physicians. Office visits to non-primary care physicians and APRNs, NPs, and PAs for patients older than 65 rose throughout the study period (see Figure 1.4). Within primary care physicians, the majority of office visits for patients older than 65 were to family physicians, and these rose over time (73 million in 2002 to 102 million in 2018). Office visits to general internists and geriatricians remained stable (see Figure 1.5).

Despite some decline in overall office visits to primary care over time, the majority of office visits for chronic conditions and preventive care are still to primary care physicians. Initially, patients with chronic conditions were increasingly availing themselves of office visits, but from 2014 to 2018 these numbers fell for primary care physicians (12%), while chronic-care visits to non-primary care physicians went up (see Figure 1.6). Primary care continues to see the largest proportion of patients with chronic disease.

FIGURE 1.3

**Trends in Ambulatory Care Visits to Clinicians Among Children (0-17 years)**



Source: Authors' analyses of 2002-2018 Medical Expenditure Panel Survey (weighted)

**Where geographically is primary care delivered?**

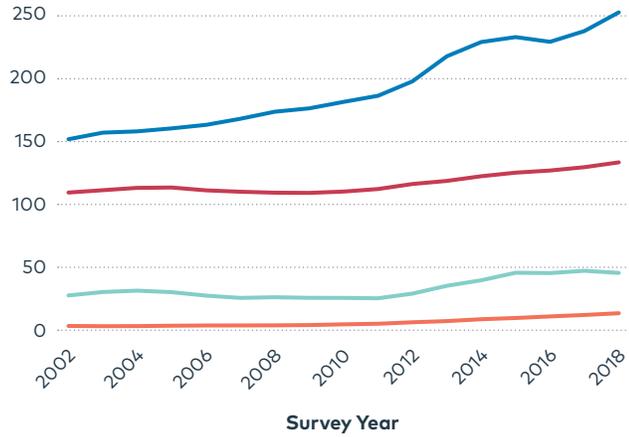
Historically, residents living in areas designated as rural have had less access to health care, and studies suggest that this may be worsening. Whereas ambulatory care visits in urban settings have increased over time, they have decreased over time in rural settings (see Figure 1.7). Whether this is due to a general shift of the population into urban areas is unclear, but these trends are worth watching particularly as the COVID-19 pandemic has started to shift where Americans are choosing to settle, with many more Americans moving out of cities to more remote locations.

FIGURE 1.4

### Trends in Ambulatory Care Visits to Clinicians Among Adults 65 Years and Older

- Primary care physicians
- Non-primary care physicians
- Advanced-practice registered nurses (includes all specialties)
- Physician assistants (includes all specialties)

Visits in Millions



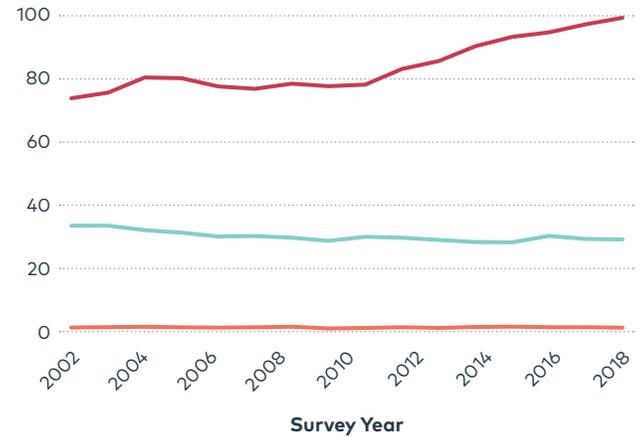
Source: Authors' analyses of 2002-2018 Medical Expenditure Panel Survey (weighted)

FIGURE 1.5

### Trends in Physician Office Visits Among Older Adults 65 Years and Older by Primary Care Specialty

- Family medicine and general practice
- Internal medicine
- Geriatrics

Visits in Millions



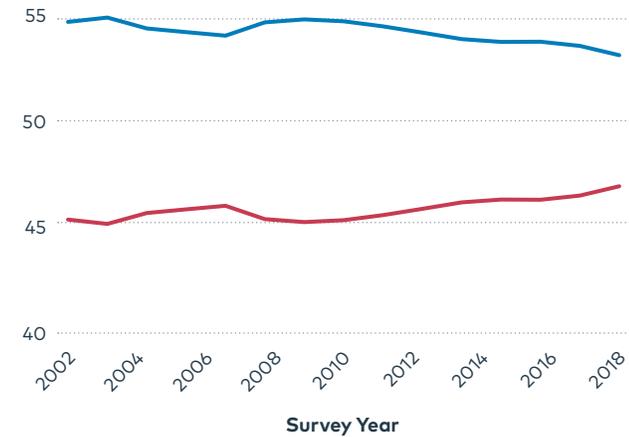
Source: Authors' analyses of 2002-2018 Medical Expenditure Panel Survey (weighted)

FIGURE 1.6

### Trends in Patients with Chronic Conditions Who Saw a Physician by Specialty

- Primary care physicians
- Non-primary care physicians

Proportion of Patients



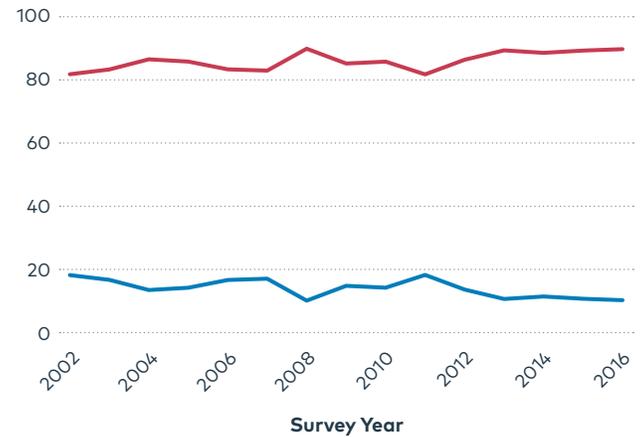
Source: Authors' analyses of 2002-2018 Medical Expenditure Panel Survey (weighted)

FIGURE 1.7

### Rural/Urban by Primary Care Specialty Over Time

- Urban
- Rural

Percent



Source: Authors' analyses of National Ambulatory Medical Care Survey 2002-2016

## SECTION 2

# Primary Care, Public Health, and Health Equity During the COVID-19 Pandemic

### BACKGROUND

Understanding trends in primary care service delivery is essential to understanding the capacity of primary care to provide care to a population. As demonstrated in section 1 of this report, primary care physicians and other clinicians provide a large proportion of the outpatient care and the majority of chronic care to the U.S. population. Given that primary care is the largest and most widely distributed care-delivery model in the U.S.,<sup>16</sup> it would make sense that primary care had an important role in responding to the COVID-19 pandemic. Yet during the height of the COVID-19 pandemic, much of the nation's focus and healthcare resources were directed toward hospitals. Much attention was being paid to care inside intensive care units (ICU) and emergency rooms (ER), while a majority of patients with suspected or confirmed COVID-19 never needed to visit the ER, and only a very small minority of patients ever needed hospital or ICU-level care.<sup>17</sup>

The ecology of care model developed by Kerr White and modified by others has demonstrated the fact that most health care in this country takes place in the outpatient setting, and COVID-19 was not an exception<sup>8</sup> (see Figure 2.1). Although many uses of this model assume that primary care is primarily located in the outpatient care “box,” during the COVID-19 pandemic, primary care impacted all levels of this model (see Figure 2.2). On the population health end, primary care had the capacity to deliver immunizations<sup>18,19</sup> and was the preferred source of information regarding COVID-19 prevention.<sup>20</sup> When patients did get COVID-19, it stands to reason that the first place they received care was in their outpatient primary care office. In fact, recent analysis of historic data shows that the majority of care for COVID-19-like respiratory illness happens in the outpatient primary care office, suggesting that this would hold true under the pandemic.<sup>21</sup> Furthermore, when patients were afraid to leave their homes to visit the ER or an urgent care clinic because they had a mild or moderate case of COVID-19, primary care stepped up to treat the patients where they were safest—their homes. Surveys of primary care physicians during the

pandemic showed that a majority transitioned quickly to telehealth services to meet the needs of their community and did this even before reimbursement models had caught up to this shifting paradigm of care delivery.<sup>22</sup>

ER visits and hospitalizations did, in fact, rise from baseline levels during the pandemic, but even in these settings, primary care was having an impact. Primary care clinicians were being redeployed to work in emergency rooms, hospitals, and ICUs all across the country.<sup>23</sup> The breadth and depth of their training allowed for easier redeployment of primary care specialists as compared to other specialists in the healthcare system.

Despite the essential role primary care could and was playing during the pandemic, many offices were having to shut their doors, taking away essential services in many communities and exacerbating healthcare disparities for the medically underserved.<sup>24,25</sup> Much of this was due to a healthcare system that has traditionally underinvested in primary care<sup>26</sup> and a fee-for-service payment model that could not withstand drops in patient volume.<sup>27</sup>

Could we have done a better job mitigating the effects of COVID-19, and could lives have been saved had the country invested more in primary care? Given primary care's historic role in the health of populations (see Figure 2.2), it seems logical that primary care could have played a major role in reducing disease burden and keeping people out of the hospital had we had stronger investment in and engagement of PCPs early in the COVID-19 response. Although current data do not allow us to answer this question directly, understanding geographic differences in COVID 19 outcomes and comparing those to primary care measures in those areas may help us to in turn understand how a strong primary care infrastructure (or lack thereof) impacted COVID-19 outcomes. In the following sections, we lay out evidence on the primary care orientation of a specific geography before the COVID-19 pandemic and compare it to COVID-19-related health outcomes during the pandemic to provide further insight into the question at hand.

FIGURE 2.1

**Ecology of Care Model**

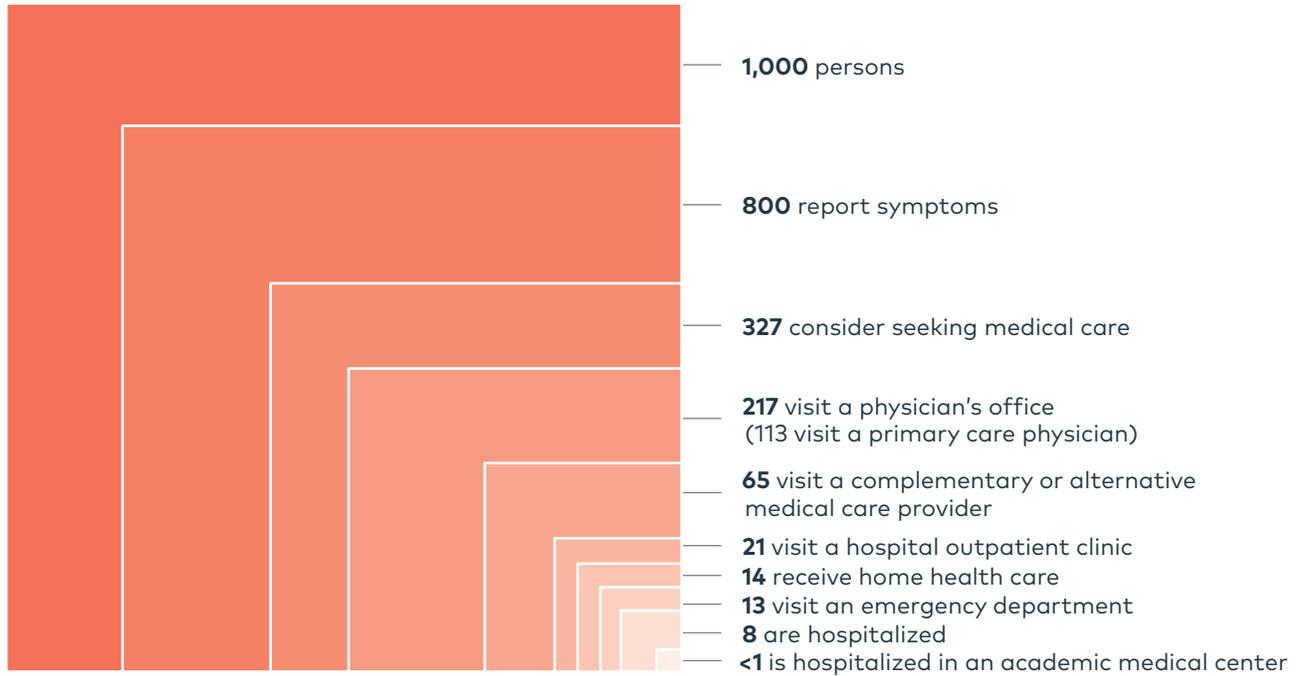
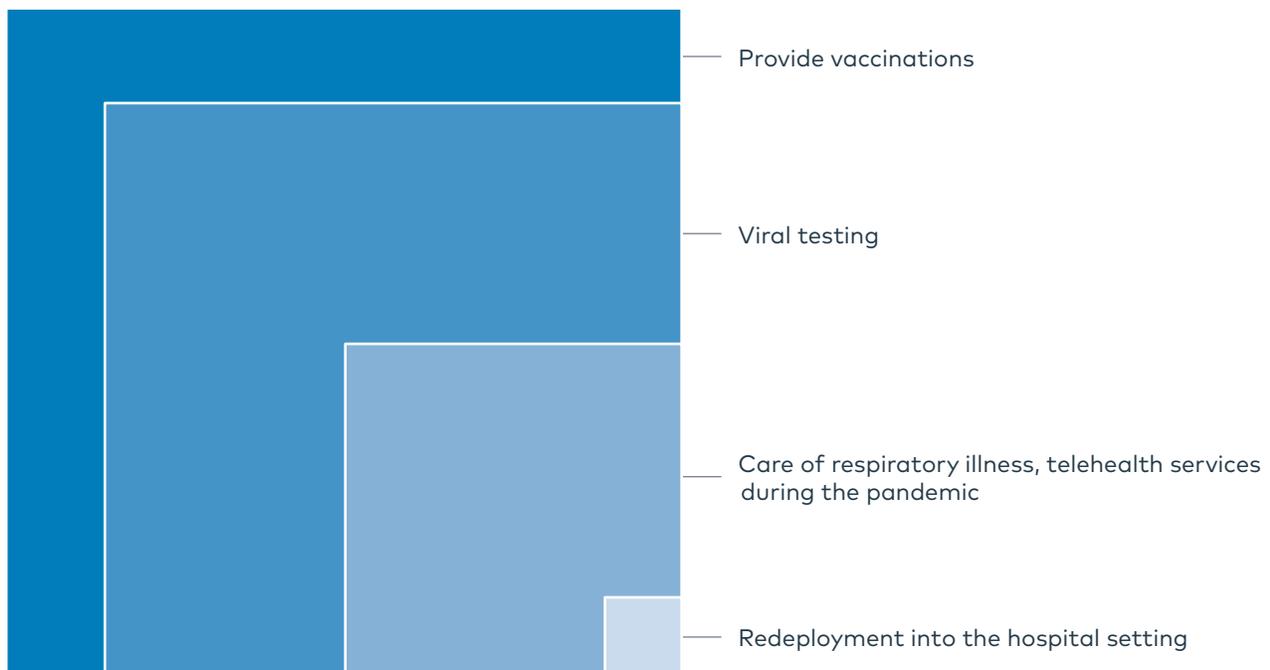


Image from: Green LA, Fryer GE, Yawn BP, Lanier D, Dovey SM. The Ecology of Medical Care Revisited. *N Engl J Med.* 2001;344(26):2021-2025. doi:10.1056/NEJM200106283442611

FIGURE 2.2

**Ecology of Care and COVID-19—Primary Care's Role**



## COMMUNITY HEALTH INDEX

Although state-level indicators of primary care are important for policy at that level, the COVID-19 pandemic taught us that it was local policies and culture that actually made a difference in how a community experienced the pandemic.<sup>5</sup> At the county level, many factors interact to impact the health of a community including access to primary care, strong public health, and health equity. Access to primary care is essential to lower rates of morbidity and mortality.<sup>3</sup> Primary care that is bolstered by strong public-health infrastructure results in the more effective delivery of clinical services, increased access to care, and better clinical outcomes,<sup>4</sup> including COVID-19-specific outcomes.<sup>28</sup> Finally, the COVID-19 pandemic and the recent racial reckoning in this nation have brought to light the health disparities for Black and Hispanic residents and the importance of equity to the health of a population. The combination of access to primary care, strong public health, and health equity should lead to improved health outcomes for an entire community. To test this hypothesis, the Community Health Index (CHI) was created and used to examine associations between primary care access, public health quality, and social determinants of health to COVID-19-related outcomes at the county level.

## METHODS

To create the novel Community Health Index, three data sources were used:

- The National Health Security Preparedness Index (NHSPI) was used to derive a public-health preparedness score.
- The American Medical Association (AMA) Masterfile was used to provide the PCP supply rates.
- The American Communities Survey (ACS) was used to calculate a Social Deprivation Index (SDI).

The NHSPI and SDI are discussed in detail elsewhere.<sup>29,30</sup> The CHI is an average score of public-health preparedness, PCP supply rates, and the SDI. Each component of the CHI can have a score between 1 (lowest) to 10 (highest) for a total CHI score that ranges from 3 to 30. The mean CHI was 15, and the standard deviation was 6. (see Table 1, Figure 2.3). For purposes of this analysis, the counties were divided into five groups, or quintiles, based on their CHI scores, with the highest quintile representing the counties with the highest CHI scores (mean 26.7 (SD 1.5)) with a mean population of 233,000 and the lowest quintile representing the lowest CHI scores (8.6 (2.5)) with a mean population of 54,000.

TABLE 1  
Distribution of Population by Community Health Index

Community Health Index	Number of counties	Population			
		n	%	Mean	SD
Quintile 1	1,214	65,300,000	20%	53,762	328,459
Quintile 2	857	76,700,000	24%	89,498	326,780
Quintile 3	453	59,400,000	19%	131,017	332,814
Quintile 4	385	6,200,000	21%	172,066	290,942
Quintile 5	229	3,300,000	17%	232,934	327,783
Missing CHI	3	99,739	0.00	33,246	38,292
Overall CHI	3,141	320,999,739	1	102,198	328,339

We derived data on COVID-19 outcomes including number of cases and deaths from the USA Facts and/or the Johns Hopkins Coronavirus Resource Center on April 15, 2021. We then divided the raw number of cases and deaths by population and multiplied the resulting quotient by 100,000 to get incidence and death rates per 100,000 population. We downloaded the data on COVID-19 vaccinations from the Centers for Disease Control and Prevention on April 21, 2021, two days after the vaccinations were made available (April 19, 2021) to everyone 16 years and older. Using the date when vaccinations began in the U.S. (i.e., December 14, 2020) and the length of time between the date when first case of COVID-19 was seen in the U.S. until April 15, 2020, when the data on outcomes was downloaded, we created two periods:

1. The pre-vaccination period is the interval before December 14, 2020.
2. The post-vaccination period is December 14, 2020, and later.

Linear regressions were performed for each of the COVID-19 outcomes—number of cases per 100,000 population and number of deaths per 100,000 at the county level before and after vaccinations, with Community Health Index (quintiles) as the explanatory variable. The proportion of the county population that is rural, the percentage of Black, and the percentage of Hispanic were used as controls. We controlled for the percentage of Black and Hispanic in a county because these two populations were disproportionately affected by COVID-19. We controlled for geography given, rural-urban variation in COVID-19 impacts, particularly early in the pandemic. All analyses were weighted by population size.

## RESULTS

County-level COVID-19 outcomes, including vaccination rates, incidence of COVID-19 pre- and post-vaccination, as well as deaths pre- and post-vaccination, were associated with CHI. As CHI scores increased, vaccination rates increased as well (see Figure 2.4). The counties in the highest CHI quintile had 26% higher vaccination rates than the counties in the lowest CHI quintile. As the CHI scores increased, the cumulative incidence of COVID-19 in the population decreased. After vaccination commenced, the cumulative incidence of COVID-19 in the population was lower for every quintile of CHI, but the rate of decrease was 12% higher among counties in highest CHI quintile compared to the counties in lowest quintile of CHI (see Figure 2.5). Finally, counties in the lowest CHI quintile had higher COVID-19-related deaths as compared to the counties in the highest CHI quintiles.

FIGURE 2.3

### Community Health Index Distribution by County

3-9 10-13 14-17 18-21 22-30

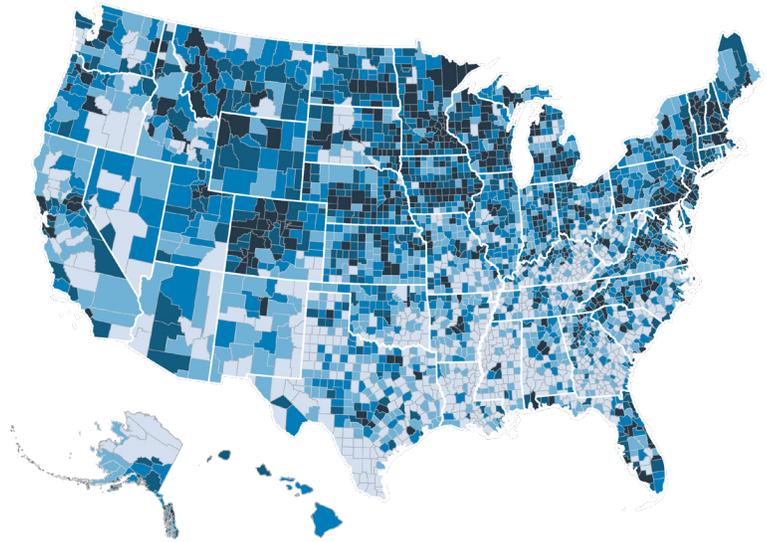
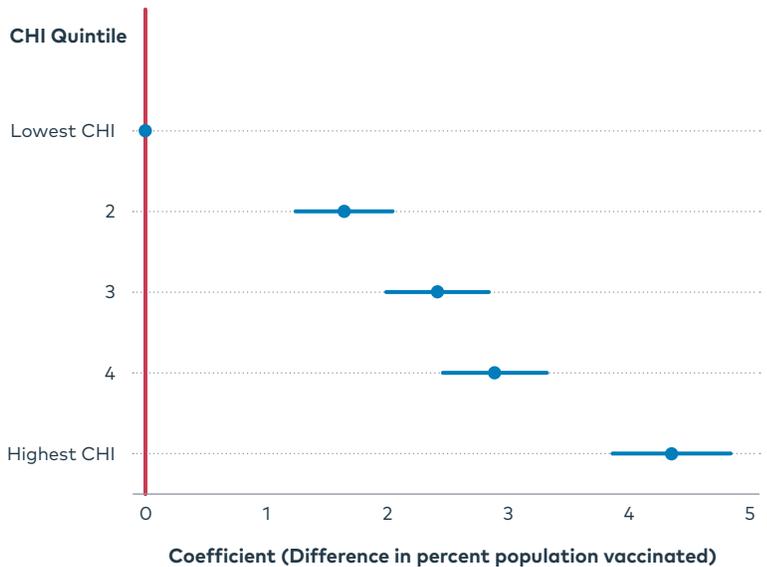


FIGURE 2.4

### Percentage of the Adult Population (18+) who Received COVID-19 Vaccinations\*



\* Adjusted for county-level percentage of rural, Black, and Hispanic populations

Source: Authors' analysis of Community Health Index, derived from the American Medical Association Physician Masterfile 2020; American Community Survey 2014-2018 5-year Summary File; National Health Security Preparedness Index 2020; Centers for Disease Control and Prevention COVID-19 County Vaccination Data, April 21, 2021).

FIGURE 2.5

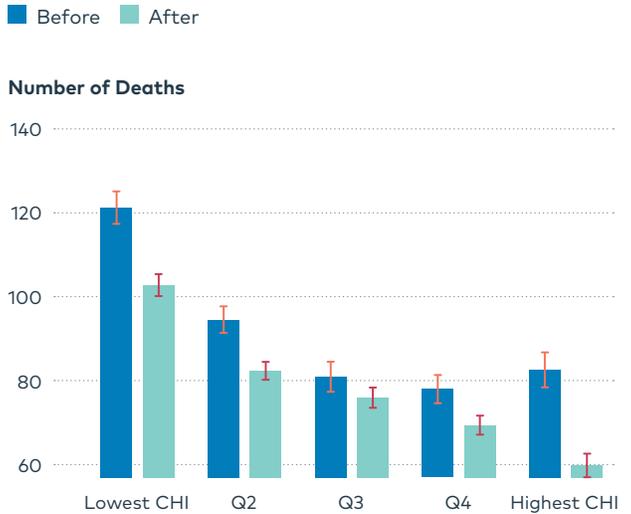
**Number of COVID-19 Cases per 100,000 Population Before and After Date of Vaccination Commencement (Dec. 14, 2020)\***



\* Adjusted for county-level percentage of rural, Black, and Hispanic populations  
 Source: Authors' analysis of the Community Health Index, derived from the American Medical Association Physician Masterfile 2020; American Community Survey 2014-2018 5-year Summary File; National Health Security Preparedness Index 2020; USA Facts/Johns Hopkins Coronavirus Resource Center COVID-19 data (April 15, 2021).

FIGURE 2.6

**Number of Deaths per 100,000 Before and After the Date of Vaccination Commencement (Dec. 14, 2020)\***



\* Adjusted for county-level percentage of rural, Black, and Hispanic populations  
 Source: American Medical Association Physician Masterfile 2020; American Community Survey 2014-2018 5-year Summary File; National Health Security Preparedness Index 2020; USA Facts/Johns Hopkins Coronavirus Resource Center COVID-19 data (April 15, 2021).

Although vaccination did decrease the COVID-19 related deaths for counties in every CHI, the counties with the highest CHIs still had the lowest COVID-19-related deaths after vaccination commenced in the United States. The counties in highest CHI quintile had a 42% lower number of deaths than the counties in the lowest CHI quintile (post-vaccination period) (see Figure 2.6).

**DISCUSSION**

The Community Health Index, which combined measures of primary care access, public health, and health equity, was associated with better COVID-19-related outcomes. Although the contribution of each component of the CHI to healthcare systems has been demonstrated by many others, this is the first time that a combined index has been used to demonstrate the cumulative effect of all three measures on health outcomes.

The greatest difference in COVID-19-related outcomes was between counties with the lowest CHIs and those with the highest CHIs. Counties in the top quintile had 26% higher vaccination rates and 42% lower death rates than counties in the lowest quintile. Furthermore, after vaccination commenced, rates of COVID-19 dropped more dramatically in counties in the highest quintile, compared to counties in the lowest quintile.

These findings highlight a few important points.

First, and maybe the most obvious: Vaccination matters. After vaccinations commenced, all counties, regardless of their CHI, had a drop not only in COVID-19 cases, but also, most importantly, deaths. Certainly, this mirrors data that have shown that states that depended on vaccination as opposed to natural immunity had lower death rates,<sup>5</sup> and more recent data that suggest the COVID-19 vaccine may have saved more than 100,000 lives in the U.S. alone.<sup>6</sup>

Perhaps the most important finding in these data is the differences in outcomes between counties with high and low CHIs and the implications this has for our healthcare system. The fact that cases dropped 12% more in counties with the highest CHIs after vaccination demonstrates that it is more than just having the vaccine available that matters. It does not matter that vaccines are developed if communities cannot access them or individuals do not want them. This is where public health and primary care integration can help. Although data are still emerging about how important primary care and public health working together is in COVID-19 vaccine uptake, the integration of public health and primary care in vaccine distribution is not unique to this pandemic and has been a successful delivery model in many other vaccine-preventable

disease processes.<sup>31</sup> Similarly, success stories of COVID-19 vaccination rates in counties with coordinated public health and primary care responses are emerging.<sup>32</sup> Although primary care was initially left out of vaccine distribution efforts in many communities, primary care was still highly involved and depended upon by patients in all communities for vaccine counseling.<sup>20, 33</sup> Lack of vaccine uptake, whether due to vaccine hesitancy or lack of access, has led to a resurgence of COVID-19 and an emergence of more serious variants. It has also led to hundreds of thousands of preventable hospitalizations costing approximately \$5.7 billion.<sup>7 (p. 19)</sup> Public health and primary care play an important role in addressing the barriers to vaccine uptake and COVID-19 outcomes. As these data suggest, it is not enough to have created and distributed the vaccine to states. Access to primary care, a robust public-health infrastructure, and strong social assets (i.e., a high CHI) in a community are also associated with higher vaccination rates and lower COVID-19-related illness and death.

An examination of the mean CHI score in the lowest quintile compared to the highest quintile further highlights the importance of a multi-pronged approach to curbing the impact of the pandemic. Counties in the highest quintile had a mean score of 26.7, whereas counties in the lowest quintile had a mean score of 8.6. Because each component of the CHI had a maximum score of 10, this implies that counties with the highest CHIs had high scores in each component of the CHI, whereas counties in lower quintiles could have been strong in one (or no) components of the CHI. Because counties in the highest CHI quintiles had better vaccination rates, lower COVID-19 infection rates, and lower COVID-19 hospitalization rates, our data strongly indicate the importance of all three factors *together* in curbing the pandemic. Primary care alone could not educate the masses on mitigation strategies. Public health alone could not support the unique health needs of individuals in a community. And the potential impact of both primary care and public health are dependent on the resources and social need within a community. Case studies from abroad have repeatedly highlighted the health benefits of a public health and primary care infrastructure that work hand-in-hand.<sup>34</sup> Our study findings demonstrate that, even right here in the United States, areas with better public health, more robust primary care, and lower social vulnerabilities were associated with better COVID-19-related health outcomes.

This data is limited in that certain county-level characteristics that may have impacted the findings could not be controlled for. Importantly, there was no control for testing rates in each county. It is possible that counties with a higher COVID-19 case rate had higher testing rates. Yet, given that higher rates were found in counties with lower CHI and thus less access to primary care and less robust public health, it seems unlikely that this would be the case. Furthermore, the analysis is at the ecological level and does not capture subcounty variations in COVID-19 outcomes. There are obvious county-level characteristics that could not be controlled for, such as mask mandates, social distancing policies, and stay-at-home orders. Yet it stands to reason that the public health component of the CHI would have accounted for this, as counties with stronger public health likely had these measures in place. Finally, there may have been individual-level variables that were not controlled for due to data limitations. Yet, we did control for most of the major factors that did impact COVID-19 outcomes, such as Black/Hispanic race and rurality.

Communities throughout the United States differed in their capacity to curb COVID-19 surges and keep their residents safe. In areas where public-health mandates such as mask wearing and social distancing were followed, communities had less COVID-19 morbidity and mortality.<sup>35</sup> Similarly, access to health care, specifically chronic-disease management where primary care plays a major role, may have prevented excess deaths in a community.<sup>36</sup> Finally, as has been demonstrated repeatedly, the social determinants of health played a major role in COVID-19 morbidity and mortality.<sup>37</sup> Strong public health, robust primary care, and health equity each had an impact on the success of a community in addressing COVID-19. Yet working together, these three factors have the potential to lead to exponentially better success in combating future surges or the next pandemic.

## SECTION 3

# Emerging Issues in Primary Care Post-COVID-19

COVID-19 has had multi-faceted impacts on both patients and clinicians in primary care, which the community is only beginning to understand. It has also affected the way primary care interacts with other parts of the medical and non-medical neighborhoods.

Three issues have emerged that we believe need further examination and could become the topic of PCC's 2022 Evidence Report. They include the longer-term clinical impacts of COVID-19, including long-haul COVID-19; the implications of healthcare consolidation spurred on in part by COVID-19, particularly between primary care and other entities; and how primary care and public health may better interface in the future to both mitigate the effects of a subsequent pandemic and address healthcare inequities.

### LONGER-TERM CLINICAL IMPACTS OF COVID-19

Data are emerging about the amount of care—urgent, emergency, and routine care—that was delayed or missed during the pandemic. Nearly 41% of adults reported that they delayed or skipped care, with higher percentages for subgroups, including non-Hispanic Black adults and Latino adults; those with two or more chronic conditions; and those without health insurance.<sup>38</sup> Delays or missed care for children were reported to be a bit lower at 29%, with statistically significant worse differences for lower-income children.<sup>39</sup> In addition to medical care, patients did not avail themselves of needed mental health and other behavioral care. Those services became more crucial as the mental health status of patients declined and as the prevalence of substance-use disorder increased. For example, prior to the pandemic, one in ten adults reported symptoms of anxiety or depression; this increased to four in ten during the pandemic, and adults reported higher drug and alcohol use (12%).<sup>40</sup>

It is possible that patients can catch up on some of the delayed or missed preventive primary care, e.g., vaccinations, and that some of the mental health/SUD may be mitigated as the virus subsides. Yet this remains to be seen while the effects of other missed care may be identified in the years to come, e.g., cancer diagnoses that are identified at a later stage or further deterioration of a chronic condition because ongoing management was sidelined.

Long COVID-19—symptoms that persists for four or more weeks after recovery—is also a concern, and research scientists and clinicians are studying its short- and longer-term effects. Researchers estimate that between 10% and 25% of those who got COVID-19 develop long-haul COVID-19, and researchers continue to study the risk factors involved. “Long-haulers” report shortness of breath, fatigue, headaches, and difficulties in smelling and tasting, among other symptoms.<sup>41</sup> Because of the multiple organ systems involved in long-COVID-19 and the chronic nature of the disease process, primary care clinicians are well positioned to be providing care for long-COVID-19 patients.

As we emerge from the pandemic, primary care will be in a key position to respond to a growing list of patient needs. But questions about the robustness of the primary care platform may make it challenging to do so. The responses of nearly 1,000 primary care clinicians in a Larry A. Green Center-PCC survey, conducted September 10-14, 2021, underscore these challenges: 64% said that the workforce was too small and not ready to handle the demands of long-haul COVID-19, with only 8% reporting that current payment models were adequate to support care for long-haul patients.

A future PCC Evidence Report could examine the effects of care delayed during COVID-19 in terms of population health and equity or focus on the prevalence and implications of long-haul COVID-19 on primary care.

## CONSOLIDATION AND POTENTIAL IMPLICATIONS

Both vertical and horizontal consolidation has been increasing over the last few decades, with studies suggesting that COVID-19 has been a further accelerant.<sup>42</sup> With primary care revenue losses estimated at \$15 billion in 2020,<sup>43</sup> primary care leaders considered a range of strategies to survive, including selling their practices to local hospitals, health systems, or health plans. Alternatively, some practices or individual clinicians joined larger primary care organizations that contract with health plans or employers.

Consolidation is reducing the number of physicians working in independent practices, with 70% of physicians now working for a hospital or other corporate entity. In 2019 and 2020, more than 48,000 physicians left independent practice and became employees of hospitals or corporate entities, with 47% of that shift occurring after the onset of COVID-19.<sup>35</sup>

A growing number of studies suggests that both horizontal (hospital-hospital, physician-physician) and vertical (hospital-physician practice) consolidations result in greater market power and ability to raise prices.<sup>44, 45</sup> Some studies suggest that consolidation also leads to a decline or plateau in quality.<sup>46</sup> Finally, there is anecdotal evidence that consolidation-driven price hikes may have disproportionate effects on marginalized communities' ability to pay for care and that the loss of independent practices may dampen access for safety-net patients. Others argue that some kinds of consolidation—by insurance companies as opposed to hospitals—can be positive for physician practices as it may provide them with more bargaining clout in an increasingly consolidated marketplace as well as access to more resources and infrastructure support, potentially without the increase in prices.<sup>47</sup>

Part of the challenge regulators face is that the mergers and acquisitions in the hospital-primary care practice space are not large enough to trigger federal reporting even if they result in anti-competitive behavior. In addition, health-plan acquisition of physician practices is not within the Federal Trade Commission's line of sight.<sup>42</sup>

The Biden administration's Executive Order on Promoting Competitiveness, which includes health care and more specifically hospitals, puts a flag in the ground that consolidation may be problematic, particularly for consumers.<sup>48</sup> The Federal Trade Commission's January 2021 announcement that it will be studying the effect of mergers between physician groups and facilities (health plans) is another sign that regulators are taking a hard look at what increasing consolidation may mean for patients, payers, and the clinical community.<sup>49</sup>

Given the pace of consolidation and the current administration's focus on anti-competitive behavior, there are likely to be new data sources to inform a potential PCC Evidence Report on this topic. A potential angle is to focus on the implications of consolidation on marginalized and vulnerable populations and primary care practices that serve the safety net.

## STRENGTHENING THE INTERFACE BETWEEN PRIMARY CARE AND PUBLIC HEALTH

Along with primary care, state public health departments play a crucial part in mitigating the effects of COVID-19. And like primary care, public health was handicapped in this role due to persistent underfunding. Of total healthcare spending estimated at \$4 trillion annually, public health spending has historically garnered about 2.5%, with primary care spending between 5% and 7%.<sup>50, 51</sup>

As the COVID-19 vaccine ground game continues—and the need for vaccine administration accelerates with new variants—the need for a strong relationship between primary care and public health is increasingly apparent. More research is needed, but it appears that states that had existing strong relationships between public health and primary care, including bi-directional information-sharing, were better able to mitigate the effects of COVID-19, including Maryland, Vermont, and Wisconsin.<sup>52, 53, 54</sup>

For the country to be better prepared for the next pandemic and to better address persistent and growing health inequities, the relationship between primary care and public health needs to be stronger across all states and localities. A key enabler to strengthening these relationships is the ability to readily communicate and to share data bi-directionally between primary care practices and their local health department. With substantial funding for public health in recent COVID-19 relief bills (albeit short-term), there is an opportunity to build public-health IT infrastructure. A key use case for this infrastructure investment is the ability to connect with primary care and exchange data.

PCC's 2022 Evidence Report could do a deeper dive on how some states moved beyond theory to integrate public health and primary care, what the effects of such integration were on COVID-19 mitigation, and lessons learned to catalyze further integration.

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APPENDIX

# Description of Data Sources Used in Analyses

Data Source (s)	Description of data source	Measure(s) used
<b>American Medical Association Masterfile (2020)</b>	<p>The AMA Physician Masterfile is a proprietary data set maintained by the American Medical Association (AMA) that includes a near-complete listing of all physicians (nearly 1.4 million physicians, residents, and medical students) in the U.S. It includes data on individual physicians, including age, gender, self-reported specialty, practice address, type of medical degree (MD or Doctor of Osteopathic Medicine, DO), practice type, specialty, and home address.</p>	<p>Rates of primary care physicians (number of primary care physicians per 100,000 population) converted into deciles</p>
<b>Medical Expenditure Panel Survey (2002-2018)</b>	<p>The Medical Expenditure Panel Survey (MEPS) (1996-2018) comprises surveys of households, healthcare and insurance providers, and nursing homes. MEPS Household Component (MEPS-HC) is a set of large-scale surveys of families and individuals, their medical providers, and employers across the U.S. The MEPS-HC survey provides nationally representative estimates of health status, healthcare utilization, and costs. Interviews are conducted with one member of each family who reports on the healthcare experiences for the entire family. Each respondent is interviewed five times over 2 ½ years. Each panel represents a new sample, and each round within a panel represents interviews during one of five, discrete, six-month time periods. Since new panels are formed in subsequent years, the panels overlap, increasing the effective sample size at a given time. Pooled data from 2002-2018 were used in this study.</p>	<p>Total number of ambulatory care visits by year</p> <p>Total number of regular check-ups by year</p> <p>Total number of well-child visits by year</p> <p>Total number of vaccinations by year</p> <p>Proportion of patients with chronic conditions by year</p>
<b>The Behavioral Risk Factor Surveillance System (BRFSS) (2019)</b>	<p>The Behavioral Risk Factor Surveillance System is an ongoing surveillance system to track health behaviors for noninstitutionalized adults (18 and older) in the U.S. It is a cross-sectional telephone survey administered and supported by CDC's Population Health Surveillance Branch. Each state health department conducts these surveys over landline and cellular telephones using standardized questionnaires. The data on healthcare access, preventive and risk behaviors, healthy fruits and vegetables, seatbelt use, exercise, immunization, tobacco use, alcohol consumption, HIV/AIDS knowledge and prevention, health status, healthy days, health-related quality of life, hypertension awareness, arthritis burden, and other chronic health conditions is collected from a randomly selected adult from a household.</p>	<p>Proportion of state population report having a personal doctor (Usual Source of Care)</p>

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<b>American Community Survey (ACS) 2015-2019 5-Year Summary File</b>	The American Community Survey is an ongoing survey that provides estimates of the U.S. population and demographic characteristics, including age, gender, race/ethnicity, education, employment, owner/renter status, transportation, language spoken at home, etc. The information collected is used in community resource planning and allocation by public officials, planners, and entrepreneurs.	Total population at state and county level Proportion of rural population at county Proportion of Black or African American population at county (converted to quintiles) Proportion of Hispanic or Latinex population at county (converted to quintiles)
<b>The Robert Graham Center Social Deprivation Index</b>	A composite index created from the following measures at the county level: poverty (<100% FPL), single-parent households, non-employed, percentage living in renter-occupied units, percentage living in crowded housing units, percentage with no vehicle, percentage with high school education (methodology described elsewhere) <a href="https://www.graham-center.org/rgc/maps-data-tools/sdi/social-deprivation-index.html">https://www.graham-center.org/rgc/maps-data-tools/sdi/social-deprivation-index.html</a> . The raw scores were converted to deciles.	
<b>USA Facts/Johns Hopkins Coronavirus Resource Center</b>  <a href="https://usafacts.org/visualizations/coronavirus-covid-19-spread-map">https://usafacts.org/visualizations/coronavirus-covid-19-spread-map</a>	These databases provide state and county-level data on COVID-19 cases, deaths, and hospitalizations	Total number of cases per 100,000 population by state and county Total number of deaths per 100,000 population by state and county Cumulative number of cases pre- and post-vaccination availability (December 14, 2020) at state and county level
<b>Centers for Disease Control and Prevention (CDC) COVID data tracker</b>  <a href="https://covid.cdc.gov/covid-data-tracker/#vaccinations-county-view">https://covid.cdc.gov/covid-data-tracker/#vaccinations-county-view</a>	CDC provides data on state and county level vaccination data	Total number of state residents 18 and older vaccinated prior to April 21, 2021 Proportion of state residents 18 and older vaccinated prior to April 21, 2021 Total number of state residents 65 and older vaccinated prior to April 21, 2021 Proportion of state residents 65 and older vaccinated prior to April 21, 2021 Total number of county residents 18 and older vaccinated prior to April 21, 2021 Proportion of county residents 18 and older vaccinated prior to April 21, 2021 Total number of county residents 65 and older vaccinated prior to April 21, 2021 Proportion of county residents 65 and old vaccinated prior to April 21, 2021
<b>National Health Security Preparedness Index</b>  <a href="https://nhspi.org/wp-content/uploads/2020/06/NHSPI_2020_Methodology.pdf">https://nhspi.org/wp-content/uploads/2020/06/NHSPI_2020_Methodology.pdf</a>	The NHSPI indicates the extent of the national, state, and county-level preparedness for large-scale public health emergencies that threaten health and well-being of Americans. The index can be used to track changes in preparedness, response, and recovery from disasters and other emergencies over time.	NHSPI index at state and county levels



### About the Primary Care Collaborative

Founded in 2006, the Primary Care Collaborative (PCC) is a not-for-profit multi-stakeholder membership organization dedicated to advancing an effective and efficient health system built on a strong foundation of primary care and the patient-centered medical home. Representing a broad group of public and private organizations, the PCC's mission is to unify and engage diverse stakeholders in promoting policies and sharing best practices that support growth of high-performing primary care and achieve the "Quadruple Aim": better care, better health, lower costs, and greater joy for clinicians and staff in delivery of care.

[www.thePCC.org](http://www.thePCC.org)



### About the Robert Graham Center

The Robert Graham Center aims to improve individual and population healthcare delivery through the generation or synthesis of evidence that brings a family medicine and primary care perspective to health policy deliberations from the local to international levels.

The information and opinions contained in research from the Robert Graham Center do not necessarily reflect the views or policies of the American Academy of Family Physicians.

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