OPEN

All Public Health is Local

Lessons From Eagle County During the First 2 Years of the Coronavirus Disease-2019 Pandemic

William A. Knaus, MD, Shaneis Kehoe, MS, CO,† and Chris Lindley, MS‡*

Background: During the coronavirus disease-2019 (COVID-19) pandemic cumulative United States COVID-19 deaths per capita were higher than all other large, high-income nations, but with substantial variation across the country.

Objective: The aim was to detail the public health response during the pandemic in Eagle County, Colorado.

Research Design and Measures: Observational study using pre-COVID-19 county public health metrics. Pandemic actions were recorded from a narrative summary of daily phone consultations by a county-wide taskforce and interviews. Outcomes obtained from local, state, and nationally reported databases.

Methods: Eagle County began with a life expectancy of 85.9, low all-cause age-adjusted death rates equal for both White and Latinx populations, a high household median income, and other prepandemic advantages. It also launched an innovative, independent county-wide taskforce lead by experienced mid-level managers. The taskforce implemented rapid communication of decision consequences, made immediate course corrections without traditional organizational approvals or contradictory political pressures.

Results: Eagle County was first in Colorado to obtain Personal Protective Equipment and to establish a drive-through testing facility. The COVID-19 case fatality rate was 0.34%. The sole intensive care unit never reached maximum capacity. By March 2022, Eagle County had administered at least 1 vaccine dose to 100% of the population and 83% were fully vaccinated.

Conclusions: It is not possible to directly attribute superior outcomes to either the baseline characteristics of Eagle County or its innovative taskforce design and deployment. Rather this report highlights the potential impact that improving the baseline health status of US citizens and permitting novel problem-solving approaches by local public health officials might have for the next pandemic.

Key Words: public health response, public health co-ordination, public health performance, public health politics, public health leadership

(*Med Care* 2022;60: 596–601)

The United States has more deaths from coronavirus disease-2019 (COVID-19) than any other country in the world and the highest per capita mortality rates.[1] During the pandemic, US life expectancy decreased by 1.87–76.87 years, 8.5 times the average decrease in peer countries (0.22 y).[2] While a national failure, response to the pandemic was not uniform across the country. Then-President Donald Trump gave primary responsibility for managing the pandemic to states; the federal government served as "back-up,"[3] resulting in a patchwork of responses by 50 state and 3142 local county governments.[4,5]

This article reports on the characteristics and actions taken by Eagle County, located in central Colorado with a land area of 1684 square miles and a 2019 population of 55,127. Eagle County entered the pandemic with important economic and health status advantages: a median household income of $84,790, higher than the median income of Colorado residents ($65,782) and the United States ($58,100); an educated populace (88.3% had a high school education; 47.2%, a bachelor's degree or higher); most residents (86.3%) had health insurance; and a poverty rate of 7.7%, lower than state (11.6%) and national (14.6%) levels.[6,7]

Eagle County also started with a superior life expectancy (85.9 y) than the United States (78.7 y). Its all-cause, age-adjusted death rate by race/ethnicity per 100,000 of population was 340 for both White and Latinx populations. This is lower than national figures for White (730) and Latinx (664) groups.[6]

Colorado also delegated substantial decision-making authority on key public health decisions, such as the degree of reopening, to local authorities.[5] Consequently, Eagle County had substantial autonomy to deliver an early, comprehensive, and extremely well-coordinated response. It recorded pandemic outcomes superior to the nation and equivalent to other high-performing localities. While it is not possible to attribute Eagle County's performance directly to either its advantaged demographics or novel decision-making process, the design and actions of the county's public health taskforce have important implications for future local and national pandemic-planning efforts.

From the *Emeritus Professor of Public Health Sciences University of Virginia School of Medicine, Edwards, CO; †Director Project Management, Disease Prevention, and Public Health Response, Colorado Department of Public Health and the Environment, Denver, CO; and ‡Vail Health, Eagle Valley Behavioral Health, Vail, CO.

S.K. was, and C.L. is an employee respectively of Vail Health. W.A.K. declares no conflicts of interest.

Correspondence to: William A. Knaus, MD, 142 River Ranch Road Edwards, CO 81632. E-mail: wknaus@virginia.edu.

ISSN: 0025-7079/22/6008-0596

ANALYTICAL METHODS

This observational study used existing public data and interviews with key taskforce participants. Review from an Institutional Review Committee was not conducted. Pre-COVID-19 county public health metrics were obtained from a 2019 Eagle County Community Health Needs Assessment Report.[6] Specific responses to the COVID-19 pandemic came from a dynamic narrative summary maintained by the taskforce Incident Commander, who made available logs kept from twice-daily phone consultations with taskforce members consisting of public health, medical, and emergency providers. One of the authors not involved in the response (W.A.K.) conducted interviews with key taskforce leaders. Questions were designed to elicit a detailed description of communication methods and actions initiated. All responses confirmed by at least 2 of the taskforce members. Performance metrics and outcomes came from aggregated data encompassing Eagle County's Public Health Department, the Vail Health System, Colorado Mountain Medical, and other taskforce agencies (Table 1). Colorado State data came from the Colorado Department of Public Health and Environment. Comparisons made with published United States COVID-19 case-fatality rates and other performance measures.[8] Eagle County's performance contrasted with all other US counties using the Johns Hopkins COVID-19 dashboard and the US Census.[1,7]

COUNTY-WIDE INTERVENTION METHODS

Eagle County launched an early, sustained response characterized by the following 4 major problem-solving approaches:

Early Preparation, Including Creation of County-wide Taskforce of Experienced Mid-level Managers

COVID-19 was first diagnosed in Eagle County on March 6, 2020. Anticipating its arrival, in mid-January 2020 (well before vendors became overwhelmed by demand), Vail Medical Center had ordered Personal Protective Equipment. On January 31, 2020, Vail Health and Eagle County Public Health Department issued a joint announcement preparing the community for COVID-19.

By mid-February 2020, a 40-person county-wide taskforce was assembled; this "team of teams" included individuals from agencies listed in Table 1. Many participants had worked together in response to Eagle County's first major disaster, the 2018 Lake Christine Fire. The taskforce Incident Commander, an epidemiologist employed by Vail Health, had previously served as the County's Public Health Director during the Lake Christine Fire. This shared institutional knowledge enabled close collegial relationships and open communications.

A clear division of responsibilities was assigned to specific taskforce members and their organizations. For example, all COVID-19 testing was assigned to Vail Health and the Colorado Mountain Medical physician group. Eagle County's Public Health Department was responsible for issuing community public health orders regarding social distancing and other community safety measures. Vail Health and Eagle County Public Health jointly participated in, and closely coordinated, vaccine roll-out efforts.

TABLE 1. Major Organizations Participating in Eagle County's COVID-19 Taskforce

Vail Health
Vail Health Hospital (only hospital in Eagle County)
Vail Health Clinics
Shaw Cancer Center
Vail Health Foundation
Colorado Mountain Medical (largest Primary and Specialty Group in Eagle County)
Mountain Family Health Centers (the Federally Qualified Health Center system in Eagle County)
Eagle County Public Health Department
Eagle County Paramedics
Mobile Intercultural Resource Alliance Bus operated by Eagle County Public Health Department
Castle Peak Senior Care Community (only skilled nursing facility in Eagle County)
Colorado Department of Public Health and Environment (CDPHE)

COVID-19 indicates Coronavirus Disease-2019.

Rapid Communication of Consequences of Decisions and Rapid Course Corrections

For 6 months (March–August 2020), the Incident Commander initiated twice-daily phone calls (@0800 and 2000) with all 40 taskforce participants. To achieve the goal of keeping the sole hospital's intensive care unit as empty as possible, performance metrics were developed, such as the daily volume of testing and the reporting of the county-wide outpatient volume of moderate to severely ill COVID-19 patients. The Incident Commander facilitated discussion on the calls but was not the sole decision maker. As performance metrics were presented, all participants could report their progress and describe concerns. With all critical players on the call, most issues were resolved before the call ended. Daily wins were celebrated with "kudos" during the calls. Failures were not analyzed; instead, mitigating next steps and finding new solutions became the focus of discussion. As an example, the taskforce named COVID testing results as a key metric but also recognized that county-wide testing could increase viral transmission among patients waiting for testing inside clinics that lacked pre-existing isolation areas and proper ventilation. Their solution: in early March 2020, the taskforce decided to create a drive-through testing facility, the first in Colorado. Best practices were still unknown that early in the pandemic so, absent centers for disease control guidance, the team created most work processes from scratch (Table 2). In late 2021 daily Incident Command phone calls with frontline staff and county-wide partners were re-established because of the emergence of the Omicron variant.

Decision-making Framework Included Multiple Goals: Those Related to Scientific Issues and Those Responsive to Needs and Concerns of Frontline Workers

As happened elsewhere, all elective surgeries were canceled early in the pandemic. Rather than furlough staff, operating room nurses and aides were deployed to mask construction if they

TABLE 2. Establishing First Drive-Through COVID-19 Testing Facility in Colorado: Questions Faced and Taskforce Response

Questions Faced	Taskforce Response
Best location for first drive-through test site?	Gypsum (small unincorporated town) selected as first site because it allowed ease of drive-through logistics. Conversion of urgent care center to drive-through testing facility permitted urgent care clinic personnel to provide initial staffing. The entire process from recognition of need to opening and providing first test took 18 hours
Who and when to test?	Recommendations regarding testing were changing daily, sometimes multiple times per day. This constantly shifting landscape addressed through daily staff "huddles" that gave everyone the most up to date information regarding testing policies and procedures, worked through operational adjustments to these changes, and ensured that everyone had the same "source of truth" platform. Took 2 weeks to reach steady state at Gypsum facility
How would patients request tests?	Marketing team provided public outreach and instructions for registration and provide frequent updates
Who would register patients, do testing and process them into the system?	Additional testing staff (based on a projected patient throughput of 1–2 patients every 5 min) recruited. Because of shortage of licensed medically trained individuals available in the county, nonmedical applicants were accepted and rapidly trained in proper approaches to testing and documentation. Accomplished without customary organizational approvals
How best to test and collect specimens?	Followed CDC guidance closely and referenced available commercial laboratory recommendations
What labs were available to process tests?	Initially had to rely on 1 commercial laboratory but within a month developed in-house capability for all testing
Should there be a charge for testing?	Started with principle that all testing should be free so initial tests were not billed. Then developed contract with CDPHE to cover cost of testing and administration. Also accepted requests for testing from both providers and patients, no requirement for referral
What information needed to be given to patients regarding isolation and treatment	On the basis of latest CDC guidance. Designed all guidance to be identical in current content regardless of whether it was communication direct to an individual patient or provided generally through a public website
Who to admit to the hospital and when?	Had low threshold for referring patients with any shortness of breath or difficulty breathing to emergency department or 911 as recognized early in pandemic that patients could deteriorate rapidly
What approval processes were required?	Since this was the first drive-through testing facility in the state, there was no state approval process yet available. This would have stopped or delayed some organizations, but the Gypsum testing team was given autonomy to launch the program without organizational or legal approvals
What were the final outcomes?	Multiple testing sites established throughout county with one 7-day-a-week operation. Over 90,000 COVID-19 PCR tests conducted (Fig. 1). Effort so successful an adjacent county that had outsourced its testing to a commercial firm and found it to be inadequate asked Vail Health Team to replicate its testing approach in its place

CDC indicates centers for disease control; CDPHE, Colorado Department of Public Health and Environment; COVID-19, Coronavirus Disease-2019; PCR, polymerase chain reaction.

were not needed for patient care. Physical therapists were cross-trained to assist testing centers, hospital-screening efforts, and respiratory-care support. With school closures, childcare services were identified and provided for Vail Health employees. A clinical psychologist monitored and supported the well-being of all frontline workers and first responders, including contacting employees with COVID or COVID exposure and engaging all teams involved with a local death or critical incident. Resilience-training was offered to all hospital staff. An integrated approach allowed Primary Care Providers (PCPs) to make an immediate "warm handoff" to behavioral health providers so that patients could receive help with developing coping skills and managing stress.

Eagle County's PCPs were telehealth-enabled and telehealth-trained before the first COVID-19 case. The county also expedited the onboarding of first responders, adding an additional 27 paramedics. To reduce unnecessary exposure, paramedics provided telehealth consultations during 911 calls to assess a person's need for medical services or hospitalization. Community paramedics were deployed for in-home consultation with chronic patients and newborns.

The Vail Health marketing team led community engagement, risk communication regarding the pandemic, and public education. Extensive (often daily) messaging throughout the community, both online and in print, helped patients navigate to the appropriate level of care.

Absence of Bureaucratic and Political Interference

Vail Health's Chief Executive Officer and Chief Medical Officer both participated in the daily taskforce calls. Neither person overrode any consensus decisions but instead permitted rapid implementation of those decisions. Because of the fast-changing needs of emergency management, all taskforce members had to be comfortable with quick decision-making and changes in direction. To streamline discussion and reduce the burden of unnecessary documentation, such as might prevent the rapid hiring of more paramedics, for example, regulatory and compliance officials were available for consultation as needed but were not formal members of the taskforce.

At the state level, the Colorado Governor did not impose personal biases or political considerations on pandemic decision-making. A statewide mask mandate was implemented and uniform public-health-based county-level metrics were identified to determine restrictions imposed on gatherings and businesses, but these actions were at the discretion of local officials.[9] The three Eagle County Commissioners who determine county-wide spending were also not members of the taskforce, but they publicly supported all public health measures taken.[10–12]

RESULTS

Eagle was the first county in the state to receive Personal Protective Equipment. On March 4, 2020, Eagle County

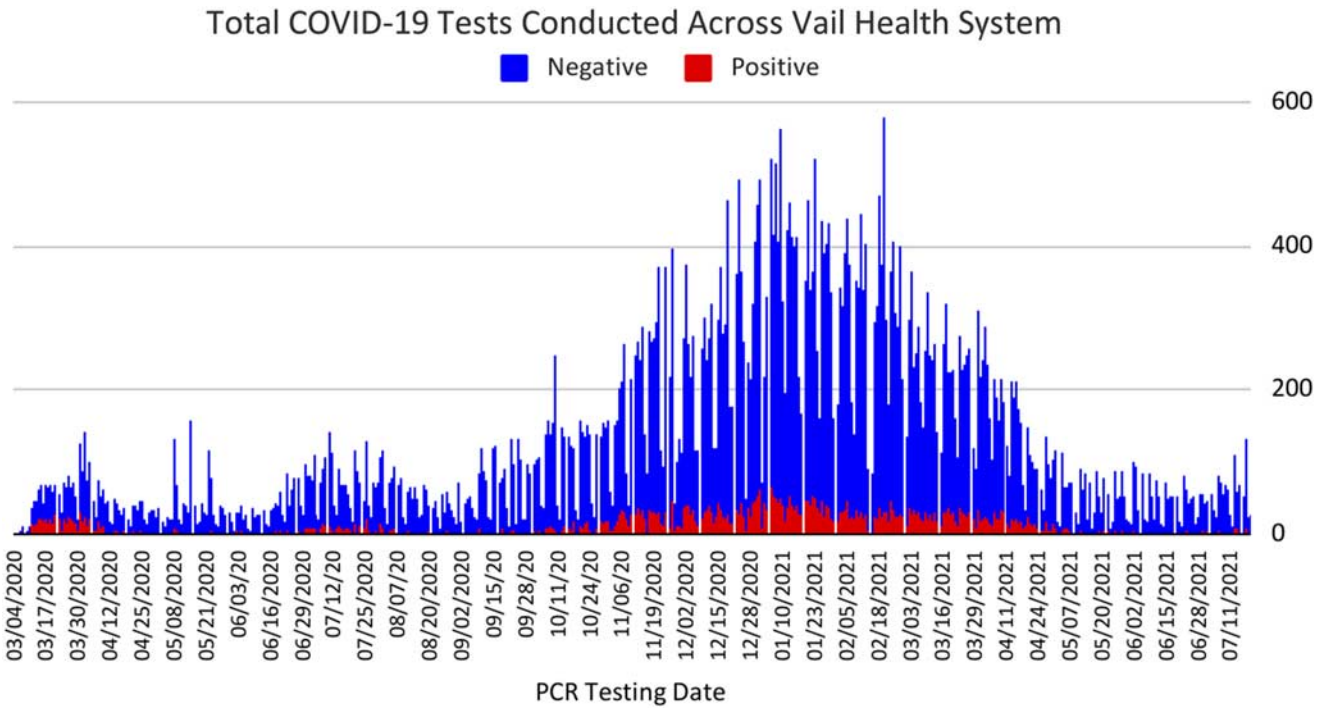

FIGURE 1. Total number of Coronavirus Disease-2019 (COVID-19) polymerase chain reaction (PCR) tests and positive results conducted in Eagle County from March 6, 2020 to July 11, 2021. Figure Courtesy of Karina Schorr Eagle County Public Health Department.

FIGURE 2. Relationship between 3142 US counties Coronavirus Disease-2019 (COVID-19) case fatality rate and their median household income. Size of the circle indicates total county population. COVID-19 case and death surveillance data since January 21, 2020 as recorded in the Johns Hopkins COVID-19 dashboard.[1] Median household income from the 2019 United States.[7] The green dot O represents Eagle County with a case fatality rate of 0.34% per 100,000 and a median income of $84,790. Figure courtesy of Francisco Buera Ph.D. Sam B. Cook Professor of Economics Washington University St. Louis.

opened the first drive-through COVID-19 testing facility in the state (Fig. 1 and Table 2). In December of 2020, the Colorado Department of Public Health and Environment (CDPHE), National Guard, and State Police delivered one of the first batches of COVID-19 Vaccines to Eagle County because it, along with other selected centers statewide, had completed coordinated delivery exercises. The Vail Health system was able to meet all 250 requests for new childcare services by health care workers within two days of school closures. The Vail Hospital's intensive care unit never reached maximum capacity for COVID-19 cases. The county had a case fatality rate of 0.34% lower than the state (1.2%) and United States (1.8%).[7,9] This performance was superior to many other US counties, including those with similar economic characteristics (Fig. 2). By March 2022, the county had provided at least 1 dose of COVID-19 vaccine to 100% of its eligible population and 83% were fully vaccinated. These are among the highest vaccination rates in Colorado for counties containing 1% or more of the state's population.[9] They are also substantially better than the many rural counties reporting <25% of residents vaccinated.[13] Unfortunately, detailed information on minority outcomes was not available because ethnicity designations were voluntary and infrequently recorded.

DISCUSSION

Although nationally the United States failed to respond adequately to the pandemic and protect the health of its citizens, many localities achieved superior performance, Eagle County among them. The county's characteristics and its local and state response provide an outline for how this nation could improve performance. Eagle County exemplifies how improved baseline health of citizens may provide substantial advantages in pandemic situations. While improving the nation's health status has been recommended,[2,4,14] this report provides observational, outcomes-based support for the potential impact of improvement. The well-coordinated, independent, and sustained response to pandemic challenges by members of the Eagle County COVID-19 taskforce is also significant. In many other locales, competition and lack of communication among disparate public health and local medical institutions and providers[4,15,16] impeded a robust pandemic response.

It is important to acknowledge that Eagle County is rural with a low-population density and thus has an advantage when compared with densely populated urban areas where social distancing and other public-health measures are more difficult to maintain.[17] Some of the practices described in this account, such as canceling elective surgeries, reassigning staff, "just in time" training, behavioral support for health care workers, and reducing the burden of unnecessary documentation, have also been reported by the largest municipal hospital system in the United States.[14] Using telehealth for outpatient care delivery is also well documented.[18]

But what this report aims to highlight is Eagle County's innovative and rapid public-health response. The creation of a county-wide taskforce consisting of experienced middle managers from multiple agencies who were empowered with significant independence to design and quickly initiate actions free from bureaucratic and political interference has not been specifically reported. Mounting such a response in states where political interference in public health occurs may be difficult or even impossible.[16,19] But for counties without such interference, the transformative nature of Eagle County's COVID-19 taskforce and its flexibility to manage and respond to emerging challenges are important to consider when designing their responses to either the ongoing COVID-19 or the next such pandemic.

ACKNOWLEDGMENTS

Acknowledgments to the main participants in the Eagle County COVID-19 Response. Ada Borg, COO of Colorado Mountain Medical. Alana Hurst, Colorado Mountain Medical Clinical Director. Amanda Veit, Chief Operating Officer, Vail Health. Amy Lavigne, Quality Director Vail Health Hospital. Barry Hammaker, Chief Medical Officer Vail Hospital. Bill Adochio Senior Director, Facilities and Construction, Vail Health. Birch Barron, Director of Emergency Management Eagle County. Brianna Maher, PA/RN Urgent Care Provider Vail Health. Brooks F. Bock, MD CEO Colorado Mountain Medical. Caitlyn Ngam, Infection Preventionist Vail Health. Casey Wolfington, Community Behavioral Health Director EVBH. Chad Milam, Director of Patient Experience Vail Health. Chris Montera, CEO of Eagle County Paramedic Services. Dana Erpelding, Director of Operations EVBH. Dan Pennington, Vail Health Foundation. Dave Petrowski, Vail Health Materials Management. Diane Schmidt, Employee Health Nurse. Mary Ellen Broersma, Director of Operations, Howard Head Sports Medicine. Emily Tamberino, Vail Health Marketing Director. Erica Hyslop, Vail Health. Heath Harmon, Director Eagle County Public Health Environment Department. Joe Fasolino, Manager of COVID Testing Operations. Kim Goodrich, ESF 8 Lead, Eagle County. Kimberly Flynn, Vail Health Safety Officer. Marc A. Burdick, Eagle County Public Schools. Matthew Smithson, Director Occupational Health Vail Health. Michael Holton, Chief Marketing Officer Vail Health. Mike Murray, Senior Real Estate Analyst, Vail Health. Nico Brown, VP of Business Development Vail Health. Rachel Blackwell, Vail Valley Surgery Center. Sally Welsh, Director Public Relations Vail Health. Sarah Drew, Director of Emergency & Trauma Services. Sara Dembeck, Associate Chief Nursing Officer, Vail Health. Shannatay Bergeron, Specialty Director Colorado Mountain Medical. Shelly Cornish, Administrator, Castle Peak. Stacy Toyama, Vice-President Shaw Cancer Center. Stephanie Kearney, Vice-President of Ambulatory Services Vail Health. Steve Debs, Director of IT Vail Health. Will Cook, CEO Vail Health. Zach Kent, Mountain Family Health Centers. Z McDaniel, Family Birth Center Vail Health.

REFERENCES

1. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect Dis*. 2020;20:533–534.
2. Woolf S, Masters R, Aron L. Effect of the covid-19 pandemic in 2020 on life expectancy across populations in the USA. *BMJ*. 2021;373:1343–1352.

3. Yen H, Woodward C AP fact check: Trump, "wartime" pandemic leader or "backup"? AP 2020. Available at: https://apnews.com/a64cf7fd5095d4d3b002dc4830e32119. Accessed May 25, 2021.
4. Altman D. Understanding the US failure on coronavirus—an essay by Drew Altman. *BMJ*. 2020;370:3417–3420.
5. KFF. State actions to mitigate the spread of covid-19. 2020. Available at: https://www.kff.org/other/state-indicator/state-actions-to-mitigate-the-spread-of-covid-19/. Accessed June 30, 2021.
6. Vail Health. Community Health Needs Assessment: Final Summary Report. September 2019.
7. United States Census Quick Facts, Eagle County, Colorado. Available at: https://www.census.gov/quickfacts/eaglecountycolorado. Accessed August 6, 2021.
8. Centers for Disease Control and Prevention. CDC's response. Available at: https://www.cdc.gov/coronavirus/2019-ncov/cdcresponse/index.html. Accessed August 4, 2021.
9. Colorado Department of Public Health and Environment COPVIFD-19 update. Available at: https://covid19.colorado.gov/. Accessed August 10, 2021.
10. Cook W. Cook: Protecting Our Community from COVID-19. Vail Daily March 13, 2020.
11. Vail Town Council. A message to our community. RealVail March 26, 2020.
12. McQueeney JM, Scheer M, Chandler-Henry K. Valley Voices: Eagle County Commissioners: We need your help creating the new normal. Vail Daily April 23, 2020.
13. Kadri SS, Simpson SQ. Potential implications of SARS-CoV-2 Delta Variant for Rural Areas and Hospitals. *JAMA*. 2021;326:1003–1004.
14. Wei E, Long T, Katz M. Nine lessons learned from the COVID-19 Pandemic for Improving Hospital Care and Health Care Delivery. *JAMA Intern Med*. 2021;181:1161–1163.
15. Makridis C and Rothwell JT, The Real Cost of Political Polarization: evidence from the COVID-19 Pandemic (June 29, 2020). Available at: https://ssrn.com/abstract=3638373 or http://dx.doi.org/10.2139/ssrn.3638373. Accessed May 20, 2021.
16. Fineberg HV. Public health and medicine: where the Twain Shall Meet. *Am J Prev Med*. 2011;41(4S3):S149–S150.
17. Jung J, Manley J, Shresta V. Coronavirus infections and deaths by poverty status: the effects of social distancing. *J Econ Behav Organ*. 2021;182:311–330.
18. Patel SY, Mehrotra A, Huskamp HA, et al. Trends in outpatient care delivery and telemedicine during the COVID-19 pandemic in the US. *JAMA Intern Med*. 2021;181:388–391.
19. Kaiser Health News. Six Takeaways of the KHN-AP Investigation into the Erosion of Public Health. 2020.

