Journal Pre-proof

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

Lilanthi Balasuriya MDMMS, Peter A. Briss MDMPH, Evelyn Twentyman MDMPH, Jennifer L. Wiltz MDMPH, Lisa C. Richardson MDMPH, Elizabeth Bigman PhD, Janet S. Wright MD, Ruth Petersen MD, Casey Hannan MPH, Craig Thomas PhD, Wanda D. Barfield MDMPH, Deirdre L. Kittner PhDMPH, Karen Hacker MDMPH

PII: S0749-3797(22)00471-8
DOI: https://doi.org/10.1016/j.amepre.2022.09.012
Reference: AMEPRE 6973

To appear in: American Journal of Preventive Medicine

Please cite this article as: Lilanthi Balasuriya MDMMS, Peter A. Briss MDMPH, Evelyn Twentyman MDMPH, Jennifer L. Wiltz MDMPH, Lisa C. Richardson MDMPH, Elizabeth Bigman PhD, Janet S. Wright MD, Ruth Petersen MD, Casey Hannan MPH, Craig Thomas PhD, Wanda D. Barfield MDMPH, Deirdre L. Kittner PhDMPH, Karen Hacker MDMPH, Impacts of the COVID-19 Pandemic on Nationwide Chronic Disease Prevention and Health Promotion Activities, American Journal of Preventive Medicine (2022), doi: https://doi.org/10.1016/j.amepre.2022.09.012

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2022 Published by Elsevier Inc. on behalf of American Journal of Preventive Medicine.
Impacts of the COVID-19 Pandemic on Nationwide Chronic Disease Prevention and Health Promotion Activities

Lilanthi Balasuriya, MD, MMS,1 Peter A. Briss, MD, MPH,2 Evelyn Twentyman, MD, MPH,2 Jennifer L. Wiltz, MD, MPH,2 Lisa C. Richardson, MD, MPH,2 Elizabeth Bigman, PhD,2 Janet S. Wright, MD,2 Ruth Petersen, MD,2 Casey Hannan, MPH,2 Craig Thomas, PhD,2 Wanda D. Barfield, MD, MPH,2 Deirdre L. Kittner, PhD, MPH,2 Karen Hacker, MD, MPH2

From the 1Yale National Clinician Scholars Program, Yale School of Medicine, New Haven, Connecticut; and 2National 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 Hwy NE, Atlanta GA 30341. E-mail: pju3@cdc.gov.
INTRODUCTION

The COVID-19 pandemic has underscored the need to prevent chronic disease and promote health.\textsuperscript{1,2} Over a million American lives have been lost to COVID-19 and life expectancy decreased between 2018–2020.\textsuperscript{3,4} Chronic diseases are major risk factors for COVID-19 morbidity and mortality.\textsuperscript{5} Additionally, 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, American Indian or Alaska Native as well as those living at lower SES.\textsuperscript{6} This has magnified preexisting health inequities in chronic disease.\textsuperscript{1,2,7}

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.\textsuperscript{7,8} The 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 preeminent 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 were 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 on 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’ post-pandemic 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 (L.B.) initially reviewed the information across responses to all questions and identified and summarized common preliminary themes based on 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 K.H., P.B., J.W., E.T.). Together, they reached a consensus on thematic categories. These themes were then refined with 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 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.\textsuperscript{9} The National Health and Nutrition Examination Survey (NHANES), National Health Interview Survey (NHIS), National Youth Tobacco Survey (NYTS), Youth Risk Behavior Surveillance System (YRBSS), Global Adult Tobacco Survey (GATS) and Global Youth Tobacco Survey (GYTS) all saw significant adaptations which impacted how chronic diseases and health promotion were monitored (Table 2).\textsuperscript{10–12}

Health Debt

The pandemic also incurred “health debt.”\textsuperscript{7} 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 like avoiding care due 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.\textsuperscript{7,8,13,14}

As a result of these challenges, there were steep decreases in breast, colon, and cervical screening during the pandemic.\textsuperscript{15} It is estimated that delays in screening and treatment may result in nearly 10,000 preventable deaths from breast and colorectal cancer.\textsuperscript{16} So
too, delays in 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 suggests that both chronic disease and chronic disease risk factors were also affected by the pandemic. 17-19,20,21 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. 20 Eating habits also changed due to food insecurity, school closures, and other behavioral changes. 17,18 Studies suggested increased pediatric obesity during the pandemic and increased risk for diabetes in children who had COVID-19. 22,23 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. 17

Substance use, including alcohol use, opioid use and overdose deaths rose during the pandemic. 21,24,25,26 The effects of changes in local and state alcohol policies surrounding the pandemic (e.g., expanded alcohol delivery, carryout policies) will be important to monitor. 21 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. 19,27

**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–February 2021. 28 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.21,25,28,29

Health Equity and Social Determinants of Health

Pre-pandemic, there were already grave disparities in chronic disease and its outcomes.30 The pandemic exacerbated disparities as African American, Hispanic or Latino, and American Indian or Alaska Native communities experienced higher levels of morbidity and mortality due to COVID-19.6 Achieving health equity requires addressing the upstream drivers of poor health outcomes such as food insecurity, structural racism, and differences in built environment.31 These SDOH impact the ability for all communities to achieve their highest health potential and innovative solutions are needed to address these.31

Public Health Innovations

NCCDPHP leaders identified pandemic-driven innovations that deserve replication. These fell into 3 categories; improvements to information systems, strategies 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.32,33 The CDC PLACES Project proved useful for this purpose. PLACES provides localized U.S. data for chronic disease-related measures and health behaviors from BRFSS.32 PLACES data and the Social Vulnerability Index were used in the
COVID-19 data tracker to identify areas of chronic disease burden. 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’ (NCHS’) Research and Development Survey from CDC and the U.S. Census Bureau fielded real-time surveys to understand issues on pertinent data including telemedicine. This timely information was helpful in understanding the pandemic’s impact on healthcare access. NCHS 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.

To improve data gathering during COVID-19, new questions were added to existing surveillance tools. NHIS, the Pregnancy Risk Assessment Monitoring System, BRFSS and YRBSS included questions that covered topics including COVID-19, disaster preparedness, social support, SDOH, racism, new tobacco-related products and other emerging issues.

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 (EHR), web-based and social media data proved helpful. Partner organizations also collected data.
For example, the National Association of Community Health Centers built a multi-state system to monitor outcomes and support health centers’ responses to COVID-19. It is critical to understand how these new data sources compare to in-person data collection.

Strategies for returning to and assuring health care. The pandemic led to rapid adoption of innovative strategies in healthcare 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. 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. Telehealth provided a safer and easier way to deliver care removing barriers such as transportation, time off work, and parking fees. 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 by 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.
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. 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. In principle, these approaches could accelerate expansion of program reach and impact in a post-pandemic world.

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

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. These community-clinical linkages, were critical in delivering trusted information, COVID-19 testing and vaccinations in communities most in need. Community partners hold valuable insights on how resources are best used. The CDC’s Racial and Ethnic Approaches to Community Health (REACH) is a national program aimed at reducing disparities through investing in local and
culturally appropriate programs based in community partnerships. Many REACH recipients received funding to address communities’ COVID-19 vaccination needs, leveraging pre-existing partnerships. 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.

**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 the CDC NCCDPHP are committed to achieving health equity and meeting the emerging challenges head-on. The recommendations require multiple partnerships to rebuild, reframe and support community resilience and ensure 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 U.S. Department of Health and Human Services. The opinions expressed by authors contributing to this report do not necessarily reflect the opinions of the U.S. Department of Health and Human Services, the Public Health Service, the Centers for Disease Control and Prevention, or the authors’ affiliated institutions.

No conflicts of interest or financial disclosures were reported by the authors of this paper.
REFERENCES


Table 1. Post-Pandemic Questions Asked to the National Center for Chronic Disease Prevention and Health Promotion Leaders

<table>
<thead>
<tr>
<th>Post-Pandemic Survey Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Briefly describe how the pandemic has affected your area(s) of work.</td>
</tr>
<tr>
<td>2) How will the priorities of your Division post-pandemic need to change to address the</td>
</tr>
<tr>
<td>impacts that have occurred during the last 12-months?</td>
</tr>
<tr>
<td>3) What will you need to achieve your [Division’s] goals?</td>
</tr>
<tr>
<td>4) If you had to pick one non-COVID impact to public health that worries you the most</td>
</tr>
<tr>
<td>within your area, what would be the biggest concern?</td>
</tr>
<tr>
<td>Surveillance system</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
</tbody>
</table>
| National Health and Nutrition Examination Survey (NHANES) | NHANES examines the health and nutritional status of the U.S. population utilizing interviews, exams, and the collection of biospecimens in the field | • NHANES field operations for data collection were halted in March 2020 due to the pandemic and did not resume until mid-2021.\textsuperscript{10}  
• A data set was created for the pre-pandemic period: NHANES 2017–March 2020 pre-pandemic data files, where data from 2019 and early 2020 were combined with the 2017–2018 data cycle.\textsuperscript{10} | • 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.\textsuperscript{10}  
• 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.\textsuperscript{10}  
• While NHANES has resumed, new estimates will not be available until at least mid-2023.\textsuperscript{10} |
| National Health Interview Survey (NHIS) | NHIS is usually conducted by household interview and tracks data on health status, access to care and national health objectives | • Due to COVID-19, data collection procedures in 2020 were disrupted.\textsuperscript{10}  
• From April through June all interviews were conducted by telephone only and survey response rates declined.\textsuperscript{10}  
• From July through December interviews were attempted by telephone first, with follow-ups to complete interviews by personal visit.\textsuperscript{10} | • Depending on the type of analysis, authors may need to be careful which data files are used in 2020.\textsuperscript{10,12} |
<p>| National Youth The NYTS is typically a | • In the course of the pandemic, | • While this adaptation allowed for |</p>
<table>
<thead>
<tr>
<th>Tobacco Survey (NYTS)</th>
<th>school-based survey examining tobacco use in middle and high school youth</th>
<th>NYTS changed the methodology to virtual data collection, and eligible students could participate at home, in the classroom or other places.\textsuperscript{10}</th>
<th>innovative data collection, this methodology change makes monitoring trends over time specifically related to the pandemic difficult.\textsuperscript{10}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Youth Risk Behavior Surveillance System (YRBSS)</td>
<td>The YRBSS is conducted in schools every 2 years, typically in the spring, and monitors youth health behaviors nationally</td>
<td>• The 2021 version was conducted in person using a paper format in schools.\textsuperscript{10}</td>
<td>• In addition to the potential changes in behaviors due to seasonality, the variability of school attendance policies will make it hard to compare trends in behaviors nationwide.</td>
</tr>
<tr>
<td>Global Adult Tobacco Survey (GATS)</td>
<td>GATS is the global standard for monitoring adult tobacco use</td>
<td>• For COVID-19 safety reasons, GATS was paused throughout the first year of the pandemic.\textsuperscript{10}</td>
<td>• We will need to further understand the impacts of these pauses in data collection during the first year of the pandemic.</td>
</tr>
<tr>
<td>Global Youth Tobacco Survey (GYTS)</td>
<td>GYTS is a school-based survey that collects similar data to GATS in youth</td>
<td>• The pandemic fostered global opportunities to pilot electronic methods of GYTS data collection, which are ongoing.\textsuperscript{10}</td>
<td>• The GYTS survey collection did not completely pause, but collection volumes are lower, creating smaller sample sizes.\textsuperscript{11}</td>
</tr>
</tbody>
</table>

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.
Table 3: Recommendations for Future Public Health Innovations

<table>
<thead>
<tr>
<th>Improvements to Information Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• Evaluate and address COVID-19’s impact on local and population-level data collection related to chronic disease and prevention.</td>
</tr>
<tr>
<td>• Provide and make data on the direct and indirect effects of the pandemic available at the local level to support public health interventions, including our understanding of gaps at the local community level.</td>
</tr>
<tr>
<td>• Validate and expand the use of virtual data collection tools and real-time data from EHRs, web-based platforms, social media platforms and possible other new data sources, many of which were expanded or created related to the COVID-19 pandemic.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategies for Returning to and Assuring Health Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Leverage strategies that provide care to people where they live including telehealth, phone visits, utilization of text messaging platforms, and care in community settings.</td>
</tr>
<tr>
<td>• Increase patient engagement by expanding virtual, in-community and in-home care interventions to decrease barriers to access.</td>
</tr>
<tr>
<td>• Perform ongoing assessment and evaluation of the shifting modalities in health care delivery, many of which occurred during the COVID-19 pandemic, including their strengths and limitations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community-Clinical Linkages and Partnerships</th>
</tr>
</thead>
</table>
• 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.