



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Impacts of the COVID-19 Pandemic on Nationwide  
Chronic Disease Prevention and Health Promotion  
Activities

Lilanthi Balasuriya, MD, MMS,<sup>1</sup> Peter A. Briss, MD, MPH,<sup>2</sup> Evelyn Twentyman, MD, MPH,<sup>2</sup> Jennifer L. Wiltz, MD, MPH,<sup>2</sup> Lisa C. Richardson, MD, MPH,<sup>2</sup> Elizabeth T. Bigman, PhD,<sup>2</sup> Janet S. Wright, MD,<sup>2</sup> Ruth Petersen, MD,<sup>2</sup> Casey J. Hannan, MPH,<sup>2</sup> Craig W. Thomas, PhD,<sup>2</sup> Wanda D. Barfield, MD, MPH,<sup>2</sup> Deirdre L. Kittner, PhD, MPH,<sup>2</sup> Karen A. Hacker, MD, MPH<sup>2</sup>

## INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has underscored the need to prevent chronic disease and promote health.<sup>1,2</sup> More than a million American lives have been lost to COVID-19, and life expectancy decreased between 2018 and 2020.<sup>3,4</sup> Chronic diseases are major risk factors for COVID-19 morbidity and mortality.<sup>5</sup> In addition, COVID-19 morbidity and mortality have been higher among persons from racial and ethnic groups such as those who are African American, Hispanic or Latino, and American Indian or Alaska Native as well as those living at lower SES.<sup>6</sup> This has magnified pre-existing health inequities in chronic disease.<sup>1,2,7</sup>

Throughout the pandemic, accounts of disruptions in health care, avoidance of and delays in receiving care, socioeconomic hardships, inability to shelter in place, and changes in healthy behaviors were reported.<sup>7,8</sup> The Centers for Disease Control and Prevention (CDC)'s National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) addresses the major chronic diseases in the U.S. such as cardiovascular disease, cancer, and diabetes and the major risk factors, including tobacco, inactivity, poor nutrition, and excessive alcohol. The center's work addresses 4 domains: epidemiology and surveillance, environmental approaches, healthcare system interventions, and community-clinical linkages. As part of the nation's pre-eminent public health agency, it is critical to gain an understanding of the impacts of COVID-19 on chronic disease and how to respond in the future. How did the pandemic impact the work of the center, including surveillance, population-based interventions, and prevention? To answer these questions, leadership from NCCDPHP's 8 divisions was surveyed on the adverse impacts of COVID-19 on CDC's chronic disease prevention efforts and

what should be done to address them. The perspectives of the CDC's NCCDPHP provide helpful insights into the impact of COVID-19 on chronic disease and prevention, and these recommendations aspire to support and inform the public health workforce going forward.

## METHODS

A survey was sent in April 2021 to NCCDPHP division leaders who also involved selected staff in crafting responses. It consisted of open-ended questions on the divisions' postpandemic priorities, including the impacts of the pandemic on their work, how priorities needed to change to address the needs of the pandemic, and what would be needed to achieve their division goals (Table 1). The primary author (LB) initially reviewed the information across responses to all questions and identified and summarized common preliminary themes on the basis of the recurrence of content and depth of response. These themes were compiled and then shared with a team of diverse CDC physicians with cross-division expertise, including in the areas of public health, healthcare, emergency response, and chronic disease prevention and health promotion (authors KH, PAB, JLW, ET). Together, they reached a consensus on thematic categories. These themes were then refined with the division directors' input.

## RESULTS

From the responses, 5 themes were identified, reflecting the impact of COVID-19 on division activities. These included (1) changes to surveillance systems, (2) health

---

From the <sup>1</sup>National Clinician Scholars Program, Yale School of Medicine, New Haven, Connecticut; and <sup>2</sup>National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia

Address correspondence to: Karen Hacker, MD, MPH, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway Northeast, Atlanta GA 30341. E-mail: [pju3@cdc.gov](mailto:pju3@cdc.gov).

0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2022.09.012>

**Table 1.** Postpandemic Questions Asked to the National Center for Chronic Disease Prevention and Health Promotion Leaders

Postpandemic survey questions
Briefly describe how the pandemic has affected your area(s) of work.
How will the priorities of your Division post-pandemic need to change to address the impacts that have occurred during the last 12-months?
What will you need to achieve your (Division's) goals?
If you had to pick one non-COVID impact to public health that worries you the most within your area, what would be the biggest concern?

debt incurred, (3) a focus on health equity and social determinants of health (SDOH), (4) emerging public health innovations, and (5) recommendations for the future.

### Surveillance

During COVID-19, many CDC chronic disease surveillance systems were affected, making it difficult to ascertain the magnitude of COVID-19's impact.<sup>9</sup> The National Health and Nutrition Examination Survey, National Health Interview Survey, National Youth Tobacco Survey, Youth Risk Behavior Surveillance System (YRBSS), Global Adult Tobacco Survey, and Global Youth Tobacco Survey all saw significant adaptations, which impacted how chronic diseases and health promotion were monitored (Table 2).<sup>10–12</sup>

### Health Debt

The pandemic also incurred health debt.<sup>7</sup> *Health debt* is defined as the accumulated impact of changes in health behaviors, including utilization of health care during the pandemic that will have long-term negative effects on health and chronic disease. Environmental and system issues such as avoiding care owing to COVID-19 concerns, sheltering in place, and decreased access to healthy food also influenced health behaviors and access to care, as did deployment of the chronic disease prevention workforce in state and local health departments to the COVID-19 response.<sup>7,8,13,14</sup>

Because of these challenges, there were steep decreases in breast, colon, and cervical screening during the pandemic.<sup>15</sup> It is estimated that delays in screening and treatment may result in nearly 10,000 preventable deaths from breast and colorectal cancers.<sup>16</sup> So too, delays in the diagnosis and management of other chronic diseases such as diabetes, hypertension, and heart disease were challenges. These effects likely disproportionately impacted populations that are historically disadvantaged, amplifying existing disparities.

**Risk factors for chronic disease.** Early data suggest that both chronic disease and chronic disease risk factors were also affected by the pandemic.<sup>17–21</sup> Consumer-survey data showed that 20% of U.S. adults reported increased physical activity behavior during the pandemic; however, 30% of those surveyed reported decreased physical activity.<sup>20</sup> Eating habits also changed owing to food insecurity, school closures, and other behavioral changes.<sup>17,18</sup> Studies suggested increased pediatric obesity during the pandemic and increased risk for diabetes in children who had COVID-19.<sup>22,23</sup> Given pandemic-related changes in food prices, stay-at-home orders, closure of nonessential businesses, and nutritional assistance resources, food insecurity is likely to continue.<sup>17</sup>

Substance use, including alcohol use, opioid use, and overdose deaths, rose during the pandemic.<sup>21,24–26</sup> The effects of changes in local and state alcohol policies surrounding the pandemic (e.g., expanded alcohol delivery, carry-out policies) will be important to monitor.<sup>21</sup> Although commercial tobacco use did not appear to increase during the pandemic, severe COVID-19 was identified as another in the long list of health consequences of smoking.<sup>19,27</sup>

**Social connectedness and mental health.** Recent symptoms of a depressive disorder or anxiety increased for adults, as did reported unmet mental healthcare needs between August 2020 and February 2021.<sup>28</sup> The impacts of stress and social isolation influence chronic disease, alcohol consumption, mental health, and the ability to promote healthy behaviors and therefore are likely to further adversely affect health promotion and chronic disease burden.<sup>21,25,28,29</sup>

### Health Equity and Social Determinants of Health

Before pandemic, there were already grave disparities in chronic disease and its outcomes.<sup>30</sup> The pandemic exacerbated disparities because African American, Hispanic or Latino, and American Indian or Alaska Native communities experienced higher levels of morbidity and mortality owing to COVID-19.<sup>6</sup> Achieving health equity requires addressing the upstream drivers of poor health outcomes such as food insecurity, structural racism, and differences in built environment.<sup>31</sup> These SDOH impact the ability for all communities to achieve their highest health potential, and innovative solutions are needed to address these.<sup>31</sup>

### Public Health Innovations

NCCDPHP leaders identified pandemic-driven innovations that deserve replication. These fell into 3 categories: improvements to information systems, strategies

**Table 2.** Examples of Surveillance Systems That Experienced Changes During the COVID-19 Pandemic

Surveillance system	Brief description of the surveillance system	Changes that occurred during the pandemic	Programmatic and public health impacts
NHANES	NHANES examines the health and nutritional status of the U.S. population, utilizing interviews, examinations, and the collection of biospecimens in the field	NHANES field operations for data collection were halted in March 2020 owing to the pandemic and did not resume until mid-2021. <sup>10</sup> A data set was created for the prepandemic period: NHANES 2017–March 2020 prepandemic data files, where data from 2019 and early 2020 were combined with the 2017–2018 data cycle. <sup>10</sup>	The 1999–2020 data cycle was not completed, and thus the collected data were not generalizable, and data were not collected during the first year of the pandemic, posing major challenges in tracking the impact of COVID-19. <sup>10</sup> With the suspension of NHANES, nationally representative data on chronic disease indicators, including nutritional status, health-related measurements, and laboratory measures from the early part of the pandemic, do not exist. <sup>10</sup> Although NHANES has resumed, new estimates will not be available until at least mid-2023. <sup>10</sup>
NHIS	NHIS is usually conducted by household interview and tracks data on health status, access to care, and national health objectives	Owing to COVID-19, data collection procedures in 2020 were disrupted. <sup>10</sup> From April through June, all interviews were conducted by telephone only, and survey response rates declined. <sup>10</sup> From July through December, interviews were attempted by telephone first, with follow-ups to complete interviews by personal visit. <sup>10</sup>	Depending on the type of analysis, authors may need to be careful about which data files are used in 2020. <sup>10,11</sup>
NYTS	The NYTS is typically a school-based survey examining tobacco use in middle and high school youth	In the course of the pandemic, NYTS changed the methodology to virtual data collection, and eligible students could participate at home, in the classroom, or in other places. <sup>10</sup>	Although this adaptation allowed for innovative data collection, this methodology change makes monitoring trends over time specifically related to the pandemic difficult. <sup>10</sup> Estimates from the 2021 NYTS cannot be used to draw comparisons with surveys completed in previous years. <sup>10</sup>
YRBSS	The YRBSS is conducted in schools every 2 years, typically in the spring, and monitors youth health behaviors nationally	The 2021 version was conducted in person using a paper format in schools. <sup>10</sup> Many schools postponed the survey until fall 2021 given the uncertainty of in-classroom instruction at the time. <sup>10</sup>	In addition to the potential changes in behaviors because of seasonality, the variability of school attendance policies will make it hard to compare trends in behaviors nationwide.
GATS	GATS is the global standard for monitoring adult tobacco use	For COVID-19 safety reasons, GATS was paused throughout the first year of the pandemic. <sup>10</sup> In fall 2021, countries began preparing to restart data collection. <sup>10</sup>	We will need to further understand the impacts of these pauses in data collection during the first year of the pandemic.
GYTS	GYTS is a school-based survey that collects data similar to those of GATS in youth	The pandemic fostered global opportunities to pilot electronic methods of GYTS data collection, which are ongoing. <sup>10</sup>	The GYTS survey collection did not completely pause, but collection volumes are lower, creating smaller sample sizes. <sup>12</sup>

GATS, Global Adult Tobacco Survey; GYTS, Global Youth Tobacco Survey; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; NYTS, National Youth Tobacco Survey; YRBSS, Youth Risk Behavior Surveillance System.

for returning to and assuring health care, and leveraging community–clinical linkages and partnerships.

**Improvements to information systems.** Hyperlocal data were needed in the pandemic to understand the unique risks of individual communities.<sup>32,33</sup> CDC Population Level Analysis and Community Estimates (PLACES) Project proved useful for this purpose. PLACES provides localized U.S. data for chronic disease–related measures and health behaviors from the Behavioral Risk Factor Surveillance System.<sup>32</sup> PLACES data and the

Social Vulnerability Index were used in the COVID-19 data tracker to identify areas of chronic disease burden.<sup>32–34</sup> This was used to rapidly plan interventions and support effective resource allocation.

During COVID-19, the Household Pulse Survey and the National Center for Health Statistics' Research and Development Survey from CDC and the U.S. Census Bureau fielded real-time surveys to understand issues on pertinent data, including telemedicine.<sup>35,36</sup> This timely information was helpful in understanding the pandemic's impact on healthcare access. National Center for

Health Statistics also produced more real-time and ongoing data on death statistics, including by selected causes. Another strategy focused on integrating data from multiple sources to improve situational awareness. Examples include the National COVID Cohort Collaborative and the Health and Human Services Protect, which integrated data from multiple sources to provide near real-time information to address the evolving COVID-19 landscape.<sup>37,38</sup>

To improve data gathering during COVID-19, new questions were added to existing surveillance tools. National Health Interview Survey, the Pregnancy Risk Assessment Monitoring System, Behavioral Risk Factor Surveillance System, and YRBSS included questions that covered topics, including COVID-19, disaster preparedness, social support, SDOH, racism, new tobacco-related products, and other emerging issues.<sup>10</sup>

To meet the need for data during the pandemic, additional data sources were required. Virtual data collection tools (online polls and registries), electronic health records, and web-based and social media data proved helpful. Partner organizations also collected data. For example, the National Association of Community Health Centers built a multistate system to monitor outcomes and support health centers' responses to COVID-19.<sup>39</sup> It is critical to understand how these new data sources compare with in-person data collection.<sup>10</sup>

### Strategies for returning to and assuring health care.

The pandemic led to the rapid adoption of innovative strategies in health care aimed at safely delivering quality care. These actions hopefully diminished some of the worst direct and indirect outcomes of the pandemic. Many strategies provided care to people where they live, increased the safety of clinical environments, and were delivered virtually.<sup>40–43</sup> Examples include telehealth, phone visits, text messaging platforms, screening staff or patients for COVID-19, and providing care in community settings.

Nationally, telehealth expanded using platforms including Zoom and Teams to support chronic disease management.<sup>44</sup> Telehealth provided a safer and easier way to deliver care, removing barriers such as transportation, time off work, and parking fees.<sup>42,45</sup> It is critical to determine when telehealth is most and least useful, for what conditions, specialties, and types of services.

Innovations were seen in cancer screening delivery. The Riggs Community Health Center changed its way of operating, using the medical record to assess who needed cervical cancer screening and offering same-day screenings. This clinic increased up-to-date cervical cancer screening from 65% to 87% between 2019 and 2020.<sup>46</sup>

During the pandemic, community and home care proliferated. Much work was done to increase access to preventive care, such as self-measured home blood pressure monitoring and the delivery of COVID-19 vaccines in homes, central community locations, and workplaces, eliminating access barriers.<sup>40,41</sup> Programs, such as CDC's Child Obesity Research Demonstration projects, transitioned to online platforms and telehealth, which allowed for successful engagement of families and improved no-show rates.<sup>43</sup> In principle, these approaches could accelerate the expansion of program reach and impact in a postpandemic world.

Although telehealth and home care can facilitate the delivery of services to individuals and families, these options are unequally distributed in part owing to technology access, language differences, privacy and security concerns, and reimbursement.<sup>42,47</sup> These issues will need to be addressed if telehealth is to reach lower-income, rural, and certain racial or ethnic subpopulations.<sup>42,47</sup> An array of patient engagement tools are needed to help all people attain their highest health potential, address SDOH, and achieve health equity.<sup>31</sup>

### Community–clinical linkages and partnerships.

Throughout the pandemic, in addition to homes, neighborhoods, and workplaces, communities leveraged care and prevention in pharmacies, schools, places of worship, barbershops, and other gathering places.<sup>41,48</sup> These community–clinical linkages were critical in delivering trusted information, COVID-19 testing, and vaccinations in communities most in need.<sup>41,48</sup> Community partners hold valuable insights on how resources are best used. CDC's Racial and Ethnic Approaches to Community Health is a national program aimed at reducing disparities by investing in local and culturally appropriate programs on the basis of community partnerships.<sup>49</sup> Many Racial and Ethnic Approaches to Community Health recipients received funding to address communities' COVID-19 vaccination needs, leveraging pre-existing partnerships.<sup>49</sup> These partnerships provide opportunities to reach communities most likely to experience barriers to care.

### Recommendations

Table 3 provides innovative recommendations in the areas of improvements to information systems, strategies for returning to and assuring care, and community–clinical linkages and partnerships. Many of the innovations, developed in real time, show promise for the future and should be maintained and expanded moving forward.



**Table 3.** Recommendations for Future Public Health Innovations

Improvements to information systems
Information systems—new and existing—must rapidly identify public health gaps in real time, including examining disparities in health outcomes by race, ethnicity, and other drivers of health inequity
Evaluate and address COVID-19's impact on local and population-level data collection related to chronic disease and prevention.
Provide and make data on the direct and indirect impacts of the pandemic available at the local level to support public health interventions, including our understanding of gaps at the local community level.
Validate and expand the use of virtual data collection tools and real-time data from EHRs, web-based platforms, social media platforms, and possibly other new data sources, many of which were expanded or created related to the COVID-19 pandemic.
Invest in ongoing data modernization initiatives to unite public health jurisdictions across state, tribal, and local levels and private and public sector partners to create real-time surveillance systems for COVID-19 and beyond.
Ensure continuous quality improvement of surveillance tools to enable tracking of health equity, social determinants of health, racism, social isolation, substance use, mental health, and disaster preparedness and the impact on health promotion and chronic disease risk factors.
Strategies for returning to and assuring health care
Leverage strategies that provide care to people where they live, including telehealth, phone visits, utilization of text messaging platforms, and care in community settings.
Increase patient engagement by expanding virtual, in-community, and in-home care interventions to decrease barriers to access.
Perform ongoing assessment and evaluation of the shifting modalities in healthcare delivery, many of which occurred during the COVID-19 pandemic, including their strengths and limitations.
Community–clinical linkages and partnerships
Leverage and invest in community–clinical linkages and partnerships (both pre-existing and newly formed during the COVID-19 pandemic) to deliver trusted information, resources, wellness initiatives, prevention efforts, and care where applicable.
Examine and assess community–clinical linkages and partnership models utilized during the pandemic for COVID-19 testing and vaccination and catalyze opportunities to advance current and future public health efforts.
Examine successful community–clinical linkages and partnerships (both pre-existing and newly formed during the COVID-19 pandemic) to assess efficacy and opportunities to advance health equity and improvements in chronic disease prevention and health promotion.

HER, electronic health record.

### Limitations

This work reflects views of division leadership in NCCDPHP, and these views may not be generalizable. Given the rapidly changing pandemic environment, it is possible that new insights and recommendations would

be forthcoming if the survey was repeated at a different time. However, continuing conversations among national partners suggest that the themes identified resonate with the field.

### CONCLUSIONS

COVID-19 has been a defining event in the lives of Americans; early indicators suggest that chronic disease burden and existing health inequities have increased. There have also been innovative approaches that can enhance prevention, surveillance, and healthcare delivery in the future. Leaders at CDC NCCDPHP are committed to achieving health equity and meeting emerging challenges head on.<sup>31</sup> The recommendations require multiple partnerships to rebuild, reframe, and support community resilience and ensure that we are prepared for the future.

### ACKNOWLEDGMENTS

Use of trade names and commercial sources is for identification only and does not imply endorsement by the HHS. The opinions expressed by authors contributing to this report do not necessarily reflect the opinions of the HHS, the Public Health Service, the Centers for Disease Control and Prevention, or the authors' affiliated institutions.

No financial disclosures were reported by the authors of this paper.

### CREDIT AUTHOR STATEMENT

**Karen Hacker:** Conceptualization, methodology, formal analysis of assessing themes, writing-reviewed and edited all drafts, supervision. **Lilanthi Balasuriya:** Formal analysis of assessing themes, writing-original draft preparation, writing-reviewing and editing. **Peter A. Briss:** Formal analysis of assessing themes, writing-reviewing and editing. **Evelyn Twentyman:** Formal analysis of assessing themes, writing-reviewing and editing. **Jennifer L. Wiltz:** Formal analysis of assessing themes, writing-reviewing and editing. **Lisa C. Richardson:** writing-reviewing and editing. **Elizabeth Bigman:** writing-reviewing and editing. **Janet S. Wright:** writing-reviewing and editing. **Ruth Petersen:** writing-reviewing and editing. **Casey Hannan:** writing-reviewing and editing. **Craig Thomas:** writing-reviewing and editing. **Wanda D. Barfield:** writing-reviewing and editing. **Deirdre L. Kittner:** writing-reviewing and editing.

### REFERENCES

- Hacker KA, Briss PA, Richardson L, Wright J, Petersen R. COVID-19 and chronic disease: the impact now and in the future. *Prev Chronic Dis.* 2021;18:E62. <https://doi.org/10.5888/pcd18.210086>.
- Hacker KA, Briss PA. An ounce of prevention is still worth a pound of cure, especially in the time of COVID-19. *Prev Chronic Dis.* 2021;18:E03. <https://doi.org/10.5888/pcd18.200627>.
- COVID-19 mortality overview. Centers for Disease Control and Prevention, National Center for Health Statistics; 2021. <https://www.cdc.gov>.

- [gov/nchs/covid19/mortality-overview.htm](https://www.cdc.gov/nchs/covid19/mortality-overview.htm). Updated May 16, 2022. Accessed August 21, 2021.
- Woolf SH, Masters RK, LY Aron. Effect of the COVID-19 pandemic in 2020 on life expectancy across populations in the USA and other high income countries: simulations of provisional mortality data. *BMJ*. 2021;373:n1343. <https://doi.org/10.1136/bmj.n1343>.
  - People with certain medical conditions. Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html>. Updated October 19, 2022. Accessed August 21, 2021.
  - Risk for COVID-19 infection, hospitalization, and death by race/ethnicity. Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html>. Updated September 15, 2022. Accessed June 29, 2021.
  - Ruth L, Alongi J, Robitscher J. Confronting the health debt: the impact of COVID-19 on chronic disease prevention and management. *Bethesda, MD: HealthAffairs*. 2021 <https://www.healthaffairs.org/doi/10.1377/hblog20210914.220940/full/>. Published September 17, 2021. Accessed September 30, 2021.
  - Czeisler ME, Marynak K, Clarke KEN, et al. Delay or avoidance of medical care because of COVID-19-Related concerns—United States, June 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(36):1250–1257. <https://doi.org/10.15585/mmwr.mm6936a4>.
  - Surveillance systems. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 2021. <https://www.cdc.gov/chronicdisease/data/surveillance.htm>. Updated April 28. Accessed August 15, 2021.
  - Data. Centers for Disease Control and Prevention; 2022. <https://data.cdc.gov/>. Accessed February 5, 2022.
  - Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey Early Release Program. Technical notes for early release of selected estimates based on data from the national health interview survey. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey Early Release Program; 2021. <https://www.cdc.gov/nchs/data/nhis/earlyrelease/earlyrelease202108-tech-508.pdf>. Published August 2021. Accessed March 2, 2022.
  - Global youth tobacco survey. WHO; 2021. <https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/global-youth-tobacco-survey>. Accessed September 1, 2021.
  - Findling MG, Blendon RJ, Benson JM. Delayed care with harmful health consequences—reported experiences from national surveys during coronavirus disease 2019. *JAMA Health Forum*. 2020;1(12):e201463. <https://doi.org/10.1001/jamahealthforum.2020.1463>.
  - HHS. Strategies for managing a surge in COVID-19 cases. Washington, DC: HHS; 2021. <https://files.asprtracie.hhs.gov/documents/strategies-for-managing-surge-roadmap-final.pdf>. Published 2020. Accessed December 11, 2021.
  - Patt D, Gordan L, Diaz M, et al. Impact of COVID-19 on cancer care: how the pandemic is delaying cancer diagnosis and treatment for American seniors. *JCO Clin Cancer Inform*. 2020;4:1059–1071. <https://doi.org/10.1200/CCL.20.00134>.
  - Sharpless NE. COVID-19 and cancer. *Science*. 2020;368(6497):1290. <https://doi.org/10.1126/science.abd3377>.
  - Food and consumers. U.S. Department of Agriculture, Economic Research Service; 2021. <https://www.ers.usda.gov/covid-19/food-and-consumers/>. Updated October 3, 2022. Accessed December 12, 2021.
  - U.S. Department of Agriculture. USDA issues pandemic flexibilities for schools and day care facilities through June 2022 to support safe reopening and healthy, nutritious meals. Washington, DC: U.S. Department of Agriculture; April 20, 2021. <https://www.usda.gov/media/press-releases/2021/04/20/usda-issues-pandemic-flexibilities-schools-and-day-care-facilities>. Published April 20, 2021. Accessed February 4, 2022.
  - Smoking & tobacco use. Current cigarette smoking among adults in the United States. Centers for Disease Control and Prevention; March 17, 2022. [https://www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/adult\\_data/cig\\_smoking/index.htm](https://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/index.htm). Updated March 17, 2022. Accessed April 30, 2022.
  - Watson KB, Whitfield GP, Huntzicker G, et al. Cross-sectional study of changes in physical activity behavior during the COVID-19 pandemic among U.S. adults. *Int J Behav Nutr Phys Act*. 2021;18(1):91. <https://doi.org/10.1186/s12966-021-01161-4>.
  - Grossman ER, Benjamin-Neelon SE, Sonnenschein S. Alcohol consumption during the COVID-19 pandemic: a cross-sectional survey of U.S. adults. *Int J Environ Res Public Health*. 2020;17(24):9189. <https://doi.org/10.3390/ijerph17249189>.
  - Lange SJ, Kompaniyets L, Freedman DS, et al. Longitudinal trends in body mass index before and during the COVID-19 pandemic among persons aged 2-19 years—United States, 2018–2020. *MMWR Morb Mortal Wkly Rep*. 2021;70(37):1278–1283. <https://doi.org/10.15585/mmwr.mm7037a3>.
  - Barrett CE, Koyama AK, Alvarez P, et al. Risk for newly diagnosed diabetes >30 days after SARS-CoV-2 infection among persons aged <18 years—United States, March 1, 2020–June 28, 2021. *MMWR Morb Mortal Wkly Rep*. 2022;71(2):59–65. <https://doi.org/10.15585/mmwr.mm7102e2>.
  - Knell G, Robertson MC, Dooley EE, Burford K, Mendez KS. Health behavior changes during COVID-19 pandemic and subsequent “stay-at-home” orders. *Int J Environ Res Public Health*. 2020;17(17):6268. <https://doi.org/10.3390/ijerph17176268>.
  - Czeisler ME, Lane RI, Petrosky E, et al. Mental health, substance use, and suicidal ideation during the COVID-19 pandemic—United States, June 24–30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(32):1049–1057. <https://doi.org/10.15585/mmwr.mm6932a1>.
  - Overdose deaths accelerating during COVID-19. Centers for Disease Control and Prevention; 2020. <https://www.cdc.gov/media/releases/2020/p1218-overdose-deaths-covid-19.html>. Updated December 18, 2020. Accessed February 4, 2022.
  - Clift AK, von Ende A, Tan PS, et al. Smoking and COVID-19 outcomes: an observational and Mendelian randomisation study using the UK biobank cohort. *Thorax*. 2022;77(1):65–73. <https://doi.org/10.1136/thoraxjnl-2021-217080>.
  - Vahratian A, Blumberg SJ, Terlizzi EP, Schiller JS. Symptoms of anxiety or depressive disorder and use of mental health care among adults during the COVID-19 pandemic—United States, August 2020–February 2021. *MMWR Morb Mortal Wkly Rep*. 2021;70(13):490–494. <https://doi.org/10.15585/mmwr.mm7013e2>.
  - Alzheimer’s disease and healthy aging. Loneliness and social isolation linked to serious health conditions. Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/aging/publications/features/lonely-older-adults.html>. Updated April 29, 2021. Accessed June 20, 2021.
  - Institute of Medicine (US) Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. In: Smedley BD, Stith AY, Nelson AR, eds. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: The National Academies Press, 2003. <https://pubmed.ncbi.nlm.nih.gov/25032386/>. Accessed October 30, 2022.
  - Melkonian SC, Crowder J, Adam EE, White MC, Peipins LA. Social determinants of cancer risk among American Indian and Alaska Native populations: an evidence review and map. *Health Equity*. 2022;6(1):717–728. <https://doi.org/10.1089/heq.2022.0097>.
  - PLACES: local data for better health. Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/places/index.html>. Updated September 6, 2022. Accessed October 30, 2022.
  - Razzaghi H, Wang Y, Lu H, et al. Estimated county-level prevalence of selected underlying medical conditions associated with increased risk for severe COVID-19 illness—United States, 2018. *MMWR Morb*

- Mortal Wkly Rep.* 2020;69(29):945–950. <https://doi.org/10.15585/mmwr.mm6929a1>.
34. ATSDR Annual Report. Geospatial Research, Analysis, and Services Program (GRASP). Centers for Disease Control and Prevention; 2021. <https://www.atsdr.cdc.gov/2020atsdrannualreport/covid-19-collaboration/grasp-support.html>. Updated December 29, 2021. Accessed May 25, 2022.
  35. Health care access, telemedicine, and mental health. Centers for Disease Control and Prevention, National Center for Health Statistics; 2021. <https://www.cdc.gov/nchs/covid19/health-care-access-and-mental-health.htm>. Updated October 26, 2022. Accessed September 1, 2021.
  36. Health care access, telemedicine access and use, and loss of work due to illness. Centers for Disease Control and Prevention, National Center for Health Statistics; 2021. <https://www.cdc.gov/nchs/covid19/rands.htm>. Updated August 6, 2021. Accessed March 21, 2022.
  37. National COVID Cohort Collaborative. <https://covid.cd2h.org/>. Accessed August 9, 2021.
  38. HHS protect public data hub. HHS. <https://protect-public.hhs.gov>. Updated October 28, 2022. Accessed January 30, 2022.
  39. Building the capacity of health centers to respond to COVID-19. <https://www.nachc.org/clinical-matters/current-projects/building-capacity-of-community-health-centers-to-respond-to-covid-19/>. Accessed August 1, 2021.
  40. Sharma K, Desai HD. Role of self-measured home blood pressure monitoring (HBPM) and effectiveness of telemedicine during the era of COVID-19 pandemic. *SN Compr Clin Med.* 2021;3(5):1071–1073. <https://doi.org/10.1007/s42399-021-00852-0>.
  41. Centers for Disease Control and Prevention. A guide for community partners. Increasing COVID-19 vaccine uptake among member of racial and ethnic minority communities. Atlanta, GA: Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/vaccines/covid-19/downloads/guide-community-partners.pdf>. Published April 6, 2021. Accessed July 30, 2021.
  42. COVID-19. Using telehealth services. Centers for Disease Control and Prevention; 2020. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/telehealth.html>. Updated June 10, 2020. Accessed December 12, 2021.
  43. Calcaterra V, Verduci E, Vandoni M, et al. Telehealth: a useful tool for the management of nutrition and exercise programs in pediatric obesity in the COVID-19 era. *Nutrients.* 2021;13(11):3689. <https://doi.org/10.3390/nu13113689>.
  44. Chu RC, Peters C, Lew ND, Sommers BD. *Assistant secretary for planning and evaluation. State Medicaid telehealth policies before and during the COVID-19 public health emergency.* Washington, DC: HHS; 2021. <https://aspe.hhs.gov/sites/default/files/2021-07/medicaid-telehealth-brief.pdf>. Published July 2021. Accessed January 21, 2022.
  45. Reed ME, Huang J, Graetz I, et al. Patient characteristics associated with choosing a telemedicine visit vs office visit with the same primary care clinicians. *JAMA Netw Open.* 2020;3(6):e205873. <https://doi.org/10.1001/jamanetworkopen.2020.5873>.
  46. Screening reminders help Indiana clinic save a life. Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/cancer/nbccedp/success/screening-reminders-indiana.htm>. Updated November 10, 2021. Accessed July 22, 2021.
  47. Almathami HKY, Win KT, Vlahu-Gjorgievska E. Barriers and facilitators that influence telemedicine-based, real-time, online consultation at patients' homes: systematic literature review. *J Med Internet Res.* 2020;22(2):e16407. <https://doi.org/10.2196/16407>.
  48. Michener L, Aguilar-Gaxiola S, Alberti PM, et al. Engaging with communities—lessons (Re)learned from COVID-19. *Prev Chronic Dis.* 2020;17:E65. <https://doi.org/10.5888/pcd17.200250>.
  49. Racial and ethnic approaches to community health (REACH). Centers for Disease Control and Prevention; 2021. <https://www.cdc.gov/nccdphp/dnpao/state-local-programs/reach/index.htm>. Updated July 25, 2022. Accessed August 2, 2021.