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COVID-19 Impact on Dental Service Delivery, Financing, Regulation, and Education Systems: An Environmental Scan

OHWRC
Oral Health Workforce Research Center

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PREFACE

The Oral Health Workforce Research Center (OHWRC) at the Center for Health Workforce Studies (CHWS) at the University at Albany's School of Public Health completed a study to describe the immediate and longer-term impacts of the COVID-19 pandemic on 4 domains of the oral health care system: care delivery, regulation, education, and finance.

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The mission of OHWRC is to provide accurate and policy-relevant research on the impact of the oral health workforce on oral health outcomes. The research conducted by OHWRC informs strategies designed to increase access to oral health services for vulnerable populations. OHWRC is based at CHWS at the School of Public Health, University at Albany, State University of New York (SUNY), and is the only HRSA-sponsored research center with a unique focus on the oral health workforce. The views expressed in this report are those of OHWRC and do not necessarily represent positions or policies of the School of Public Health, University at Albany, SUNY.

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BACKGROUND

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Health care systems worldwide were extraordinarily challenged by the rapid, uncontrolled spread of the SARS-2 (COVID-19) virus. Many health systems in the US were at capacity treating patients under frenzied conditions when little was known about transmissibility, disease pathways, or expected outcomes from a previously unknown and highly contagious pathogen. The COVID-19 pandemic had a profound impact on all aspects of the oral health care system as well. The temporary suspension of oral health services impacted patients seeking preventive and restorative dental services with enduring consequences that transcended the temporary "pause" in ambulatory care in early 2020.

The postponement of dental care during the COVID-19 pandemic also impacted providers. Dentists and their staffs faced unprecedented threats to job security as well as to their physical safety while practicing dentistry. Dentistry was widely regarded as a profession whose workforce was among the most "at risk" for contracting COVID-19 during provision of clinical services. In addition, the COVID-19 pandemic impacted the education and training of oral health students, jeopardizing the educational pipeline.

The economic hardships resulting from the COVID-19 pandemic were far reaching, affecting providers in all settings including private dental practices, large group practices, and the oral health care safety-net. To understand the impact and the short- and long-term consequences of the COVID-19 pandemic, the Oral Health Workforce Research Center (OHWRC) undertook a multipart project to summarize the immediate and longer-term consequences of the COVID-19 pandemic on 4 domains of the oral health care system: care delivery, regulation, education, and finance.

METHODS

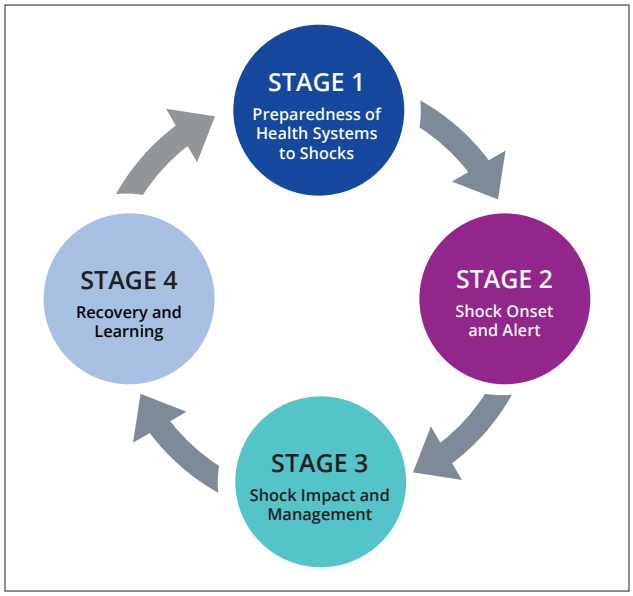
METHODS

This report discusses health care service delivery generally with a special emphasis on the oral health care delivery system. This compendium is intended to provide a strategic overview of the impact and implications of the COVID-19 pandemic on dentistry. Researchers were interested in learning about the systemic adaptability of oral health providers and identifying exogenous and endogenous facilitators and barriers to providing patient care during the COVID-19 pandemic. The service delivery system proved itself resilient; dental providers effectively navigated environmental uncertainty about the contagion and treatment of the coronavirus.

To understand the responses of the oral health care system to the COVID-19 pandemic crisis, it is important to understand resilience as it applies to a health system. While resilience is a core concept in disaster risk reduction, its application to health systems is relatively new. Resilience is defined broadly as the capacity of institutions and health actors to prepare for, recover from, and absorb shocks, while maintaining core functions and serving the ongoing and acute care needs of their communities.[1] During a crisis, a resilient health system can effectively respond to dynamic situations and reduce vulnerability across and beyond the system.

Conceptually, resilience is a positive response to the occurrence of a shock, defined as a sudden and extreme change impacting a health system.[2] There are several distinguishable stages within a shock cycle **(Figure 1)**. Stage 1 (preparedness of health systems to a shock) is related to how well a system has appraised its vulnerabilities and addressed possible response scenarios.[2] The focus of stage 2 (shock onset and alert) is the timely identification of the onset and type of the shock; these activities require robust and comprehensive surveillance and early response systems. Stage 3 (shock impact and management) is related to understanding the shock's impacts and managing the effects across health systems and within society. Stage 4 is characterized by the return to normalcy, recognizing that the "new normal" may be dissimilar from the previous "normal." However, the experience of a shock is not a necessary precondition for a health system to be judged as resilient: a resilient health system may be one that is prepared for the occurrence of a shock whether or not it actually experiences one.

FIGURE 1. Stages of the Shock Cycle



Source: Thomas S, Sagan A, Larkin J, Cylus J, et al. European Observatory on Health Systems and Policies. 2020.

In the context of the COVID-19 pandemic, it is important to remember that many sectors within the health care delivery system in the US had done some planning in preparation for a variety of public health emergencies, albeit few likely anticipated the scope of the challenges presented by the

COVID-19 pandemic. Many health care organizations had disaster preparedness plans. Some plans were general in nature while others were specific to scenarios and local events such as a mass shooter incident or an earthquake. Few of these plans were designed to address a global pandemic impacting people worldwide with far reaching health, social, economic, and political consequences. Existing disaster and public health preparedness plans were likely helpful in adapting to the demands of the COVID-19 pandemic, enabling organizational and health system resilience to varying degrees. However, many of these plans needed re-engineering or supplementing to address the particular challenges of the COVID-19 pandemic.

This multipart project was conducted by researchers at OHWRC based at the University at Albany, State University of New York and the University of California, San Francisco. Several theoretical frameworks were considered when deciding how best to present the material in the following pages. We reviewed theories of change, recognizing that the COVID-19 pandemic was a catalyst for adaptation within systems and consequently for both short- and long-term change. Many change theories suggest that a first step in understanding or directing change is to complete a situational analysis to understand why change is needed. Steps within that analysis include a review of all aspects of a circumstance including the strengths and weaknesses of a system in responding to threats. Examining research and listening to stakeholders about their experiences are also important to comprehensive evaluations of a situation. This report is essentially a situational analysis describing an overview of peer-reviewed literature, government regulatory changes, agency directives, educational accommodations, and health system responses to the COVID-19 pandemic.

Descriptive Framework

The descriptive framework used by researchers complemented the shock cycle and the determinants of the health system resilience framework. The drivers of change that researchers identified through thematic analysis of literature discussing the impact of the COVID-19 pandemic on dentistry by each of the 4 domains (care delivery, regulation, education, and finance) are listed below.

Drivers of Adaptation in Care Delivery:

1. Prevent disease transmission through instruments and the environment during dental service delivery
2. Protect workforce and patients from contracting the virus
3. Interface with patients when routine service delivery is interrupted
4. Preserve the business structures and economics of the practice

Drivers of Adaptation in Regulation:

1. Ensure public health measures that protect patients from exposure to the COVID-19 virus
2. Build surge capacity in hospitals and outpatient settings for testing and triage
3. Support organizational and workforce capacity to treat those affected by the COVID-19 virus
4. Enable patients who become unemployed to have access to health insurance through eligibility for Medicaid or through various insurance marketplaces
5. Provide alternative methods for dentists to deliver care to patients

6. Provide vaccines to the population quickly
7. Provide funding to defray extra expenses related to ensuring public safety

Drivers of Adaptation in Education:

1. Protect individuals (patients, faculty, staff, students) from exposure to the COVID-19 virus
2. Prevent disruption in the educational pipeline
3. Determine an exit strategy for graduating students

Drivers of Adaptation in Finance:

1. Mitigate anticipated financial hardship during the COVID-19 pandemic
2. Offset additional dental care-related expenses and lost revenue due to the COVID-19 pandemic
3. Reimburse providers for alternative methods of care delivery
4. Explore payment models outside of the traditional fee-for-service model

Once the main drivers of change were known, researchers attempted to identify the systemic accommodations that resulted in changes to processes, systems, and regulatory guidance at the organizational, local, state, and federal level to mitigate the anticipated and emerging consequences of the COVID-19 pandemic on dentistry. Researchers analyzed a large body of literature to describe the expected outcomes and the possible long-term changes and potential paradigm shifts in dental care delivery in the US.

Selection of Relevant Literature

Since the inception of this project, continuous and routine literature searches of peer-reviewed publications, case studies, data analytics, expert interviews, and government documents were conducted. Researchers monitored databases including PubMed, Google Scholar, and the LitCovid database (created by the Computational Biology Branch of the National Center for Biotechnology Information, US National Library of Medicine)[3] to find pertinent literature. In addition to those databases, researchers reviewed relevant journals and professional organizations' websites and publications for COVID-19-related literature and policy. The review also included grey literature such as articles in oral health-related newsletters, news articles, reports, white papers, policy literature, and government documents. Throughout the project period beginning in September 2020 and ending in June 2022 approximately 700 resources were selected for preliminary curation.

Researchers also conducted a thorough analysis of state and federal legislation, which informed dental practice closures and reopenings, nursing home closures, and school closures. Researchers reviewed executive orders and regulations in each US state related to changes in licensure, scope of practice for dental professionals, and vaccine administration.

Following the initial literature search, a subsequent literature search focusing on the impact of the COVID-19 pandemic on education systems was conducted and additional reports and manuscripts were collected through the end of 2022. A total of 94 additional resources were found. These resources were additive, not substitutionary, and created a clearer and more recent understanding of the state of dental education after the COVID-19 pandemic had reached a steadier status.

Curation of Selected Literature

Following collection, the identified resources were subjected to a stringent curation process to select those that were most pertinent. More than 700 resources identified by research associates were first reviewed by the principal investigators for their relevance to the environmental scan project and to each of the 4 topic areas: care delivery, regulation, education, and finance.

A total of 127 of the curated resources were pertinent to both the care delivery and regulation chapters, while 10 were relevant to the care delivery chapter only and 4 were relevant to the regulation chapter only (see Appendix A). In addition to these resources, an additional review of regulatory guidance from approximately 200 different sources was conducted. The hyperlinks are provided in Appendix B.

About 45% of the resources cited in the care delivery chapter (n=67) were published as peer-reviewed literature. The remaining references in the care delivery chapter and all the references in the regulation chapter (n=30) were grey literature: news articles, reports, legislation, and interviews.

Approximately 90% of the resources cited in the education chapter (n=111) were peer-reviewed articles, whereas only about 12% of the resources cited in the finance chapter (n=105) were peer-reviewed. Most sources in the finance chapter were grey literature: reports, presentations, news articles, legislation, websites, and blog posts.

Oral Health Workforce Research Center COVID-19 Webpage

All approved resources were shared on the OHWRC COVID-19 webpage which provided oral health care professionals timely and relevant research specific to the oral health workforce audience. The webpage was updated frequently with new resources under the 4 topic areas. In addition, the OHWRC website included a page for upcoming events with health workforce relevance. The webpage was live on the OHWRC website from November 2020-February 2022.

Qualitative Analysis

All qualitative analyses were conducted using Dedoose (version 9), a cross-platform application used for analyzing qualitative and quantitative data for mixed methods research. Once in Dedoose, each of the resources was coded using a descriptive framework developed by the principal investigators. The major themes used for coding included:

1. Drivers of change
2. Accommodations/responses to the crisis
3. Expected or determined outcomes from these responses
4. Possible long-term outcomes/potential paradigm shifts that might result

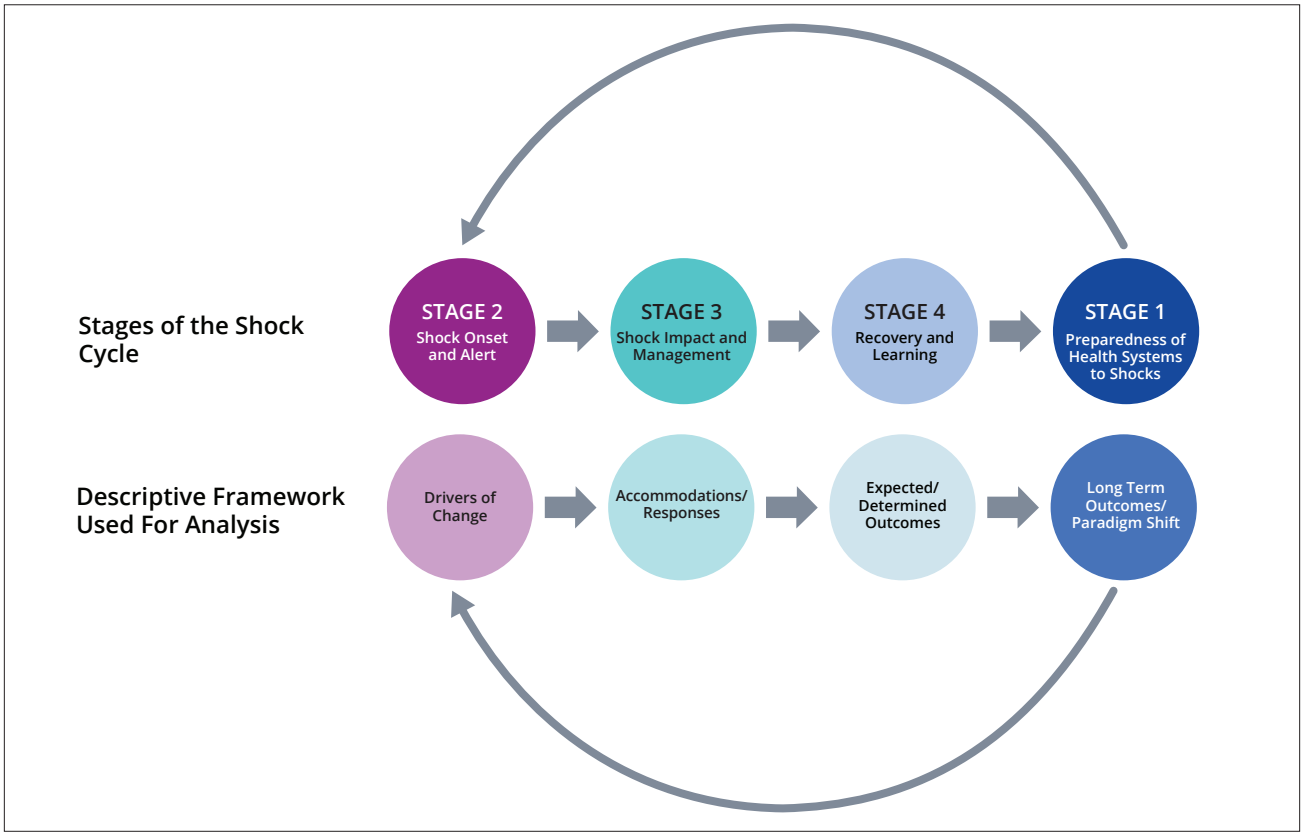
Each of these major themes was followed by multiple codes to refine the sorting of subtopics within each area. Researchers applied 170 descriptor fields used to sort sources and for indexing and categorizing the text of each article to the established thematic ideas.[4] During coding of the care delivery and regulation resources, over 5,000 codes were applied on Dedoose resulting in approximately 1,000 coded

excerpts. Coding and analyzing of the education and finance resources occurred using both Dedoose and Microsoft Word but followed the same descriptive framework described above.

While some duplication was inevitable across topic areas, duplication was important because it provided intersectional context relevant to each domain of the environmental scan. An example of duplication is found in the regulation and financing chapters. Changes in Medicaid regulations related to patient enrollment were essential to financing care for newly unemployed people during the COVID-19 pandemic. Thus, Medicaid is discussed in both the regulation and financing context. Some duplication was also necessary so that each chapter could stand alone.

Researchers built an analytic framework for this report by drawing parallels between the descriptive framework used for coding in Dedoose and the stages of the shock cycle shown in **Figure 1** (see **Figure 2** for the parallel schema). The stages of the shock cycle have been rearranged to start with stage 2, the "shock onset and alert" **(Figure 2)**. COVID-19 pandemic-related "drivers of change" in this report's descriptive framework relate to stage 2 of the shock cycle, the "shock onset and alert." Stage 3 of the shock cycle discusses the "shock impact and management," which coincides with "identified accommodations/responses" in this report's descriptive framework. Stage 4 of the shock cycle discusses "recovery and learning" and coincides with "expected/determined outcomes" of our descriptive framework. The "long-term outcomes and paradigm shift in dentistry" identified in the descriptive framework relates to stage 1 of the shock cycle, the "preparedness of health systems to shocks." All of these schemata show a continuous cycle of health system learning and adaptation to the challenges caused by the pandemic.

FIGURE 2. Descriptive Framework Used for Analysis



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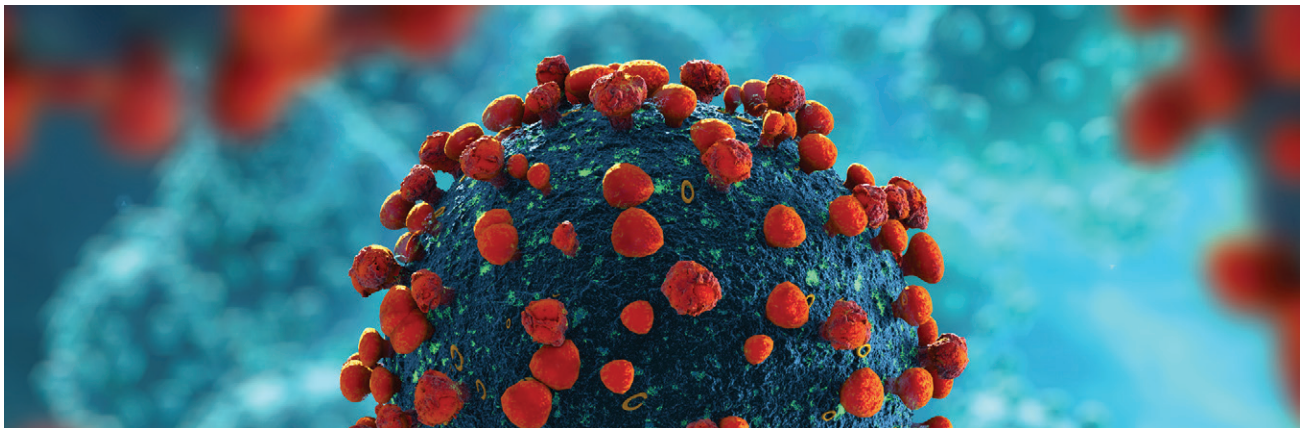
CHAPTER 1: CARE DELIVERY



INTRODUCTION

Following the recommendations of the emergency committee of the World Health Organization (WHO), on January 30, 2020, its Director General declared that the outbreak of the novel coronavirus SARS-CoV-2 (COVID-19) constituted a Public Health Emergency of International Concern.[1] On March 11, 2020, WHO declared the COVID-19 outbreak a global pandemic.[2]

According to the Centers for Disease Control and Prevention (CDC), the virus that causes COVID-19 spreads most commonly through close person-to-person contact (within about 6 feet). Transmission primarily occurs through inhalation of respiratory particles (droplets and aerosols) produced when an infected person exhales, talks, sings, shouts, coughs, or sneezes.[3] The disease is less commonly spread through airborne transmission over longer distances when smaller droplets and particles linger in the air, particularly in enclosed spaces with inadequate ventilation.[3] Person-to-person spread is likely to continue to occur in areas with high rates of community transmission and insufficient mitigation strategies.[3] For this reason, governments, health professionals and clinicians, and policymakers issued advisories about indoor gatherings, the importance of wearing masks when public facing, and avoiding crowds whenever possible.

Other less common but possible methods of transmission include contact with a contaminated surface and subsequent touching of mucous membranes including the nose, mouth, or eyes that are hospitable to the virus.[3] Researchers have implicated the oral mucosa as a possible route of initial entry to the body and hand-to-mouth contact as a common occurrence that facilitates infection.[4] Loss of taste and smell is a strong predictor symptom of infection with COVID-19. A large number of taste receptors are present in the tongue, further suggesting that the oral cavity may be an initial infection site.[4] Recent studies report that the virus resides in saliva and periodontal pockets in the mouth.[5] These findings support the need for precautions among clinicians working within the oral cavity.

Current evidence suggests that COVID-19 may remain viable for hours to days on a variety of surfaces.[3] Frequent cleaning of visibly dirty and high-touch surfaces, followed by disinfection, can help prevent COVID-19 and other respiratory pathogens (germs) from spreading in workplaces.[3] Although touching contaminated surfaces or objects is not considered the dominate way in which the virus spreads, the CDC advises caution as experts continue to learn about the various pathways for transmission.[3]

THE RAPID RESPONSE WITHIN THE DENTAL CARE DELIVERY SYSTEM

Implications for the Dental Care System

The COVID-19 pandemic adversely impacted the global health care system. While the burden on the health care delivery system in the US became apparent early in the pandemic resulting in the lockdown of many essential health services, the COVID-19 pandemic also had (and continues to have) a profound impact on all aspects of the oral health delivery system. Dental clinicians are included in the highest risk category for occupational exposure to the virus and dental procedures are considered potential vectors for environmental contamination and virus transmission.

Dental Practice Closures

In late February 2020, the first case of a nontravel-related COVID-19 death was reported in Washington state, suggesting that community transmission was occurring.[6,7] The lack of federal guidance and response at that time resulted in states, counties, localities, and professional organizations implementing local and regional directives to address the obvious threat to public health.

Initial mitigation strategies to limit COVID-19 transmission in March and April 2020 involved recommendations by local authorities to stay home, avoid large gatherings, and work remotely, where and when possible, with special emphasis on the high risk of morbidity and mortality for especially vulnerable groups.[8,9] In the weeks that followed, an increasing number of states began implementing mandatory stay-at-home orders, social distancing measures, and closure of nonessential businesses. These closures did not include health and dental services that were deemed essential. However, postponement of nonemergency and elective procedures for medical or dental diagnoses was required. While some states specifically mandated dental providers to delay elective procedures, several states deferred to the American Dental Association's (ADA) directive, issued on March 16, 2020, that recommended dentists nationwide postpone elective procedures for at least 3 weeks or until the risk to the public was reduced.[10] On April 1, the ADA extended that recommendation until April 30, 2020. By May 4, 2020, 27 states permitted dental practices to resume elective services; by June 1, 2020, 48 states and the District of Columbia allowed dental offices to reopen.[11]

In recognition of the high transmission risk of COVID-19 in dental settings, the CDC together with federal, state, and local stakeholders developed resources and guidance for dental settings as they reopened for elective procedures in the late spring and early summer of 2020. Dentistry was challenged with the need to provide necessary services while simultaneously minimizing risk to patients and dental health care personnel (DHCP).[12] The responsibility to stay abreast of infection control practices befell oral health professionals who were advised to regularly consult state dental boards and health departments for current requirements specific to their jurisdictions including recognizing the degree of community transmission and impact, and their region-specific recommendations.[11,13]

The return to routine dental care was complicated by interim guidance from WHO on August 3, 2020, advising that "routine nonurgent oral health care,

which usually includes oral health check-ups, dental cleanings and preventive care, be delayed until there was sufficient reduction in COVID-19 transmission rates from community transmission to cluster cases or according to official recommendations at the national, subnational or local level."[14] This interim guidance, was met with stark opposition, including from the ADA, which highlighted oral health as an integral part of overall health and concluded that dentistry was essential health care.[15]

EMERGENCE OF ACCOMMODATION AND RESPONSE TO THE CRISIS

Infection Control within Dental Practices and for Patients

Dentists' efforts to balance the need to provide necessary services while minimizing the risk to patients and personnel involved research to develop and implement best practices for enhanced infection control in dental settings. The reopening of dental practices was supported by guidance provided by the CDC, the Occupational Safety and Health Administration (OSHA), the ADA, the American Dental Hygienists' Association (ADHA), and other state, local, and professional organizations.

To ensure safe delivery of dental care to patients, the ADA and the CDC recommended instituting new protocols for screening patients as well as wearing appropriate personal protective equipment (PPE), which included N95 respirators during aerosol-generating procedures.[16] The CDC also recommended avoiding aerosol-generating procedures whenever possible.

Information from the CDC, which was mirrored by other authorities, described several recommendations about infection prevention and control (IPC) that were critical for the safe reopening of dental practices and provision of patient care.[12] Those guidelines included:

1. Consider if elective procedures, surgeries, and nonurgent outpatient visits should be postponed in certain circumstances
2. Implement teledentistry and triage protocols
3. Screen and triage everyone entering a dental health care facility for signs and symptoms of COVID-19
4. Monitor and manage DHCP
5. Create a process to respond to SARS-CoV-2 exposures among DHCP and others
6. Implement universal source control measures
7. Encourage physical distancing
8. Consider performing targeted SARS-CoV-2 testing of patients without signs or symptoms of COVID-19
9. Use administrative controls and work practices
10. Implement universal use of PPE
11. Use PPE supply optimization strategies
12. Require hand hygiene
13. Manage equipment considerations
14. Optimize the use of engineering controls
15. Mandate environmental infection controls
16. Continue with sterilization and disinfection of patient-care items
17. Provide education and training

The recommended IPC practices when providing dental health care for a patient with suspected or confirmed COVID-19 infection[12] were:

1. Defer nonemergency dental treatment

2. If dental care is medically necessary, follow CDC's Interim Infection Prevention and Control Recommendations for Healthcare Personnel During the Coronavirus Disease 2019 (COVID-19) Pandemic
3. Consider providing care in an individual patient room with closed door
4. Adhere to standard precautions and use of PPE
5. Clean and disinfect a dental operatory used by a patient with suspected or confirmed COVID-19

In addition, it was recommended that dentists use professional judgement in situations where there was no specific guidance or regulation and remain mindful of the objective of ensuring patient and personnel safety. Dentists were advised that best practices would continue to be updated as the pandemic evolved.[13]

These guidelines necessitated financial and other institutional investments to reopen dental practices with sufficient PPE to safely provide care.[16] In many cases, the safety guidelines required a reengineering of office protocols to triage patients before and at entry to the office; to allow more time for patient turnaround considering restricted patient waiting within offices; to enforce consistent use of infection control activities within dental operatories and between patients, including "fallow" time; and to realign and prioritize appropriate services to meet patient need while also minimizing aerosol-generating procedures (AGPs). Dentists and dental hygienists considered using more preventive and less invasive methods for delivering services in order to better manage risk of COVID-19 transmission to patients and staff.

Data indicate that the rate of COVID-19 transmission among US dentists during the early stages of the COVID-19 pandemic was low and that nearly all dentists implemented enhanced infection prevention and control practices in the provision of dental care.[17,18] Froum and Froum conducted a retrospective study of COVID-19 infection control protocols involving 2,810 patients treated over a 6-month period (March 15 to September 15, 2020) by 2 dentists and 3 dental hygienists in 3 dental offices in New York.[19] These researchers demonstrated that by utilizing screening questionnaires, performing enhanced infection control, and having appropriate PPE, the dental offices were able to record no transmission of COVID-19 to the dental health care workers or patients during the study. This was especially notable since 69% of the patients treated in these dental offices were known to have one or more high-risk comorbidities related to COVID-19 severity.[19]

In a study of licensed dentists (n=2,195) practicing primarily in private offices or public health settings in the US, less than 1% had confirmed or probable cases of COVID-19.[17] Enhanced infection control procedures, most commonly disinfection, COVID-19 screening, social distancing, and wearing face masks, were implemented in 99.7% of dentists' primary practices.[17] Most practicing dentists (72.8%) used PPE according to interim guidance from the CDC.[17]

IMPLICATIONS OF COVID-19 ON CARE PATHWAYS AND PATIENT TREATMENTS

Aerosol Generating Dental Procedures

The practice of dentistry frequently involves the use of instruments such as high-speed dental drills, rotary hand pieces, ultrasonic scalers, and air-water syringes that create sprays containing droplets of water, saliva, blood, microorganisms, and other body fluids, particulates, and debris, all of which can contribute to the generation of aerosolized droplets and thus the transmission of COVID-19.[3]

Creating aerosol-generating dental procedures (AGDPs) or being present in a room where they are performed for a patient infected with COVID-19 increases the risk of exposure, even if the patient is not experiencing signs and/or symptoms of COVID-19.[3] While OSHA's occupational risk pyramid includes the performance of AGPs on known or suspected COVID-19 patients in the "very high risk" category, performing such procedures on patients with unknown COVID-19 infection status is equally risky, especially in areas with ongoing community spread.[3]

The pandemic and the transmission of COVID-19 caused renewed interest in dental aerosols and their potential for viral transmission.[18] The COVID-19 pandemic also raised awareness of current gaps in scientific knowledge related to AGDPs that may inform future research,[18] which include:

1. Quantification of aerosol bio load created during various AGDPs
2. Establishing the minimum infectious doses of individual pathogens
3. Identification of environmental factors that influence aerosol spread in dental offices
4. Assessment of patient susceptibility based upon individualized characteristics
5. Epidemiologic surveillance to identify the true rates of situational-specific spread
6. Assessment of infectious disease prevalence among DHCPs and dental office personnel

As COVID-19 spreads, new opportunities to mutate into novel strains and become more virulent or more contagious abound. Multiple variants of COVID-19 have already emerged across the world and in the US. At this point, the original variant that caused the initial COVID-19 cases in January 2020 is no longer widely circulating as newer variants have increased.[20] Infectious disease experts believe that COVID-19 could eventually be similar to the seasonal flu and persist within the community, progressing from pandemic to endemic. Even as the next generation of COVID-19 vaccines are developed and administered, the primary approach to limit the spread of COVID-19 is to adhere to transmission-based precautions.[21]

Antibiotic Use/Antibiotic Stewardship

One common concern among oral health stakeholders was that recent progress in reducing the use of both antibiotics and opioids for palliation and treatment of oral health symptoms would be erased by the need to address pain and infection in patients when practice shutdowns distanced patients and their dental providers.

Optimizing the use of antibiotics is critical to effectively treating susceptible infections, protecting patients from the multiple harms caused by

unnecessary antibiotic use, and combating antibiotic resistance from overuse of these drugs as therapeutic measures.[22] Antibiotic stewardship programs (ASPs) can help clinicians improve clinical outcomes and minimize harms by improving antibiotic prescribing.[22] A review by Induri and colleagues implicated dentistry as indirectly impacting COVID-19 by triggering deaths due to secondary infection. Induri and co-authors cited data from a study conducted in Wuhan, China in early 2020 of a cohort of patients who had died or been discharged from hospitals in that city as a result of COVID infection. That study found that half of the patients who did not survive COVID-19 had a secondary bacterial infection at the time of death.[22] Unnecessary antibiotic usage in dentistry may ultimately contribute to the growing problem of untreatable antibiotic resistant bacteria.[23]

King et al. aimed to identify trends in outpatient antibiotic prescription dispensing in retail pharmacies in the US from January 2020 through May 2020 and concluded that the number of outpatient prescriptions decreased substantially more than expected due to seasonal trends alone, possibly related to the COVID-19 pandemic.[24] A study in the United Kingdom (UK) by Shah et al. showed that restricted access to dental care due to COVID-19 resulted in greatly increased dental antibiotic

prescribing, compared to an otherwise downward trend previously.[25] Lack of access to dental services is an important nonclinical factor which drives unnecessary dental antibiotic prescribing.[25] As dental care provision adapts to the COVID-19 era, it is important to ensure access for all to high-quality urgent dental care and to understand the reasons for variation in prescribing patterns to optimize antibiotic use in the future.[25]

Ren and co-authors discussed dental patient management during the initial months of COVID-19 at the Eastman Institute for Oral Health in Rochester, New York.[4] The Eastman Institute is a large multispecialty dental practice affiliated with the University of Rochester with an associated residency program.[4] The Eastman Institute has a long-established urgent care unit, Howitt Dental Urgent Care, with 7 dental operatories for treatment of dental emergencies.[4] When the Eastman Institute largely closed to patients during the early months of the pandemic, it remained partially open to handle dental emergencies and to avoid overcrowding in the urgent care.[4] During this period, the urgent care center along with the general dentistry and specialty clinics provided approximately 80 urgent care visits per day, a reduction of 85% over normal volume. Patients who presented for care had a variety of serious conditions including pain, inflammation, and infection.[4] The authors commented that had the urgent care visits not been available, these patients would have needed hospital emergency department services, increasing the burden on providers in those settings and the risk of COVID-19 infection for patients.[4] During these urgent care encounters, 30% of patients received tooth extraction and incision and drainage services and the remaining 70% received palliative care and prescriptions for antibiotics. This was a reversal of pre-COVID-19 trends at the Eastman Institute, when 70% of patients received treatment and just 30% received palliation and prescriptions.[4] These findings suggest that further study of the impact of COVID-19 shutdowns on prescribing of antibiotics and pain management medications in dentistry is needed.

Patients' Utilization of Dental Services

Patients' care-seeking behaviors were impacted by the COVID-19 pandemic consequent to the closure of dental practices and postponement of routine care delivery. Rising rates of COVID-19 morbidity and mortality may have impacted patient's perceptions of their susceptibility and the severity of the virus affecting their behaviors and creating reluctance to seek dental care.[26]

In a study of the characteristics of US adults who postponed dental care due to the pandemic, Kranz et al. concluded that nearly half of US adults reported delaying dental care due to concerns about COVID-19 during the spring of 2020.[16] A study by Moffat et al. explored patient perceptions about professional dental services during COVID-19; the results suggested that assurances of the safety of returning to routine dental care from public health officials was the largest contributing factor to patients' willingness to, once again, seek care.[26] Triage protocols in dental practices also may have reduced anxiety about COVID-19 transmission in dental offices. In addition to providing current educational content, pre-visit online interviews with patients provided real-time screening that would traditionally occur in person during an office visit for treatment.[27] In-office safety protocols in dental practices also reduced anxiety about receiving dental services.

In a study that used data describing millions of dental procedures provided in more than 26,000 dental practices nationwide in 2019 and 2020, Choi and colleagues found that changes in utilization of dental services began to exhibit in early March 2020; utilization was at its lowest in early April 2020, with a 94% decrease in overall procedures.[28] The measure of the impact of the pandemic was the average number of weekly procedures performed in the dental practices.[28] Choi found that, for privately insured patients, utilization had fully rebounded by August 2020.[28] However, among publicly insured patients utilization remained 7.54% lower than in the same month in the previous year (2019), when COVID-19 was not a concern.[28] The authors remarked that engagement with dental services varied noticeably by patient cohort with the very young and older adults (those younger than age 2 and adults older than age 75) exhibiting a 10% reduction in utilization in August 2020 in comparison to pre-pandemic rates.[28] The researchers also observed county-level differences in utilization; counties with higher percentages of Black people or partial-county dental professional shortage designations showed greater decreases in service volume than other counties during the period of study.[28] Concerns abound that delays in accessing preventive services or in seeking treatment for caries would result in more serious dental disease for many patients over the long term.

Vaccine Administration by the Oral Health Workforce

As federal, state, and local governing bodies were creating logistical plans for providing COVID-19 vaccinations to their populations, it became evident that dentists were ideally suited to administer vaccinations by virtue of their education and training. The ADA offered its support to dentists who were seeking to administer COVID-10 vaccines, according to Resolution 91H-2020 passed by the ADA House of Delegates on October 19, 2020.[29] The resolution stated that a recommended expansion in scope of practice to include vaccination was based on dentists having the appropriate clinical knowledge and competency to perform tasks in a manner consistent with the prevailing standards of care for vaccine administration.[29]

Emergency orders from several states also temporarily expanded scopes of practice for dentists to administer COVID-19 vaccines. On March 11, 2021, a White House spokesperson stated that President Biden planned to expand the pool of qualified professionals able to administer vaccines to include dentists and dental students.[30,31] An amendment to the declaration of the Public Readiness and Emergency Preparedness Act for Medical Countermeasures Against COVID-19 by the US Department of Health and Human Services authorized dentists and dental students to administer vaccines for COVID-19.[31]

The ADA Tracking Survey

The ADA has continuously collected data from dentists beginning in March 2020 to the current date with the objective of monitoring the closing of dental practices and describing the post-reopening impacts on dental staff, practice finances, and patients' utilization of dental services. Although the polling initially garnered a robust response from approximately 19,000 participating dentists, the number of dentists providing feedback has dwindled; however, the data continue to be useful to a variety of audiences. The following summarizes salient findings from this publicly available data.[32]

- Data from March and April 2020 found that 76% and 79.4%, respectively, of all dental practices were closed but providing limited services on an emergency basis.
- The highest percentage of practice closures in those 2 months was among large group practices of 10 or more dentists.
- Solo dentists and practices comprised of 2 to 9 dentists constituted a much higher percentage of dental practices that were closed but still seeing emergency dental patients than did large group practices.
- In May 2020, just 10.8% of dental practices were open and operating as usual. In that month, 53.9% of dental practices that were open were seeing lower patient volume than during pre-pandemic months.
- By May 2020, large group practices constituted the highest percentage of practices that were open and operating as usual.
- The percentage of dental practices open and operating as usual increased from May to August 2020 but declined again until November 2020.
- Since March and April 2021, fewer solo dental practices were open and operating as usual when compared to dental practices with two or more dentists.
- The percentage of practices open and operating as usual increased from November 2020 until September 2021.
- Between September and November 2021, the percentage of practices open and operating as usual remained stagnant at 60%.
- The percentage of dental practices in the top 20 US cities that were open and operating as usual was stable between November 2020 and March 2021.

Practice Earnings and Dentists' Incomes Were Affected by Practice Closures

The ADA Health Policy Institute's (HPI) Survey of Dental Practice found that general practitioner dentists experienced a decline of 17.9% in their average annual net income in 2020 compared to 2019. For specialists, the decline was 6.9%; this decline was not statistically significant (*P*=.20).[32] HPI examined the impact on dentists' net income separately for female and male dentists and by age group. The analysis only used the data gathered from general practitioners due to sample size limitations among specialist dentists.

The data showed a larger drop in net income for female dentists compared to male dentists.[32] On average, female general practitioners saw a 26.6% decline in net income in 2020 compared to 2019, while male general practitioners reported an average decline of 14.7%.[32] Similarly, older dentists saw larger declines in net income compared to younger dentists. General practice dentists age 65 years and older reported a 27.5% reduction in average net income compared to a 10.3% reduction among general practitioners age 40 years and younger; these differences were not statistically significant (*P*=.07).[32] HPI's findings provided further evidence that the economic impact of COVID-19 continues to affect women to a greater degree than men.

Trends in hours worked had differing effects on net income by dentist's specialty, age, and gender. In terms of total hours worked in the year, general practitioners worked 285 fewer hours in 2020, or 16.6% less, than in 2019.[32] For specialist dentists, the

decline was 11.7%. The magnitude of the decline in hours worked and the decline in net income were very similar, suggesting that earnings declined because dentists worked fewer hours.[32]

Gender differences related to the impact of COVID-19 on dentistry are reflective of the greater impact of pandemic disruptions on females generally, which is widely discussed relative to workforce shortages.[32] HPI analyzed poll results from early in the pandemic, during the weeks of March 23 and April 20, 2020, when practices were generally closed, by gender of respondents.[32] Female general practitioners saw a much larger decline in hours worked (22.1%) compared to male general practitioners (14.5%).[32] Older dentists saw a large decline in hours worked (21%), while younger general practitioners saw a smaller decline in hours worked (13.2%).[32]

Results of the April 20, 2020 wave of the HPI poll showed that a higher percentage of female dentists' practices were closed and not seeing any patients when compared to male dentists.[32] More than 8 of 10 (81%) male respondents to the HPI survey indicated their practices were closed but they were seeing emergency patients versus 76.2% of female dentists who reported being closed to all but emergency cases. In 19 waves of survey polling conducted since June 15, 2020, female practices reported lower rates of conducting business as usual than male practices during all but 5 weeks; (those were the weeks of March 15, 2021, May 17, 2021, July 12, 2021, September 13, 2021, and November 15, 2021).[32] On average, female dentists more often reported lower percentages of fully paying staff when compared to males.[32]

During the week of December 13, 2021, a higher percentage of female dentists reported having more than 14 days of N95/KN95 masks on hand than did male dentists (72.7% vs. 64.9%).[32] A higher percentage of female owned practices also reported more than 14 days' supply of surgical masks, face shields, and gowns when compared to male owned practices.[32] A higher percentage of female practices said they would "definitely" hire more staff and invest in new equipment or technology in the next 3 months when compared to male practices.[32] A lower percentage of females reported they were "very confident" of the recovery of their dental practice and the dental care sector in general, when compared to males.[32]

In October 2020, a special wave of the HPI poll focused on dentists in public health settings found that only 18.1% of practices were open and operating as usual, while 78.7% of practices were open but had lower patient volume than usual.[33] That poll also found that, while staffing in dental offices had returned to 93% of pre-pandemic levels, many survey participants reported open positions.[33] Respondents had recently or were currently recruiting for a variety of staff positions; 60.6% of respondents were recruiting dental assistants, 41.5% were looking for dentists, 25.5% needed dental hygienists, and 29.8% were searching for administrative staff.[33] Respondents also shared that recruiting dental assistants and dental hygienists had been extremely challenging.[33]

Federally Qualified Health Centers

Federally Qualified Health Centers (FQHCs) occupied a particularly pivotal role during the COVID-19 pandemic because of their positioning within the delivery system. These health centers mainly treat low-income diverse populations, many of whom were at increased risk of morbidity and mortality during the pandemic. The risk of infection among

patients was increased based on status as essential workers, living in communities of color which were inordinately affected by the disease, or having multiple medical comorbidities predictive of more serious COVID-19 infection. Yet, like other health and oral health providers, many FQHCs were required to close their doors or provide access to emergency only patients, especially in the early months of the pandemic.

Data from a survey during the week of May 8, 2020 by the Bureau of Primary Health Care at the US Health Resources and Services Administration (HRSA)[34] was analyzed by researchers at the Kaiser Family Foundation.[35] The data showed that at that point in the pandemic timeline, FQHCs had closed 1,954 sites temporarily due to the impact of COVID-19.[35] In 2020, there were approximately 1,400 FQHCs in the US operating almost 12,000 health center sites.[35] The researchers commented that the number of closures might be an undercount due to nonrespondents to the survey (25% of those solicited to participate).[35]

The National Association of Community Health Centers (NACHC) also used the HRSA data from these continuous surveys of FQHCs to compile important information about the critical role of FQHCs in detection and prevention. Using the HRSA data, NACHC estimated that in April 2020, FQHCs' average visit rate was 54% of normal patient volume.[36] By April 2021, that rate had increased to 87% of pre-pandemic patient volume.[36] NACHCC estimated that by April 2021, just 507 FQHCs remained temporarily closed due to the pandemic, a considerable drop from the 1,643 FQHCs temporarily closed due to COVID-19 in April 2020.[36]

During the early months of the pandemic, FQHCs, like other outpatient health providers, reported a large decline in patient visits and in staff who were able to work. During the week of May 8, 2020, there was a 43% net decline in the volume of patient visits despite an increase in the number of telehealth visits provided to patients to compensate for the lack of available in person care.[35] In that week, 51% of patient visits occurred through virtual visitation either through video or phone.[35] FQHCs noted that approximately 11% of staff were not able to work at that point either due to exposure to the virus, lack of sufficient protective equipment, site closures, family demands, or for other reasons.[35]

A study using electronic health record data describing the medical, behavioral health, and dental services provided to patients by 36 FQHCs in 19 states between February 3 and May 17, 2020 compared volume between these pandemic months and pre-pandemic time periods. Simon and colleagues described a precipitous drop of in-person visits commensurate with an increase in telehealth visits during the study period resulting in a net reduction of 23% in medical visits when compared to pre-pandemic volume.[37] Mental health visits in these health centers dropped 58% between February 10 and March 16, 2020, but soon thereafter returned to nearly normal levels with the use of tele-behavioral health services.[37] However, dental care services declined by 82% between February and March 2020 and remained low, suggesting that dental services were profoundly affected in FQHCs in the initial months of the pandemic.[37]

The ability to provide testing was a critical function for FQHCs since their patients are often in high-risk groups for contraction of COVID-19 and for also experiencing complications from the disease. Early detection and management of COVID-19 were also critical to community containment and to improved

health outcomes. FQHCs in many places across the US innovated to provide accessible testing services for patients using curbside clinics, mobile vans, or tented areas; these sites were specifically established to manage patient safety and service availability. A study conducted the week of May 8, 2020 found that 90% of FQHCs were providing COVID-19 testing; in 16 states and the District of Columbia all FQHCs within those states were providing testing and of those, 67% were using walk-up or drive-through testing sites.[35] People of color represented 57% of all people tested in that week and 56% of those patients who were confirmed to have the disease.[35]

According to data compiled by NACHC using the HRSA surveys, as of February 2022, FQHCs had tested approximately 17 million patients, 60% of whom were from diverse racial or ethnic minority backgrounds.[38] In addition, FQHCs had administered 19 million vaccines to patients, 67% of whom were from diverse racial or ethnic backgrounds.[38]

FQHCs benefited from federal funding during the pandemic, which helped many to sustain service delivery. Capital Link estimated that by December 2020, FQHCs had received $5 billion in various rapid-response grants.[39] The grants received included $2 billion from the Bureau of Primary Health Care for preparedness, response, and testing, $401 million from the US Department of Health and Human Services (HHS) provider relief fund for general distribution, $322 million from the HHS provider relief fund for rural distribution, $74 million from the Federal Communications Commission for telehealth, and $2.3 billion in loans through the Paycheck Protection Program.[39] Capital Link states that although this represents substantial funding to support these safety net health centers, FQHCs experienced significant losses due to the expense of infection control, equipment costs, other unanticipated COVID-19-related expenses, and the loss of patient revenue from reduced service delivery despite having substantial fixed capital and personnel costs.[39] This is concerning since many FQHCs carry only small reserves and they are heavily dependent on revenue from operations and governmental grants.

School Based Oral Health Services

In addition to disrupting the learning and socialization skills of children, school closures, due to the pandemic, also limited access to critical health and oral health services.[40] The DentaQuest Partnership for Oral Health Advancement estimates that nearly 1 million Medicaid enrolled children rely on school-based oral health programs (SBOHP) or school-linked oral health services to access basic preventive dental care.[40] Oral health services in schools are often delivered by providers who work with portable dental equipment or who deliver services in mobile vans that can be located near schools. Many SBOHPs were suspended near the end of the 2019–2020 school year, and many of them have been disrupted during the 2020–2021 school year. This disruption has major implications for the oral health of children.[40]

In addition to screening children for signs of tooth decay, SBOHPs also offer preventive services, such as applying fluoride varnish to teeth or placing dental sealants on permanent teeth.[40] It is important to note that SBOHPs are also the primary manner through which states and territories gather surveillance data that is critical to understanding the oral health status of children and for measuring progress of governmental programs.[40]

In June 2020, the Association of State and Territorial Dental Directors (ASTDD) disseminated a survey to the oral health program directors in all US states and territories to learn their plans for implementing SBOHPs during the 2020–2021 school year. Directors in 44 states or territories participated in the survey.[40]

Eighty-four percent of respondents reported that they were spending at least some time on pandemic-related support, including communication materials for executive orders, dental licensing board consultation, dental provider communication, and infection control guidance. These new and generally unanticipated responsibilities reduced the time available for planning and implementing SBOHPs.[40] Only 17 of the 44 responding directors planned to conduct a basic screening survey (BSS) during the 2020–2021 school year.[40] Nine of the 17 said the BSS was a new endeavor and 6 states indicated that the BSS was a continuation of the survey that had begun during the previous school year.[40] The report describing the survey concluded that the COVID-19 pandemic had impacted the effectiveness and efficiency of service delivery to children in SBOHPs and that until SBOHPs can resume their typical operations, millions of children will be at higher risk for oral disease.[40]

As schools reopened, there were a number of obstacles to reinstituting existing health and oral health programs including environmental limitations related to air filtration systems in schools generally, and specifically, in areas where oral health clinical services would be delivered. In addition, schools often limited presence in schools to teachers, students, and other essential personnel. Thus, oral health programs that were not already based within fixed health centers were limited in their ability to treat children.[40]

In another survey conducted in early 2021 by CareQuest Institute for Oral Health (formerly DentaQuest) and ASTDD, approximately 40% of state dental directors indicated that the SBOHPs were preparing new communication materials to engage or inform schools and parents about the safety of oral health programs during the COVID-19 pandemic.[41] The materials generally included a COVID-19 safety flyer, a safety brochure to encourage dental sealants despite COVID-19 concerns, a question and answer sheet from the school nurse, and flyers reiterating the importance of maintaining regular oral health care for students during the pandemic.[41]

Teledentistry

Teledentistry facilitates the remote delivery of dental guidance, education, or treatment using information technology rather than in-person contact with a patient.[42] Teledentistry is not a new concept, although it is only recently embraced by more providers and patients than in the past. One of the earliest teledentistry projects was initiated by the US military in 1994 to serve US troops around the world.[42] Over the years, teledentistry has proven beneficial for remote dental screenings, arriving at dental diagnoses, providing consultations, and proposing treatment plans.[42]

A research brief by the CareQuest Institute for Oral Health discussed how providers used teledentistry for a variety of purposes, including examining the mouth and teeth, prescribing medications, triaging patients, facilitating referrals to specialists, and providing oral hygiene instructions.[43] Teledentistry can be used to prioritize care to patients who urgently need to see a dentist, while providing oral hygiene advice, prescriptions, or other services to

patients with conditions that can be managed at home. The modality is useful in ensuring access, even in times of crisis, while also saving expense.[43]

Teledentistry is unlikely to ever replace a face-to-face consultation with an oral health caregiver. However, it is important to recognize that teledentistry is a useful treatment modality that can improve access and assist with screening and clinical triage of patients. The COVID-19 pandemic demonstrated the utility of teledentistry in ensuring access to care for vulnerable populations, especially in times of crisis.

Choi and coauthors examined changes in dental care use patterns due to the pandemic and found that dental care use began to decrease during the week of March 9, 2020 reaching the lowest point in the week of April 6, 2020.[28] The decline represented a 94.5% decrease in use compared to the same period in the previous year.[28] The researchers found that during the shelter-in-place period of the pandemic, the use of teledentistry increased.[28] In April 2020, the use of teledentistry was as much as 60 times greater than pre-pandemic levels.[28] While usage of teledentistry modalities decreased once dental offices began reopening, use of teledentistry remained 12.7 times higher in the last week of August 2020, when dental practices were mostly open, than at the same time in 2019.[28]

Weintraub et al. described efforts at using teledentistry during the pandemic at the Adams School of Dentistry, University of North Carolina at Chapel Hill.[44] The school developed the Carolina Dentistry Virtual Oral Health Care Helpline using a quality

improvement framework informed by faculty and staff member feedback.[44] The process included building infrastructure for phone and video consultations, establishing protocols for documentation and referrals, and training personnel in scheduling, calibration, and communication.[44] The authors demonstrated that the Helpline was able to resolve some patients concerns without their seeking unnecessary in-person care from emergency departments and urgent care clinics, especially when dental practices were closed or limited to providing only essential urgent and emergency oral health services.[44]

Early in the pandemic, a survey of dentists in Nova Scotia to describe care provided to patients during the week of April 19, 2020 found that only a very small percentage of dentist respondents provided any in-person care (7.2%) and that many used teledentistry applications to interface with patients.[45] Among those who provided any remote services to patients, most did so using telephone, video, email, or text communications; 95% of dentists who used teledentistry used telephonic consultations sometimes in conjunction with additional methods such as video and email to discuss oral health problems including pain, swelling, and trauma with their patients.[45] More than 86% of the telephone consultations resulted in a prescription for an antibiotic and 59.3% resulted in a prescription for a pain medicine.[45]

One often reported complaint of patients during the period of the COVID-19 pandemic was an increase in the number and severity of temporomandibular jaw disorders and issues with bruxism, or grinding of teeth.[46] These disorders are not included among those qualifying for emergency treatment yet the resulting discomfort and facial pain can be substantial.[46] Dentists reported that the increase in anxiety and stress in the general population particularly during the early months of COVID-19 contributed to increased rates of these disorders and exacerbations of already existing disease.[46] Bruxism can occur both during sleep and when awake.[46] A literature review found that dentists in several countries were reporting worsening of these conditions for existing patients as well as greater risk of developing symptoms among those who were newly diagnosed. Perlman and Eli discussed the utility of using teledentistry to identify these disorders and provide patients with strategies to address their pain and discomfort.[46] Temporal mandibular jaw dysfunction is often identified by patient self-report and through visual examination which can easily be achieved through use of a variety of teledentistry applications.[46] The treatments can involve self-massage, heat therapy, and stretching; all of these therapeutic interventions can be instructed via teledentistry.[46]

Interest in teledentistry was reinvigorated during the COVID-19 pandemic as its utility became apparent when routine oral health care was postponed. As adoption of teledentistry spreads, there are likely to be improvements to hardware and software, leading to a growing list of advantages for practices that visit with patients remotely.[47] Triage, monitoring, and postoperative care can be accomplished successfully via remote visits, thus contributing to efficiency and limiting the need for face-to-face patient interaction.[47] Distant patient evaluations by trained dental team members can enable consultation and expand access to certain dental services in rural locations and other communities.[47]

It is important to note that the expansion of teledentistry is not limited to the US. At the onset of the first lockdown in the UK on March 23, 2020, pediatric

dental emergency walk-in services were suspended and replaced with a telephone triage system at the department of Pediatric Dentistry at St. Thomas' Hospital in London.[48] As described by Patel et al., remote telephone consultations and digital photographs were useful for screening emergency pediatric dental patients.[48] During the study period, 464 patients were able to access the pediatric dental emergency service via telephone.[48]

IMPACTS OF COVID-19 ON THE DENTAL WORKFORCE

Redeployment of the Dental Workforce

An adequate supply of health care workers was a necessity as the COVID-19 pandemic increased the need for health care services and for hospitalizations. The unexpected demand and exponential requirements for everything from testing and triage to complex intensive care telemetry and medical equipment, including respirators and ventilators, occasioned a crisis in finding equipment and personnel to meet the spectrum of need within communities. The pandemic pointed to the limitations in scope of practice that restrict the ability of the delivery system to respond with agility to public health emergencies. For example, dentists' and dental hygienists' scopes of practice are generally limited to the oral cavity and do not include surrounding structures such as the nose. These boundaries prevented oral health professionals in many states from being able to perform nasal swab testing unless performing that service under medical or nursing delegation. Some states, including New York, removed that barrier through executive order. However, this is an example of overly prescriptive regulation hindering redeployment of a portion of the health workforce that was well equipped to contribute to service delivery.

The pandemic was the impetus in many states for governors to issue executive orders removing licensure and scope of practice boundaries for many clinical professions for a stated time period to alleviate the pressure on the health care system to provide care to so many in distress. This allowed for engagement of itinerant clinicians and also for use of learned competencies that might not have been in the current legal scope of practice and supervision for a profession. While these executive orders often addressed personnel in medicine and nursing, many failed to engage dentists and dental hygienists with community efforts to supplement existing health care workforce. This was especially egregious since dentists and dental hygienists are state licensed and highly trained in infection control because of the pervasive need in dentistry to prevent disease transmission to personnel and patients. The mouth, teeth, tongue, and saliva are hosts to many infectious pathogens and hundreds of bacterial species. This fact requires dental clinicians to practice safe and effective infection control for every procedure.

Dental health care workers are a valuable resource and should be called upon to act as provisional health care personnel in times of crises and emergencies. They are adequately trained to provide support for some of the basic needs of patients within a health care facility and could certainly be used in triage and testing functions.[49] Dental anesthesiologists and oral and maxillofacial surgeons can function alongside medical colleagues in the most complex health care settings because of their

extensive training in medical life support, infection control, and general anesthesia, which requires expertise in intubation.[49] These professionals could easily be integrated into the medical, surgical, emergency department, or anesthesia teams and support the operation of hospitals and other health care facilities.[49] While some health care providers engaged dentists on their staff to do COVID-19-related activities, this was not a majority practice. In many ways, this was another missed opportunity to integrate dentistry with medicine, again demonstrating the separation of disciplines to the disadvantage of patients and the health care system overall.

Jacobi Medical Center (JMC), located in New York City in the North Bronx, is part of the municipal hospital system of NYC Health + Hospitals. At the end of March 2020, as JMC was being overwhelmed by COVID-19 patients, Governor Andrew Cuomo called upon all licensed professionals, including dentists, to come to the aid of their colleagues who were dealing with the COVID-19 pandemic.[49,50] Jacobi redeployed health care personnel, including staff members at the Department of Dentistry and Oral and Maxillofacial Surgery, to provide a wide range of nontraditional services.[49] A case study of these efforts by Badner and Saraghi found dental health care providers capable of supporting health care efforts during the current and any future health crises, as demonstrated during this hospital-wide effort to control and combat the COVID-19 pandemic.[49]

Employment Challenges with Recruitment and Retention

In response to dental offices postponing routine and nonemergency dental care early in the pandemic, dental practices and clinics were forced to consider furloughs and layoffs of staff to reduce operational costs. To evaluate the economic impact of COVID-19 on dental practices, the HPI at ADA launched a tracking poll of private practice dentists, which later also included dentists in public health settings.[51] About 93% of dentists who participated in the HPI polls during the pandemic-affected months had applied for federal pandemic relief funds through the Paycheck Protection Program, the HHS Provider Relief Fund, and/or an Economic Injury Disaster Loan with dentists in small group or solo dental practices being proportionally more likely to do so. A large majority of those who applied to any of these programs received funding. When asked why some had not applied, the most common reasons were not knowing about it or believing they were ineligible.[52]

Dental practice closures reduced employment in dentistry in April 2020 to 44% of employment in January 2020. By June 2020, employment levels in dental offices rebounded to 90% of pre-pandemic levels and by October 2020, employment levels were at 100%. However, while employment rates have recovered (eg, numbers of employees are at pre-pandemic levels), demand for dental services has increased. As a consequence, dental practices are reporting that they are short-staffed, particularly for dental hygienists and dental assistants. In August 2021, 4 of 20 practice owners responding to a survey conducted by the ADA's HPI were trying to recruit dental assistants and one-third of practices were recruiting dental hygienists. Poll participants reported significant difficulties in finding qualified staff to fill these positions.[53]

Dentists responding to the HPI poll in October 2020 were asked to compare recruitment of

dental personnel before the COVID-19 pandemic with recruitment during the pandemic. Poll participants indicated a much greater degree of difficulty with hiring dental hygienists and dental assistants during the pandemic than before. Recruitment of dental hygienists was described by most dentists as extremely challenging (33.3%), very challenging (25.0%), or moderately challenging (20.8%). A minority described recruitment as only slightly challenging or not challenging at all (16.7%). Recruitment of dental assistants during the pandemic was also considered extremely challenging (40.4%), very challenging (17.5%), moderately challenging (22.8%), or slightly challenging (10.5%). Again, only a small minority of dentists described recruiting dental assistants as not challenging or were unsure of recruitment difficulties (8.8%).[33]

Impact of the Pandemic on the Auxiliary Dental Workforce

Employment Patterns of Dental Hygienists in the US During the COVID-19 Pandemic

The inherently higher risk of infection for all dental occupations was established at the onset of the pandemic.[54] Additionally, the pandemic had a disproportionately high impact on women, especially those in professions where women dominate, such as allied health, nursing, dental hygiene, and dental assisting. Women make up 96% of the dental hygiene workforce.[54] Dental hygiene was identified as being among the most at-risk nonhospital occupations during the pandemic, with a rating of 99.7 of 100 because of contact with patients, physical proximity, and exposure to disease and infection.[54]

Environmental factors including school and daycare closures, the already existing unequal burden of caring for aging parents, and the higher risk of infection in female-dominated occupations, such as health care, resulted in a large number of women exiting the labor force.[54] During the COVID-19 pandemic, childcare issues played an exaggerated role in driving career choices. While unique issues are likely to resolve as the pandemic subsides and schools and childcare facilities reopen, there is evidence to suggest that COVID-19 may have long-term consequences for workforce participation, earnings, and the career prospects of women.

Survey research, conducted in 2020, investigated how the COVID-19 pandemic affected employment patterns of US dental hygienists. Findings included that 7.9% of responding dental hygienists had exited the workforce after the onset of the COVID-19 pandemic.[54] This was described as equivalent to a reduction of approximately 18,000 dental hygienists from the pre-pandemic workforce.[54]

Nearly 8% of those who were employed as dental hygienists on March 1, 2020 reported they had left the workforce. Within this group, 59.1% reported leaving the position voluntarily, while 24.1% were laid off or furloughed and 16.7% were permanently let go.[54] Respondents older than age 65 were more likely to report having voluntarily left compared to respondents younger than age 35.[54]

While the majority of dental hygienists in the survey left their jobs voluntarily, many had not yet returned to work even after their employers had reopened their practices.[54] Study authors suggested that most voluntary departures were likely to last through the COVID-19 pandemic.[54] Among those who voluntarily left a dental hygiene position during COVID-19, 48.3% did not want to return to work until the disease was better controlled, 12.7% had concerns about safety in the workplace, 11.2%

no longer wished to work as a dental hygienist, 10.7% had childcare concerns, and the remainder listed reasons such as retiring, moving out of state, concerns about reduced salary, etc.[54] The researchers anticipated that approximately 0.5% of those departures might be permanent.[54]

Of the 4,776 respondents from all 50 states and Puerto Rico, almost one-third of the sample (31.9%) reported they had at least one medical condition associated with a higher risk of developing severe illness from COVID-19.[54] The study by Gurenlian showed that PPE availability was an important factor driving dental hygienists' concerns about contracting COVID-19 in the workplace.[54] Dental hygienists in places of employment with higher stockpiles of N95 or KN95 masks reported lower levels of concern.[54] A small percentage of dental hygienists did not know how many days of PPE were in stock at their place of work.[54] This was concerning as dental hygienists may be making decisions regarding their employment without full knowledge of PPE availability.[54]

The Impacts of the COVID-19 Pandemic on Dental Assistants and Front Office Staff

The magazine, *DentalPost*, has surveyed its community of 900,000 dental professionals over recent years to track and share job trends including salaries, and in 2020, to describe the pandemic's effect on dental hiring.[55] Together with *RDH* (registered dental hygienists) magazine, *DentalPost* conducted the annual nationwide salary survey of dental professionals (including dental assistants and dental hygienists). This comprehensive survey in 2020 included 10,890 respondents from the 50 states. The survey was conducted over a six-week period from September 1, 2020, to October 15, 2020.[55] The key takeaways about dental assistants were among the only current published data available on the impact of the COVID-19 pandemic on the dental assistant workforce.[55]

Ten percent of dental assistant respondents were unemployed at the time of survey completion compared with just 4% of dental hygienist respondents.[55] These data suggest that during the pandemic, dental assistants were the category of employees that was most laid off or furloughed.[55] Among dental assistant respondents, 67% had been working at their current practice for fewer than five years.[55] Almost half of the respondents had applied for at least one new job in the past year.[55] The authors commented that this is the most dramatic turnover position in the industry.

Stress and Anxiety in the Workforce

The COVID-19 pandemic revealed the importance of monitoring the psychological well-being of oral health care personnel. The mental health of front-line workers is critical to a community's ability to manage crises and disasters.[56] Dentistry, as a profession, is in a unique position as dentists work at close proximity to the patient. Social distancing in the chair is not possible; hence, the risk of transmission of respiratory infections, including COVID-19, is very high, particularly when aerosol generating procedures are used to treat the patient.[57]

These challenging circumstances enhanced the level of stress inherent in providing services to patients, especially during the early months of the COVID-19 pandemic when knowledge of the virus was evolving. Uncertainty about transmissibility and outcomes contributed to heightened concerns about the risk of public interaction and thus provision of any dental services. A web-based survey of

US dentists conducted in June 2020 determined that one-third of participating dentists experienced mild psychological distress in the 2 weeks before survey administration.[17]

Dentistry is widely regarded as a job with significant psychological and mental risk factors such as stress, tension, depression, and emotional exhaustion.[58] Working as a care provider during the COVID-19 pandemic may have exacerbated occupation-related physical and psychological health concerns.[58] A lack of adequate PPE, especially during the early months of the COVID-19 pandemic, fear of transmission of the virus to and from patients and to family, and lack of financial security may have contributed to increased stress and anxiety. Oral health staff have reported fear for their professional future as a result of measures taken during the early months of COVID-19, including office closures. These fears included an inability to pay practice expenses leading the dentist to go out of business.[59,60] It is important to recognize that these psychological impacts may not be limited to just the oral health care worker but may extend to their families as well.[59]

A case study reported by Badner and Saraghi highlights the various situations specific to the COVID-19 pandemic where stress and anxiety might be increased among clinicians, including being deployed to perform services in other than dental practices.[48] During the early stages of the COVID-19 pandemic, JMC called upon nontraditional health care personnel, including staff members at the Department of Dentistry and Oral and Maxillofacial Surgery, to provide a wide range of services.[48] Redeployment of dental staff members to medical teams was intended to support medical and surgical care delivery during a critical time of need.[48] Dental staff members who were performing tasks outside their regular roles may have experienced trauma from observing the serious illness and sometimes, death of patients with COVID-19.[48] JMC was aware of the potential concerns so it made emotional support services available to all staff members. The "Helping Healers Heal" program was provided by JMC to keep health care providers from experiencing burnout and secondary trauma from the critical situation occasioned by the public health emergency.[48]

Findings, like those described above, are echoed in the international literature. In a survey to describe the mental health status of dentists in the UK, Ranka and Ranka identified a significant deterioration in the mental health of dentists during the COVID-19 pandemic due to a change in their working patterns and the impact of loss of work, income, and the lack of hands-on dentistry.[57] Psychological distress in the dental workforce may result in increased errors in a dentist's practice, including knowledge-based errors (eg, misdiagnosis), rule-based errors (eg, forgetting instructions), or skill-based errors (eg, leaving cement in the sulcus), all of which can impact the effective and efficient delivery of dental care to patients.[61]

Stress and anxiety also affected the dental hygiene workforce. A survey of 1,074 dental hygienists from 48 US states found that 70.6% of respondents experienced stress-related symptoms at their dental practices during the COVID-19 pandemic.[59] Furthermore, respondents reported that their healthy work-life balance was impacted by the COVID-19 pandemic with many experiencing symptoms such as difficulty sleeping.[58]

Vaccinating the Oral Health Workforce

Less than 1 year after the SARS-CoV-2 genome was first sequenced, an application for Emergency Use

Authorization for a candidate vaccine was filed with the Food and Drug Administration (FDA).[62] However, demand for COVID-19 vaccine exceeded supply during the first months of the national vaccination program.[62] The Advisory Committee on Immunization Practices (ACIP) convened on December 1, 2020, in advance of the completion of the FDA's review of the Emergency Use Authorization application, to provide interim guidance to federal, state, and local jurisdictions on allocation of initial doses of COVID-19 vaccine.[62] ACIP recommended that when a COVID-19 vaccine was finally authorized by the FDA and recommended by ACIP, health care personnel and residents of long-term care facilities (LTCFs) be offered vaccination in the initial phase of the COVID-19 vaccination program (Phase 1a).[62] The CDC confirmed that dentists, dental teams, and dental students were included in the initial recommendation about vaccination for health care personnel. Oral health clinicians were among those offered the first doses of the COVID-19 vaccines.[63]

MOVING FORWARD

Traditional approaches to infection control and prevention, including patient screening and triage and sterilization and disinfection protocols, will need to be reevaluated and adapted to the new era.[21] Many of the tools developed or embraced by dental practices during the early months of the COVID-19 pandemic may prove useful moving forward. Furthermore, comprehensive oral health preventive measures and minimally invasive intervention techniques that limit or eliminate aerosol generating procedures should be embraced to maintain and improve the oral health of the population.[21]

Researchers in India studied the utilization of silver diamine fluoride (SDF) as an alternative to AGPs during the COVID-19 period when elective dental procedures were prohibited.[64] SDF is a liquid compound that is placed on a decaying tooth to forestall caries progression.[64] SDF has some restorative properties and is frequently used on children and elders.[64] The treatment exhibits many positive results. However, one negative outcome associated with the compound is discoloration of the treated tooth. The retrospective study by Singhal et al. used data on 2,459 carious molars treated with SDF in 1,072 patients during the early months of COVID-19; 96.8% of patients reported complete relief from sensitivity and pain on stimulation and 3.17% of patients reported just mild sensitivity and pain of treated teeth.[64] SDF application was described as a non-aerosol generating procedure that was an effective alternative to more invasive therapies.[64]

As the pandemic progressed and effective methods of infection control within dental offices became routine, one abiding concern was the risk of treating asymptomatic patients who carry the virus but do not manifest illness. Prescreening protocols effectively prevent patients with symptoms or recent exposure to the virus from receiving services but those patients without identifiable disease may still present the risk of airborne transmission. Spread of the virus from asymptomatic patients is equal to that of symptomatic patients. Ren et al. proposed that an ideal solution would be the use of rapid, point-of-care COVID-19 testing kits in dental settings.[4] However, implementing their use in dental settings would increase the cost of providing services. Also, widespread availability of those test kits, while a goal for the US health care system, is still not a reality. However, such testing would allow

dental offices to maintain service delivery in the event of another surge in infections.

The COVID-19 pandemic has presented the oral health care system with an opportunity to reassess how care is delivered in the future. It is important not to ignore positive innovations and service adaptations which may improve access and quality as dental practices resume operations. Teledentistry is one such innovation. Teledentistry proved to be an effective tool for assessing risk and providing patients with consultation, diagnosis, and palliative care during the worst of the health care crisis. As such, it has the potential to increase access to oral health care services beyond the COVID-19 pandemic. By addressing legal and regulatory barriers to teledentistry, states can ensure that when another regional or national crisis arises, people would have access to health, mental health, and oral health services in compliance with emergency mandates.[65] In addition, teledentistry and other telehealth initiatives create jobs and help alleviate the financial hardships and workforce shortages faced by health care facilities, especially those in rural settings and those with an overwhelming demand for healthcare services.[65]

Now more than ever, the dental delivery system must be more responsive to the needs of local populations and prioritize care for groups with high needs for dental services including populations from low-income, marginalized, and vulnerable groups and those with multiple medical comorbidities.[66] Current restrictions on aerosol-generating procedures provide an opportunity to reorient dental care towards a less invasive and more preventive approach, one in which the dental team works in partnership to tackle the shared risks for oral and other communicable diseases.[66]

COVID-19 has exacerbated persistent disparities in health outcomes and social-risk factors at a time when health agencies anticipate lower revenues.[67] This new environment challenges health professionals and stakeholders to reconsider how the oral health care system is designed and how the business operations of dental offices are conducted.[67] Dentistry is changing rapidly amid the COVID-19 pandemic, revealing new opportunities for transforming and strengthening the oral health care system.[67] These economic drivers, such as the cost of materials and supplies and ongoing difficulty with recruitment and retention of personnel, may change the predominant management and business structures in dentistry. Consolidations of management and purchasing functions for small dental practices stands to benefit both providers and patients.

The oral health safety net has become even more important as a resource to low-income patients as job shifts and unemployment have affected eligibility for health insurance and in some places, increased the number of people who are eligible for state Medicaid and Children's Health Insurance Programs. While there was an increase of approximately 12 million people in the Medicaid program during COVID-19, it is difficult to say how many will continue to qualify once states resume recertification and renewal applications when the Federal moratorium on those processes ends. FQHCs have been a resource for those without dental insurance and those with Medicaid benefits so it is likely that demand for oral health services in those settings will continue to grow.

The impacts on the dental workforce could be substantial depending on the length of pandemic slowdowns and the personal decisions of clinical professionals. Many dentists are within age

cohorts nearing or at expected retirement age. The economic pressures, the stress of maintaining a small business, and the risk of infection may encourage some to consider retirement. Women in the health workforce, including dental hygienists and dental assistants, have been inordinately affected by school and daycare closures and concerns about transmission of the virus to their families. Some have left the workforce entirely; others are delaying decisions about returning to their clinical positions. This is stressing capacity in the oral health care delivery system. Practices may continue to experience difficulties in recruiting dental hygienists and dental assistants as demand for dental services continues to surge.

COVID-19 has spotlighted, once again, the strong siloes in health care delivery and has underscored the importance of efforts at medical and dental integration. While it has always been important for dentists to be aware of patients' chronic diseases such as diabetes and hypertension, the COVID-19 pandemic necessitated awareness of communicable illness. The pandemic should be an impetus to implement continuous medical screening of patients as routine practice.

The importance of multistakeholder engagement in outlining processes that harness the opportunities presented by COVID-19 and the ingenuity of stakeholders during the pandemic cannot be overstated.[67] It is important to evaluate the lessons learned from national, state, and local initiatives during a public health crisis to not only continue providing quality care to patients in the midst of a pandemic, but also to determine how these strategies might be embraced to make dentistry more accessible to the population in the future.

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CHAPTER 2: REGULATION

THE IMPACT OF REGULATORY STRUCTURES DURING COVID-19

Governmental regulation of healthcare entities and personnel is essential to support public safety, standardize service delivery, and build and maintain quality of care. Regulation occurs at the local, state, and national levels often resulting in a tangled web of rules that govern clinical practice and healthcare organizations. Countless regulations inform to whom services may be delivered, who may provide healthcare, where services may occur, and how they are conducted. The regulatory environment may act as either a structural facilitator or barrier to patients' access to health services.

The complexity of healthcare regulation was on vivid display during the many months of the public health emergency caused by the spread of the SARS-CoV-2 (COVID-19) virus worldwide. Regulatory structures are not generally agile or quickly responsive, which initially resulted in cumbersome delays of disease management guidance, substantial difficulties in obtaining necessary supplies and personnel to combat the illness, and public confusion about how to contain virus spread. A reactive, rather than proactive response by government affected the public health community's reactions to cessation of all but essential healthcare services and the ensuing workforce shortages, especially during the first months of the crisis.

Once healthcare facilities were advised to only offer urgent or emergency care and to shutter for routine services, the lack of preparedness within government and healthcare delivery systems became apparent. The dearth of knowledge about virus related morbidity and mortality, uncertainty about the vectors for disease transmission, and the absence of prevention or treatment protocols complicated the response. Public officials were required to suspend or loosen regulations for clinical practice and service delivery to open pathways to critical healthcare services. At all levels, regulatory bodies were required to adopt emergency interim rules to counter existing regulations that impeded the ability of healthcare providers to address COVID-19 along with the multitude of existing healthcare needs in the population.

The Rapid Response of the Federal Government

A public health emergency (PHE) was initially declared by the Secretary of the US Department of Health and Human Services (HHS) in late January 2020, pursuant to Section 319 of the Public Health Service Act.[1] The declaration of a PHE extends for 90 days; the PHE was renewed several times and expired on May 11, 2023.[1] Once a PHE is declared, the US president and state governors are empowered to issue executive orders that supersede regulations in force within the various jurisdictions. Executive orders issued during the pandemic were intended to ease delivery of care and increase the availability of financial resources, medical equipment and technology, and human resources to address the immediate and ongoing needs of the population for health services.

The federal government responded to the pandemic at many levels with immediate efforts to improve the agility of the medical supply chain by invoking the Defense Production Act[2] and fostering logistics to efficiently manage crucial equipment shortages such that geographic areas hardest hit by the virus received needed ventilators, personal protective equipment, testing kits, and healthcare personnel. In addition, the federal government passed fiscal

relief bills that benefited the general population and businesses affected by closures due to COVID-19, such as the Families First Coronavirus Response Act on March 18, 2020; the Coronavirus Aid, Relief, and Economic Security (CARES) Act on March 27, 2020; the Paycheck Protection Program and Healthcare Enhancement Act on April 24, 2020; the Consolidated Appropriations Act on December 27, 2020; and the American Rescue Plan on March 11, 2021.[3]

Several federal initiatives were aimed at providing opportunities for healthcare clinicians and organizations to interface with patients despite closure of many healthcare settings. These included legislative action addressing the availability and cost of testing for COVID-19, federal support to fast-track research and production of effective vaccines, fiscal support for American households and businesses, and efforts to engage corporate partners with production of medical equipment, including ventilators and personal protective equipment. Adjustments to federal regulation of telehealth and teledentistry services were especially impactful because they broadened the types of technical interfaces that could be used, loosened but maintained essential privacy requirements, expanded the geographies and populations that could use the services, and enabled payment mechanisms to encourage use.

Testing for COVID-19

Two legislative bills made it possible for patients to access COVID-19 tests without personal cost. With the Families First Coronavirus Response Act (FFCRA),[4] Congress emphasized the importance of disease detection as a first line defense against COVID-19. Under FFCRA, starting on March 18, 2020, and continuing for the duration of the PHE, all public and private insurance plans were required to cover US Food and Drug Administration (FDA)-approved COVID-19 tests and costs associated with medically appropriate diagnostic testing with no cost sharing by patients.[4] Centers for Medicare & Medicaid Services (CMS) ruled that there was no limit on the number of COVID-19 tests that an insurer or plan was required to cover as long as the test was medically indicated, meaning that the individual had signs or symptoms of COVID-19 or had a known or suspected exposure.[4] The CARES Act was the second bill passed on March 27, 2020, and it expanded protections by requiring private plans to fully cover out-of-network tests.[4] Medicare, Medicaid, and private plans were also required to cover serology tests.[4]

Since the enactment of FFCRA and the CARES Act, some plans have denied COVID-19 testing claims or applied cost sharing for COVID-19 testing for asymptomatic individuals unless they had known or suspected exposure to COVID-19 and had a referral for testing from their provider.[5] Some plans also denied COVID-19 testing claims unless ordered by a physician.[5] Federal guidance released in early 2021 under the Biden Administration clarified that insurers must cover testing without cost sharing for asymptomatic individuals and without requiring medical screenings.[5,6] However, insurers are not required to cover COVID-19 testing without cost sharing if it is conducted as part of employee return-to-work programs or if the testing was for public health surveillance purposes.[5]

Vaccines for COVID-19

Early in the pandemic, the federal government established vaccine development as a priority, encouraging and supporting vaccine research and taking initiatives to develop production capacity and

logistical systems for distribution and handling in anticipation of emergency approval by the FDA. The initial vaccine rollout was staged so that high-risk populations and direct-care clinical providers were the first to receive inoculations. Vaccines were allocated based on established criteria so that access to immunization was equitable. Dentists were among the clinical professionals permitted to be vaccinated in the first round (1A) of administration. Vaccine administration was regulated in that supplies were available only to state governments and designated pharmacies throughout the US.[7]

During the pandemic, the federal government used emergency COVID-19 funding provided through multiple appropriations, such as the CARES Act, the Consolidated Appropriations Act, and the American Rescue Plan, to purchase supplies of vaccines, rapid test kits, PCR tests, and treatments (eg, monoclonal antibodies and antivirals) and distributed these resources through pharmacies, community health centers, federal sites, and by allocations to states and localities.[3,8] However, once the current supply runs out, the federal government cannot purchase more tests, treatments, or vaccines without additional Congressional appropriations.[8]

Federal guidance from CMS reinforced existing policy regarding coverage for the administration of the COVID-19 vaccine and described methods for providers to seek federal reimbursement for incurred costs related to administration of a COVID-19 diagnostic test or a COVID-19 vaccine to those who are uninsured.[6] One existing program is the Provider Relief Fund, which has a mechanism for providers to submit claims and seek reimbursement on a rolling basis for COVID-19 testing, COVID-19 treatment, and administering COVID-19 vaccines to uninsured individuals (the HRSA COVID-19 Uninsured Program).[6]

In November 2021, the White House used an executive order to issue an interim final rule that mandated that any person working in a Medicare- or Medicaid-certified healthcare facility or supplier was required to be vaccinated.[9] The order covered 21 types of providers and suppliers including hospitals, hospices, long-term care facilities, rural health clinics, home health, and rehabilitation centers.

EMERGENCE OF ACCOMMODATION AND RESPONSE TO THE CRISIS AT BOTH THE FEDERAL AND STATE LEVEL

Telehealth/Teledentistry

Changes to regulatory guidance related to telehealth/teledentistry were particularly useful to patients and providers during the earliest months of the pandemic when many medical, dental, and allied health provider offices were closed due to shutdown policies in states. The ability to contact clinical providers through electronic modalities reduced the pressure on emergency rooms and urgent care providers who were grappling with an exponential increase in critical care patients. The ability to contact providers from a patient's home also eased anxieties among the general population about their options for clinical advice and treatment of illness.

While Medicare and Medicaid policy substantially drive provider and patient behaviors, Medicare policy less commonly affects dentistry. Covered oral health services within the Medicare program are limited to dentistry related to trauma, oral cancers,

and corrective surgery for maxillofacial conditions and deformities. While Medicare and Medicaid share some common regulatory mandates, Medicaid policy more directly impacts dentistry and is therefore the focus of the discussion that follows.

It is important to note that much of the federal and state guidance on telehealth does not specifically cite teledentistry applications. States have addressed this issue in regulation in various ways including introducing separate clauses describing teledentistry in dental practice acts or by including dentists as authorized providers in Medicaid regulation. All states have some Medicaid regulations describing the conditions for use of telehealth but the variation across states continues to be substantial.[10] During the PHE, many states issued executive orders describing the broadening of telehealth and teledentistry regulations to meet the needs of the population.

HIPPA Compliance for Telehealth

The rapid expansion of telehealth services prompted the Office of Civil Rights (OCR) at HHS to exercise discretionary enforcement of regulations issued under the Health Insurance Portability and Accountability Act of 1996 (HIPAA), as amended by the Health Information Technology for Economic and Clinical Health (HITECH) Act, which aims to protect the privacy and security of protected health information (the HIPAA Privacy, Security and Breach Notification Rules).[11]

Provision of telehealth services offered through various modalities during the PHE was initially restricted since some technologies that were considered useful in interacting with patients during the pandemic did not fully comply with HIPAA rules.[11] Further guidance suggested that, during the PHE, OCR would exercise discretionary enforcement and not impose penalties for noncompliance with regulatory requirements under HIPAA rules during good-faith provision of telehealth using nonpublic facing audio or video communication products.[11]

Under this notice, covered healthcare providers were able to use popular mobile applications that allowed for video chats, including Apple's FaceTime, Facebook Messenger video chat, Google Hangouts video, Zoom, or Skype, to provide telehealth/teledentistry consultations without risk that OCR might seek to impose a penalty for noncompliance with the HIPAA rules related to the good faith provision of telehealth during the PHE.[11]

Teledentistry in Medicaid

Prior to the pandemic, CMS had issued minimal guidance on the use of telehealth for services to Medicaid patients.[10] States had the ability to determine any coverage for telehealth services, the geographic regions where telehealth could be used, the circumstances under which it could occur, and reimbursement for eligible providers.[10] However, with the COVID-19 pandemic, CMS offered broad flexibility to states to cover telehealth through Medicaid.[10]

The State Medicaid & CHIP Telehealth Toolkit released by CMS in April 2020 offered guidance to states to establish new telehealth policies to increase access to care during the pandemic.[10] The Center for Connected Health Policy (CCHP)[12] described the most common changes in states' Medicaid telehealth policies during the pandemic as:

- Permitting technology enabled communication with patients by phone

- Allowing the origination site to be a patient's home
- Easing standard consent protocols
- Extending the types of eligible services that could be reimbursed
- Allowing a more diverse group of providers (eg, physical and occupational therapists) to use telehealth to treat patients
- Relaxing some licensure requirements for cross-state providers
- Changing private payer mandates

Some states also altered patient of record requirements and instituted payment parity for services rendered by telehealth as compared to in person.

While the types of eligible telehealth services under Medicaid had been limited prior to COVID-19, expansion of the types of reimbursable services was common during the PHE.[13] Temporary telehealth polices in some states have already expired; most will expire at the end of the federal/state declared PHE.[13] Several states have promulgated recent legislation making all or some pandemic-induced telehealth policies permanent.[13] In other states, continuation of reimbursable telehealth services will be dependent on the PHE declaration.

The Consolidated Appropriations Act of 2022, signed by President Biden on March 15, 2022 extends federal telehealth flexibilities for 151 days post-PHE, including location, provider, and audio-only expansion, and includes new reporting requirements.[8] These new policies focus on some of the temporary changes made to Medicare policy in response to COVID-19.[14]

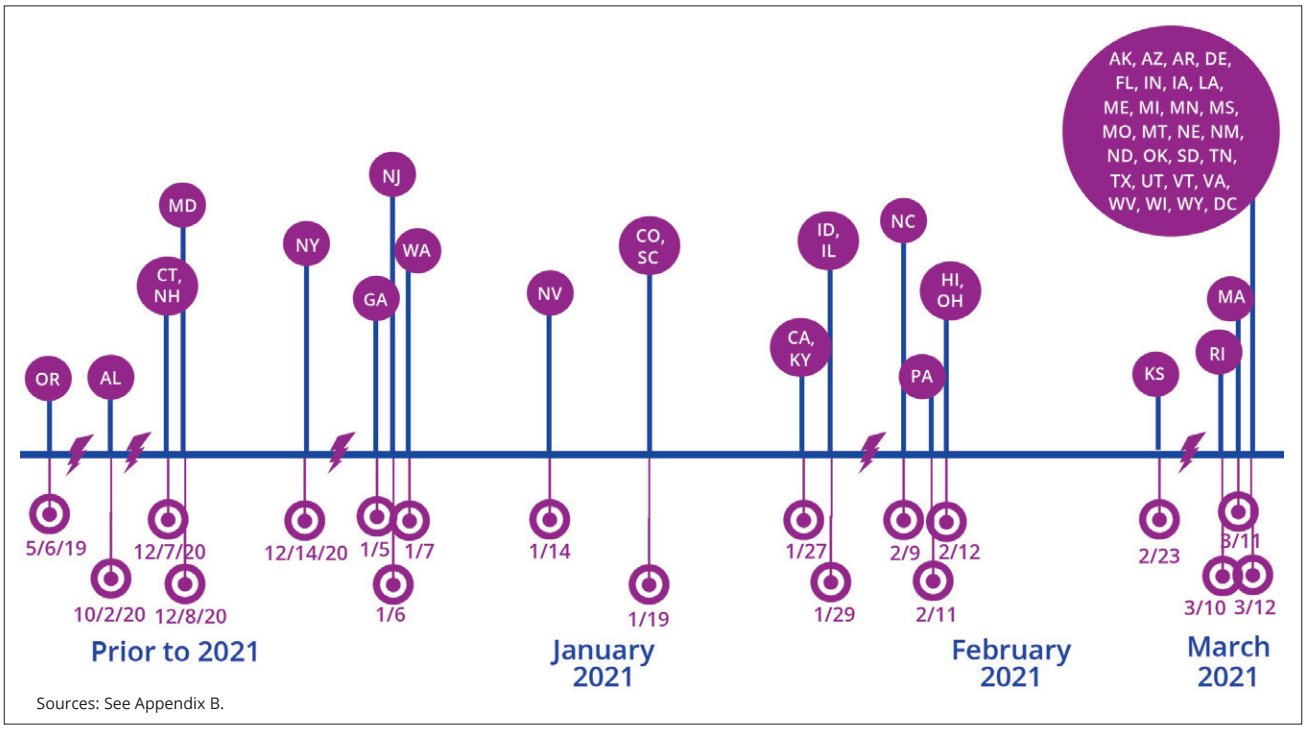
Medicaid Eligibility

The maintenance of effort provisions in the FFCRA requires that states maintain their levels of Medicaid eligibility and enrollment procedures that were in effect as of January 1, 2020.[15] The US government offered states enhanced Medicaid funding during the pandemic but required states that accepted such funding to forego recipient recertification of Medicaid eligibility. The requirement for continuous Medicaid enrollment resulted in a 19.1% increase in the number of Medicaid and CHIP enrollees over the course of the pandemic; total Medicaid enrollment in the US reached a record 85 million people.[16] The increase was likely due, in part, to job losses during the most difficult months of the pandemic. Once the PHE is no longer extended, funding will cease. States will then recertify eligibility which will result in loss of coverage for a portion of the currently qualified population. An increase in the number of people eligible for Medicaid likely increased the demand for services at safety net provider organizations. Demand for dental services from Medicaid participating dentists presumably increased as well.

Qualified Immunity for Immunization Activities

The seventh amendment to the declaration addressing medical countermeasures against COVID-19 under the Public Readiness and Emergency Preparedness Act (PREP), which was originally passed in 2005,[17] was in effect on March 11, 2021. It provided qualified immunity to covered persons including manufacturers, distributors, and providers of FDA-authorized or FDA-approved COVID-19 vaccines for their good faith activities related to making, distributing, and delivering these

FIGURE 1. Time Line of Permissions for COVID-19 Vaccine Administration by State and Date



Sources: See Appendix B.

vaccines. Among other provisions, the amendment was promulgated to revise the description of persons qualified to administer vaccines to include midwives, emergency medical technicians, physician assistants, dentists, and others. The amendment allowed students in these professions and qualified persons with inactive or expired licenses that were in good standing at the date of expiration to administer vaccinations as long as they were competent to provide intramuscular injections. The amendment included a requirement for training using the COVID-19 vaccine training module from the Centers for Disease Control and Prevention (CDC) and an observation period by a currently practicing healthcare professional with experience providing intramuscular injections. At the time of the declaration, 28 states had already enlisted dentists in their efforts to vaccinate state residents. The federal declaration superseded state law such that dentists in every state were able to administer vaccinations effective March 11, 2021. **Figure 1** illustrates the states where vaccine permissions were already in place prior to March 2021 as well as those states where the federal declaration provided dentists with authority to vaccinate.

STATE RESPONSES

While federal statute and regulation impact delivery of health services in very basic ways, state governments retain substantial power to protect public safety. Licensing authority for healthcare professions and occupations, regulation of Medicaid services and payment of benefits (eg, adult dental coverage), and oversight and licensing of healthcare entities and organizations resides within each state's regulatory purview. The impact of jurisdictional variation across 50 states was glaringly apparent in the different responses to the pandemic by state and local governments.

A lack of regulatory guidance at many levels resulted in a patchwork of approaches to virus containment and managing the healthcare needs of those affected by COVID-19. While the federal government adopted a minimalist approach to public health management activities, states were also inconsistent in their directives relative to COVID-19. Florida, for instance, was hesitant to issue statewide mandates, instead deferring, in many instances, to local governments to track their particular communities' experiences with the virus and to determine appropriate responses.[18] This inconsistent environment likely contributed to viral spread since neighboring communities varied substantially in mandates. One community might have required restaurants to shutter, for instance, while an abutting jurisdiction refused to do so. This localized approach enabled public travel to less restrictive environments that were more hospitable to contagious events.

Closures of Dental Practices

Initially, federal guidance on how to best protect the public was scattered and inconsistent. As a result, states, especially those where virus spread was alarming, declared stay-at-home orders recommending that all but essential businesses close and endorsing social distancing and telecommuting when possible. In addition, many state governments recommended that healthcare entities curtail routine service delivery, essentially closing most outpatient health facilities and medical, dental, and allied health practices. These closures did not preclude delivery of health and dental services that were deemed urgent. However, postponement of nonemergency and elective procedures for medical or dental diagnoses was required.

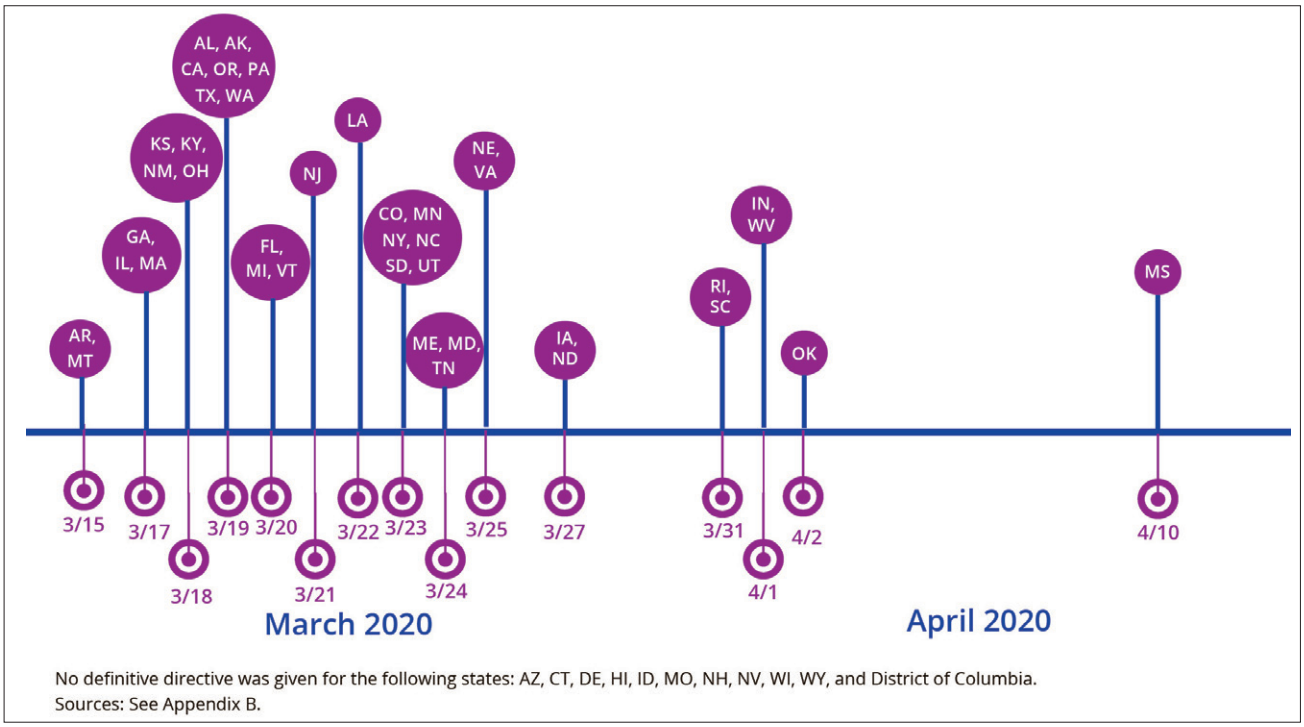
While some states specifically mandated dental providers to delay elective procedures, several states deferred to the American Dental Association (ADA) directive, issued on March 16, 2020, that recommended dentists nationwide postpone elective procedures for at least 3 weeks or until the risk to the public was reduced.[19] On April 1, 2020, the ADA extended that recommendation until April 30, 2020. By May 4, 2020, 27 states permitted dental practices to resume elective services; by June 1, 2020, 48 states and the District of Columbia allowed dental offices to reopen.[20]

Beginning in early March 2020 with the states of Arkansas and Montana, dental offices were closed to routine dental services **(Figure 2)**. In some states, including New York State[21] and Washington,[22] these closures occurred pursuant to executive orders. In others, such as Connecticut and Arizona, these closures were voluntary. On March 20, 2020, the ADA recommendation essentially closed dental practices nationwide for routine dental care.

While most closures occurred within the several days before and following the ADA recommendation, there were delays in several states, notably Mississippi **(Figure 2)**. There, the governor's executive order to close dental practices was issued on April 10, 2020. The governor noted that the first presumptive case of COVID-19 in the state had been identified on March 11, 2020; it wasn't until April 9, 2020, that the state had identified approximately 2,500 cases.[23] It is also interesting to note that the executive order in New York State was not issued until March 23, 2020. New York State experienced high rates of infection and mortality throughout the early months of the pandemic.

States that mandated closure of dental practices often delayed reopening even after the ADA

FIGURE 2. Time Line of Dental Office Closures by State and Date



No definitive directive was given for the following states: AZ, CT, DE, HI, ID, MO, NH, NV, WI, WY, and District of Columbia.
Sources: See Appendix B.

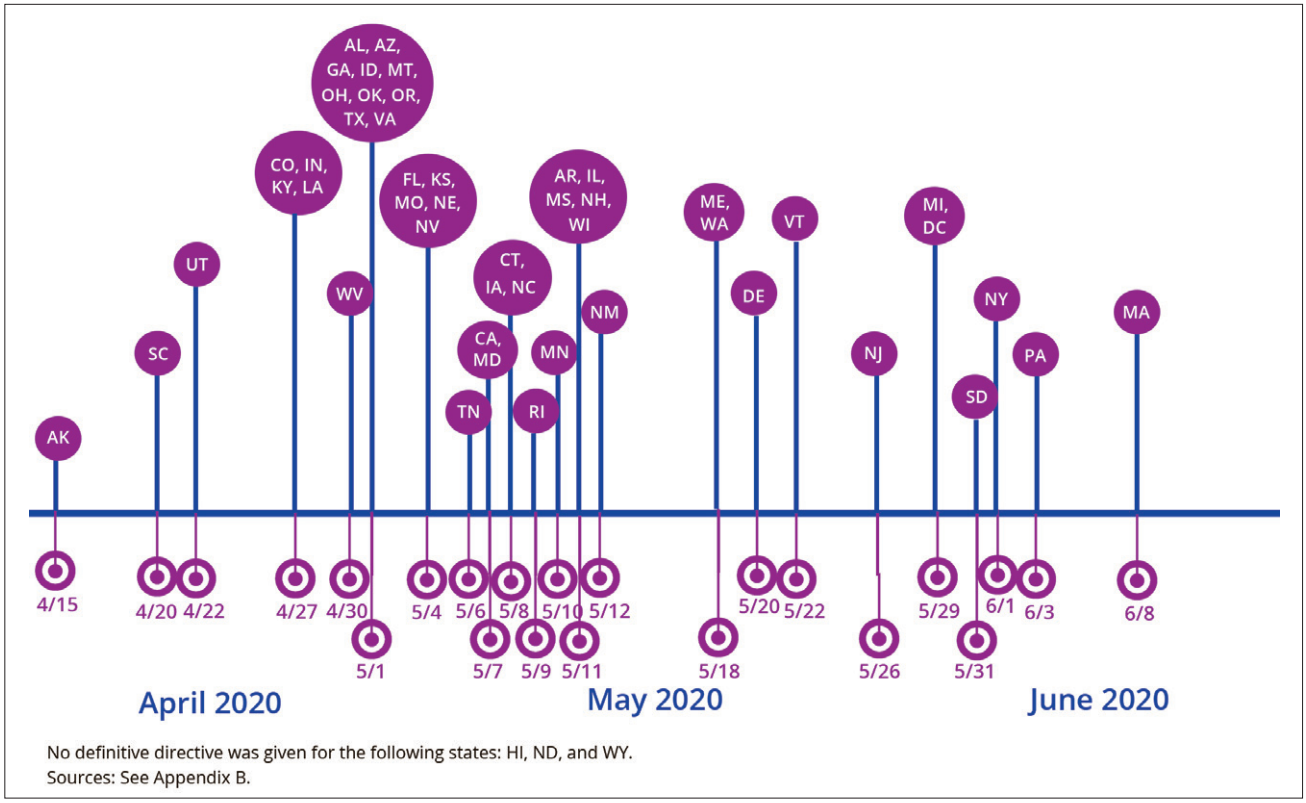
recommended resumption of services following the various federal and professional guidelines for triage and infection control **(Figure 3)**. Arkansas and Montana, the first states with mandated closures on March 15, 2020, reopened dental practices on May 11, 2020 and May 1, 2020, respectively. Mississippi was the last to close on April 10, 2020 and reopened on May 11, 2020. Alaska was the first state to allow reopening on April 15, 2020 and Massachusetts was the last on June 8, 2020. It is important to note that even in states where closure was voluntary (eg, Connecticut and Delaware), there was still governmental or association guidance about reopening.

State Regulatory Actions

The following graphical representations of COVID-19 incidence rates by state describe the period from January 2020 to July 2021. The figures, representing the daily number of COVID-19 cases from January 2020 to July 2021were retrieved from the CDC's COVID-19 Data Tracker, describing the trends in the number of COVID-19 cases and deaths in the US reported to the CDC by state and territory.[24] These figures are overlaid with the time lines for nursing home closures to visitors, school closures, dental office closures and reopenings, and permissions for vaccine administration by dentists. They are presented to show both the consistency and variation in state-level responses to the PHE. Closures of nursing homes to visitors were among the first strategic steps to control the spread of the virus in many states. High rates of morbidity among elderly people in congregate living was a pressing concern across the US; thus, most states immediately prohibited visitation. Viral spread and intensity varied geographically, especially in the initial months of the pandemic.

School closures, which were common in states hardest hit by the virus, also affected medicine and dentistry because health and dental services are delivered to many children through school-based and school-linked health centers and dental

FIGURE 3. Time Line for Dental Offices Reopening by State and Date



No definitive directive was given for the following states: HI, ND, and WY.
Sources: See Appendix B.

programs. CareQuest estimates that, typically, more than 1 million children receive dental services through school-affiliated dental programs each year.[25] These programs ceased or limited operations when schools closed and many were delayed in resuming care after schools reopened due to regulations about who could be in schools (eg, only essential personnel) or to the lack of appropriate air filtration systems to enable the safe delivery of oral health services, many of which generate aerosols.

The following graphs are arranged by census regions to allow comparisons of disease incidence and regulatory responses across proximate states. While many states within each region coincidentally issued similar executive orders, others acted more independently of their neighbors. In the northeast, for instance, Rhode Island and Vermont issued orders closing nursing home to visitors later than neighboring Massachusetts, Connecticut, and New Hampshire, while Maine never officially regulated nursing facilities' visitor policies. New Hampshire and Connecticut permitted dentists to provide COVID-19 vaccinations before others in the region.

It is interesting to note that throughout the US, dental office closures and reopenings occurred prior to the most intense period of COVID-19 infection in almost every state suggesting the importance of continuous adoption and ongoing use of precautionary measures within those practices to reduce disease spread. As indicated earlier in this report, COVID-19 infections linked to dental office exposures or treatments are considered minimal attesting to the perspicacity of the profession and the attention to infection control measures within dentistry generally.

Northeast (New England)

FIGURE 4. Maine

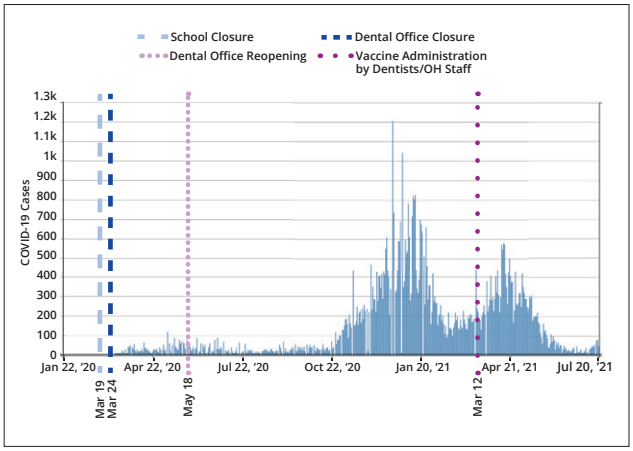


FIGURE 5. New Hampshire

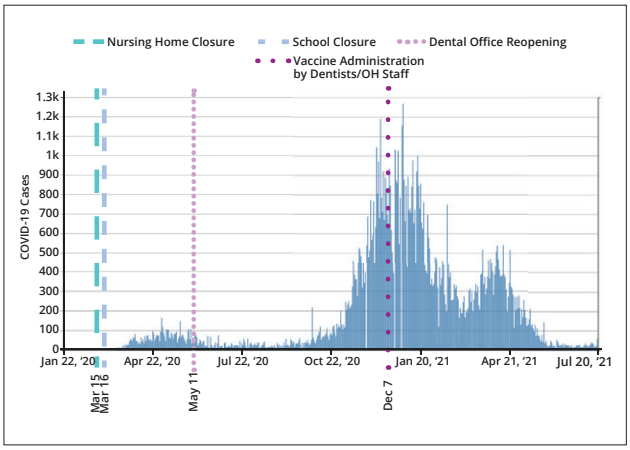


FIGURE 6. Vermont

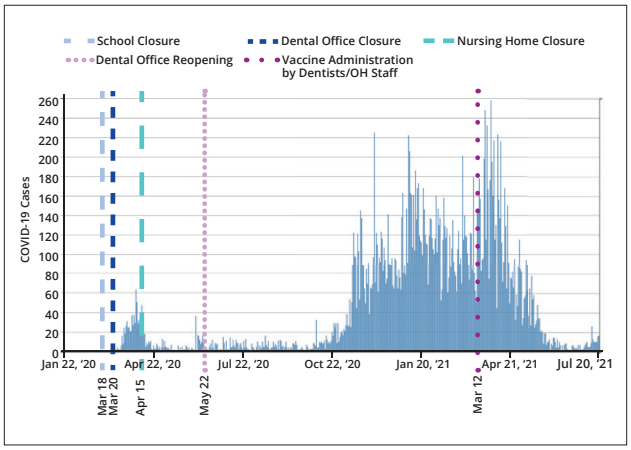


FIGURE 7. Massachusetts

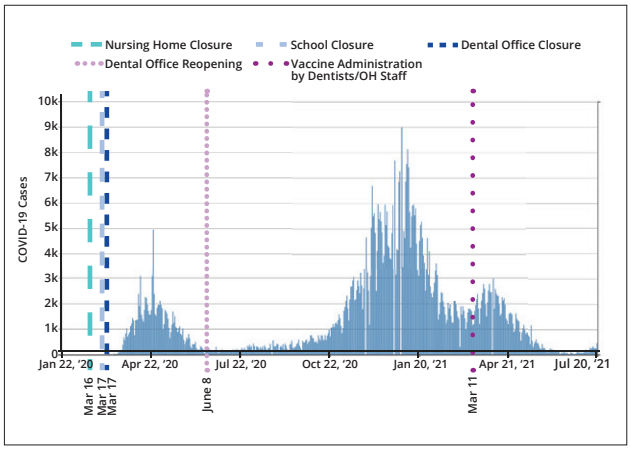


FIGURE 8. Rhode Island

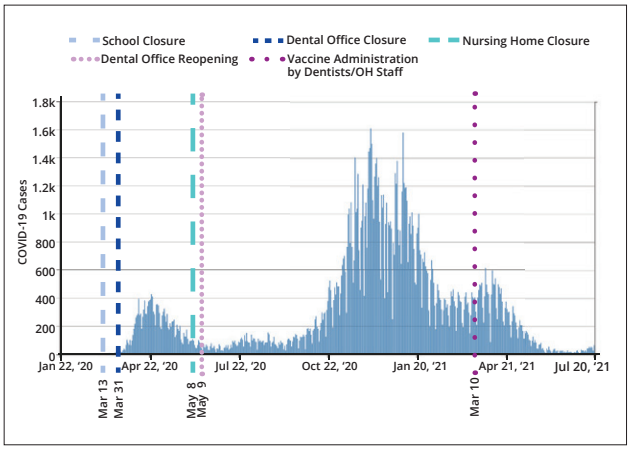
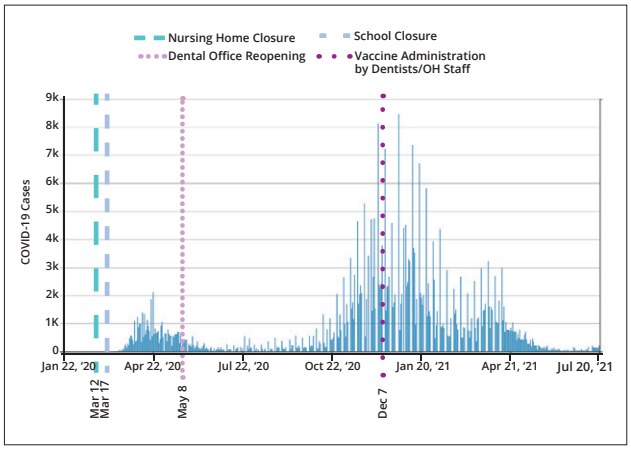


FIGURE 9. Connecticut



* Sources: See Appendix B.

FIGURE 10. New York (not including New York City)

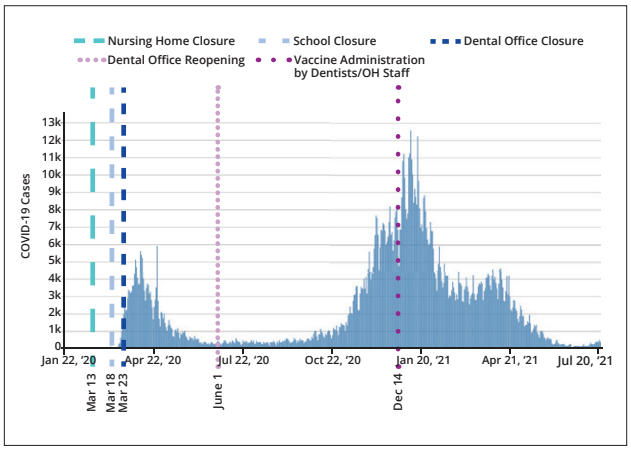


FIGURE 11. New York City

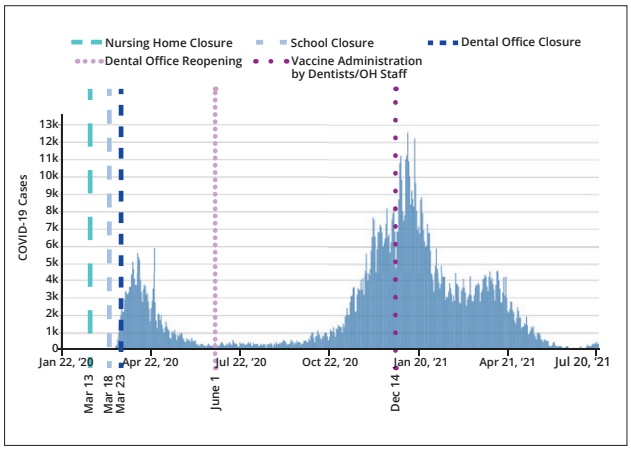


FIGURE 12. New Jersey

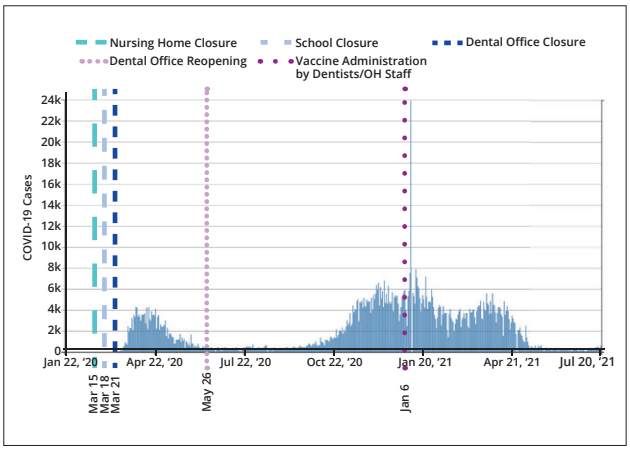


FIGURE 13. Pennsylvania

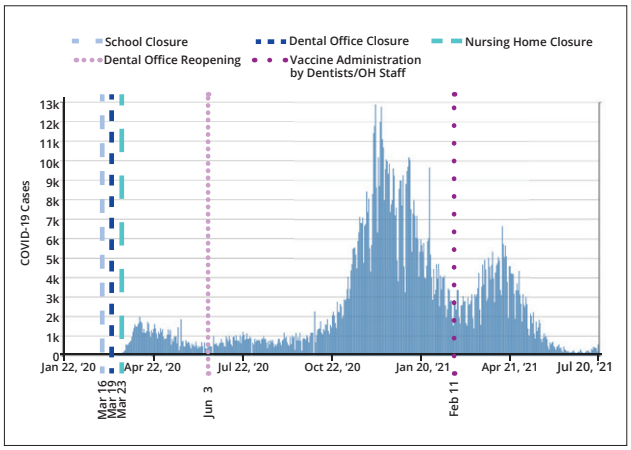


FIGURE 14. Wisconsin

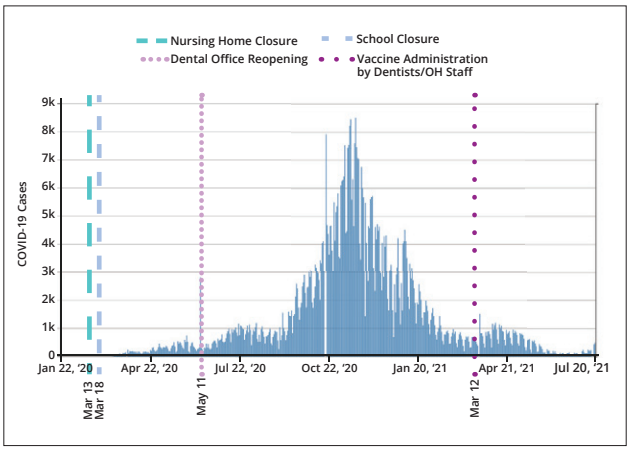


FIGURE 15. Michigan

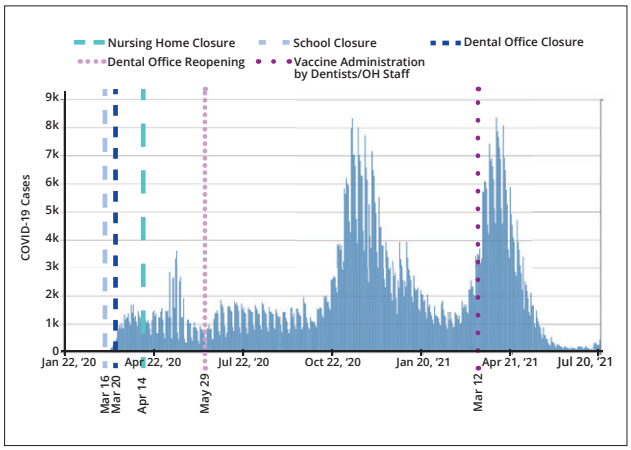


FIGURE 16. Ohio

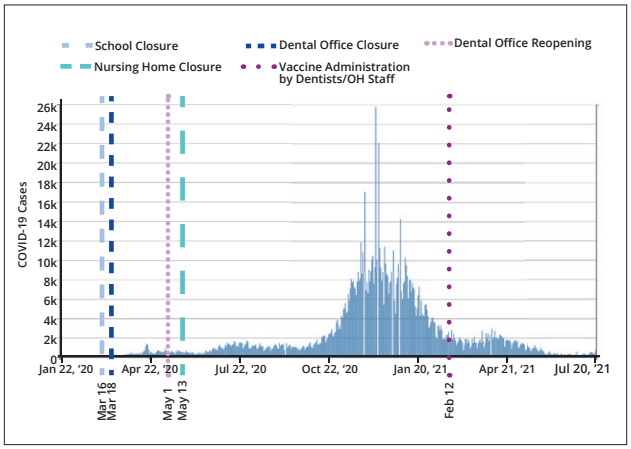


FIGURE 17. Illinois

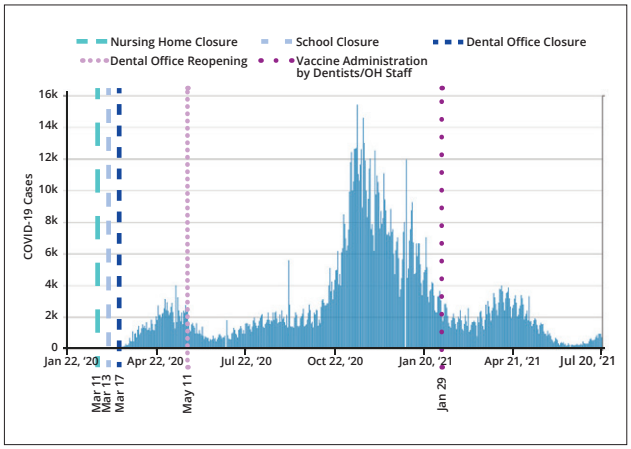


FIGURE 18. Indiana

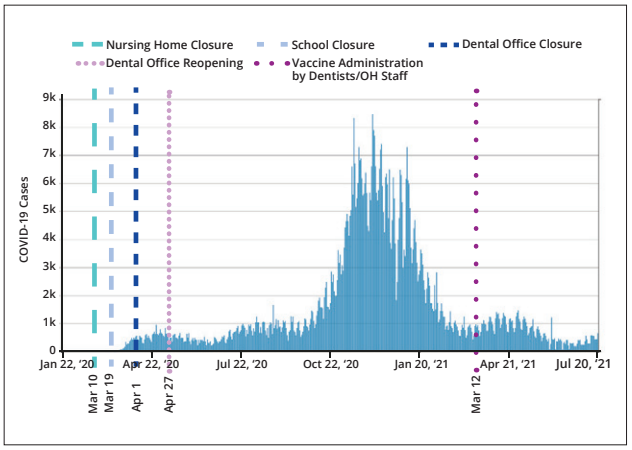


FIGURE 19. Minnesota

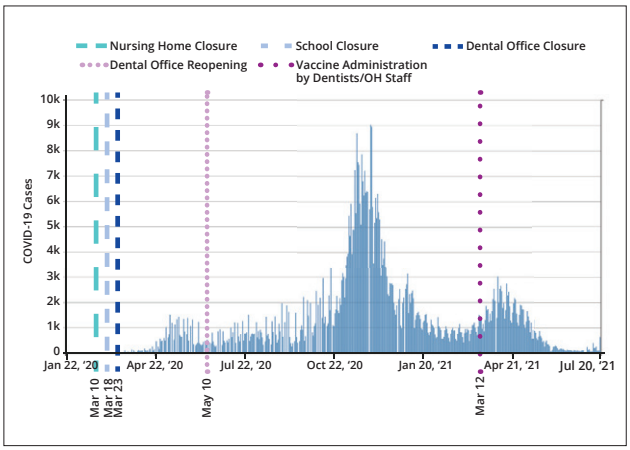


FIGURE 20. North Dakota

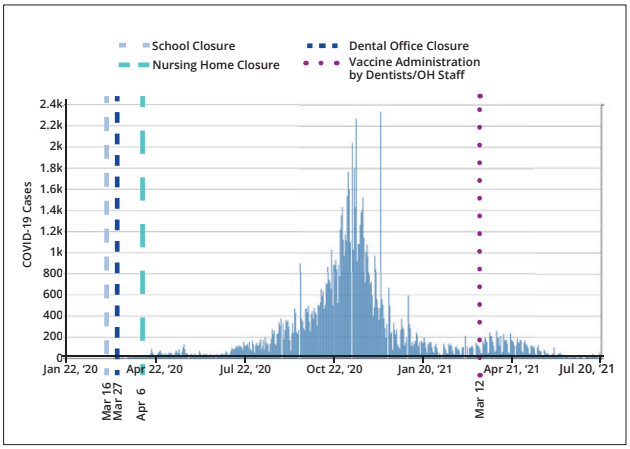


FIGURE 21. South Dakota

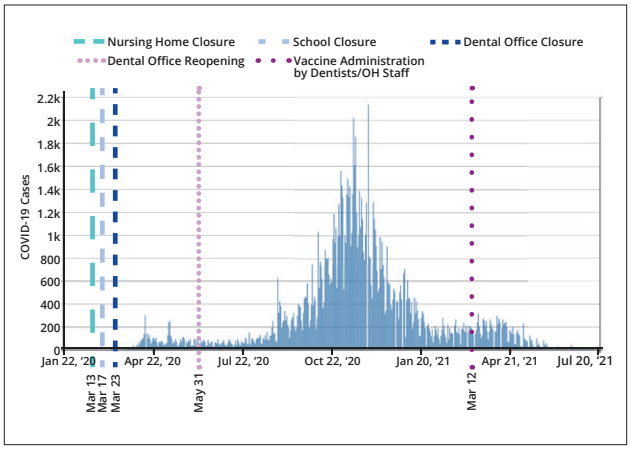


FIGURE 22. Iowa

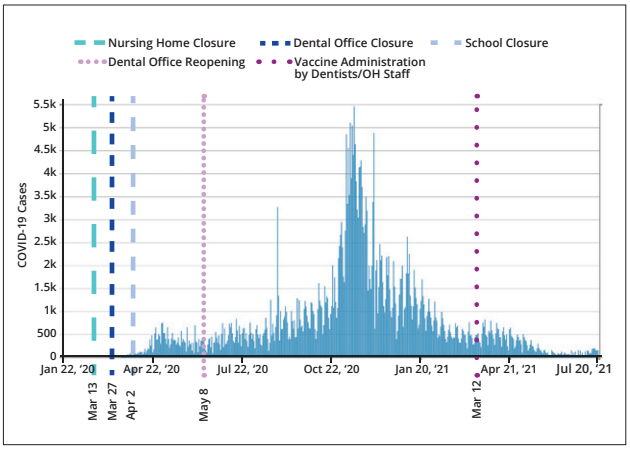


FIGURE 23. Nebraska

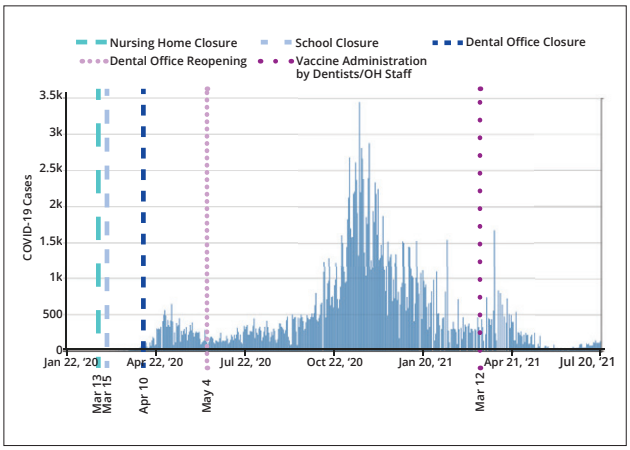


FIGURE 24. Kansas

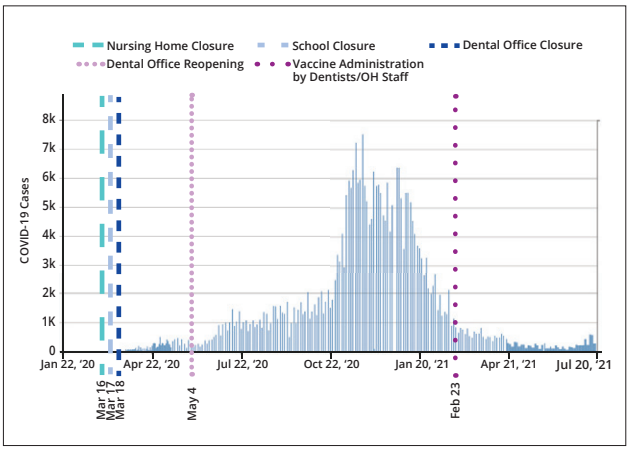
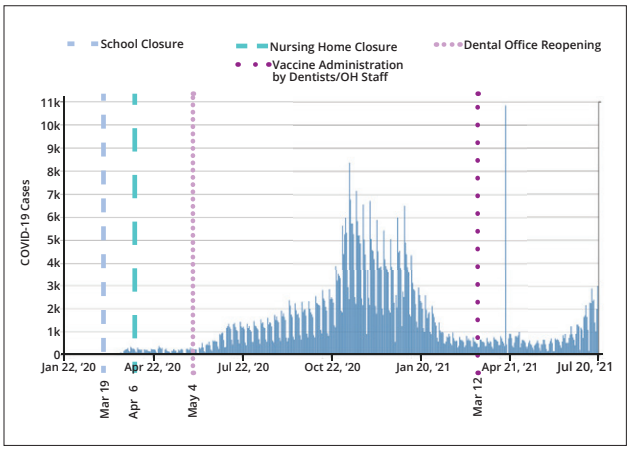


FIGURE 25. Missouri



South (South Atlantic)

FIGURE 26. Delaware

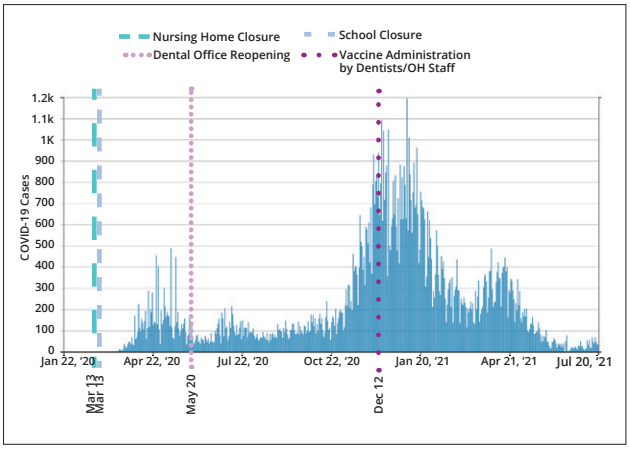


FIGURE 27. Maryland

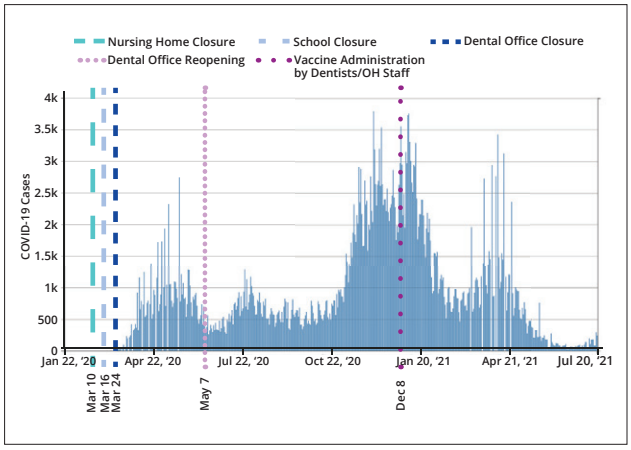
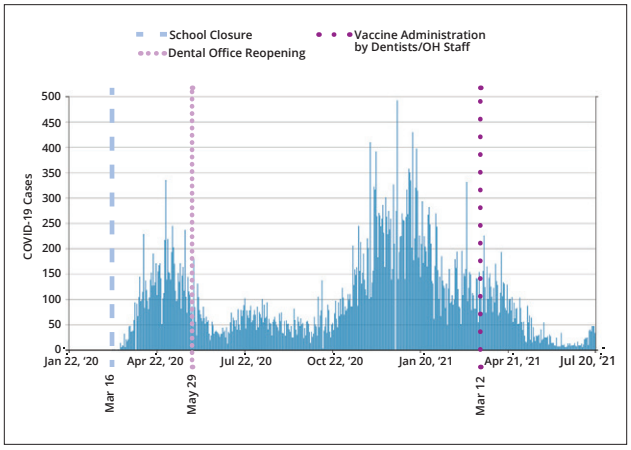


FIGURE 28. District of Columbia



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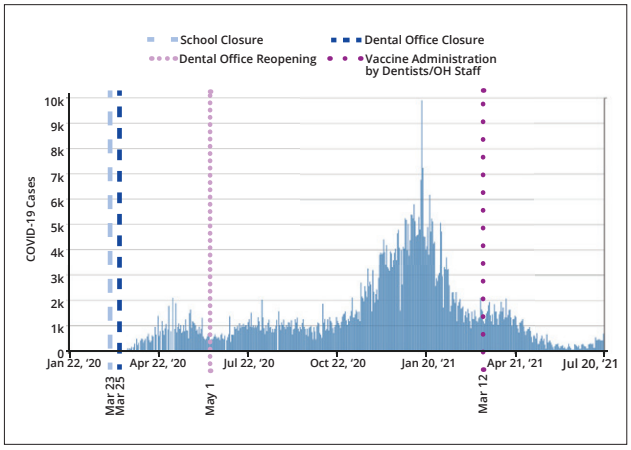

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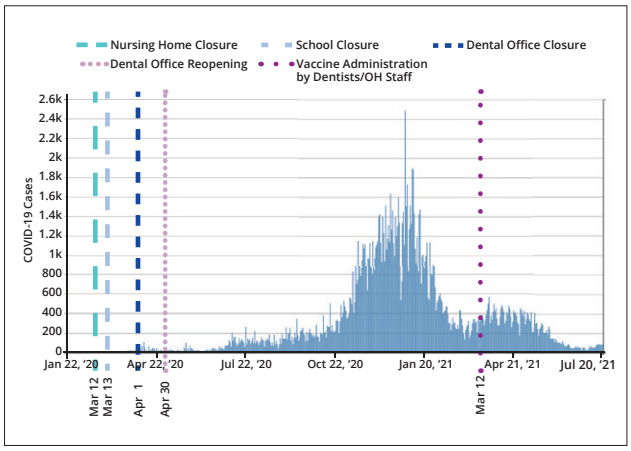
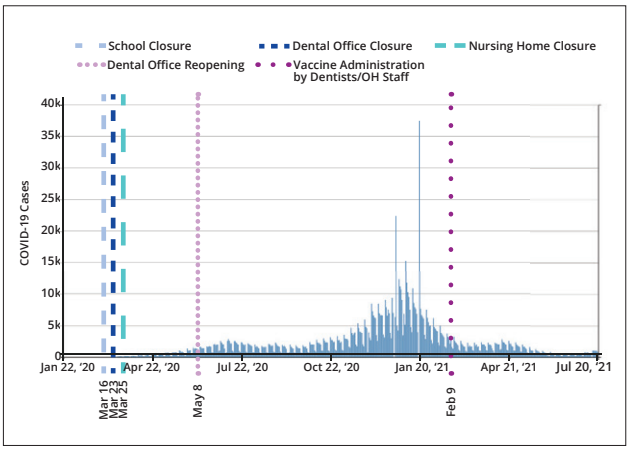


FIGURE 31. North Carolina



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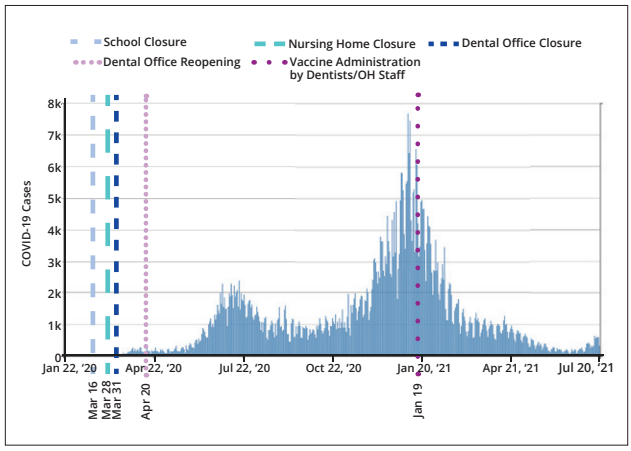

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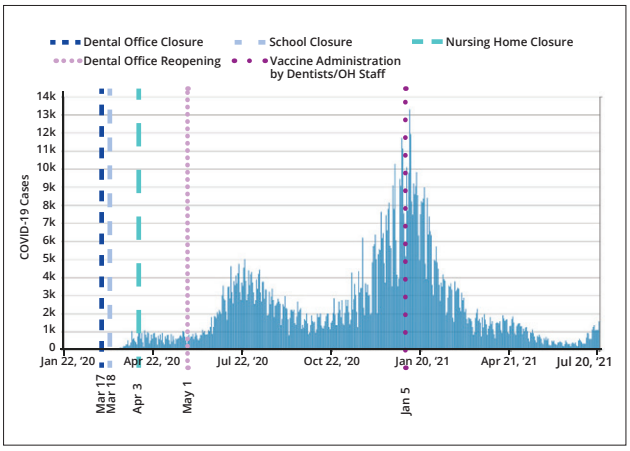

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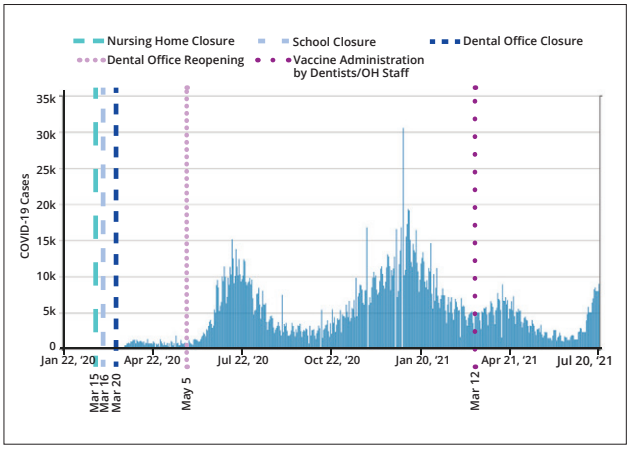

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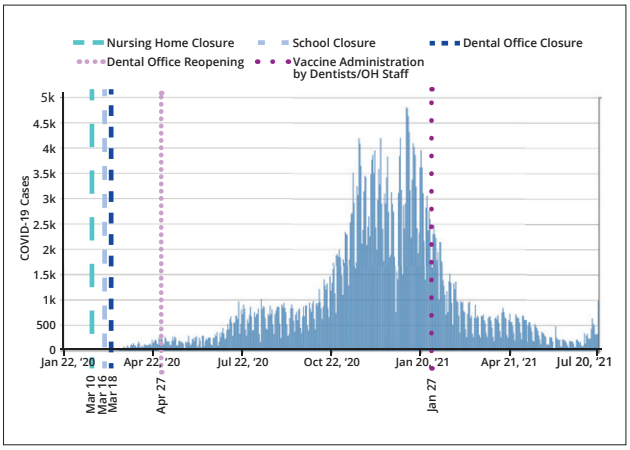

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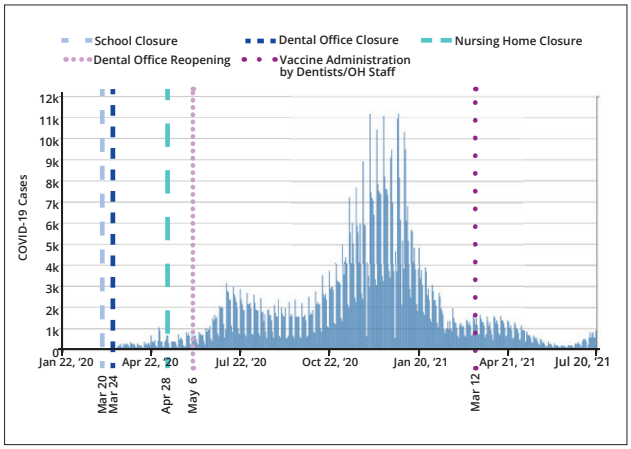

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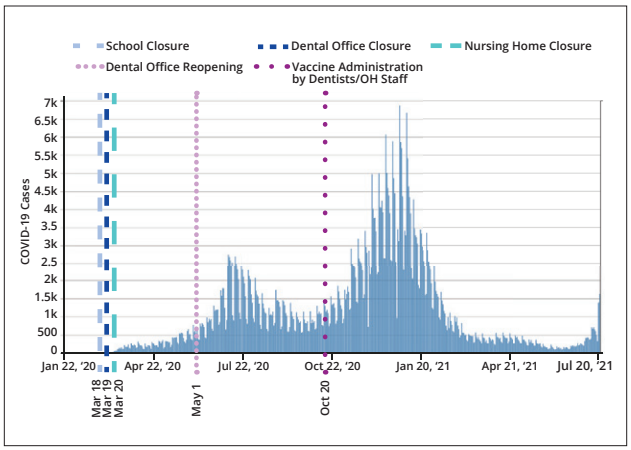
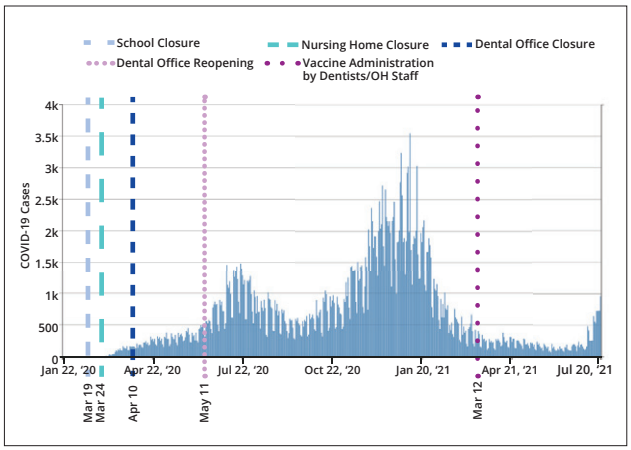


FIGURE 38. Mississippi



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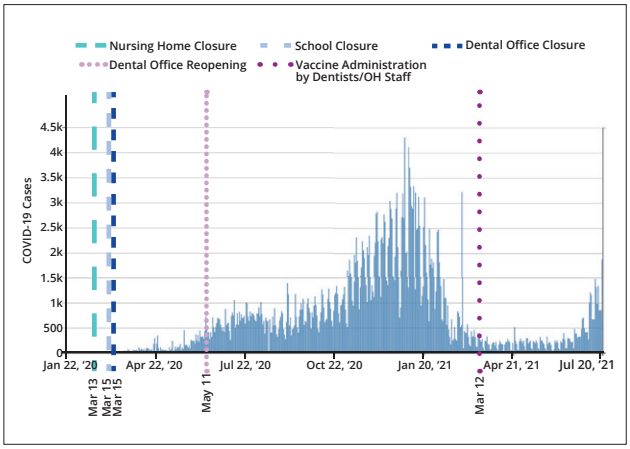

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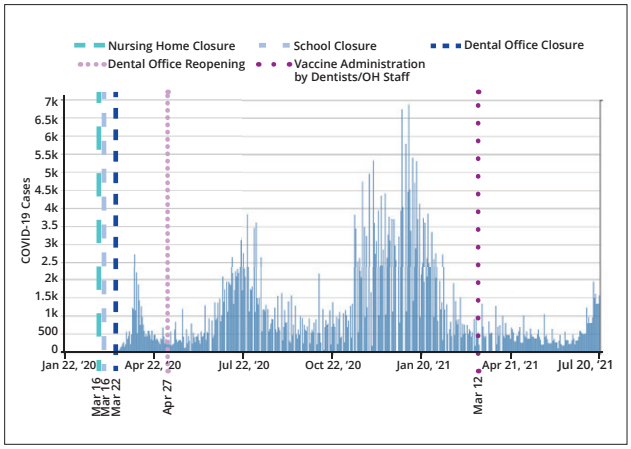


FIGURE 41. Oklahoma

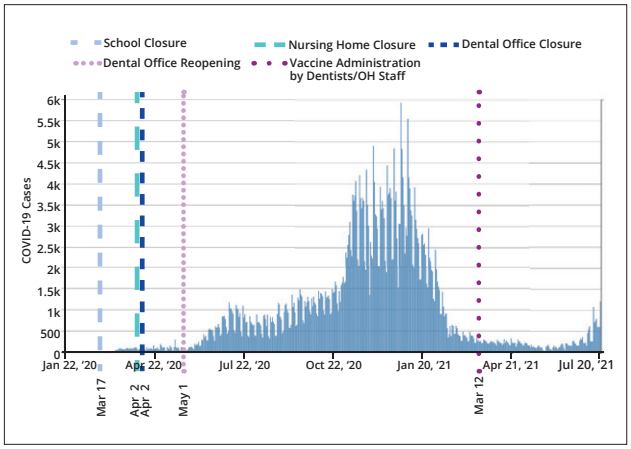


FIGURE 42. Texas

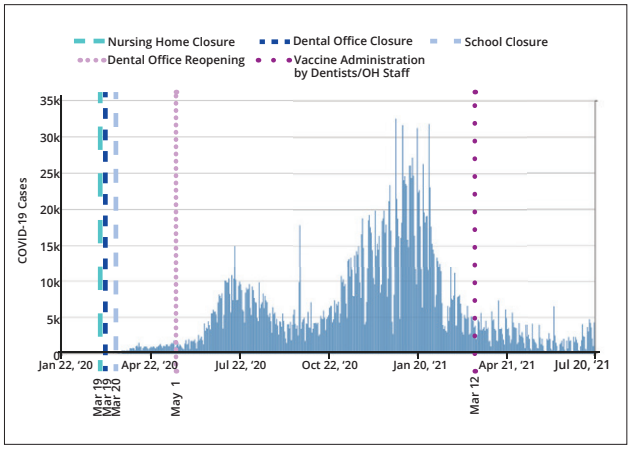


FIGURE 43. Idaho

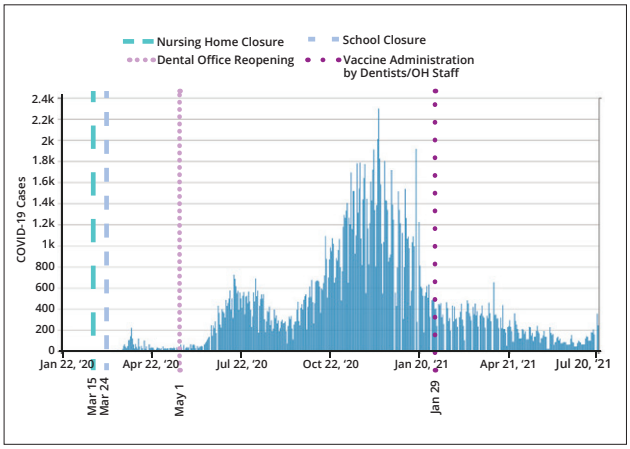


FIGURE 44. Montana

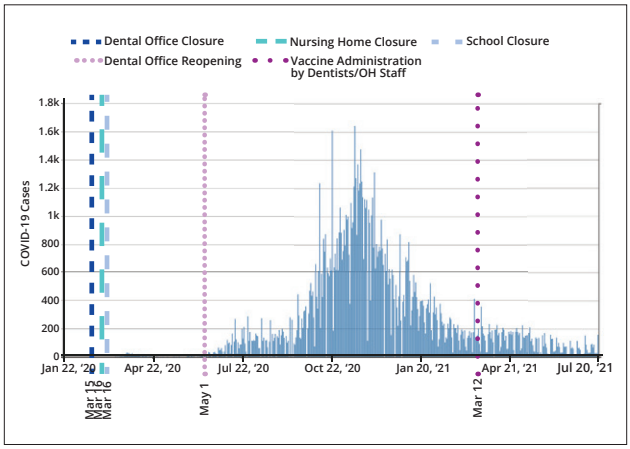


FIGURE 45. Wyoming

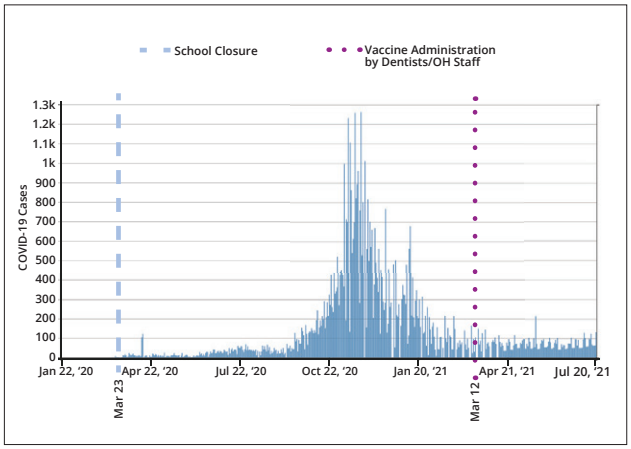


FIGURE 46. Colorado

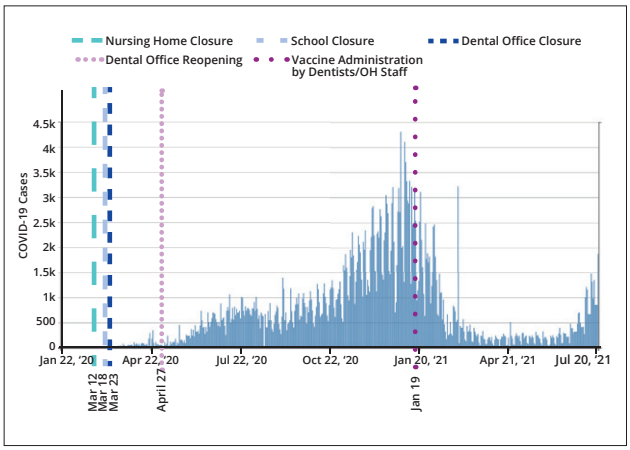


FIGURE 47. Utah

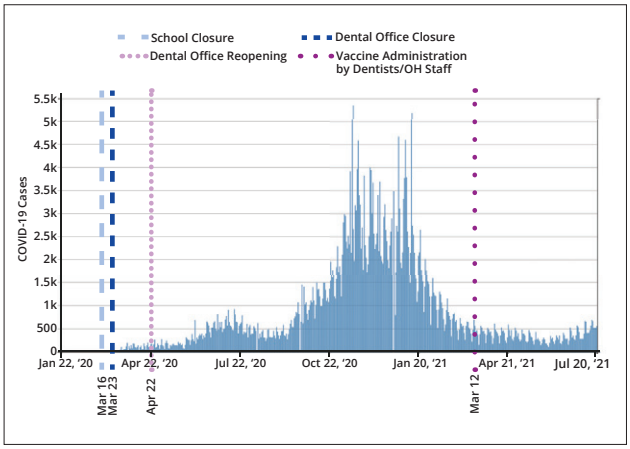


FIGURE 48. Nevada

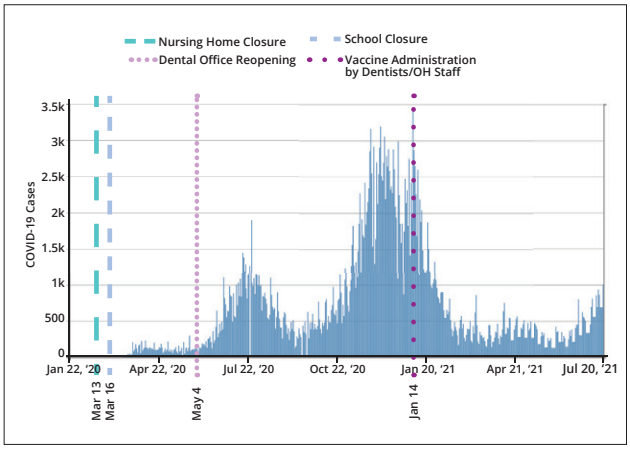


FIGURE 49. Arizona

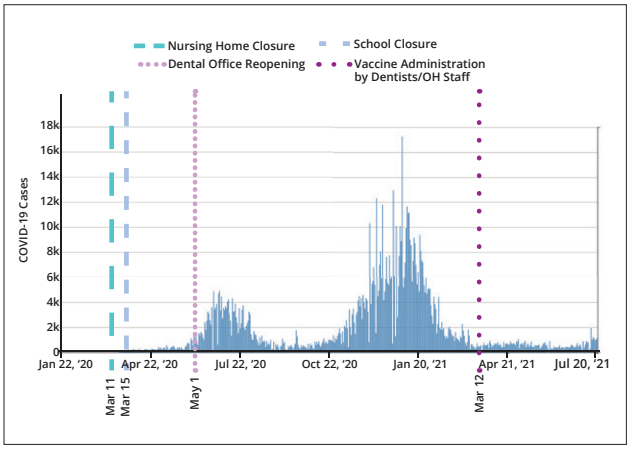


FIGURE 50. New Mexico

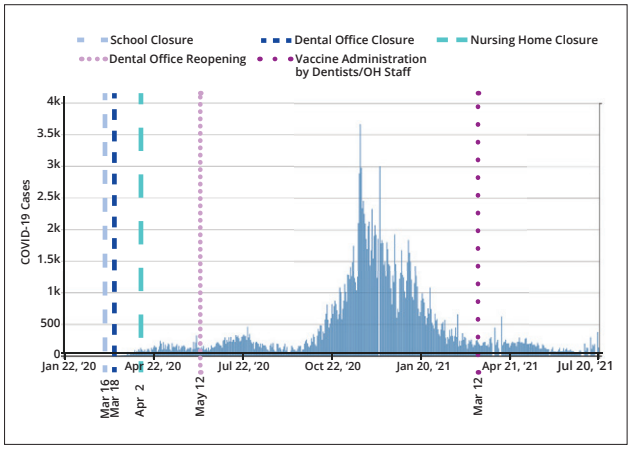


FIGURE 51. Alaska

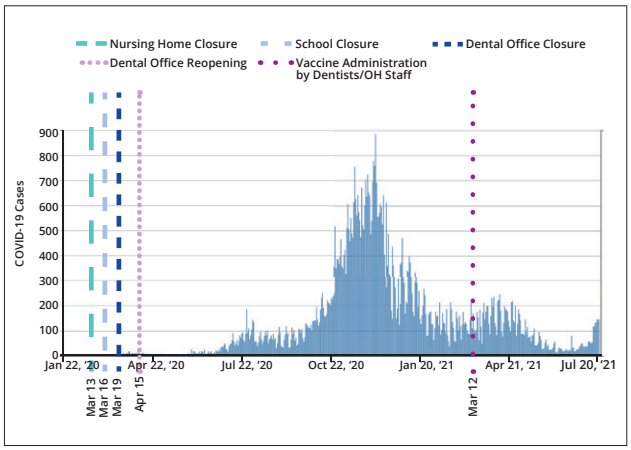


FIGURE 52. Washington

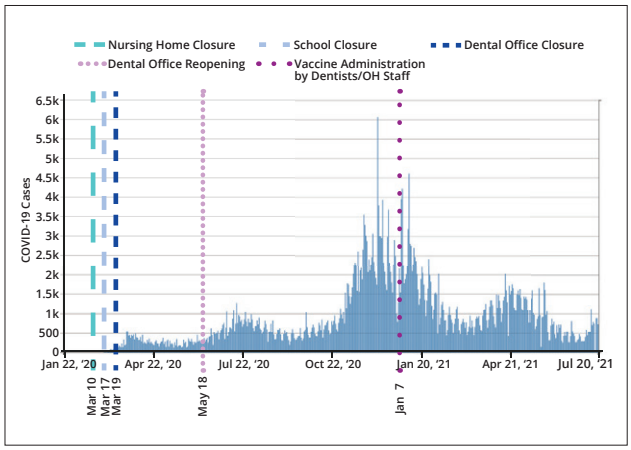


FIGURE 53. Oregon

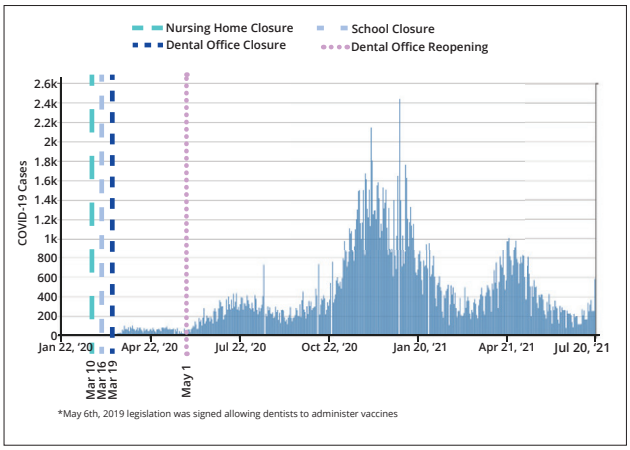


FIGURE 54. California

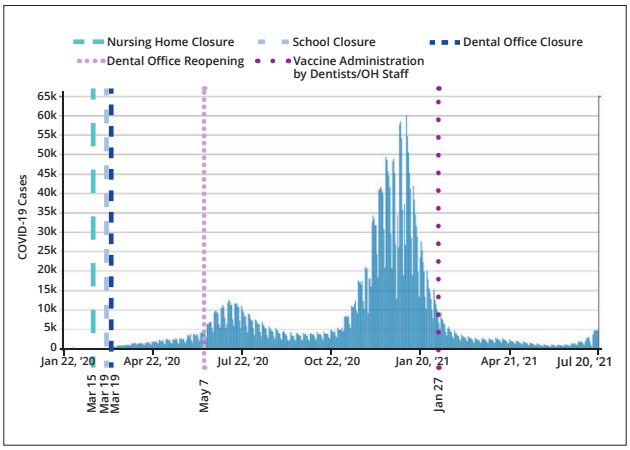
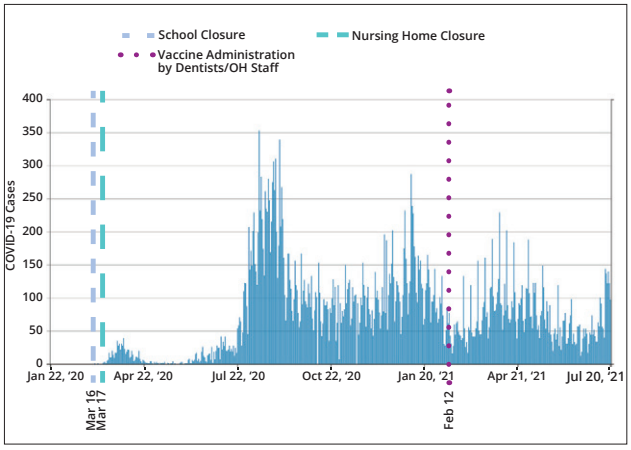


FIGURE 55. Hawaii



State Regulation of Healthcare Professions

Executive orders and regulatory waivers were used throughout the PHE to suspend regulations that restricted the ability of healthcare organizations to provide essential care. These regulations included those affecting licensure and scope of practice (SOP) for healthcare clinicians. Our review of hundreds of executive orders in all 50 states, however, found that most addressed clinicians working in medicine or allied health and few included dentists or other dental clinicians. This is, of course, reasonable since COVID-19 was a systemic virus, but the omission of dentistry in many of the COVID-19 directives is a visible manifestation of the entrenched separation of medicine and dentistry. The perception of oral health, both among the public and in policy circles, as a nonessential health service impedes integration. In this case, it was a missed opportunity to actively engage professionals with expertise in infection control during the most critical months of the pandemic.

Licensure

Many states recognized that the licensure application and renewal process for healthcare professionals would be disrupted by COVID-19. Often, regulatory agencies were required to close their offices and/or work remotely. In the early months of the pandemic, governors and professional regulatory boards issued orders waiving certain requirements for licensure and relicensure in order to prevent disruption of care delivery. One obvious concern was that professionals with expiring licenses who were unable to renew in a timely manner would be unable to continue to practice. This would be especially disruptive at a time when clinical workforce shortages were of great concern. States addressed this issue by extending licensure periods and by temporarily foregoing requirements for the completion of continuing education or by allowing all continuing education to be obtained virtually.

Also, due to the closure of medical, dental, and allied health education programs, and the subsequent unavailability of traditional testing mechanisms, especially live clinical examination testing sites, state regulatory agencies adjusted requirements for new graduates and new license applicants. In many states, dental boards allowed the replacement of the required live clinical examination for dentists and dental hygienists with mannequin-based examinations. States also issued temporary licenses (eg, Colorado) to many new graduates who were unable to meet all requirements for initial licensure due to the constraints of COVID-19.[26] These measures allowed new clinicians to supplement the existing workforce during the first critical months of COVID-19 and to delay full licensure until pathways to completion of requirements were once again available. In many cases, the executive orders in states required that those granted temporary licenses be indirectly supervised by a licensed professional when providing clinical services.

In addition, many governors waived licensure requirements for clinicians from other states to practice in their state. These measures enabled traveling clinicians and volunteer providers to work in states where they were not licensed, which helped to meet the unexpectedly high demand for services especially in hospitals. Our review of SOP changes that occurred during recent months found that, in fact, several states were passing legislation to create a new class of licensure for dentists and dental hygienists called volunteer licenses. These changes

were intended to enable retired, inactive, or out of state clinicians to obtain legal status to practice during a public health emergency. Inserting this class of license into statute is a more permanent alternative for licensing during subsequent crisis so that inactive or out of state health and dental providers would not need to wait for executive orders to practice.

Scope of Practice

Pennsylvania was among the few states to issue specific regulations early in the pandemic addressing the full complement of the health workforce. These orders were benchmarks since they allowed for the use of the broad capabilities of various professionals to combat the many challenges of a PHE.

On May 6, 2020, Governor Tom Wolf of Pennsylvania issued an inclusive executive order[27] waiving a long list of regulations governing healthcare organizations and the clinical workforce, including aspects of licensure and SOP. These directives included dentists and oral surgeons. According to the Pennsylvania Board of Dentistry, pursuant to this order, dentists were permitted to:[28]

- Triage patients in hospitals, long-term care facilities, and in other health systems
- Accept emergency referrals from hospitals and other providers
- Collect throat cultures
- Collect nasal swabs
- Prescribe, administer, and dispense medications without regard to the requirement that these actions only be taken in the course of dental professional practice
- Conduct examinations and take medical histories in conjunction with prescribing that was not undertaken during the course of dental services and not being entered into the dental record
- Reorder an emergency prescription without doing a dental examination

Oral surgeons with unrestricted anesthesia permits were allowed to help with stabilizing patients and other tasks "lawfully delegated" by a physician.

The order also provided a broad provision for qualified immunity; that is, protection against liability for good faith actions taken by clinical providers, including dentists, in response to the COVID-19 emergency, while supplementing the traditional workforce and battling the virus in patients. In some states where qualified immunity was granted, dentists were excluded. In New York State, for instance, medical professionals were granted qualified immunity for problems arising while treating patients with COVID-19; however, dental professionals were not included in the waiver.[29] This is another instance where an omission of executive orders and regulations point to the separation of medicine and dentistry.

SOP regulations were also waived for some professionals especially for nurse anesthetists, nurse practitioners, physician assistants, and registered nurses in order to maximize capacity and efficiency within the clinical workforce. Dentists were not typically included in these directives; however, there were states where SOP for dentists was either extended or clarified. One of the first issues that arose was whether a dentist could perform rapid testing since the process involved nasal swabs. Dental SOP limits the dentist to diagnosis and treatment of the oral cavity. Several states issued executive orders describing the conditions under which dentists could provide testing. Most discussed point-of-

care testing, requiring that any dentist performing the service be certified (ie, trained) and have a clinical laboratory improvement amendment (CLIA) waiver. North Carolina issued a standing order in January 2022, which discussed COVID-19 testing and included dentists as providers of the service. In September 2020, the governor of New York issued an executive order indicating that dentists could provide point-of-care testing provided they were certified (trained) and had a CLIA waiver.[30]

MOVING FORWARD

The impact of federal and state regulation on the delivery of health and oral health services was readily apparent during the protracted COVID-19 pandemic. Regulation is neither elastic nor readily changed so the powers conferred through the declaration of the state of emergency in the US provided both federal authorities and state governors with the necessary flexibility to expand or override existing regulatory mechanisms and tailor public health interventions to meet the pressing needs of their populations. These executive powers allowed for more immediate resources to address the escalating healthcare crisis in the US.

COVID-19 was a catalyst in a natural experiment to find ways to allow access to health and dental services while preserving critical and finite organizational and clinical capacity within the healthcare delivery system for the urgent needs of those most affected by the disease. Loosening of cross-state licensure restrictions, SOP boundaries, and regulations governing telehealth and teledentistry proved to be positive interventions in states' efforts to manage limited resources to the benefit of many. As management of COVID-19 has improved and as the healthcare system moves into the post-pandemic phase, it is important to consider the lessons learned. It will be useful to study the utility of revising burdensome regulatory limits to allow the healthcare workforce to function more efficiently and use their highest skills and abilities on an ongoing basis. Health workforce shortages, especially in the direct care occupations and professions, are persistent despite the mitigation of the COVID-19 emergency. Learning from state's best practices and creative initiatives during the critical months of the pandemic may better equip the healthcare delivery system to address emerging challenges in service delivery.

One major lesson from the pandemic is that the complex regulatory systems at both the federal and state levels provide safeguards for the public, but they are also inhibiting. Achieving greater consensus across jurisdictions through licensure compacts; universal regulations for nonessential Medicaid services, especially adult dental benefits; and common regulatory guidance for telehealth and teledentistry services across states would better standardize practice for healthcare professionals and benefit the public.

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CHAPTER 3: FINANCE

THE FINANCIAL IMPACT OF COVID-19 ON DENTAL CARE

At first, policies in response to the SARS-CoV-2 (COVID-19) pandemic closed dental practices to emergency services only across the United States (US). Then new policies required extensive clinical reorganization and protective equipment to reopen safely as scientists studied transmission patterns and susceptibility and local authorities adjusted guidelines and recommendations in real time. Patient volumes and revenue have cyclically followed the ebbs and flows of local COVID-19 infections, while operating costs have increased with added infection control measures. Societal restructuring resulting from the disjointing chaos led to massive workforce shortages, particularly in the dental hygiene and dental assistant workforce, while relief efforts from a multitude of organizations have tried to mitigate the economic impacts of the COVID-19 pandemic. All of this – closures, added operational costs, staffing issues, relief efforts – has had major short- and long-term effects on the dental care delivery system in the US. This chapter discusses the financial implications of the COVID-19 pandemic with a particular focus on the effect on the dental workforce.

THE RAPID RESPONSE TO REDUCE FINANCIAL HARDSHIP

Closures and Staffing

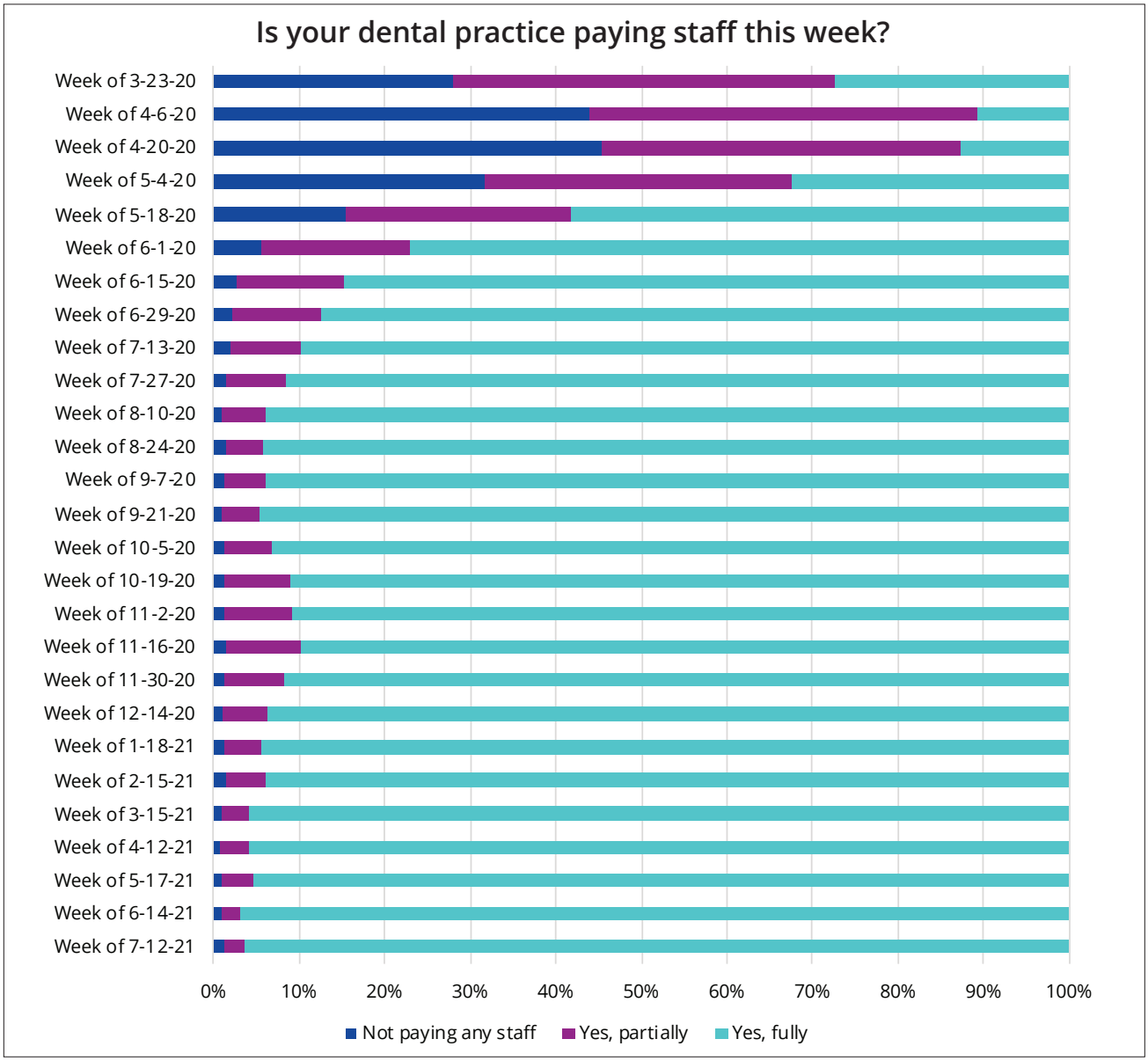
Across all sectors, national health spending was severely impacted by COVID-19. In the early months of COVID-19, shelter-in-place mandates required people to stay at home and practice social distancing and proper hygiene and sanitation behaviors whenever they needed to leave home.[1] At around the same time, the World Health Organization and the Centers for Disease Control and Prevention (CDC) announced for health care professionals, including dentists, to cease all elective, nonurgent procedures.[2,3] These measures were enacted to promote safety and to build surge capacity for access to primary care services, including COVID-19 testing and treatment. However, these measures came at a cost. A study reviewing the initial impact of the closures shows that 2020 was the first year ever to show an annual decline in overall health spending since the Centers for Medicare & Medicaid Services (CMS) began tracking spending more than 50 years ago.[4] In April 2020, year-over-year national health spending was down 20.1%, and while spending gradually increased over the year, it was still 2.3% lower than 2019.

While most health care sectors experienced a decline in patient visits and spending, the COVID-19 pandemic posed dramatic financial challenges for dental professionals. At the early stages of COVID-19, dental services saw a 16.8% decrease in health spending, the largest health spending decrease compared to all other health sectors.[4] The early decline in dental spending mirrored trends in medical sectors; however, dental spending took much longer to "bounce back."[5,6] By October 2020, dental spending was still far below pre-COVID-19 levels in February 2020: cumulative health spending growth was -16.8% for dental services compared to 14% for home health care, -3.1% for physician and clinical care, and -3.6% for hospital care.[4] It was hypothesized that these disparate impacts on health care spending were likely due to public apprehension to seek routine dental services and that the combined reduced demand and increased cost of providing services safety heightened these

trends in the dental sector. This decreased trend in dental service utilization and spending continued throughout the COVID-19 pandemic, and we can expect the impact of COVID-19 on health and health care will be experienced for many years to come.

As a result of clinic closures and limited practice revenue early on, many dental practices had to lay off or furlough their staff. During March-April 2020, nearly 1.5 million health jobs were lost in the US, including over half of all dental providers, making up 35% of all lost health-care jobs.[7–9] The American Dental Association (ADA) Health Policy Institute continually surveyed dentists from March 2020-December 2021, analyzing COVID-19's impact on US dental practices.[10,11] Survey results have been distributed regularly on the ADA Health Policy Institute's website or through webinars, and data can be broken down by state, practice characteristics, and setting type (private vs. public health practice). By mid-April 2020, 45% of dentists had furloughed all staff **(Figure 1)**.[12] The likelihood of staff being

FIGURE 1. Distribution of ADA Health Policy Institute Survey Respondents Reporting Staff Payment by Survey Week, March 23, 2020-July 12, 2021



furloughed was slightly higher in practices that were affiliated with a dental service organization (DSO), even though only about 7% of survey respondents identified as such.[13]

For private-practice dentists, a "new normal" set in around the end of June 2020. As practices reopened, staff were rehired, and in May 2020, 10% of all new jobs could be attributed to the dental care sector.[14] Safety net providers were also hit by closures and staff furloughs at similar rates to private-practice dentists. A survey of dentists practicing in Federally Qualified Health Centers (FQHCs) found that about 31% of dentists had laid off or furloughed most or all of their staff by the end of May 2020.[15] By the end of August 2020, that number was down to 9%, but at least 44% still reported some staff laid off or furloughed at that time. The ADA Health Policy Institute surveys suggest a similar pattern – private practices had rebounded to about 80% of pre-COVID-19 levels by September 2020, but public health settings were still at less than 60% of patient volume at that time.[16,17] Such extensive staff furloughs were necessary as FQHCs reported nearly $34 billion in lost revenue due to lower utilization during COVID-19.[18]

Immediate Relief Efforts

The federal government's initial response to mitigating financial hardships was to pass several enormous economic relief bills that benefited both individuals and businesses affected by closures due to COVID-19, such as dental practices:

1. Coronavirus Preparedness and Response Supplemental Appropriations Act (March 6, 2020)
2. Families First Coronavirus Response Act (March 18, 2020)
3. Coronavirus Aid, Relief, and Economic Security (CARES) Act (March 27, 2020)
4. Paycheck Protection Program and Health Care Enhancement Act (April 24, 2020)

The first of 3 COVID-19 relief bills passed in March 2020. The **Coronavirus Preparedness and Response Supplemental Appropriations Act** focused on emergency response efforts both domestically and globally, but included 3 provisions key to the dental care sector: $20 million for the Small Business Administration (SBA) to provide disaster loans to businesses financially impacted due to COVID-19, $500 million for a waiver that would allow Medicare providers to practice telehealth to all patients, and $100 million directly to Community Health Centers (like FQHCs) on top of $1 billion for the purchase of personal protective equipment (PPE) and to improve surge capacity.[19,20]

This was followed by the **Families First Coronavirus Response Act**, which focused domestically on expanding the Family and Medical Leave Act for sick leave due to COVID-19 illnesses or school and child care closures and providing additional funding for unemployment benefits, in addition to nutrition assistance and insurance coverage for COVID-19 testing.[21] Specifically, private employers with fewer than 500 employees and all public employers were required to provide additional protected leave to their employees. A few stated exemptions, however, drew questions from the dental care sector, including an exemption for "employers of health care providers" and small businesses with less than 50 employees that can "demonstrate that providing the leave would affect the viability of the business."[22] It would later become clear that clinical health care providers can be exempt from the new provisions,

but not administrative staff. The Families First Coronavirus Response Act also provided a 6.2% increase in federal matching funds for Medicaid enrollees to help support states. It ensured continuous coverage of current enrollees to promote stability of coverage for Medicaid enrollees throughout the duration of the public health emergency (PHE). Once the PHE ends, states will resume redetermination.[23]

The **CARES Act**, an extensive relief package of around $2 trillion, in addition to extending some of the benefits in the first 2 acts, had several significant provisions for the dental care sector. The ADA and the Academy of Dental CPAs (certified public accountants) (ADCPA) worked collaboratively to produce guiding documents explaining the programs available to dental professionals.[24] Within the CARES Act, many SBA loan options offered dental professionals an avenue to financially support their practices during COVID-19 ($380 billion was allocated to support small businesses). Programs such as the Paycheck Protection Program (PPP) allowed dentists to continue compensating their employees despite mandated office closures. Another, the Economic Injury Disaster Loan (EIDL), was an emergency loan that allowed dental practices to receive and advance funds of up to $10,000 to be disbursed within 3 days. The EIDL funds could be used to pay for expanded employee sick leave, mortgage or rent, or other overhead expenses, and were available on a first-come, first-served basis until the $10 billion fund was depleted. The CARES Act also included several loan forgiveness provisions on existing SBA loans for a 6-month period. According to the ADA Health Policy Institute, more than 90% of their survey respondents had applied to the PPP and nearly 60% had applied to the EIDL program.[16] Another data source reported that nearly 74% of SBA loan applicants received funding, 23% received both PPP and EIDL, 41% received PPP only, and 7% received EIDL only.[25] They also reported an average PPP loan amount per clinic of $92,000, the equivalent of only 14% of typical January 2019-June 2019 revenue. Early data from a survey of California providers in mid-May 2020 reported SBA loan applicants by practice type, with all dental corporations, 69% of private practices, 60% of mobile clinics, and 51% of FQHC respondents applying for support.[26] One-third of survey respondents reported that the awarded amounts were not adequate for their business needs, though most providers working at FQHCs felt it was adequate.

In addition to SBA loans, the CARES Act included $15 billion to the US Department of Health and Human Services to offer Provider Relief Funds for health care providers, including dentists, who participate in Medicaid and the Children's Health Insurance Program.[27] With the Provider Relief Fund, dentists could be reimbursed up to 2% of their annual reported revenue to cover expenses such as PPE, testing, or training,[9] but the purpose was not meant to cover dentists' gross income.[28] Unlike other providers, dentists qualified for funding from the Provider Relief Fund with looser restrictions; they were eligible whether or not they accepted any public insurance in the past.[29] According to ADA Health Policy Institute survey data, the rate of Provider Relief Fund applicants was the same between dentists who did and did not participate in Medicaid.[16]

Another provision of the CARES Act, the Employee Retention Tax Credit (ERTC) was an option for financial relief and was designed to encourage businesses to keep employees on their payroll. The ERTC, a refundable tax credit, was 50% or up to $10,000 in wages paid by an eligible employer

whose business had been financially impacted by COVID-19. But dental providers could only take a forgivable PPP loan or the ERTC in the original bill, which meant only a handful of them could actually use the credit.

On an individual basis, the CARES Act allowed for penalty-free withdrawal of retirement funds (up to $100,000), pauses on federal student loan payments, no income tax on loan payment assistance for employees (up to $5,250), deferred Social Security tax payments, and included federal income tax rebates and enhanced unemployment compensation benefits.[22] While not a panacea, the CARES Act was a significant financial mechanism that supported many dentists and dental practices during the early months of COVID-19.[30]

Lastly, in April 2020, the fourth major federal initiative to address COVID-19, the **Paycheck Protection Program and Healthcare Enforcement Act**, provided additional funding for the PPP ($321 billion, now totaling $670 billion overall) and Provider Relief Fund ($75 billion, now totaling $90 billion overall), both established in the CARES Act. It also included $25 billion to cover expenses related to COVID-19 testing.

EMERGENCE OF ACCOMMODATION AND RESPONSE TO THE CRISIS

Infection Control

As dental practices started to reopen after the initial closures, their practice environments had to adapt to new infection control measures, all of which added to the cost of care. This included the new and increased costs of PPE sufficient to prevent COVID-19 transmission, as well as costly infrastructural changes[31] such as adding high-efficiency particulate air (HEPA) filters, ultraviolet ionization, or even negative pressure rooms (once mandated in the state of Pennsylvania).[29,32] Shortages of equipment and supplies due to COVID-19 and supply chain issues further compounded these added expenses. Many providers reported that they felt they could not get the PPE they needed to keep themselves, their staff, and their patients safe,[33] or they could not afford the considerably increased price of standard PPE. About one-third of dentists reported that the cost of gloves, gowns, surgical masks, etc., was over 3 times as expensive in December 2020 compared to before COVID-19.[34] A survey of California dentists reported that overhead costs had increased about 27% in addition to the added costs of PPE.[26] Furthermore, added turnover time between patients (to don new PPE, allow additional antiviral agents to air-dry, etc.) and social distancing requirements reduced capacity and throughput at the dental clinic, and reduced slim profit margins. Not only were there added costs of care (PPE, fewer encounters per day, etc.), but also significant added societal costs of missed care.[35] The CDC estimated that costs to society added up to $45 million in lost productivity and 34 million school hours lost to unplanned/emergency dental care (compared to pre-COVID-19). The societal costs due to delayed care throughout COVID-19 have surely skyrocketed.[36–38]

To offset these costs, some insurers have been reimbursing "PPE fees" per encounter ($7-10),[39] while some providers have been directly charging patients for these added fees[40] (which may have been violating insurance contracts[41]), exacerbating the cost barrier to dental care, especially for underserved populations.[30]

Ongoing Staffing Challenges

Staffing remains an ongoing and critical challenge in returning the dental care system to pre-COVID-19 levels of care. The challenge has been most acute for auxiliary dental staff – dental hygienists, dental therapists, and dental assistants – professions identified as some of the highest at-risk nonhospital occupations due to their close proximity to and contact with patients.[42] Two studies specifically assessed the impact of COVID-19 on employment patterns for dental hygienists and dental therapists.

In late fall 2020, dental hygienists were surveyed on their employment status. This study estimated an 8% reduction in dental hygienist employment, with about 60% of respondents indicating that they left the workforce voluntarily, mostly out of concerns over COVID-19, child care issues, or other safety issues.[43] Older dental hygienists were most likely to voluntarily leave the profession. Nearly one-quarter of dental hygienists reported being furloughed and another 16.7% were laid off permanently. Of the respondents who were still employed as dental hygienists, 60% said they were working the same number of hours as they were pre-COVID-19, while 20% were working fewer hours. More dental hygienists working in solo dental practices reported working fewer hours (about 25%) while dental hygienists working in dental service organizations were least likely to report working fewer hours (about 12%). Most dental hygienists indicated that they would not want to return to work until the COVID-19 pandemic was under control, indicating that the reduction in the dental hygiene workforce is likely to persist as a long-term issue and employers may continue to experience difficulties in filling vacant positions.

Similarly, a survey from the Minnesota Dental Therapy Association indicated that COVID-19 has hit dental therapists hard, too.[44] At the time of the survey in April 2020, only 7 respondents reported working any hours at all, most of them employed by nonprofit practices or clinics. About one-third of respondents indicated that they "have limited finances remaining" or are "financially struggling." Of the respondents who reported not working, most of them were employed by private practices.

Ongoing staffing challenges remain a major issue nationwide. A study out of California reported that 44% of respondent dental practices were unlikely to keep all of their staff employed after the COVID-19 pandemic, though this varied by practice setting with 77% of FQHCs, 60% of mobile dental clinics, 50% of dental corporations, and 36% of stand-alone private practices reporting they were likely to keep all of their staff employed.[26]

Impact on Earnings and Care Delivery

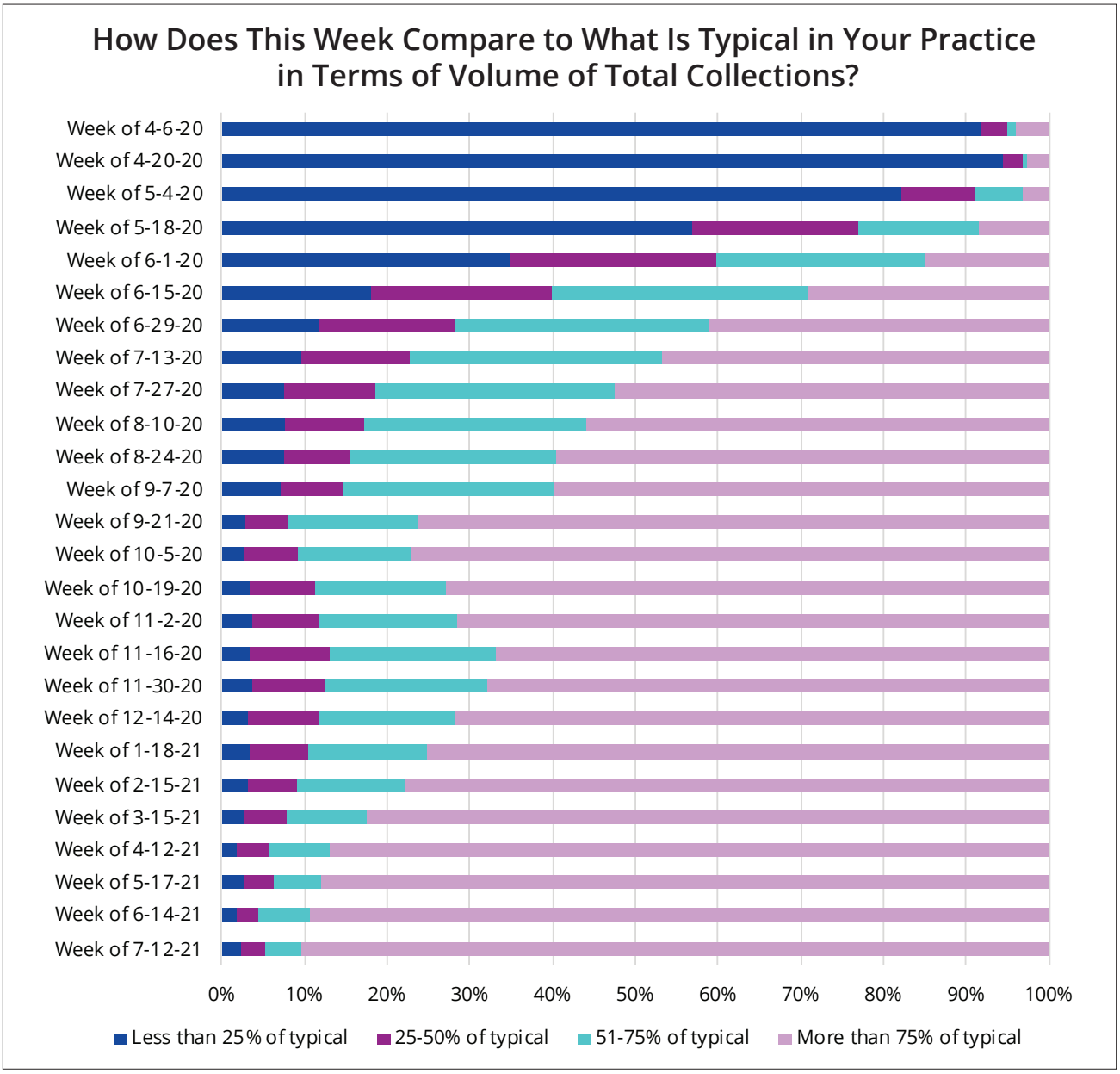
Earnings

Using 2019 and 2020 survey data, the ADA Health Policy Institute was the first to estimate the impact of the COVID-19 pandemic on net incomes for dentists in 2020. They found that 2020 net income was 17.9% lower compared to 2019 for general dentists.[45] Specialist dentists reported less of an impact on net income and hours worked, while female dentists (26.6% decline for female general dentists vs. 14.7% decline for male general dentists) and older dentists saw larger declines (27.5% decline for dentists age 65 and older vs. 10.3% decline for dentists younger than age 40). When comparing net income and hours worked from 2019-2020, the magnitude of the declines was similar, indicating

that earnings declined mostly because dentists worked fewer hours. The ADA Health Policy Institute estimated that the period of time when dental offices were shutdown explained about 67% of the decline in hours for general dentists and 80% of the decline in hours for specialists.

In addition to this analysis, the ADA Health Policy Institute's routine polling has tracked changes in collections week-by-week since the start of COVID-19. A visual representation of the reported volume of collections over time compared to a typical pre-COVID-19 week can be found in **Figure 2**.[12] Early in spring 2020, collections were very low compared to pre-COVID-19 weeks, tracking with mandated dental clinic closures, but collections have steadily increased and patient volume was around 86% on average in April 2021.[46] Dentists reported that

FIGURE 2. Distribution of ADA Health Policy Institute Survey Respondents Reporting Volume of Total Collections Compared to a Typical Pre-COVID-19 Pandemic Week, by Survey Week, April 6, 2020-July 12, 2021



raising fees, taking out loans, changing suppliers, and participating in federal programs (eg, the Paycheck Protection Program, Provider Relief Fund), in addition to more widespread vaccine rollout to the public, had led to this result. The ADA Health Policy Institute estimated that approximately 95% of dentists received some form of government relief during the COVID-19 pandemic, with general dentists receiving an average of $91,000 and specialists receiving an average of $109,000.[45] By August 2021, 99% of private practice dentists said they had reopened completely and that patient volume was nearly back at pre-COVID-19 levels, hovering around 89%. Still, the ongoing economic toll was predicted to cause a reduction of 38% in dental spending in 2020 and about a 20% reduction in 2021.[47]

Besides the ADA Health Policy Institute, other groups have analyzed the economic toll of COVID-19 on dental practices. Ceterus had access to accounting data from dental practices across the US and compared the first 6 months of 2019 to the first 6 months of 2020.[25] They found a 26% decrease in net operating income, with the toughest months being April 2020 and May 2020 (90% decrease). By June 2020 and July 2020, year-over-year net income was actually up by 3%, indicating that a slight surge of patients who missed their appointments earlier in the year came back in the summer. Nearly 80% of dentists had a loss of income in 2020 compared to 2019 and one-quarter experienced a significant loss of 50% or more. Like income, raw collections followed a similar trend, with a 17% overall decrease in net collections in 2020. Expenses were reduced by 50% and payroll spending was down by 60% in April 2020, but back up to regular levels by June 2020. Ceterus reports that around 74% of dental practices participated in government loan programs, obtaining around $92,000 on average. With these reductions in expenses and payroll and support from government relief programs, most offices actually had an influx of cash on hand (nearly double the amount in 2019) in the short term, though most of this was presumably due to loans and payroll reductions in those early months. Another analysis of 8,000 dental practices, from Dental Intelligence's proprietary data, comparing 2019 to 2020 data, suggested that practice revenue declined by 6% in 2020 ($8.3 billion less than in 2019), a much smaller decline than other groups reported.[48] They also reported that the top 10% of practices outperformed 2019 in 2020, in terms of patient volume and growth, while the bottom 10% performed much worse, indicating that COVID-19 did not impact all practices equally, with solo practices and those in the Midwest hit the hardest.

Not only were dentists' earnings disparate based on age, gender, and specialty, but also by race. A cross-sectional survey deployed in June 2020 and July 2020 found that while all dentists reported reduced revenue, Black/African American dentists were the least likely to report reductions (84.2%) compared to white (87.2%) and other (92.9%) racial groups. Nearly 9% of Black/African American dentists said they had no change in revenue and 1.8% indicated their revenue increased. The survey also found that Black/African American dentists were the most willing to join COVID-19 taskforces to address challenges from the COVID-19 pandemic (46.4% of Black/African American dentists vs. 18.8% of white dentists and 29.6% of other racial groups). As this was a short survey with a nonrepresentative sample, it's unclear how well this reflected broader trends in earnings by racial group.[49]

Survey data from a multinational electronic survey distributed to dentists in North America, Europe,

and the Eastern Mediterranean and Western Pacific regions confirm that most dentists across the world (73.6%) reported "substantial financial impacts" on their incomes.[50] Dentists from North America reported the greatest economic tolls, followed by Europe, then the Western Pacific and Eastern Mediterranean regions. Similar to US findings, more private-practice dentists reported greater financial setbacks compared to public dentists and specialists reported less of an impact.

The financial impact on FQHCs and safety net clinics has followed similar utilization patterns as private practices, with 34 million fewer visits per week;[51] however, their infrastructure created opportunities for resiliency, flexibility, and building capacity to weather the COVID-19 storm.[52] They more easily pivoted to telehealth, flexed their workforce, and, because of their prospective payment system, they had a more steady revenue stream even while practice operations plummeted in the early months of COVID-19.[18,53,54] A study by the Primary Care Collaborative suggested that safety net practices paid by a prospective payment system were financially better off in April 2020 compared to other practices with differing payment systems due to their ability to adapt and flex their care modalities (eg, using risk stratification to target high risk patients, adapting to teledentistry quickly, offering nontraditional appointment times, prioritizing prevention and minimally invasive care, pivoting staff to COVID-19 priorities like triaging and testing).[55] Despite this, over 1,900 health-center sites closed temporarily when visits were cut by more than 50%,[56] and rural hospitals also closed, with an additional 25% of rural hospitals at risk of closure.[57] While FQHCs still experienced financial hardships, their existing payment models and adaptations toward value-based payment models improved long-term financial viability and sustainability.

Impact on Care Delivery

An article from Milliman, an actuarial and consulting firm, summarized the COVID-19 impact on reduced care delivery in 2 phases: the first being driven by provider and patient concerns, and the second phase being driven by widespread and broader economic issues.[58] The second phase encompassed both the initial reduced demand for dental services, and also the concurrent and subsequent effects from furloughs and layoffs, loss of employer-sponsored dental insurance, and resultant changes in utilization patterns. These issues will be discussed in greater detail below; however, Milliman's initial simulation modeling estimated a sustained 3-year reduction in demand for dental services.

Patient Insurance

At the height of shelter-in-place lockdowns, many people in the US lost their jobs or were furloughed for an indefinite period, losing not only their incomes but also their employer-sponsored dental insurance. Using unemployment data, researchers from the Harvard School of Dental Medicine tried to estimate the impact of these employment patterns on insurance coverage and dental utilization. From March-May 2020, the US unemployment rate increased by 8.4%, resulting in approximately 16 million individuals losing their dental insurance.[59] They further estimated that about 45% of these individuals enrolled in their state's Medicaid program and 47% expected to remain uninsured, with many of these individuals living in states that have not expanded Medicaid and/or do not offer dental benefits for adults with Medicaid. The resulting

impact on dental care delivery is expected to be fewer routine exams and increases in emergency care, such as extractions and visits to the emergency department for nontraumatic dental issues.

The DentaQuest Partnership for Oral Health Advancement (now CareQuest Institute for Oral Health) published their own estimates of dental insurance loss from a nationally representative survey of 5,320 adults collected from January-February 2021.[60] They estimated that about 6 million adults lost their dental insurance coverage with 65% of those adults reporting symptoms of oral disease. Asian Americans reported losing dental insurance the most (19%), followed by Black/African Americans (14%), Hispanic/Latino adults (8%), and white adults (6%), highlighting stark disparities between people of color and whites in the US. This survey also reported that having no insurance (33%) and cost of care (38%) were the most likely reasons for not seeking routine or preventive dental care throughout the COVID-19 pandemic and in the year ahead. Having dental insurance is a major protective factor for dental care utilization,[61] and job losses with subsequent losses in dental insurance due to the COVID-19 pandemic have and will continue to contribute to significant oral health disparities, not only for adults but also for their children. A cross-sectional survey of families in summer 2020 found that the greatest unmet health care need during COVID-19 was dental care (16%) and nearly 40% of families reported job losses or reduced household incomes.[62] There was a significant association between the probability of unmet dental needs and COVID-19 pandemic-related reductions in income (21% risk vs. 12% risk in households without lost income).

From a survey of providers by DentaQuest, more than half of respondents reported treating more patients who no longer had commercial dental insurance because they had lost their jobs.[33] Provider survey data suggested that the increased cost of care delivery was also impacting their decisions on which types of insurance plans to accept. Nearly 40% of California dentists reported that they would no longer see patients with Medicaid insurance, 18% said they were unlikely to see out-of-pocket patients, and 11% said they would not see patients with private insurance.[26] The ADA Health Policy Institute reports that about 8% of private practice providers have disenrolled from their state's Medicaid program from March-December 2020, with an additional 15% considering disenrolling and 20% not taking as many patients with Medicaid insurance.[34]

Despite these studies, Advisory Board, a health care consulting and research firm, actually reports that plans and providers in their membership are reporting modest shifts in insurance patterns, with some even reporting greater levels of commercial insurance.[63] They also suggested that quickly adapting to new telehealth modalities would be a key priority to help insurers through COVID-19 and offered a number of strategic ways to enhancing virtual visits from both the perspective of the insurer and the patient.

Adoption of Teledentistry

As dental practices shuttered in the early months of COVID-19, many shifted to providing care by phone or virtually as patients still experienced care needs. National regulation on the Health Insurance Portability and Accountability Act (HIPAA) allowed telehealth to be practiced in more modalities and also

added dentists as approved telehealth providers.[33] The ADA also created new Current Dental Terminology (CDT) procedure codes specific for teledentistry and published guidance on how to use them in combination with older CDT codes.[64,65] California's Medicaid program was previously the only program that reimbursed providers for teledentistry procedure codes; however, both public and many private insurance providers began reimbursing for these codes to support phone- or video-based triaging of dental emergencies.[66] However, adoption of teledentistry was slow, with less than 25% of private practices billing these codes,[67] likely a result of confusion around state policies on licensure and scope of practice, low reimbursement rates, and concerns with technology access and patient acceptance/awareness.[68,29] Adoption of teledentistry was higher in safety net and public health settings, with 57% of dentists in these settings reporting teledentistry adoption by mid-2020.[69] Separate surveys of providers found that safety net and public health dentists were more than twice as likely to continue offering teledentistry services in the long term.[30,70]

Additional and Ongoing Relief

Federal Relief

In addition to the first 4 major economic relief bills from March-April 2020, the federal government passed a few more relief bills significant to the dental care sector:

- Paycheck Protection Program Flexibility Act (June 3, 2020)
- Consolidated Appropriations Act (December 27, 2020)
- American Rescue Plan (March 11, 2021)

The **Paycheck Protection Program Flexibility Act**, enacted in June 2020, allowed greater flexibility in use of PPP funds, including for purchases of PPE and facility modifications that were used to mitigate the transmission of COVID-19.[24] In addition, PPP funds were made eligible for tax deductions. Previously, a separate application process allowed dental professionals to apply for forgiveness of PPP funds. In addition, Congress extended the deadline to apply for a PPP loan to August 8, 2020. At the end of this deadline, the PPP had given out 5,212,128 loans worth $525,012,201,124 net dollars.[71] The Health Care and Social Assistance category, of which dentists are included, received 12.9% of all grant funding and the average loan amount was $101,000.

The **Consolidated Appropriations Act** included $868 billion of federal support to continue mitigating the economic impact of the COVID-19 pandemic. In addition to funding for unemployment benefits, nutrition assistance, child care, schools, and COVID-19 testing and vacation, the Consolidated Appropriations Act also included direct payments to individuals and families and an additional $302 billion in aid to small businesses.[72] This included additional funding for PPP loans ($284 billion) for both first-time borrowers and second PPP loans for small businesses that could demonstrate a loss of 25% of gross revenue in any quarter in 2020 relative to the same quarter in 2019. Applications were accepted starting the week of January 11, 2021. Besides the additional PPP loans, critical provisions for dentists included allowing expenses paid by PPP loans to be tax deductible, no longer reducing PPP forgiveness amounts by any EIDL grant also received, and allowing PPP borrowers to take advantage of the ERTC, removing major barriers dentists

faced in prior relief bills.[73] The ADA and ADCPA advocated strongly for the reversal on the ERTC, and the credit amount was increased to $2,000 higher per quarter per employee from 2020 values (from a maximum of $5,000 to $7,000).[74] Additional funding ($20 billion) was also allocated to the EIDL grant program. A provider was eligible for an EIDL grant only if they lived in a low-income area, and funding was limited to $1,000 per employee with a maximum of $10,000.[24]

In March 2021, the **American Rescue Plan** provided an additional $1.9 trillion dollars of federal relief, including direct payments to individuals, an extension of unemployment benefits, support for COVID-19 vaccination and testing, and to educational institutions to support safe reopening, and various tax incentives.[72] One such tax incentive, the ERTC, was extended, while others were expanded. The funding also supported the National Health Service Corps ($800 million), a federal program that includes both scholarships and loan repayment programs in exchange for service in high-need areas.[75] It also allocated an additional $46 million to HRSA for the expansion of community-based primary care medical and dental residency programs in rural and underserved communities.

State Relief

In addition to the many federal initiatives to mitigate financial hardships due to the COVID-19 pandemic, several states provided their own relief funds or modified their Medicaid programs. Historically, states have cut optional benefits in their adult Medicaid programs during economic downturns. During the Great Recession, 19 states reduced or dropped adult dental coverage on their Medicaid programs, and only 8 had reinstated their programs by 2016.[76] Many Medicaid advocates were concerned that state budget shortfalls due to COVID-19 (around $555 billion over fiscal years 2020-2022)[77] would mean that states would cut Medicaid benefits or reimbursement rates right at a time when layoffs were expected to increase the number people eligible for Medicaid benefits.[78] But, due in large part from the 6.2% increase in the federal government's match for most Medicaid expenses, a major part of the Families First Coronavirus Response Act, these worries did not come about. Instead, several states actually increased Medicaid reimbursement rates to reward dentists who participated in Medicaid and ensured there were enough providers to provide care for Medicaid members.[9] Here are a few examples:

- The Maine Department of Health and Human Services added around $1 million to MaineCare, its Medicaid program, to provide temporary incentive payments to providers delivering preventive care to children. Primary care providers received an additional $31 per child per month and dental providers received an additional $37 per child per month to support outreach efforts and offset the increased costs of delivery care during COVID-19. This was a critical investment in the oral health of children covered by MaineCare – prior to COVID-19 only 35% of children received preventive dental care and that low rate declined rapidly in 2020 when dental clinics were shutdown.[79]
- Kansas, a state that had not increased Medicaid reimbursement rates for dental services since 2001, allocated $3 million in its FY 2020 budget to do so,[80] hoping more dentists would take patients covered by KanCare, their Medicaid program. The

state then added an additional $3 million after COVID-19 hit to continue reimbursing dental providers participating in KanCare at higher rates.[81]

- Louisiana's Medicaid program decreed an emergency rule to increase reimbursement rates for dental exams for children age 0-3 years and for restorative dental services, adding $2 million in its FY 2020 budget to do so.[82]
- California and Nevada were considering reducing or dropping adult dental benefits, but efforts have been successful in preserving these benefits.[83]

That said, a few states are still considering proposals to cut adult dental benefits (eg, Washington State) or abandoning plans to extend benefits (eg, Tennessee had plans to extend benefits to pregnant and postpartum individuals).[83] State were unable to modify eligibility requirements for state Medicaid programs, however, due to the "maintenance of effort" rule in the Families First Coronavirus Response Act, so more stringent eligibility requirements was not a policy option, until November 2020 when CMS reversed course and issued an Interim Final Rule allowing states to change eligibility requirements and cut optional benefits, such as adult dental care.[84–86] As states continue to grapple with ongoing budget concerns, it is possible that legislatures will attempt to cut dental Medicaid benefits in future legislative sessions.[30]

Finally, many states updated their Medicaid benefits to include coverage and reimbursement for teledentistry to support care needs in times when patients were unable to access a dental office or in cases where immediate dental treatment was not necessary. The Center for Connected Health Policy has been tracking advances in teledentistry practice in statutes and regulations both prior to and throughout COVID-19,[87] with at least 17 states adding the practice of teledentistry to their state practice acts during the COVID-19 pandemic.

Insurance Providers

Finally, private insurance providers offered various emergency assistance and relief to dental practice owners, dental staff, FQHCs, and patients who were experiencing financial hardship because of COVID-19. The insurance trade association, AHIP, has been documenting these assistance plans and other actions taken by insurance providers in an online repository.[88] Delta Dental has also been chronicling relief efforts from their state affiliates and foundations on its website.[89] Assistance programs and initiatives included:

- Premium credits or discounted premiums to insured members (eg, one-month premium credit or 20-50% off premiums for a few months)[90]
- Freezing premium rates
- Adding coverage for, waiving cost shares of, and launching new teledentistry programs (eg, at-home orthodontia programs, virtual programs to replace grade-school education programs)
- PPE donations (eg, masks, gowns)[91] and PPE credits for submitted dental claims (eg, $10 PPE support payment per claim)
- Grants and loan programs for dental practices:
  - Individual grants to member practices[92]
  - Relief funds (eg, $1,000 "allowance" to each member dentist, checks in the

amount of about 1% of their 2019 claim payments)[92]

- Loan relief options for dental practice owners, including interest subsidies, principal deferment, and business loan refinancing
- Claim/receipt/reimbursement advance loan programs (ie, provide advances for 25-50% of typical weekly payments, to be repaid without interest)

- Establishing mental health resource centers and support phone numbers for networked dentists and staff
- Donations to community organizations (eg, food banks, toothbrushes and toothpaste to homeless shelters), frontline COVID-19 providers, and FQHCs (several insurers also offered grant programs to FQHCs)
- Gifts to members, such as gift cards to insured members to support health, wellness, and household expenses including food and free electronic toothbrushes for members who sought preventive care in summer 2020

Hundreds of insurers offered hundreds of thousands to tens of millions of dollars through these programs and initiatives, adding up to hundreds of millions of dollars of relief. Many of these programs were in response to lower-than-expected claims because of the disruption in dental service delivery; however, insurance companies may not have been doing enough. Advance loan programs, which addressed immediate cash flow needs, only delayed, not mitigated, the financial crisis in the dental office. In response to reports that some health plans were not complying with consumer protections for free COVID-19 testing in the Families First Coronavirus Response Act and the CARES Act, the Energy and Commerce Committee sent oversight letters and questioned 9 insurance companies, including several dental insurers, about their COVID-19 policies and practices.[93] On top of reports that the health insurance industry was reporting "massive profits during the pandemic as patients defer non-essential health care… saving insurers potentially billions of dollars in foregone claims," the Committee also pointed to protections in the Affordable Care Act that cap profits for health insurers or else require them to provide premium credits.

MOVING FORWARD

The economic toll of COVID-19 on dentistry was especially tough in 2020, and while practices have mostly recovered, ongoing fallout has negatively impacted staffing and practices continue to struggle to meet pent-up demand from earlier closures and yearslong reductions in patient access. Compounding an already inequitable access problem for patients are the additional costs and fees that may be placed on patients, hitting underserved communities hardest: people of color, older adults, publicly insured individuals, and individuals with special health needs.[26] However, many of the COVID-19 pandemic-related adaptations and innovations offer some silver linings for the future practice of dentistry.[11] At the start of COVID-19, a large majority of dental care was provided by small private practices operating under a fee-for-service (FFS) reimbursement system, meaning dentists' earnings were directly tied to the volume and price of services they provided, incentivizing more

treatment and expensive services.[29,94] When dental practices suddenly closed for weeks and months on end, they were hit with an immediate cash flow problem, similar to most other small businesses, but, unlike other small businesses, dental health care is essential health care and financial systems should be designed to appropriately compensate providers while prioritizing the dental health of the population. As the immediate-past president of the ADA said, "the time is right for legitimate data-driven, resource-based revision of oral health care reimbursement."[11]

Potential for Payment Reform

With patient volumes shaky and rising costs of delivering care, along with ongoing surges of COVID-19 infection complicating all of this, "dentistry will face a turbulent environment for the foreseeable future,"[95] stressing the faults of the traditional FFS reimbursement system and highlighting the potential for using innovative approaches to care delivery and payment reform.[96,97] Value-based care is a practical approach that addresses the shortcomings of both the FFS reimbursement and prospective payment systems.[98] The DentaQuest Partnership for Oral Health Advancement (now CareQuest Institute) has produced several white papers on this topic and has convened experts to develop a gap analysis and assess readiness for value-based care in the field of dentistry.[99] They reported that experts believed oral health value-based care, which covers only a small proportion of the market today, would grow rapidly over the next 10 years, and that COVID-19 may actually accelerate the adoption of value-based care. Nearly two-thirds of experts surveyed suggested that not only would adoption accelerate, but that value-based care payment models are actually necessary to support dental practices in response to COVID-19.[100] After surveying dental providers in August 2020, most (52%) agreed that they were more interested in learning about value-based care or other alternative payment models now more than ever before.[101] Providers who did not anticipate long-term changes to the dental industry as a result of the COVID-19 pandemic were far less interested in alternative payment modalities, whereas providers of color, who practice in urban settings with patients on managed care contracts already and have experience with telehealth, were more interested in new payment models. Still, the survey reported that about half (51%) of providers were unaware of alternative payment models in dentistry.[95] CareQuest has subsequently published their "Three Domain Framework," which focuses on (1) tele-prevention, (2) minimally invasive care, and (3) integrated and personalized care. The steps needed to move the dental field toward this approach are copied below:[94]

Short-term implementation steps:

- Introduce financial strategies and associated billing structures to remain flexible and responsive during the changing dental landscape.
- Establish interprofessional care team designs to support oral health case management and care-coordination efforts.
- Redefine Relative Value Units (RVUs) to ensure financial stability of care teams and maintain a high value by consumers for oral health care.

- Provide education, training, and clinical technical assistance on medical or minimally invasive care and teledentistry to support clinical care associated with Domains One and Two.
- Implement pilot programs throughout a variety of care sites and networks with rigorous data collection to inform guidance on best practice approaches.
- Create and disseminate comprehensive technical assistance documentation addressing questions and concerns about implementing these domains of care, based on community feedback.
- Propose guidance and infrastructure as well as products and technology for implementing wholistic, value-based systems of care that involve dental, oral health, and other health providers working interprofessionally to promote optimal health outcomes.
- Recommend health information technology solutions that cohesively integrate medical and dental electronic health records while improving care coordination.
- Identify state and federal regulatory barriers to the delivery of personalized and integrated services and develop intervention strategies.

Medium- and long-term implementation steps:

- Stimulate federal, state, and private sectors to invest and lead the transformation into value-based care delivery within the domain framework.
- Provide educational guidance and instruction for schools of dentistry and dental hygiene to teach the domain framework of oral health care to future dental care teams while adopting new business models for clinical care used in education.
- Create recommendations under each domain of care for working with special populations (eg, individuals with disabilities, older adults, rural communities, etc.).
- Develop educational platforms to train care teams and payors on the financial and billing components associated with the domain methodology.
- Create observable outcome measures and an evaluation process associated with each domain of dental care.
- Provide guidance on advancing partnerships to address community support needs and social determinants of health.

Medical-dental integration efforts to finally connect the mouth to the rest of the body play a significant role here, and value-based care and practices align well with these efforts.[102] FQHCs are particularly well-suited for medical-dental integration and to adapt value-based or other alternative payment models as they often already have an integrated workforce and electronic health record system (oftentimes co-located service delivery, too), emphasize prevention and person-centered care, and utilize telehealth.[18] FQHCs have taken many of the steps outlined above already, anticipated these changes coming,[15] and both CareQuest and the National Association of Community Health Centers believe "FQHC dental systems are positioned to drive change toward value-based solutions within the broader dental community. Improved health outcomes, care innovation, and information technology capabilities

all point toward the ability of FQHCs to serve as a conduit for value-based payment transformation."

But dentists in private practices may also benefit from alternative payment models. As a result of changes in infection control, higher costs of treatment, and a greater awareness of minimally invasive models of dental care, private practices can and should shift toward a prevention-focused model.[29] Expansion of outcomes- or value-based payment models can support this model of care – capitated or quality-based payment plans, instead of the predominate FFS model in dentistry today, may actually be a more profitable model of care while also providing patients with the best evidence-based preventive care. This is especially true as COVID-19 continues and the future is unsteady.

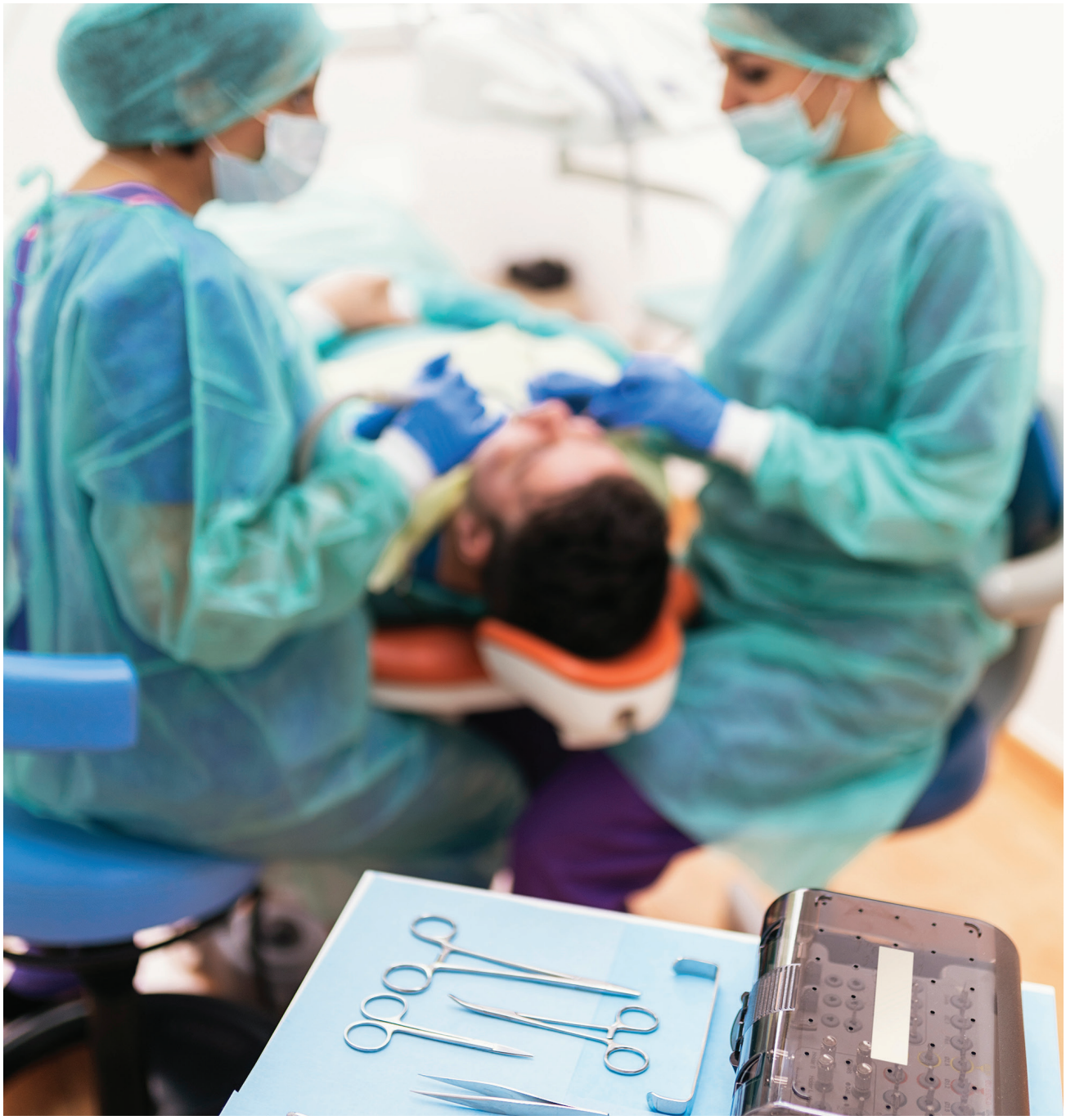
Further Support for Teledentistry

Surveys of dentists from the DentaQuest Partnership for Oral Health Advancement in summer 2020 had shown that similar proportions of respondents were continuing to see patients via various telehealth modalities (27% in June and 23% in August), with an additional 11-13% responding that they planned to offer telehealth services in the near future, suggesting that teledentistry has "staying power."[103] Respondents who used telehealth said that about 9% of their visits in the prior week were telehealth visits and about 75% of providers expected this rate to stay stable or increase over the next year. Teledentistry was more likely to be used by safety net or public health providers (44% vs. 21% in all other practice types), providers enrolled in Medicaid, and in certain states, likely due to differences in state policy in coverage and payment for telehealth services. Providers were most likely to use telehealth for diagnostic and prescriptive reasons and used phone calls more than any other modality. From a monetary perspective, DentaQuest reported that teledentistry has demonstrated financial rewards in patient retention, better value for a provider's time, low overhead costs, and fewer liability concerns. [94]

However, the exact "staying power" of teledentistry remains to be seen with several barriers to widespread adoption. These barriers include differing state practice acts, low or no reimbursement rates, concerns with data security, and inaccessibility for certain populations.[60,95] The association America's Health Insurance Plans has noted that most private insurers have been reimbursing for teledentistry services and all state Medicaid programs now reimburse for teledentistry in some form, but each state is different and certain restrictions limit the practicality of teledentistry.[104] Audio-only telehealth is the least likely to be reimbursable, despite it being the most used telehealth method, and cannot be used to write prescriptions for pain medication. The DentaQuest surveys discovered that 42% of provider respondents were using a non-HIPAA-compliant communication method,[103] which was allowable by the Office for Civil Rights through the duration of COVID-19;[105] reinstating more stringent rules at the end of the public health emergency may discourage further use of teledentistry. The teledentistry infrastructure also needs to expand – broadband internet and financial capital to purchase telehealth technology is critical for more widespread adoption in rural and underserved settings.[94] Most proponents of teledentistry agree on the need to push policymakers to adopt a legal landscape that encourages and does not frustrate teledentistry initaitves.[60]

CONCLUSION

Unfortunately, the COVID-19 pandemic paused but ultimately did not transform most of the practice of dentistry in the US. While there were plenty of innovations in practice (eg, infection control protocols, teledentistry) and government relief efforts kept most dental practices afloat in the hardest months of COVID-19, the COVID-19 pandemic did not serve as the catalyst that many oral health equity advocates had hoped would move the dental delivery system toward a value-based care system that directly uproots the core inequities inherent in the traditional model of dentistry.[29,30] While the greatest economic threats have passed, the long-term implications of some resultant staffing and broader economic issues shaping the US remain to be seen.



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CHAPTER 4: EDUCATION

THE IMPACT OF COVID-19 ON DENTAL EDUCATION

Much like the rest of the dental sector, dental education systems were closed due to the SARS-CoV-2 (COVID-19) pandemic and had to rapidly adapt to an ever-evolving landscape of policies, regulations, and mandates to keep students, staff, and faculty safe, while still teaching and graduating students with the fundamental knowledge and skills needed to practice dentistry and dental hygiene. An early review article, published in June 2020, outlined the real and perceived challenges for dental school administrations: (1) balance safeguarding the health of students, faculty, and patients, with continuity in student education, while following continually changing local, state, or national policies; (2) manage anxiety among students, faculty, and patients.[1] Many of the resulting adaptations and innovations designed to address those challenges, which are outlined in this report, were favorably viewed by many individuals who believed "dental education [was] long overdue for disruption."[2] This chapter reviews the adaptations of the dental education system in response to the COVID-19 pandemic with a particular focus on the implications of long-term effects.

Note: Several of the cited articles herein resulted from rapid development: a new type of article in the *Journal of Dental Education* titled, "Advancing Through Innovation" was launched in April 2020 to quickly share piloted new and innovative approaches to dental professions education in response to the very real challenges of educating throughout the COVID-19 pandemic.[3] While peer reviewed, they are short articles exploring new approaches based on limited availability of high quality evidence. These approaches are summarized throughout this chapter.

THE RAPID RESPONSE WITHIN THE DENTAL EDUCATION SYSTEM

School and Clinic Closures

As governmental stay-at-home measures and local restrictions were announced during the onset of the COVID-19 pandemic in March 2020, academic dental institutions responded by announcing temporary suspension of on-campus, nonessential activities, including didactic classroom, simulation, routine elective clinical patient care, and limited access to essential employees due to the risk of infection transmission in the dental setting. All learning initially transitioned to online platforms such as Zoom, Google Classroom, and Microsoft Teams to limit disruption and provide continuity in education,[4–6] while IT departments established secure remote access for learners, educators, and staff to pivot to remote work. Dental students also transitioned to participating in teledentistry consultation to continue their learning and ceased providing care in the clinic. Teledentistry consultations were used to triage patients to reduce the need for in-person appointments and mitigate risks of disease transmission.[5,6]

Most institutions continued to provide limited urgent or emergency dental care to patients with faculty clinicians and advanced dental education residents providing care.[5,6] Like all clinics, dental school clinics followed measures recommended by the Centers for Disease Control and Prevention (CDC) and the American Dental Association (ADA)

interim guidance to minimize risk of disease transmission, including limiting emergency treatments to use non-aerosol generation procedures.[7] Due to the nationwide lack of adequate personal protective equipment (PPE) during the onset of the pandemic, a number of dental schools that had access to appropriate clinical facilities and adequate PPE became the primary providers of dental emergency care for their communities, as local dentists were unable to provide care.[4] Because of this significant limited access to dental care, disparities in access to dental care for already vulnerable populations, such as the elderly[8] and those with public insurance,[9] were exacerbated.

Still, clinic closures and limited clinic capacity placed a significant financial burden on dental schools as most of them rely heavily on clinical revenue to support their operation.[10] Before the COVID-19 pandemic, more than 2.8 million patient visits were recorded among all dental schools in the 2019-2020 academic year;[11] however, the American Dental Education Association (ADEA) reported that dental school clinics experienced a 50% decline in patient visits during the first 8 months of the pandemic.[12] Fewer patient visits resulted in lower clinic revenue, which led to budget cuts for one-fifth of all dental schools. To accommodate budget shortfalls, more than two-thirds of schools reported that they intended to cut costs while also trying to respond appropriately to the needs of their patients, learners, staff, and faculty.

Initial Shift to Remote Learning

During the onset of COVID-19, didactic courses, hands-on workshops, presentations, and seminars initially transitioned to complete remote learning methods. During the stay-at-home closures, schools had a brief window of time to plan and implement short-term alternatives for the remote delivery of their curricula that were compliant with accreditation standards. The US Department of Education posted interim guidance for colleges and universities in early March 2020 that specifically stated that "online education is an option for continuing to teach students through COVID-19-related interruptions" and that they were supportive of distance learning by providing "broad approval… to use online technologies to accommodate students on a temporary basis, without going through the regular approval process."[13] Similarly, the Commission on Dental Accreditation (CODA) agreed to evaluate its policies, procedures, and modifications to their accreditation standards and circulated temporary guidelines for dental programs to follow in light of the COVID-19 pandemic.[14]

Due to the timing of the COVID-19 pandemic, some schools chose to extend spring breaks by a couple weeks, giving faculty some time to plan for the transition to a completely virtual learning environment.[15] Faculty managed to rapidly produce an online curriculum by utilizing virtual and file-sharing platforms such as Zoom, Google Classroom, and Microsoft Teams to deliver remote lectures, facilitate group discussions, and promote student engagement. Not only did education modalities shift, but so too did assessments. By March 15, 2020, CODA started requiring testing to include identity verification and online proctoring.[16] Schools had to quickly pivot to secure online testing solutions, for example eProctor through ExamN or ExamSoft with ExamID or ExamMonitor,[17] to wrap up the spring courses.

As it became clear relatively early on that direct patient care and education would be delayed for an indefinite period, dental programs looked for alter-

native strategies to adapt curricula and continue preclinical and didactic education in remote environments. These strategies included:[4]

- Expanding asynchronous instruction through the use of pre-recorded content,[16] while also using synchronous online instruction to supplement learning and comprehension and allow for greater engagement between faculty and students.[18]
- Providing students with portable handpiece units and typodonts to continue simulation classes remotely, allowing students to progress on hand skill development.
- Resequencing didactic classroom and seminar curriculum while clinic or simulation classes were cancelled, allowing students additional clinic or simulation clinic time in the future when patient care and access to campus resumed.[5] For summer coursework, one university developed 2 6-week "agile" cycles of coursework.[19] This looked like:
  - Front-loading didactic courses as much as possible, leaving clinical cycles for the fall.
  - Only allowing 2 concurrent courses per week (1 in the morning, 1 in the afternoon).
  - Pairing high-credit-hour courses with low-credit-hour-courses to avoid cognitive overload.
  - Starting with online courses already developed, allowing other faculty time to develop their online courses.
- Offering more review sessions or advanced curricular content at the post-graduate level with the additional didactic time.
- Developing virtual clinic case studies, providing the opportunity to apply knowledge in clinical case presentations.

Challenges

Despite dental educators' best efforts, many challenges arose. While many dental schools record and disseminate didactic lectures and group sessions, most dental schools had limited faculty members with the background and experience to plan and execute an online course. This challenged schools to provide faculty with intense training on the technical aspects of virtual platforms, principles of instructional design for effective online delivery, best practices for student engagement, and appropriate assessment methodology. In addition to a steep faculty learning curve, schools had to invest in new technology, faculty development resources, and support staff to provide technical support.[4]

Students had to adjust to remote learning environments as well, with some finding difficulty in locating a quiet workspace, accessing reliable internet connectivity and bandwidth, and dealing with virtual classroom fatigue and unmanageable workloads.[4,20] In addition, course and examination attendance were difficult for students who lived in different time zones or had family members to care for.[6]

EMERGENCE OF ACCOMMODATION AND RESPONSE TO THE CRISIS

Schools and Clinics Reopening

Safety

Most dental education programs moved to a hybrid educational approach during the summer of 2020. The return to hybrid learning was necessary to allow time for clinical experiences – a mandatory component of the Doctor of Dental Medicine (DMD) degree. Dental schools developed task forces to plan and develop protocols consistent with CDC guidelines and best available evidence. Such protocols included health screenings to enter campus buildings, development of circulation pathways and social distancing, rules for use of PPE, physical modifications, management of ventilation and airflow, aerosol mitigation, operatory cleaning and disinfecting, and COVID-19 testing. ADEA reported that 100% of dental schools implemented stricter PPE rules and requirements, 98% of schools added plexiglass barriers, 69% of schools invested in chairside evacuators for aerosol mitigation, and 71% of schools invested in infrastructure modifications to their heating, ventilation, and air condition (HVAC) systems.[12]

Some schools even partnered outside of their university to collaborate and share experiences and knowledge. The Testing for Tomorrow Collaborative,[21] made up of 6 dental schools with corporate and nonprofit partners, was initiated to evaluate evidence of point-of-care testing and work together to establish patient assessment protocols and share knowledge, content experts, and new tests that would not have been available to a single institution alone. A similar large-scale collaborative occurred in the state of Alabama for students returning to campuses. The state implemented GuideSafe™ Entry Testing for Alabama higher education, a higher education testing initiative that required COVID-19 testing for every student returning to a public or private 4-year college in the state.[22] Due to the ever-changing nature of the pandemic, guidelines were being continually reviewed and updated based on daily changes in federal, state, or local regulations and orders; CDC guidelines; university guidelines; or other available evidence.[4] Detailed international guidance for reopening dental schools safely was also published in early 2021.[23]

As dental schools are generally equipped with large administrative and IT cadres, they were more easily equipped to design and implement standardized safety protocols across units with designated safety teams, appointed safety leads from IT, patient services, and clinical faculty and had the ability to mass train staff and students on new protocols. IT departments were tasked with creating online screening and scheduling tools and to add systems in electronic health records (EHRs) to record essential COVID-19-related patient information (eg, testing, contact tracing, medical insurance billing).[21] Some schools also developed new EHR queries to assist with prioritizing patients once restrictions to elective care were lifted.[24] These algorithms included medical risk, urgency of need, and likelihood to attend an appointment, and the prioritized list was distributed to department chairs to make a final determination on scheduling. Other schools consolidated their clinical operations and used a centralized staffing schedule template that could be accessed and edited simultaneously by all departments. In the consolidation process, these schools also realized some unintended benefits:

gaps in standard operating procedures were identified, cross-department relationships were formed creating a more integrated school community, and patient-centered care was optimized as multiple specialists could consult at the same time.[25]

With the realization of the inevitability of COVID-19 exposures on campus, reopening plans typically included discrete teams of faculty, staff, and students to limit impact when a COVID-19-positive person entered campus and to facilitate contact tracing. In one school, teams consisted of a faculty leader with 2-3 students and core staff who occupied separate physical spaces to limit transmission and clinical disruptions should any member of the team contract COVID-19.[26] Similarly, many universities followed the didactic lectures with preclinical exercises that divided the students into smaller subgroups to maximize social distancing.[5] This kind of division of faculty and staff did require some additional faculty calibration to ensure high quality preclinical education across the discrete teams. One school used electronic surveys of past errors in preparations and restorations to identify discrepancies in faculty grading and a recalibration plan to train faculty who disagreed with the majority. Calibration occurred remotely, reducing the need for face-to-face interactions, and resulted in highly calibrated faculty.[27]

From the patient perspective, reception areas were reconfigured to allow for social distancing and patients were expected to wait outside until their clinical team was ready and come to appointments alone. Patients were also screened and expected to wear masks until notified otherwise and report back to the dental school if they became symptomatic or tested positive within a few days of their clinic visit.[4]

Faculty and Staff Experience

Mental Health

Throughout the pandemic, laws, scientific guidance, and regulations evolved on a regular basis, requiring constant adaptation. This directly impacted dental faculty in the areas of educational and assessment methods, requiring them to learn new technologies, adapt to new clinical care guidelines and PPE-wearing, interrupt their research, all while assuring student readiness for graduation.[6,28] In addition, faculty may also have been impacted by social isolation, new or increased home responsibilities, or financial hardship. As with students, socialization with colleagues at holiday, retirement, and welcome celebrations were eliminated.[29]

A survey of 216 dental school faculty members from 4 US dental schools reported burnout, loneliness, and resilience during Fall 2020 of the COVID-19 pandemic. While self-reported burnout and resilience scores did not show a significant increase during the pandemic, the rates of burnout and loneliness remained higher than the public.[29] Two studies assessing the impact of the COVID-19 pandemic on dental hygiene educator wellness at 1 institution found that the pandemic had significant impact on full-time educators' personal and professional burnout levels.[30,31] Dental hygiene educators cited that the lack of work-life balance from overwork, pressure to be available at all times, lack of boundaries with students, constant changes in developing new protocols and requirements, and an absence of a sense of connection for workplace vitality were contributors to burnout.

Work-from-home flexibility, a work environment that supported wellness and mental well-being and the ability to leave the workplace for periods

of time were reported as helpful solutions to combatting burnout. One school's response to the need to ensure school members felt connected, remained successful, and returned to campus "united and ready for the uncertainty that faced [them]" included an intentional and comprehensive communications plan.[32] This included regular check-in emails, phone calls, or texts; summaries of achievements; virtual events and biweekly social hours; and 1-on-1 coaching to support the transition to online teaching. Additional peer support included faculty members participating in their colleagues' online lectures and moderating questions, and grew into new ways of fostering faculty development, engagement, and cohesion between departments. Encouraging feedback was reported, including stronger feelings of belonging.

Staffing, Recruitment, and Retention

Unfortunately, severe budget impacts and revenue shortfalls resulted in temporary or permanent staffing issues. To address financial shortcomings, more than two-thirds of dental schools reported plans to cut costs, with more than 50% of all dental schools reporting faculty and staff layoffs and furloughs, suspension of hiring clinical (53%) and nonclinical (61%) faculty and staff, delayed tenure processes (19%), or reduced spending on professional development (67%). A small fraction of dental schools also reported pay cuts to clinical and nonclinical faculty and staff.[12] Several dental schools reported a significant number of resignations as well.

A report supported the decisions to delay tenure decisions as school closures and reopening policies certainly affected scholarly productivity and basic and human subjects-based research. A further consequence of delayed research activities included suspended research conferences and meetings, limiting the ability to communicate research and clinical findings and collaborate with colleagues at different universities. As such, authors suggested that tenure decisions should be delayed or criteria lowered with respect to faculty promotion and tenure decisions.[1] In response, several universities implemented tenure "roll-back policies" that provided additional time in their probationary periods for faculty to compensate for their loss of productivity.[10]

Recruitment to academia was a purported benefit of the COVID-19 pandemic. Dental schools could emphasize the benefits of an academic career, most notably the stability of a regular paycheck and health benefits in the face of tumultuous clinical operations.[2] The authors of this report posited that new graduates and established practitioners alike may have chosen to pivot their careers, providing the opportunity for schools to recruit the "best and brightest" to academia.

Student Experience

Recruitment

Predoctoral and postgraduate dental admission teams had to pivot quickly to ensure a fair process while maintaining established standards of admissions. Most schools canceled in-person interviews and turned to virtual interviews and virtual "open houses."[33] Simultaneously, many dental schools saw higher application numbers, which researchers hypothesized was due to virtual interviews being more accessible to candidates.[34]

A study assessing the virtual Interview process at an institution reported that even though most interviewers had no prior virtual interviewing experience before implementing the virtual process in spring 2020, nearly all felt prepared to interview virtually; characterized the teleconferencing software as user-friendly; and were satisfied with the experience due to its convenience, efficiency, and financial benefits. Virtual interviewing also gave programs the opportunity to offer interviews to more applicants in comparison to the number of in-person interviews conducted in the previous cycle.[35]

Some admissions committees may have found it harder to glean the same level of information about candidates through online interactions due to technical glitches, environmental interruptions, and variations in access to reliable high-speed internet for both the interviewer and interviewee.[34] Vallejo et al. (2022) also noted that the virtual interviewing process may have also introduced bias against applicants who have less than optimal technological skills, internet service, or visual location backgrounds.[35]

From the applicants' perspective, the COVID-19 pandemic contributed to many difficulties and challenges. Restrictions caused by the COVID-19 pandemic meant that many prospective applicants were unable to shadow dentists in 2020 and 2021, and therefore compromised their ability to learn about dentistry and demonstrate their suitability for dental practice during the application and interview phases. Many students did not get a chance to tour the dental school or campus during the 2020 and 2021 application cycles and missed out on important interactions with current students, faculty, alumni, and future peers. Standardized tests were canceled, delayed, or rescheduled creating additional financial and mental health stressors.[34]

Despite some students who saw their grades improve through virtual modes of education, many applicants' grades were negatively impacted during the 2020-2021 academic year due to changes in the grading system, change in class delivery mode, and personal hardships such as being sick or quarantined, helping sick family members, experiencing and managing grief, and other mental health concerns linked to the COVID-19 pandemic.[10,34]

As COVID-19-related restrictions ease and many schools consider transitioning from entirely virtual to hybrid or in-person interviews, understanding the importance students' place on different elements of the interview experience is especially valuable. Several advantages and disadvantages to virtual interviewing have been identified. As outlined by Jozaghi & Gottlieb (2021), advantages include lower costs, ease of scheduling, increased applicant pool, and potential for applicants to interview at more programs. Disadvantages include applicants' inability to visit a campus and surrounding area, technical glitches, diminished personal connections, and limited opportunities for informal conversations.[34]

Jozaghi & Gottlieb (2021) also encouraged dental school admissions committees to consider long-term changes to dental school admissions processes, including considering adjusting the course or lab requirement of the required science courses; offering flexibility in dental shadowing minimum requirement; waiving the secondary admission fees based on financial needs, which can also benefit the underrepresented groups that have been more negatively impacted by the pandemic; and extending the Dental Admission Test (DAT) score acceptability beyond current time limitations. Dental schools administrators could also advocate for a fee reduction of DAT costs as well as for

enhanced financial support by ADEA in the form of additional fee waivers for applicants in need.[34]

Engagement

With the transition to online learning, faculty came up with a variety of ways to enhance student engagement as much as possible. Some schools turned to the concept of gamification, creating online lessons with games and activities like crossword puzzles, flash cards, etc.[36] Another idea was a student-centered approach of peer-assisted learning in which students were grouped together to prepare a PowerPoint on a topic and teach the rest of the class.[37] Small groups could foster closer relationships among students and a sense of community while providing a safe space for dialogue. Student feedback and assessments suggested these nontraditional interactive learning methods were effective and helped them feel responsible and confident in their learning,[38] while also reducing reported stress and anxiety about their dental education.[39]

Other schools increased communication methods, adopting applications such as WhatsApp, Twitter, and Google Meet to regularly meet with students informally and help keep them motivated,[40,41] or introducing online mentoring programs.[42] These personal, structured methods of communication provided moral and psychological support and boosted students' confidence. On the other hand, a study found that engagement and discussion during lectures was higher after enabling private and anonymous chat functionality.[10]

Still, students often reported that their learning had worsened, burnout increased, and engagement and retention decreased since the transition to remote education.[18] Another survey of both students and faculty agreed that learning had worsened (70% of students, 52% of faculty), burnout had increased (72% of students, 52% of faculty), and engagement had decreased (54% of students, 55% of faculty).[43] This survey also collated difficulties and suggestions from students and faculty **(Table 1)**, finding that faculty and students faced similar challenges and suggestions for improvement.

Stressors

The COVID-19 pandemic has negatively impacted the well-being of graduate and professional students globally, exacerbating mental health outcomes experienced by these students. Sustained COVID-19 pandemic-related regulations have made certain aspects of the dental education experience less accessible and more stressful. In addition to the already-demanding workload, students experienced increased burdens due the abrupt transition to remote learning, reduced interactions with instructors, and disconnection from peers. Likewise, stress related to clinical experiences has also increased due to fear of contracting COVID-19, limited patient interaction, and shortened clinical time.

In general, stressors that dental students experienced in relation to the COVID-19 pandemic fell into 3 categories: education-related, health-related, and social isolation-related stressors. During the COVID-19 pandemic, dental students' concerns about their education included the abrupt transition to virtual learning, clinical skill deficits, disruption of education, and the inability to complete requirements in a timely manner.[5,28,44–46] Lack of access to educational materials such as quiet study spaces, laboratory time, or instructors and difficulty scheduling patients affected students' learning experience.[46] Regarding academic learning, many students found it difficult to focus on school work and struggled to study on their own rather than in groups.[28,45]

TABLE 1. Survey Findings[43] of Reported Difficulties With Remote Learning and Suggestions for Improvement, by Faculty and Students

Difficulties/Suggestions	Faculty	Students
Difficulties and feedback	• Technological challenges, instability, and associated anxiety • Difficulty judging student engagement and understanding given inability to see faces, and to call on students while screen sharing • Difficulty portraying technical concepts • Difficulty balancing family life and child-care	• Lectures less engaging than interactive case-based sessions • Learning technical concepts difficult virtually • Classes taking more time causing shortened breaks and increased fatigue
Suggestions for improvement	• Using different virtual tools like virtual whiteboards, breakout rooms, anonymous quizzes, arrows or markers, or alternative software • Additional professional technological training • Encouraging student input • Alternative class formats with segmented lectures, timed case-based discussion in breakout rooms, or multiple, smaller class sessions • Combining different learning formats both synchronous and asynchronous	• Using virtual aids like 3D models rather than 2D screens to help with visualizations • Implementing ungraded quizzes to gauge understanding and increase engagement • Avoiding fatigue by scheduling lectures prior to more interactive sessions • Using breakout rooms for smaller discussions

Additionally, as restrictions were lifted students also found the transition back to in-person learning stressful and reported experiences of performance anxiety.[5]

While most dental students believed the infection control policies in place at their schools would minimize COVID-19 infection,[28] many students still experienced fears of getting infected with COVID-19, particularly during patient interactions.[28,44,46] Students also expressed concerns about contracting COVID-19 from attending classes in school and interacting with people in the school buildings.[28]

Influences of the COVID-19 pandemic on everyday lives were also reported. Social isolation and lack of social support emerged as new stressors leading to mental health adversities. In an evaluation of a preclinical operative dentistry course, students reported that they experienced an increased feeling of burnout, difficulties in understanding and retaining material, and reduced engagement and participation due to ongoing changes in learning modalities.[5] During this time, additional stressors including financial concerns, career and job outcomes, personal and professional relationships, and general insecurities and uncertainties over the circumstances were also reported.[28,46,47]

To address these stressors, a university brought in an evidence-based diaphragmatic breathing intervention as a tool to calm anxiety on the first day that students returned to clinical activities.[48] During the faculty-student-staff huddles at the beginning of a clinic session, a faculty trainer guided the breathing

exercises for the first week, which was followed by daily sessions guided by the practice coordinators. All participants reported that the intervention was appreciated and strongly encouraged it to become a regular practice in the clinic, reporting that the more relaxed clinical environment reduced their anxiety and made them feel more comfortable.

Mental Health

Surveys of dental students have reported significant impact to overall mental health due to the COVID-19 pandemic. A survey conducted during spring 2020 at a dental institution reported that over a third (32%) of dental students had concerns about their emotional health. Nearly half (49%) of the participants often or always expressed anxiety regarding the uncertainty of the current crisis, and 8% of students often or always felt depressed. One in 10 (10%) students often or always felt lonely.[28]

At a second institution, 69% of dental trainees surveyed in fall 2020 reported that COVID-19 affected their overall mental health. One in 5 participants displayed symptoms consistent with generalized anxiety disorder, 17% displayed symptoms consistent with major depression,[46,47] and 28.6% reported 1 or more burnout symptoms. Overall, 12.7% of participants reported thinking about leaving their programs and nearly 30% of survey participants reported burnout.[47] A follow-up survey at the same institution observed that isolation from peers and burnout each significantly increased by almost 20% from fall 2020 to spring 2021.[46]

A third institution found that more than half of the respondents across all 4 years felt depressed (56%) or overwhelmingly stressed (64%) during spring 2021. At the same time, most dental students (79%) did not receive counseling or see a therapist over the course of the COVID-19 pandemic,[45] despite calls to offer and encourage counseling services school-wide.[49]

While the findings reported here only represent a snapshot in time, the results suggest that attention should be paid to dental trainees' mental health, particularly those who have weathered the COVID-19 pandemic while pursuing their education.

Retention

One study assessed the prevalence of mental health problems and the extent to which poor mental health and the COVID-19 pandemic were related to dental student intentions to leave dental school. In the study conducted during fall 2020, nearly 13% of participants reported thoughts of dropping out or leaving their programs due to burnout and poor mental health. The authors hypothesized that the COVID-19 pandemic may have compounded the effects of poor mental health, which dental trainees are already predisposed to through the rigor and intensity of training, with additional uncertainties regarding academic and clinical training, as well as future employment and income prospects.[47]

Academic Performance

While dental students faced many new challenges during the COVID-19 pandemic, there were some benefits offered from the transition to online learning. A survey of 274 predoctoral students across all years of study at a dental school observed that 67% of dental students reported more time to study during the COVID-19 pandemic, and 60% reported having less transportation concerns since the start of the pandemic. However, 61% of students also agreed or strongly agreed that online Zoom lectures did not adequately replace in-person lectures. More

than half of dental students reported that it was more difficult to study during the pandemic due to the lack of in-person group studying.[45]

The study also analyzed average grade percentages of the D1 (ie, first-year dental student) class before and after the onset of the COVID-19 pandemic. Courses that saw increases in average grade performance may have benefitted from redesigned curriculum that involved interactive approaches with breakout rooms, engaging styles, and shared group assignments, or a simple lecture format, which students benefitted from as they had more time for individual study. Courses that saw decreases in average grade performance, such as gross anatomy, may have suffered from the switch to an online environment which made studying and observing 3D details more difficult. Another possibility is decreased motivation after completion of the rigorous coursework as several students reported a lack of motivation during virtual learning.[45]

Professional Plans

Dental students' professional plans were impacted by the global pandemic. This is particularly evident for the students in graduating class of 2020 as COVID-19 was declared a global pandemic a mere 3 months before anticipated graduation. According to ADEA's 2020 Survey of US Dental School Seniors, 64% of seniors who intended to go into private practice reported changes to their immediate post-graduation plans.[50] By 2022, 19% of senior dental students who responded to the same ADEA survey reported that the COVID-19 pandemic affected their professional plans immediately after graduation.[51] The COVID-19 pandemic skewed their preferences toward pursuing advanced dental education. Of the students who reported that the pandemic affected their professional plans, 45% had planned to practice dentistry in a private office and 42% had been planning to pursue advanced education programs prior to the COVID-19 outbreak. Upon graduation in 2022, 46% of this group of respondents chose to do an advanced education program and 42% selected to join a private practice.

Between 2017-2022, the share of survey respondents who planned to join a private practice immediately after graduation increased from 48% to 53%. Almost one-third of the 2022 respondents who planned to go into private practice immediately upon graduation intended to join a dental service organization.[51]

Ongoing Curricular Adaptations

As it became clear the COVID-19 pandemic would not disrupt dental education only in the short term, educational institutions had the opportunity to reevaluate and restructure their curricula moving forward. A review article highlighted how dental schools "should focus on reevaluating and reprioritizing their policies and protocols and include a detailed contingency plan in case of future pandemics, reevaluate competency-based education, incorporate variations of distance learning permanently in their curricula, invest in haptic technology to improve psychomotor skills and also in faculty training for reaching through technology, … [and strengthen] extramural rotations and interprofessional education … to enable dental students to have the ability to make an impact in the community and help during such a crisis."[1] Below we present summaries of ongoing curricular adaptions.

Preclinical and Didactic

Many dental professions schools continue to mitigate the risk of COVID-19 transmission by keeping didactic content and preclinical courses mostly online.[4] Here are a few examples of successful remote adaptations for didactic and preclinical coursework:

- Incorporating interactive technology into preclinical courses:
  - Edpuzzle, which includes video-based quizzes to test knowledge prior to lab exercises for skills in implant dentistry, alginate impressions, periodontal instrumentation, and flossing techniques.[52]
  - Articulate Storyline for a tobacco cessation e-tutorial.[53]
  - Padlet, an online tool that allows real-time posting for interactive and collaborative generation of resources (eg, posing a question, gathering responses, and sharing model answers).[54]
  - Virtual reality (VR)[10] to demonstrate and practice dental implant surgery[55] and learn dental morphologies.[56]
  - Dentca Academy and Dentca Design to practice complete denture arrangement (vs. traditional wax-teeth arrangement).[57]
  - RealizeIt adaptive learning platform and Zoom, paired with a kit complete with supplies and tools distributed to students via drive-through, to teach and practice endodontic skills.[58]
  - Osmosis interactive online content, including short animated videos scripted by faculty.[59]
  - SoftChalk, an online tool that gamifies content into different activities, such as crossword puzzles, flash cards, and labeling exercises.[36]
  - Smart Sparrow, an adaptive learning program that enables self-directed independent learning.[60]
- Designing new software or mobile applications to teach:
  - Removable partial denture courses, which includes 3D modeling of digital casts instead of physical casts.[61]
  - Traumatic dental injuries.[62]
- Adapting existing software for unconventional usage:
  - Using Photoshop and image editing programs (eg, GIMP, ImageJ) to digitally trace and measure reference lines and angles for orthodontic courses.[63]
- Using Zoom webinars to create a national seminar series for pediatric residents, sharing curricula and speakers across institutions.[64]
- Using content from an aesthesia course to create lyrics for a karaoke video.[65]
- Using the flipped classroom technique to teach several topics:
  - Community dentistry and dental public health: virtual site visits (instead of in-person extramural community health site visits) introduces students to oral health disparities, barriers in access

to care, and social determinants of health.[66]

- Health administration and management.[67]
- Evidence-based dentistry: students review research articles and a compilation of student-generated questions are used to assess understanding.[54]
- Complete dentures: paired with instructional videos and laboratory instructional manual.[68]
- Orthodontics: including a course-complete kit in a bag that includes all the tools, instruments, supplies, and armamentarium each student needs for the course.[69]
- Interprofessional education: dental and dental hygiene students are paired with 8 other health professions students in teams that meet in virtual huddles before virtual office hours with faculty.[70]

Clinical

Most campuses reopened in late spring or early summer 2020 for students to participate in simulation clinics or labs, which was particularly important for senior dental students to complete graduation requirements.[4] To continue to minimize the spread of COVID-19, many schools implemented social distancing requirements with staggered workstations and schedules and student-faculty pods.[71–73] This could look like a longer day (7 AM - 8 PM) on weekdays and added Saturday sessions or creating 2 5-hour sessions each day (7:30 AM - 12:30 PM and 1 PM - 6 PM) to accommodate exercises that were previously completed in two 4-hour sessions.[27]

Schools also used their clinical operatories for simulation activities in addition to typodont exercises. This allowed students to practice and maintain clinical skills and prepare for clinical licensing exams while also practicing new and expanded infection control procedures and becoming increasingly efficient and confident to make up for lost time.

Below are a few examples of the ways in which clinical curricula were adapted to the challenges of the COVID-19 pandemic:

- Virtual clinics with remote operating kits (portable electric handpiece, diamond burs, typodont teeth, and ring light): students would record videos of preparations paired with small group synchronous Zoom sessions to share videos and receive real-time feedback.[74] Or, live instruction over Zoom while students practice the skill in real time at home.[75]
- Microsoft Teams was used to conduct virtual consultations by sharing clinical, chart, and radiographic content digitally while remaining compliant with security and privacy laws.[76,77] The consultation workflow was simplified and streamlined with several of the features offered by Teams (secure instant messaging, file sharing, screen sharing, etc.), which limited face-to-face interactions and accelerated treatment decisions. One school reported such success with Teams that they extended the use of Teams beyond the clinic and into other courses and departments.[78]
- Using 3D-printed (vs laboratory-processed) removable partial dentures on typodont-mounted manikins instead of elective patient care which was not an option.[79]

- Small group study clubs (8-9 students, 1-2 faculty members) were held weekly on Zoom and clinical content was derived from digitized and deidentified patient records, paid online subscriptions to Spear Online, and guest presentations by faculty specialists.[80]
- Completing literature reviews, critically appraising randomized controlled trials, and presenting the trial to the class.[81]
- Using Instagram to share short recorded videos from simulation lab sessions in addition to polls, quick quizzes, and photos with common mistakes.[71]
- Posting videos of clinical procedures on YouTube,[82] livestreaming procedures and interacting with the operating team in real time,[83] or using VR mobile applications to practice procedures.[84]
- Using the flipped classroom technique to discuss instrumentation, patient management, concerns about becoming a provider, and other topics relevant to ongoing clinical care.[85]
- Role-playing over videoconference to practice information gathering, dentist-patient interactions, communication skills, and clinical management.[86] Some schools even used live actors via videoconference to simulate a teledentistry visit.[87,88]

A benefit of the pivot to remote education included added time for faculty to develop case scenarios for case-based learning as an alternative to clinical instruction. At one school, faculty were asked to collect pertinent data from patient charts (eg, demographics, vitals, health and social history, dental conditions, pretreatment photographs, radiographs, etc.) to create 10 cases per week – after 6 weeks of case collection, over 800 cases were documented.[89] After a second stage of case collection and auditing for accuracy and integrity, a searchable database of over 1,000 cases was used in summer 2020 to assist students with board preparations. Many schools chose to replace in-person clinic time with remote case-based presentations with both faculty- and student-generated cases, and more often than not, several of the components described above were used to meet the CODA standards for clinical education.[83,90–95]

Assessments

The COVID-19 pandemic required revisions in dental school curricula and assessments, which have traditionally required hands-on, in-person learning and examinations.[96] While some educators have expressed concern that the transition to online education could adversely affect student performance, others found that student performance on the identical exam was actually improved through the use of synchronous Zoom lectures and asynchronous review sessions utilizing platforms such as Nearpod and Explain Everything.[97–100]

A study assessed learning outcomes of a 5-week module on cariology for first-year dental students that was delivered in 2 different modes. The dental class of 2023 received the cariology material in a live, in-person lecture format. The class of 2024 received the same material in a combination of synchronous Zoom lectures and asynchronous interactive presentations utilizing the interactive education platform Nearpod. Results from the study showed that the virtual class had a significantly higher mean score than the in-person class on the midterm examination, and that students overwhelmingly expressed support for the ease

of use and educational value of the Nearpod platform.[98]

Additional studies have assessed the feasibility and outcomes of utilizing specific digital tools for virtual assessments or feedback. One dental school utilized the Explain Everything app in a preclinical lab for students. The app allowed faculty to synchronously evaluate student practice preparations on simulated patients and provide live feedback using video and screen-sharing functions. Similar issues were noted for the virtual class compared to previous classes. However, based on the initial assessment of the data, it was evident that students in the virtual class demonstrated fewer critical errors than students in previous courses.[97] Tools such as Explain Everything can provide several benefits for preclinical education and can be scaled for additional remote instruction requiring live feedback as well.

Not only were dental schools tasked with creating virtual alternatives to traditionally in-person exams, but they were also responsible for ensuring students were clinically competent to graduate. The well-established objective structured clinical exam (OSCE) offered a virtual option through WebEx or Zoom, which enabled clinical assessments with meticulously calibrated faculty examiners.[101–103] Some schools also paired the OSCE with simultaneous, small-group, structured discussions moderated by faculty based on the results of each student's OSCE.[104] Still, a major drawback of the OSCE is its inability to measure technical skills.[105] However, without many other options, these assessments were rapidly scalable to address the fluctuating needs throughout the COVID-19 pandemic and are likely to remain as stalwarts in dental education.[10]

Promoting Safety and Crisis Management

While most dental school curricula addressed basic infection control measures, few addressed droplet and airborne infections prior to the COVID-19 pandemic and most provided infection control content through classroom lectures and clinic demonstrations, not through a focused course on the topic.[106] Now, experts are recommending that students are taught the basic principles of epidemiology, infection susceptibility and modes of transmission, risk factors and signs/symptoms of infection, preventive measures including droplet and airborne precautions, etc. This education could be delivered by lectures and demonstrations online or through smart phone apps. An example of a newly designed infection control course delivered virtually through summer 2020 demonstrated that dental students have the aptitude for and interest in learning complex epidemiological principles.[107]

Similarly, educators are advocating to create programs within dental curricula that address crisis management should a natural disaster or another health crisis occur.[10] These trainings should include information on how to access credible information; communicate effectively with patients, staff, and the general public; deliver emergency dental care and effectively triage patients; incorporate teledentistry into a dental practice;[108] and manage the financial burden under crisis.

Vaccine Administration

Another change to dental school curricula because of the COVID-19 pandemic was the addition of instruction in vaccine administration. The Biden Administration authorized dentists and dental students to administer the COVID-19 vaccine to join the mass vaccination effort across the country, but

most dentists do not receive this as part of their predoctoral dental education.[109] The ADEA Council of Deans Administrative Board also supported this effort, drafting a resolution in support of and encouraging the education of dental students, residents, and practitioners in the administration of vaccinations.[110]

MOVING FORWARD

Remote Opportunities

The dental education community continues to mitigate the risk of spread of COVID-19 by utilizing online learning platforms for most didactic content. Faculty and students have continued to adapt to this methodology. For some learning experiences, such as guest lectures or seminars, remote learning is now considered a preferred platform to provide content both synchronously and asynchronously. Providing asynchronous coursework allows for self-paced progress and time flexibility. The increased flexibility is particularly important for work-life balance for students and faculty alike and supports disability justice. Ongoing remote accommodations are an equitable approach to learners, faculty, and staff with disabilities and those with caregiving responsibilities at home.

The shift to online dental and dental education conferences, which are often inaccessible due to costs or other reasons that may prevent travel, enhanced faculty development and institutional collaboration. They opened the door to more people to exchange knowledge and collaborate across divisions, specialties, universities, and countries. Many multi-institutional collaboratives have sustained and grown their collaborations.[64]

It is true that many challenges remain such as the technical and logistical ability to proctor students while they are taking high-stakes summative examinations, internet connectivity concerns, a lack of productive work/study environments, and general frustration. However, as dental education continues to evolve in a post-COVID-19 pandemic landscape, it will become clear which content can be supplanted by or supplemented with online learning modalities. A survey of dental students on the state of dental education during the COVID-19 pandemic found that while most students felt that their didactic learning had not changed much compared to pre-COVID-19 pandemic learning, they reported significant barriers in preclinical and clinical education.[111] The inability to practice hands-on skills in simulation labs and learn from patient care experiences could not be replaced with remote learning alternatives. This indicates that the innovative adaptations to traditional dental education could be best used to supplement in-person preclinical and clinical learning post-COVID-19 pandemic.

Reforming Assessment and Licensure

The pandemic also disrupted the dental licensing and certification process. Many licensing exams were postponed or cancelled, causing delays for dental students and recent graduates. In order to maintain the dental workforce during the COVID-19 pandemic, clinical licensure examinations were shifted to manikin-only assessments, and many state boards approved their use, at least temporarily.[4] Others supported a multidisciplinary OSCE combined with a written exam, similar to the Canadian OSCE licensing exam,[1] and put the onus on

dental schools to certify the competency of their graduating dental students. Additionally, many dental residency programs were suspended or modified, affecting the training and career development of residents. Similarly, residency programs were tasked with certifying residents to graduate and were instructed to evaluate residents based on clinical care already completed or perhaps have peer reviews of their work alongside a faculty panel.[1]

The move toward typodont and manikin-based assessments has long been favored over traditional live-patient-based exams.[96] Because of the COVID-19 pandemic, the new Dental Licensure Objective Structured Clinical Examination (DLOSCE), administered by the Joint Commission on National Dental Examinations, was released 1 year ahead of schedule in summer 2020 to move toward a more modern and ethical approach to dental licensure.[2] Advocates report that the DLOSCE has stronger validity and reliability compared to procedure-based clinical exams on patients that (1) present ethical dilemmas, (2) are subject to random order, and (3) are narrow in scope, not assessing a comprehensive set of competencies and skills required to provide safe and high quality dental care.[110] While some states have joined the 11 pre-COVID-19 pandemic states that offered manikin-based assessments as an alternative pathway to licensure, advocates continue to push to eliminate the live-patient clinical exam for licensure.

CONCLUSIONS

While the COVID-19 pandemic has had many negative effects on dental education, it has also led to some positive changes and innovations that have the potential to benefit students, patients, and the dental profession in the long term.

1. Accelerated adoption of technology, including the use of teledentistry, virtual simulation, and interactive teaching modalities. These technologies have the potential to enhance the quality of dental education and improve patient care.

2. Improved infection control protocols in dental education, which can help reduce the spread of other infectious diseases.

3. Increased focus on mental health and well-being, with many dental schools increasing their support for students' mental health needs, including offering counseling services and stress-management programs.

4. Greater collaboration and teamwork among dental educators, students, and staff, resulting in a greater sense of community and shared purpose in the dental education community and sharing of best practices.

5. A stronger emphasis on equity in the dental education community with a focus on accessible educational modalities to meet the diverse needs of students and the promotion of manikin-based licensing examinations over live-patient exams.

Like major pandemics of the past, the full effect of the COVID-19 pandemic on dental education will only be known in the ensuing years. However, more and more dental institutions are seeing the undeniable need to change the course of dental education. As an author put it, "the COVID-19 pandemic has achieved virtually overnight what years of curriculum committee meetings, institutional strategic planning, and nationwide reforms could not."[83]

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APPENDIX A

APPENDIX A

Articles Coded for Care Delivery and Regulation

1. Abdelrahman H, Atteya S, Ihab M, et al. Dental practice closure during the first wave of COVID-19 and associated professional, practice and structural determinants: a multi-country survey. *BMC Oral Health* 21, 243 (2021). doi:10.1186/s12903-021-01601-4.
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Articles Coded for Regulation Only

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140. H.R. 7216- Small Business PPE Tax Credit Act. U.S. Congress. Accessed June 1, 2021. https://www.congress.gov/bill/116th-congress/house-bill/7216/text?r=68

141. House Bill 20-1361. General Assembly of the State of Colorado. Accessed June 1, 2021. https://leg.colorado.gov/sites/default/files/documents/2020A/bills/2020a_1361_enr.pdf

APPENDIX B

APPENDIX B*

Alabama

Dental Office Closure:
https://governor.alabama.gov/newsroom/2020/03/governor-ivey-issues-statement-on-statewide-public-health-order/

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://governor.alabama.gov/newsroom/2020/03/supplemental-state-of-emergency-coronavirus-covid-19/

Nursing Home Closure:
https://governor.alabama.gov/assets/2020/04/Safer-At-Home-Order-Signed-4.28.20.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.dentalboard.org/wp-content/uploads/2020/12/Minutes-Oct-2020-approved-signed.pdf

Alaska

Dental Office Closure:
https://gov.alaska.gov/wp-content/uploads/sites/2/COVID-19-Health-Mandate-006.pdf

Dental Office Reopening:
https://covid19.alaska.gov/wp-content/uploads/2020/06/06032020-COVID-MANDATE-015.pdf

School Closure:
http://dhss.alaska.gov/News/Documents/press/2020/SOA_03132020_COVID-19_HealthMandate.pdf

Nursing Home Closure:
http://dhss.alaska.gov/News/Documents/press/2020/SOA_03132020_COVID-19_HealthMandate.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Arizona

Dental Office Closure: Not closed and deemed essential.

Dental Office Reopening:
https://azgovernor.gov/sites/default/files/eo_2020-32_elective_surgeries.pdf?utm_source=Arizona+Dentists&utm_campaign=-25152b98a9-EMAIL_CAMPAIGN_2020_04_13_10_22_COPY_01&utm_medium=email&utm_term=0_80f716afc3-25152b98a9-335971369

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year

Nursing Home Closure:
https://azgovernor.gov/sites/default/files/eo_2020-07.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

** Accessed August 12, 2022.*

Arkansas

Dental Office Closure:
https://www.5newsonline.com/article/news/dental-offices-to-lift-restrictions-may-18th/527-81b3c5ca-4d17-4698-a69a-5e7b27650d29

Dental Office Reopening:
https://arkansasdentistry.org/2020/05/may-11-set-as-reopen-date-for-dental-offices/

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year

Nursing Home Closure:
https://www.nwahomepage.com/news/new-covid-19-policy-takes-into-effect-bans-visitors-in-all-arkansas-nursing-homes/

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

California

Dental Office Closure:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

Dental Office Reopening:
https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Guidance-for-Resuming-Deferred-and-Preventive-Dental-Care--.aspx

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year

Nursing Home Closure:
https://www.gov.ca.gov/wp-content/uploads/2020/03/3.15.2020-COVID-19-Facilities.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Colorado

Dental Office Closure:
https://drive.google.com/file/d/1Sp3le5zUavA3GKM_omeDXpm7FNfL-wSt/view

Dental Office Reopening:
https://ewscripps.brightspotcdn.com/b4/20/950e4abf420fabe0983e42dbaa2d/d-2020-045-elective-surgeries-1.pdf

School Closure:
https://drive.google.com/file/d/1ecMEQj3F3qeEl3qNMtLkAlk3ya3FbVH3/view

Nursing Home Closure:
https://www.colorado.gov/pacific/sites/default/files/atoms/files/Nursing%20Home%2C%20ALR%2C%20ICF%20PH%20Order-links.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Connecticut

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://www.ctdhp.com/documents/Gov_Dental_Report.pdf

School Closure:
https://portal.ct.gov/-/media/Office-of-the-Governor/Executive-Orders/Lamont-Executive-Orders/Executive-Order-No-7C.pdf

Nursing Home Closure:
https://portal.ct.gov/-/media/Office-of-the-Governor/Executive-Orders/Lamont-Executive-Orders/Executive-Order-No-7.pdf

Vaccine Administration by Dentists/OH Staff:
https://portal.ct.gov/-/media/Coronavirus/20201207-DPH-Order-Expanding-Authorized-Professions-to-Administer-Vaccines.pdf

Delaware

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://delawarestatedentalsociety.org/covid19-05202020.html

School Closure:
https://governor.delaware.gov/wp-content/uploads/sites/24/2020/03/Letter-to-Schools-03.23.2020.pdf

Nursing Home Closure:
https://governor.delaware.gov/wp-content/uploads/sites/24/2020/03/State-of-Emergency_03122020.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

District of Columbia

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://coronavirus.dc.gov/sites/default/files/dc/sites/coronavirus/page_content/attachments/MO2020-067.pdf

School Closure:
https://mayor.dc.gov/release/mayor-bowser-adjusts-district-columbia-government%E2%80%99s-operating-status

Nursing Home Closure:
https://coronavirus.dc.gov/sites/default/files/dc/sites/mayormb/release_content/attachments/Mayor%27s%20Order%202020-053%20Closure%20of%20Non-Essential%20Businesses%20and%20Prohibiti....pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Florida

Dental Office Closure:
https://www.flgov.com/wp-content/uploads/orders/2020/EO_20-72.pdf

Dental Office Reopening:
https://www.floridadental.org/docs/librariesprovider57/private-library-florida/public-docs/executive-order-20-112.pdf?sfvrsn=2

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://ahca.myflorida.com/docs/DEM_ORDER_NO_20_011_In_re_COVID_19_Public_Health_Emergency_Issued_October_22_2020.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Georgia

Dental Office Closure:
https://www.gadental.org/docs/librariesprovider16/default-document-library/member-letter-3-17-20-gda-covid-19-advisory.pdf?sfvrsn=0

Dental Office Reopening:
https://gov.georgia.gov/executive-action/executive-orders/2020-executive-orders

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://gov.georgia.gov/executive-action/executive-orders/2020-executive-orders

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Hawaii

Dental Office Closure: Open for elective procedures. Never Closed.

Dental Office Reopening: Open for elective procedures. Never Closed.

School Closure:
https://www.hawaiipublicschools.org/ConnectWithUs/MediaRoom/PressReleases/Pages/HIDOE-extends-school-closures-implements-remote-work-to-maintain-essential-functions.aspx

Nursing Home Closure:
https://governor.hawaii.gov/newsroom/latest-news/proper-use-of-covid-19-tests-imperative-there-is-a-current-shortage-of-hand-sanitizers-and-toilet-paper-in-hawaii-in-part-because-of-the-publics-over-reaction-to-covid-19-the-hawai/

Vaccine Administration by Dentists/OH Staff:
https://governor.hawaii.gov/wp-content/uploads/2021/02/2102078-ATG_Eighteenth-Proclamation-Related-to-the-COVID-19-Emergency-distribution-signed.pdf

Idaho

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://www.idahoednews.org/coronavirus/state-board-recommends-four-week-school-soft-closure/

Nursing Home Closure:
https://www.boisestatepublicradio.org/news/2020-06-12/idahos-long-term-care-centers-can-open-to-visitors-this-weekend-under-new-guidelines

Vaccine Administration by Dentists/OH Staff:
https://coronavirus.idaho.gov/wp-content/uploads/2021/01/proclamation_emergency- declaration_012921.pdf

Illinois

Dental Office Closure:
https://www.isds.org/news-details/2020/03/16/isds-issues-recommendations-for-dental-offices-regarding-covid-19

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://www.fox32chicago.com/news/illinois-shuts-down-all-schools-due-to-coronavirus

Nursing Home Closure:
https://www.nbcchicago.com/news/local/new-guidelines-for-illinois-nursing-homes-as-coronavirus-spreads/2235144/

Vaccine Administration by Dentists/OH Staff:
https://www.idfpr.com/Forms/COVID19/Dental%20COVID%20Vaccine%20Updated%20Proclamation%202121.pdf

Indiana

Dental Office Closure:
https://www.in.gov/gov/files/Executive%20Order%2020-13%20Medical%20Surge.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://www.in.gov/gov/files/EO_20-05.pdf

Nursing Home Closure:
https://www.wishtv.com/news/local-news/some-indiana-nursing-homes-close-access-to-visitors/

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Iowa

Dental Office Closure:
https://dentalboard.iowa.gov/sites/default/files/documents/2020/03/igov_phproclamation_march262020.pdf

Dental Office Reopening:
https://governor.iowa.gov/sites/default/files/documents/Proclamation%20of%20Disaster%20Emergency%20-%202020.05.06.pdf

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://www.leadingageiowa.org/assets/LTC%20Reopening%20Phases%20and%20Testing_Updated%206302020.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Kansas

Dental Office Closure:
https://www.kmuw.org/sites/kmuw/files/202004/kda_letter.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://governor.kansas.gov/wp-content/uploads/2020/03/EO-20-07-Executed.pdf

Nursing Home Closure:
https://www.kdads.ks.gov/media-center/news-releases/2020/03/16/new-federal-guidelines-increase-restrictions-for-visitors-to-nursing-homes-kdads-working-quickly-to-ensure-kansas-facilities-following-enhanced-cms-guidelines

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Kentucky

Dental Office Closure:
https://governor.ky.gov/attachments/20200323_Directive_Elective-Procedures.pdf

Dental Office Reopening:
https://kentucky.gov/Pages/Activity-stream.aspx?n=GovernorBeshear&prId=138

School Closure:
https://www.wdrb.com/in-depth/public-school-districts-across-kentucky-closed-for-at-least-two/article_0b796c14-6531-11ea-8c34-57abc0d37640.html

Nursing Home Closure:
https://www.courier-journal.com/story/news/local/2020/03/10/coronavirus-beshear-wants-kentucky-nursing-homes-restrict-visits/5006147002/

Vaccine Administration by Dentists/OH Staff:
https://apps.legislature.ky.gov/law/kar/201/008/505e.pdf

Louisiana

Dental Office Closure:
https://gov.louisiana.gov/assets/Proclamations/2020/33-JBE-2020-Public-Health-Emergency.pdf

Dental Office Reopening:
https://gov.louisiana.gov/index.cfm/newsroom/detail/2468

School Closure:
https://gov.louisiana.gov/assets/ExecutiveOrders/27-JBE-2020-COVID-19.pdf

Nursing Home Closure:
https://ldh.la.gov/assets/medicaid/hss/docs/Coronavirus_2019/LDH_Nursing_Homes_Visitor_Restrictions_CMSGuidance_03162020.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Maine

Dental Office Closure:
https://www.maine.gov/governor/mills/sites/maine.gov.governor.mills/files/inline-files/An%20Order%20Regarding%20Essential%20Businesses%20and%20Operations%20_0.pdf

Dental Office Reopening:
https://www.maine.gov/dhhs/documents/coronavirus/COVID-19-Guidance-for-Health-Care-Providers-051220_.pdf

School Closure:
https://www.maine.gov/governor/mills/sites/maine.gov.governor.mills/files/inline-files/EO%2015%20An%20Order%20Regarding%20School%20Readiness.pdf

Nursing Home Closure: No definitive directive.

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Maryland

Dental Office Closure:
https://governor.maryland.gov/wp-content/uploads/2020/05/05.06.2020-MDH-Sec-Order-Amended-Various-Healthcare-Matters.pdf

Dental Office Reopening:
https://governor.maryland.gov/wp-content/uploads/2020/05/05.06.2020-MDH-Sec-Order-Amended-Various-Healthcare-Matters.pdf

School Closure:
https://www.nytimes.com/2020/03/12/world/coronavirus-live-news-updates.html#link-66fc99fb
Nursing Home Closure:

https://governor.maryland.gov/2020/04/05/governor-hogan-takes-aggressive-action-to-protect-nursing-home-residents-and-staff-amid-covid-19-outbreaks/

Vaccine Administration by Dentists/OH Staff:
https://phpa.health.maryland.gov/Documents/MDH%202020-12-08-01-%20Vaccination%20Matters.pdf

Massachusetts

Dental Office Closure:
https://www.boston.com/news/health/2020/03/22/dentists-coronavirus

Dental Office Reopening:
https://www.mass.gov/doc/reopening-massachusetts-may-18-2020/download

School Closure:
https://www.mass.gov/doc/march-16-2020-k-12-school-closing-order/download

Nursing Home Closure:
https://www.leadingagema.org/assets/COVID19/03.16.20Memo%20-%20COVID-19%20Visitation%20Restriction%20for%20Long%20Term%20Care%20Facilities.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.mass.gov/doc/covid-19-vaccinators/download

Michigan

Dental Office Closure:
https://www.michigan.gov/whitmer/0,9309,7-387-90499_90705-522451--,00.html

Dental Office Reopening:
https://content.govdelivery.com/attachments/MIEOG/2020/05/21/file_attachments/1456636/EO%202020-96%20Emerg%20order%20-%20MI%20Safe%20Start%20-%20re-issue.pdf

School Closure:
https://www.michigan.gov/whitmer/0,9309,7-387-90499_90705-521595--,00.html

Nursing Home Closure:
https://www.michigan.gov/whitmer/0,9309,7-387-90499_90705-521676--,00.html

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Minnesota

Dental Office Closure:
https://mn.gov/governor/assets/Emergency%20Executive%20Order%2020-09_FINAL_As_Filed_tcm1055-424357.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://www.leg.mn.gov/archive/execorders/20-02.pdf

Nursing Home Closure:
https://www.health.state.mn.us/diseases/coronavirus/hcp/ltcindoor.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Mississippi

Dental Office Closure:
https://www.sos.ms.gov/content/executiveorders/ExecutiveOrders/1470.pdf

Dental Office Reopening:
https://mcusercontent.com/08cb3e52aa1308600f84d49ea/files/e24a9045-8ab7-4aa0-bb23-bb49d342c816/Executive_Order_1477_Safer_at_Home.pdf

School Closure:
https://www.sos.ms.gov/Education-Publications/ExecutiveOrders/1460.pdf

Nursing Home Closure:
https://www.sos.ms.gov/Education-Publications/ExecutiveOrders/1463.pdf

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Missouri

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://governor.mo.gov/press-releases/archive/governor-parson-extends-statewide-stay-home-missouri-order-through-may-3

School Closure:
https://www.news-leader.com/story/news/2020/03/19/all-missouri-public-schools-closed/2879472001/

Nursing Home Closure:
https://governor.mo.gov/priorities/stay-home-order

Vaccine Administration by Dentists/OH Staff:
https://success.ada.org/en/practice-management/patients/covid-19-vaccine-regulations-for-dentists-map

Montana

Dental Office Closure:
https://covid19.mt.gov/_docs/EO-02-2020_COVID-19%20Emergency%20Declaration.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations?utm_source=ad-aorg&utm_medium=covid-statement-200401

School Closure:
https://dphhs.mt.gov/Portals/85/Documents/NewsImages/2020-03-15GovernorDirectivereCOVID-19.pdf

Nursing Home Closure:
https://dphhs.mt.gov/Portals/85/Documents/NewsLetters/NursingHomeVisitationDirective.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Nebraska

Dental Office Closure:
https://dhhs.ne.gov/Documents/COVID-19-StateDirectedHealthMeasures-Lancaster-Dodge-Saunders-Counties.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://www.cms.gov/files/document/qso-20-14-nh-revised.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Nevada

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://nvhealthresponse.nv.gov/wp-content/uploads/2020/04/Press-release-Nevada-ready-to-resume-limited-medical-and-dental-procedures.pdf

School Closure:
https://gov.nv.gov/News/Emergency_Orders/2020/2020-03-15_-_COVID-19_Declaration_of_Emergency_Directive_001/

Nursing Home Closure:
https://www.reviewjournal.com/local/local-nevada/nevada-program-to-restart-visits-to-long-term-care-facilities-2134612/

Vaccine Administration by Dentists/OH Staff:
https://nvhealthresponse.nv.gov/wp-content/uploads/2021/01/Directive-011-guidance.pdf

New Hampshire

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#cite_note-MT315-85

Nursing Home Closure:
https://www.governor.nh.gov/sites/g/files/ehbemt336/files/documents/2020-04.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.gwhwi.org/vaccinator-policies.html

New Jersey

Dental Office Closure:
https://www.njconsumeraffairs.gov/den/Documents/COVID-19-ADVISORY-FOR-NEW-JERSEY-DENTAL-PROFESSIONALS.pdf

Dental Office Reopening:
https://www.nj.gov/infobank/eo/056murphy/pdf/EO-145.pdf

School Closure:
https://nj.gov/infobank/eo/056murphy/pdf/EO-104.pdf

Nursing Home Closure:
https://www.state.nj.us/health/legal/covid19/3-16-2020_MandatoryGuidelinesforVisitors_andFacilityStaff_%20Super-sedes3-13-2020Guidelines.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.nj.gov/health/legal/covid19/ExecutiveDirectiveNo20-037_HCPVaccinationAuthorization.pdf

New Mexico
Dental Office Closure:
https://www.facs.org/covid-19/legislative-regulatory/executive-orders

Dental Office Reopening:
https://www.facs.org/covid-19/legislative-regulatory/executive-orders

School Closure
https://www.governor.state.nm.us/wp-content/uploads/2020/03/Executive-Order-2020-005.pdf

Nursing Home Closure:
https://www.governor.state.nm.us/wp-content/uploads/2020/04/Executive-Order-2020-019.pdf

Vaccine Administration by Dentists/OH Staff
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=fed-eralregister.gov&utm_medium=email

New York

Dental Office Closure:
https://www.facs.org/covid-19/legislative-regulatory/executive-orders

Dental Office Reopening:
https://www.governor.ny.gov/news/governor-cuomo-announces-dentists-can-reopen-statewide-tomorrow-and-updates-new-york-ers-states

School Closure:
https://www.governor.ny.gov/news/no-2024-continuing-temporary-suspension-and-modification-laws-relating-disaster-emergency

Nursing Home Closure:
https://coronavirus.health.ny.gov/system/files/documents/2020/03/acfguidance.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.governor.ny.gov/news/no-20282-continuing-temporary-suspension-and-modification-laws-relating-disaster-emergency

North Carolina

Dental Office Closure:
https://www.facs.org/covid-19/legislative-regulatory/executive-orders

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations?utm_source=ad-aorg&utm_medium=covid-statement-200401

School Closure:
https://files.nc.gov/governor/documents/files/EO117-COVID-19-Prohibiting-Mass-Gathering-and-K12-School-Closure.pdf

Nursing Home Closure:
https://files.nc.gov/governor/documents/files/EO120.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.gwhwi.org/vaccinator-policies.html

North Dakota

Dental Office Closure:
https://www.smilenorthdakota.org/docs/librariesprovider39/default-document-library/covid-19-april-23-2020-update.pdf?s-fvrsn=bb5d268a_2

Dental Office Reopening: No definitive directive.

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#cite_note-MT315-85

Nursing Home Closure:
https://www.governor.nd.gov/sites/www/files/documents/executive-orders/Executive%20Order%202020-22%20-%20Suspending%20visitation%20to%20long-term%20care%20facilities.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Ohio

Dental Office Closure:
https://www.facs.org/covid-19/legislative-regulatory/executive-orders

Dental Office Reopening:
https://dental.ohio.gov/News/ohio-state-dental-board-covid-19-update-dental-offices-opening-on-may-1-2020
School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://coronavirus.ohio.gov/wps/wcm/connect/gov/76bf6fbf-a597-4ea2-a5a0-26c3c8364551/1280_001.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-76bf6fbf-a597-4ea2-a5a0-26c3c8364551-n4p5m0G

Vaccine Administration by Dentists/OH Staff:
https://files.constantcontact.com/83169573201/2f6904fa-e758-48d6-9aa0-f23072e9f3bd.pdf

Oklahoma

Dental Office Closure:
https://www.sos.ok.gov/documents/executive/1928.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://www.sos.ok.gov/documents/executive/1928.pdf

Vaccine Administration by Dentists/OH Staff:
http://webserver1.lsb.state.ok.us/cf_pdf/2021-22%20ENR/SB/SB408%20ENR.PDF

Oregon

Dental Office Closure:
https://www.oregon.gov/gov/Documents/executive_orders/eo_20-10.pdf

Dental Office Reopening:
https://www.oregon.gov/gov/Documents/executive_orders/eo_20-22.pdf

School Closure:
https://www.oregon.gov/gov/Documents/executive_orders/eo_20-08.pdf

Nursing Home Closure:
https://www.oregon.gov/DHS/PROVIDERS-PARTNERS/LICENSING/APD-AFH/Alerts/DHS%20Long-Term%20Care%20Covid-19%20Visitation%20Policy%203-16-2020%20+%20docs.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.oregon.gov/dentistry/Pages/hot-topics.aspx

Pennsylvania

Dental Office Closure:
https://www.health.pa.gov/topics/disease/coronavirus/Pages/Guidance/Dental-Personnel-COVID-19.aspx

Dental Office Reopening:
https://www.health.pa.gov/topics/disease/coronavirus/Pages/Guidance/Dental-Personnel-COVID-19.aspx

School Closure:
https://ballotpedia.org/School_responses_in_Pennsylvania_to_the_coronavirus_(COVID-19)_pandemic_during_the_2020-2021_school_year#cite_note-PA313-7

Nursing Home Closure:
https://www.governor.pa.gov/wp-content/uploads/2020/03/03.23.20-TWW-COVID-19-Stay-at-Home-Order.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.wkbn.com/news/coronavirus/new-castle-dentist-selected-to-administer-covid-19-vaccine/

Rhode Island

Dental Office Closure:
https://health.ri.gov/publications/frequentlyaskedquestions/Dental-COVID19-20200421.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#cite_note-MT315-85

Nursing Home Closure:
https://governor.ri.gov/documents/orders/Executive-Order-20-33.pdf

Vaccine Administration by Dentists/OH Staff:
https://covid.ri.gov/healthcare-professionals/vaccine-information-healthcare-providers

South Carolina

Dental Office Closure:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

Dental Office Reopening:
https://governor.sc.gov/sites/default/files/Documents/Executive-Orders/2020-04-20%20FILED%20Executive%20Order%20No.%202020-28%20-%20Modification%20of%20Restrictions%20for%20Public%20Beaches%20%26%20Waters%20%26%20Incremental%20Modification%20of%20Non-Essential%20Business%20Closures.pdf

School Closure:
https://governor.sc.gov/sites/default/files/Documents/Executive-Orders/2020-03-28%20eFILED%20Executive%20Order%20No.%202020-15%20-%20State%20of%20Emergency%20Due%20to%20COVID-19%20Pandemic.pdf

Nursing Home Closure:
https://governor.sc.gov/sites/default/files/Documents/Executive-Orders/2020-03-28%20eFILED%20Executive%20Order%20No.%202020-15%20-%20State%20of%20Emergency%20Due%20to%20COVID-19%20Pandemic.pdf

Vaccine Administration by Dentists/OH Staff:
https://www.scstatehouse.gov/sess124_2021-2022/bills/3707.htm

South Dakota

Dental Office Closure:
https://covid.sd.gov/docs/2020-08.pdf

Dental Office Reopening:
https://covid.sd.gov/docs/2020-20.pdf

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#cite_note-MT315-85

Nursing Home Closure:
https://www.youtube.com/watch?v=NIjuy-HIlCw

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Tennessee

Dental Office Closure:
https://publications.tnsosfiles.com/pub/execorders/exec-orders-lee18.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://publications.tnsosfiles.com/pub/execorders/exec-orders-lee30.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Texas

Dental Office Closure:
https://gov.texas.gov/uploads/files/press/EO-GA_08_COVID-19_preparedness_and_mitigation_FINAL_03-19-2020_1.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://gov.texas.gov/uploads/files/press/EO-GA_08_COVID-19_preparedness_and_mitigation_FINAL_03-19-2020_1.pdf

Nursing Home Closure:
https://gov.texas.gov/uploads/files/press/EO-GA_08_COVID-19_preparedness_and_mitigation_FINAL_03-19-2020_1.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Utah

Dental Office Closure:
https://coronavirus-download.utah.gov/Health/state%20public%20health%20order.20.04.21.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#cite_note-MT315-85

Nursing Home Closure:
https://coronavirus.utah.gov/wp-content/uploads/COVID-19-LTCF_Assist-Living_Leaving-and-Visiting-Guidance_041620.pdf?x97939

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Vermont

Dental Office Closure:
https://governor.vermont.gov/sites/scott/files/documents/ADDENDUM%203%20TO%20EXECUTIVE%20ORDER%2001-20.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#cite_note-MT315-85

Nursing Home Closure:
https://governor.vermont.gov/sites/scott/files/documents/EO%2001-20%20Declaration%20of%20State%20of%20Emergency%20in%20Response%20to%20COVID-19%20and%20National%20Guard%20Call-Out.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Virginia

Dental Office Closure:
https://www.governor.virginia.gov/media/governorvirginiagov/executive-actions/Order-of-Public-Health-Emergency-Two---Order-of-The-Governor-and-State-Health-Commissioner.pdf

Dental Office Reopening:
https://www.facs.org/covid-19/legislative-regulatory/executive-orders

School Closure:
https://www.governor.virginia.gov/media/governorvirginiagov/executive-actions/EO-53-Temporary-Restrictions-Due-To-Novel-Coronavirus-(COVID-19).pdf

Nursing Home Closure: No definitive directive.
Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Washington

Dental Office Closure:
https://www.governor.wa.gov/sites/default/files/proclamations/20-24%20COVID-19%20non-urgent%20medical%20procedures%20%28tmp%29.pdf

Dental Office Reopening:
https://www.governor.wa.gov/sites/default/files/proclamations/20-24%20COVID-19%20non-urgent%20medical%20procedures%20%28tmp%29.pdf

School Closure:
https://www.governor.wa.gov/sites/default/files/proclamations/20-08%20Coronavirus%20%28tmp%29.pdf

Nursing Home Closure:
https://www.governor.wa.gov/sites/default/files/proclamations/20-06%20Coronavirus%20%28tmp%29.pdf

Vaccine Administration by Dentists/OH Staff: https://www.governor.wa.gov/sites/default/files/proclamations/20-24%20COVID-19%20non-urgent%20medical%20procedures%20%28tmp%29.pdf

West Virginia

Dental Office Closure:
https://governor.wv.gov/Documents/EO%2016-20electiveprocedures.pdf

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://governor.wv.gov/News/press-releases/2020/Pages/COVID-19-UPDATE-Gov.-Justice%2c-Department-of-Education-issue-updated-guidance-on-school-closures-in-West-Virginia.aspx

Nursing Home Closure:
https://governor.wv.gov/News/press-releases/2020/Pages/COVID-UPDATE-Gov.-Justice-announces-State-employee-travel-ban%2c-basketball-tournament-cancellation-among-latest-precautions.aspx

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Wisconsin

Dental Office Closure: No definitive directive.

Dental Office Reopening:
https://success.ada.org/en/practice-management/patients/covid-19-state-mandates-and-recommendations

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map
Nursing Home Closure:
https://www.dhs.wisconsin.gov/dph/memos/communicable-diseases/2020-07.pdf

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

Wyoming

Dental Office Closure: No definitive directive.

Dental Office Reopening: No definitive directive.

School Closure:
https://ballotpedia.org/School_responses_to_the_coronavirus_(COVID-19)_pandemic_during_the_2019-2020_academic_year#School_closures_map

Nursing Home Closure:
https://drive.google.com/file/d/1S0COYaGJC5C4LUmMwyq_xbwT3_6mc_mG/view

Vaccine Administration by Dentists/OH Staff:
https://public-inspection.federalregister.gov/2021-05401.pdf?utm_campaign=pi%20subscription%20mailing%20list&utm_source=federalregister.gov&utm_medium=email

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Ms. Werts is a project policy analyst with the Department of Preventive and Restorative Dental Sciences, School of Dentistry and Healthforce Center at UCSF. Her undergraduate academic career at the University of California, Berkeley – where she received a bachelor's degree in both Molecular and Cell Biology and Public Health – led her to pursue research addressing health inequities. As an analyst, she utilizes mixed methods to conduct research investigating healthcare workforce issues, scope of practice, access to care, and health disparities.

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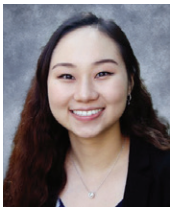

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Senior Investigator, Oral Health Workforce Research Center

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