

ORIGINAL ARTICLE

Operational and financial impact of the COVID-19 pandemic on U.S. dental school clinics

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Abstract

Purpose: This study assessed the impact of the COVID-19 pandemic on U.S. dental schools and their school-based clinic operations and finances during the first eight months (April to December 2020) of the outbreak. School-based clinics are critical to training and educating future dentists and delivering oral health care services to underserved communities.

Methods: The American Dental Education Association (ADEA) conducted a structured survey with the 67 accredited U.S. dental schools between November 2020 and January 2021 to assess the impact of the COVID-19 pandemic on their operations, especially on their school-based clinics. The response rate was 67%. The authors employed descriptive statistics and text analysis to examine the survey results.

Results: This study revealed that from April to December 2020, dental schools experienced a 50% reduction in patient visits at dental school clinics, a 7% median decrease in budget, a 42% decline in revenue, changes in clinical and nonclinical faculty and staff, and investments related to infection control measures to remain operational. Ninety-two percent of dental school clinics suspended community-based patient care experiences outside the dental school in the first eight months of the pandemic compared to the same time period the year prior.

Conclusions: This research shows the extent of the operational and financial challenges dental school clinics faced in the pandemic's first eight months, April to December 2020. In these unique times, dental school clinics continued to train and educate the dentists of tomorrow and deliver oral health care services to vulnerable communities while implementing safeguards and infection control measures to combat the propagation of the COVID-19 virus in their institutions.

KEYWORDS

COVID-19, dental school clinics, finance, operations, oral health, pandemic

1 | INTRODUCTION

The COVID-19 pandemic placed an unprecedented strain on the public health and health care delivery systems in the United States and worldwide. Health profession education institutions, such as academic medical centers (AMC), school-based clinics, community-based centers, and so on, encountered barriers to ensuring their teaching facilities remained operational.¹

The COVID-19 pandemic significantly affected hospitals, including AMC operations. Overall, hospitals across the United States suffered significant financial losses as a result of the pandemic with outpatient center closures, elective appointment cancellations, and the cost of implementing a variety of procedures to slow the spread of the COVID-19 virus.² Teaching hospitals, particularly small facilities located in rural areas, experienced the hardest impact, as their main financial revenue comes from outpatient departments and elective appointments.² In March 2020, credit rating agencies changed the financial outlook for U.S. non-profit and public hospitals from stable to negative.³ The reasons for this change included reduced medical center revenue resulting from the pandemic, more spending on staff and supplies, and increased use of expensive intensive care unit equipment for COVID-19 patients.³ The loss in revenue at AMCs threatens their ability to carry out their entire mission (clinical, educational, cultural, economic, etc.).

Dental school clinics were not spared from this trend. Dental school clinics are the clinical training grounds for dental students and other health care providers and provide affordable dental care to underserved communities. Each dental school has operated clinics from its inception.⁴ After the pandemic began, most schools suspended clinical teaching and implemented stay-at-home policies or social distancing in clinical skills laboratories, while also facing challenges to ensure dental students are competent and practice-ready upon graduation.⁵ In the absence of existing hospitals like the AMCs for medical education, every dental school runs its own hospital-like dental clinics to get students practice-ready by graduation. Dental school graduates must be as prepared as possible to become licensed to practice dentistry immediately after graduation. In comparison, medical students graduate “residency ready” and gain a significant amount of their clinical experience in residency after medical school. Dental graduates may pursue advanced dental education and training to obtain specialty status, but many dentists begin practice upon obtaining licensure after graduation from dental school.

Dental school clinics provide oral health care to populations of greatest need. During the 2019–2020 academic year, U.S. dental school clinics averaged more than 48,000 patients, nearly 4,500 of whom were new patients being

screened for the first time.⁶ As safety nets, dental school clinics also are more likely to provide comprehensive and affordable oral care to marginalized communities. For example, A.T. Still University’s Arizona School of Dentistry & Oral Health serves about 11,000 members of the community annually, with a focus on providing comprehensive dentistry to patients with intellectual, physical, and emotional disabilities.⁷ Additionally, approximately 60% of all U.S. dental school clinics provided \$10.6 million in oral health services to Medicaid-eligible beneficiaries in 2019.⁸

This study’s purpose is to examine the impact of the COVID-19 pandemic on U.S. dental schools and their school clinic operations and finances. This article provides insight into the pandemic’s effects on a less explored type of health care provider. To the authors’ knowledge, this is the first research examining this topic nationally. Specifically, the analysis explores the pandemic’s impact on U.S. dental school clinic patient visits, revenue and budgets, personnel, community-based outreach and patient care, and infection control investments to limit the spread of the COVID-19 virus. During the pandemic’s first eight months (defined as April to December 2020), in spite of the myriad of challenges, dental school clinics remained steadfast in providing comprehensive dentistry for emergency procedures and to populations with the greatest oral health care needs.

2 | METHODS

2.1 | ADEA survey

This research analyzes data from the American Dental Education Association (ADEA) COVID-19 Pandemic Impact Survey of U.S. Dental Schools (henceforth called “ADEA survey”). An independent ethical review/institutional review board, Adverra, Inc., reviewed this semi-structured survey and granted IRB exempt status from the specific regulations and requirements in Title 45, Part 46 of the Code of Federal Regulations. ADEA research staff field tested the structured survey questionnaire for reliability. Invitations to participate in the study were sent to the deans of the 67 accredited U.S. dental schools. The authors developed and disseminated the survey through Qualtrics (Qualtrics Software Company, Seattle, WA and Provo, UT) via a populated email distribution to each dental school dean. The survey was conducted between November 2020 and January 2021, and to amplify survey response, a series of three email reminders were sent to each school over the data collection period. To compare the impact of the COVID-19 pandemic, the ADEA survey identified two time periods for comparison: (a) April to

TABLE 1 Survey sample relative to the U.S. dental school population

U.S. Census region	Sample		Population	
	Count	Percentage	Count	Percentage
West	12	27	14	21
Midwest	11	24	15	22
South	14	31	24	36
Northeast	8	18	14	21
U.S. dental schools – total	45	100	67	100

Source: American Dental Education Association (ADEA) COVID-19 Pandemic Impact Survey of U.S. Dental Schools, November 2020 to January 2021.

December 2019 (before the COVID-19 pandemic), and (b) April to December 2020 (during the COVID-19 pandemic). Analysis related to dental school personnel questions were aggregated into two categories: clinical faculty and staff and nonclinical faculty and staff.

2.2 | Analysis methodology

Summary statistics and frequencies for open and closed questions were run in SAS 9.4 (SAS Institute, Inc., Cary, NC). The frequencies for questions where participants could select more than one option were calculated based on the total number of options. Open-ended survey questions were text analyzed where appropriate. Overall, 67% ($n = 45$) of the dental schools consented to participate in the survey across U.S. census regions (Table 1). Of these dental schools, 62% ($n = 28$) were public institutions, 36% ($n = 16$) private, and 2% ($n = 1$) both private/public.

The response sample is representative of the population of U.S. dental schools, and therefore dental school clinics, based on the distribution of U.S. dental schools by Census region (Table 1). The authors conducted a one-sample chi-square test ($p < 0.05$) to test if the proportions of dental schools in the sample were equal to the proportions in the population of U.S. dental schools. Finally, the analysis presents results reflecting the population of U.S. dental schools by employing sample weights.

3 | RESULTS

3.1 | COVID-19 pandemic impact on dental school clinics' patient visits, revenue, and budgets

The onset of the pandemic precipitated a 50% drop in the number of patient visits at dental school clinics and

a reduction in the revenue generated from these visits. On average, clinic revenue represents 22% of a U.S. dental school's operating budget.⁸ During the pandemic's first eight months, dental school clinics' revenue declined by 42% compared with the same period in 2019. The drop in patient visits was statistically significant across the four patient groups: children (<19 years), adults (20–64 years), older adults (≥ 65 years), and patients with special needs (Figure 1). Independent of age, the number of visits among patients with special needs dropped by 64%, with a median drop of 43%. Twenty-nine dental school clinics with special care dentistry programs revealed that the COVID-19 pandemic impacted their ability to operate, resulting in clinic closures and reduced patient visits.

The COVID-19 pandemic also substantially impacted dental school clinics' budgets and operations. In the wider context, 67% of dental schools experienced budget reductions due to the pandemic, with a 7% median drop in budget. Dental schools attributed their overall budget reductions to a variety of factors, including reductions in university-wide budgets (57% of the dental schools), budget withholds from state governments (17%), and reallocation of state funds (8%). In response to the budgetary reductions, some dental schools (15%) increased their dental school clinic procedural fees and decreased their expenses with faculty and staff, while 67% decreased their expenses with faculty and staff only.

3.2 | COVID-19 impact on dental school clinic personnel

The consequential impact of the COVID-19 pandemic on dental school faculty and staff was observed across dental schools. Clinical and nonclinical faculty and staff are critical for educating, training, and supporting students to be practice-ready dentists upon graduation. During the pandemic's first eight months, dental schools implemented certain measures that impacted dental school personnel (Figure 2). For example, 54% of the dental schools suspended clinical faculty and staff hiring compared with nonclinical faculty and staff (61%). All dental schools experienced a higher percentage of layoffs (27%), furloughs (33%), and resignations (59%) of their clinical faculty and staff compared with nonclinical faculty and staff. As noted by one school, "some faculty experienced burnout or had to return to private practice to offset faculty layoffs, furloughs, or other types of faculty removal from dental schools." The pandemic also impacted academic tenured promotions, with 19% of schools postponing the tenure process for clinical faculty and staff, compared with 21% for nonclinical faculty and staff.

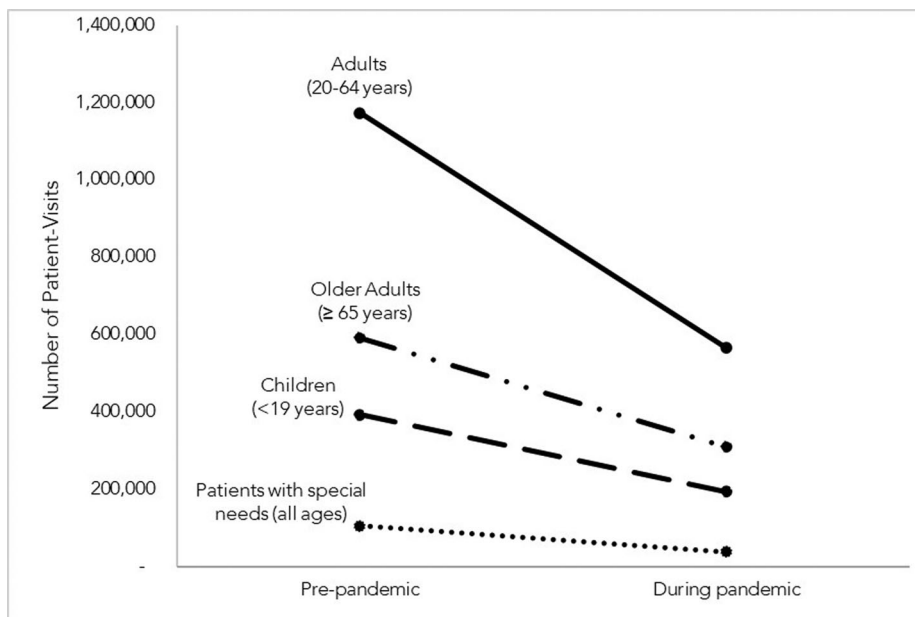


FIGURE 1 Change in the number of patient visits* in dental school clinics, April to December 2020 compared with April to December 2019. Source: American Dental Education Association (ADEA) COVID-19 Pandemic Impact Survey of U.S. Dental Schools, November 2020 to January 2021. *Patients with special needs in Special Care Dentistry are those patients with physical, medical, developmental, or cognitive conditions that limit their ability to receive routine dental care. <https://www.scdonline.org/page/SCDADefinitions/>. Note: All changes in the number of patient visits during the first eight months of the pandemic are statistically significant at 90% confidence interval.

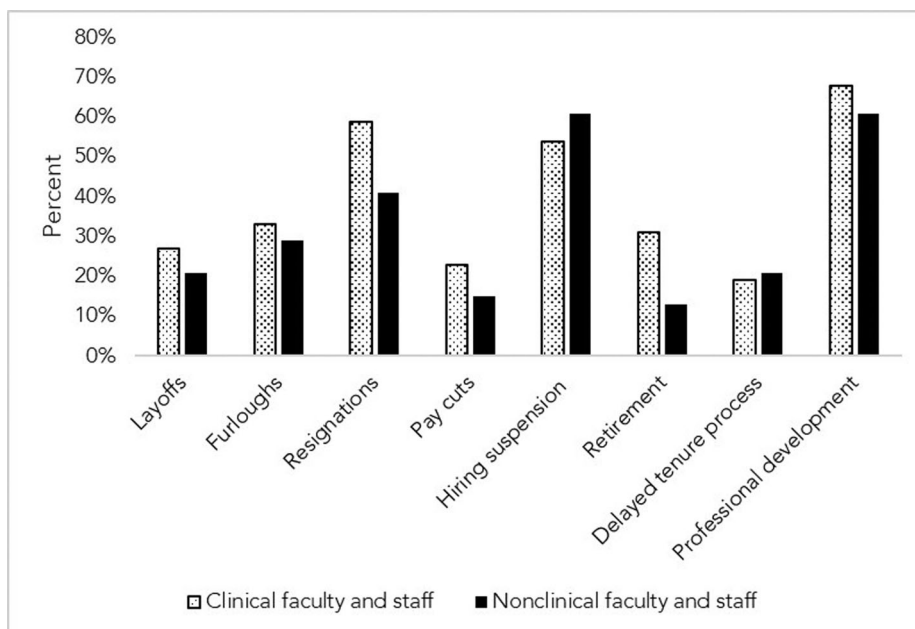


FIGURE 2 Impact of the COVID-19 pandemic on dental school clinical faculty and staff relative to dental school nonclinical faculty and staff, November 2020 to January 2021. Source: American Dental Education Association (ADEA) COVID-19 Impact Survey of U.S. Dental Schools, November 2020 to January 2021

3.3 | COVID-19 impact on community outreach and community-based patient care

Throughout their didactic and clinical training at dental school clinics, students are trained and educated in var-

ious dental disciplines, including public health dentistry. In addition, dental students expand their clinical training by providing oral health care to underserved populations through dental school partnerships with community-based sites, such as Federally Qualified Health Centers, prisons, nursing homes, and teaching hospitals.⁹

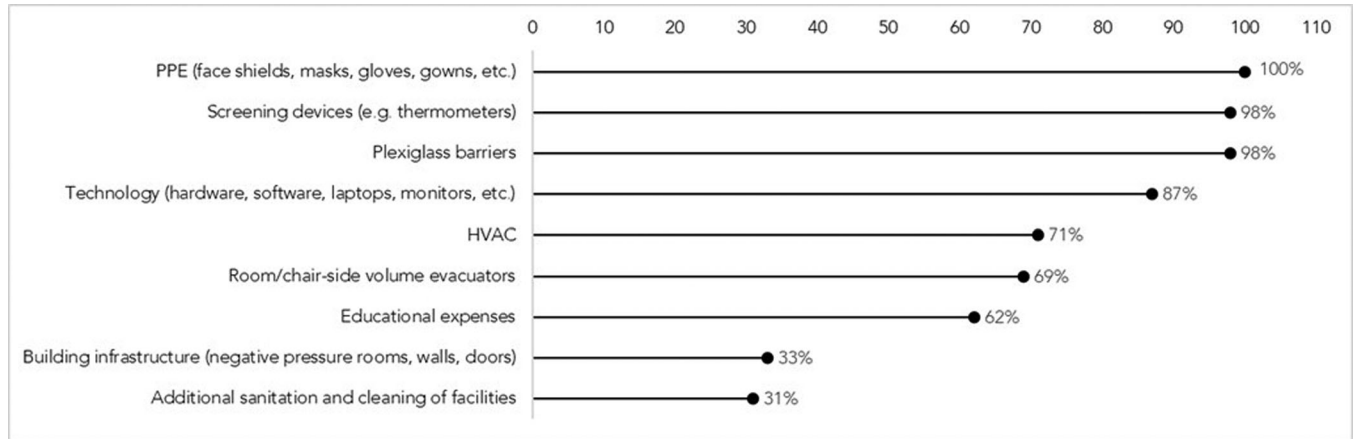


FIGURE 3 Infection control expenditures related to COVID-19 pandemic, as of December 2020. Source: American Dental Education Association (ADEA) COVID-19 Impact Survey of U.S. Dental Schools, November 2020 to January 2021

According to the American Dental Association's 2018–2019 Survey of Dental Education, 89% of the dental schools required community-based patient care experiences in 222 community-based sites as a component of the dental curriculum.¹⁰

Ninety-two percent of the schools suspended some or all community-based patient care experiences for a period of time during the first eight months of the pandemic. As noted by one responding school, “community-based patient experiences have been suspended for the 2020–2021 academic year... [and] community-based patient care sites, such as Federally Qualified Health Centers, closed at the start of the COVID-19 pandemic.” Eight percent of the dental schools reported permanently eliminating some community-based patient care experiences, while 2% had no changes in community-based patient care experiences. “Although [dental] school clinics had closed during the pandemic, dental schools continued to provide emergency oral health services during the majority of the pandemic period,” another responding school reported.

3.4 | COVID-19 impact on dental schools' infection control expenditures

Dental schools and school-based clinics must meet infection control protocols for patient care. To continue didactic and simulation courses, and clinical care, dental school clinics invested in a variety of infrastructure modifications to prevent the spread of the COVID-19 virus through infection control measures (Figure 3). Infection control expenditures ranged from personal protective equipment (PPE), such as masks, gloves, and gowns (100% of dental schools implemented this measure), to plexiglass barriers for protection while providing emergency dental procedures (98% of schools). Sixty-nine percent of dental schools invested in

chair-side evacuators for aerosol mitigation due to the production of aerosolized particles containing saliva, blood, bacteria, and other viral pathogens during oral health procedures. Lastly, 71% of dental schools invested in enhancements to heating, ventilation, and air condition systems, and 31% invested in additional facility sanitation and cleaning.

4 | DISCUSSION

The study findings show the adverse impact of the COVID-19 pandemic on U.S. dental schools and their school-based oral health clinics. Unlike teaching hospitals, which experienced a high volume of COVID-19 patients² during the pandemic's first eight months, patient visits at dental school clinics decreased. This decline may further exacerbate oral health disparities for patients who rely on the dental care offered in one of the 67 dental school clinics. The decrease in patients also may impact students' ability to complete their clinic requirement, primarily for third- and fourth-year dental students.¹¹ Furthermore, the decrease in patient visits was consequential to reducing revenue and implementing personnel changes for dental school clinical faculty and staff.¹² National compensation data from the American Association of University Professors showed that 10% of U.S. colleges and universities adopted furloughs and retirement,¹² whereas our study determined a greater percentage of furloughs for clinical faculty and staff at dental school clinics. The pandemic's impact on clinical faculty and staff may pose future challenges to clinical dental pedagogy and training the next generation of dentists to help curb the spread of the COVID-19 virus.

Dental school-based oral health clinics play a key role in combatting the COVID-19 pandemic in their

communities. Some community-based experiences afford dental students the opportunity to not only provide continuing oral care to underserved communities, but also facilitate educational opportunities about public health preparedness related to infectious disease outbreaks and pandemics.¹³ Exposure to clinical training via community-based learning experiences not only enhances dental students' education and training, but also helps them understand the intersectionality of social and cultural norms related to public oral health.¹³

Dental school clinics were partially or fully closed during the pandemic's first eight months. During this time, dental school clinics remained committed to providing emergency oral health and dental care, while ensuring measures were in place to mitigate the spread of the COVID-19 virus. Some school clinics resumed more expanded patient care earlier than others based on local (university, county, and/or state) emergency regulations. As the COVID-19 pandemic evolves, dental education can lead in revising and strengthening infection control measures, including hand hygiene, proper use of PPE, instrument sterilization, and disinfection practices in the dental school clinics.¹³

Sustaining pandemic response measures warrants financial aid and investment. The Coronavirus Aid, Relief, and Economic Security (CARES) Act became law on March 27, 2020, a month prior to the start of the comparison period in this survey. The CARES Act directed \$175 billion in relief funds to hospital and health care providers impacted by the pandemic.¹⁴ Practicing dentists were among the health care providers eligible to apply for relief funds through the CARES Act. However, no clarity was given to dental school-based clinics. The American Rescue Plan Act cleared the path through Congress in 2021, providing \$40 billion in grants to higher education institutions through the Higher Education Emergency Relief Fund (HEERF).¹⁵ A portion of the HEERF funding would allow higher education institutions to implement evidence-based strategies to curtail the spread of the COVID-19 virus as well as defray expenses related to faculty and staff payroll, lost revenue, and technology costs associated with changes to learning and teaching modalities as a result of the pandemic.¹⁵ It will be each higher education institution's prerogative to determine how they distribute federal funds from the American Rescue Plan to their health professions schools, including dental schools and dental school-based clinics.

5 | LIMITATIONS

This study has several limitations. The dental schools self-reported the data; therefore, the authors cannot inde-

pendently verify it. Because of the survey's focus on the impact of the pandemic on the dental schools overall, the data on dental school clinics specifically are limited.

This study examines a short period of the COVID-19 pandemic with a limited toolset. The article limited its assessment to the changes in the number of patient visits, costs, and revenue experienced by dental school clinics during the pandemic's first eight months relative to the same period in 2019. Therefore, these results cannot be generalized to the effects on dental school clinics during the entire pandemic period. Further, the analysis conducted cross-tabulation analyses and did not attempt to model the factors that resulted in the changes at U.S. dental school clinics. The research presents national results and does not analyze geographical differences or differences based on some other variables of interest.

Further research could unveil insights into the COVID-19 pandemic's effect on dental school clinics. It could explore the same research questions this study undertook, but for a later period of the pandemic, to examine how dental school clinics continued to adapt and recover to the changing situation. Expanding the survey questionnaire for dental school clinics could provide a richer dataset about the COVID-19 pandemic's impact on the operations of the entire dental school. This would enable more sophisticated analysis by looking at variations across the country or identifying causal links for the effects observed by dental school clinics.

6 | CONCLUSION

Overall, this study shows that dental school clinics rose to the challenge of providing comprehensive oral health services to vulnerable populations during the pandemic's first eight months. Despite the challenges the COVID-19 pandemic presented, dental school clinics continued to educate and train the dentists of tomorrow to address and minimize oral health disparities in their patients, and implemented infection control measures to curb the pandemic. As dental schools and their clinics fully reopen, future research is needed to explore the pandemic's long-lasting impact on dental school operations and clinics and their ongoing measures to combat the evolution of COVID-19 and its variants.

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CONFLICT OF INTEREST

The authors of this study report no financial, economic, or professional conflicts of interest that may have influenced the design and execution of this study.

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