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Facilitators and Barriers to Implementing COVID-19 Prevention Strategies in K-12 Public Schools

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Abstract

To meet the educational needs of students, most schools in the United States (U.S.) reopened for in-person instruction during the 2021–2022 school year implementing a wide range of COVID-19 prevention strategies (e.g., mask requirements). To date, there have been limited studies examining facilitators and barriers to implementing each of the recommended COVID-19 prevention strategies in schools. Twenty-one semistructured interviews were conducted with public school staff from across the U.S. responsible for overseeing prevention strategy implementation. MAXQDA was used for thematic analysis. Findings identified key facilitators including utilizing Centers for Disease Control and Prevention guidance and district policies to guide decision-making at the school level, possessing financial resources to purchase supplies, identifying key staff for implementation, and having school health services infrastructure in place. Key barriers included staff shortages, limited resources, and community opposition. Findings from this study provide important insight into how schools can prepare for future public health emergencies.

Keywords

COVID-19; schools; health; school nurses; qualitative research; interviews

Introduction

Safe schools are essential to the healthy development of children and youth. In addition to providing education, schools provide numerous supports, including food and nutritional support, after-school programming, and multidisciplinary health care services, including

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those offered by school nurses (Centers for Disease Control and Prevention [CDC], 2020; Verlenden et al., 2021). As community transmission of COVID-19 was emerging in the United States (U.S.) in early 2020, schools across the country faced difficult decisions about how best to educate while protecting the health and well-being of students and staff, supporting community-wide efforts to lower transmission, and reducing strain on healthcare infrastructure.

Schools that offered in-person instruction during the 2020–2021 and 2021–2022 school years implemented numerous prevention strategies to reduce the risk of COVID-19 transmission. These strategies, typically grounded in the CDC's *Operational Guidance for K-12 Schools and Early Care and Education Programs to Support Safe In-Person Learning* for operating schools during COVID-19 (CDC, 2022), have included strategies for promoting behaviors that reduce the spread of COVID-19, maintaining healthy environments, and maintaining healthy operations. Commonly implemented approaches have included requiring or recommending masks, increasing physical distance between students and staff, supporting improved hand hygiene and respiratory etiquette, increasing COVID-19 testing, promoting COVID-19 vaccinations, improving ventilation, cohorting (i.e., grouping or staggering the schedules of students and/or staff in ways that minimize physical contact with other groups of students and/or staff), implementing contact tracing and quarantine, and enhancing cleaning and disinfection practices. Many of these prevention strategies are also effective in preventing the spread of other infectious diseases, such as influenza. In particular, school nurses are integral to keeping students safe from the spread of infection by developing guidelines for schools to respond to and monitor infectious diseases and assisting schools with the implementation of prevention strategies (McIntosh et al., 2022; Rothstein & Olympia, 2020; Um & Choi, 2022). Furthermore, school nurses have the potential to minimize community transmission of COVID-19 and other infectious diseases and play an essential role in helping schools assess, implement, and monitor the spread of infection (Lee et al., 2021)

Understanding barriers and facilitators schools experienced in the successful implementation of infection prevention strategies during the COVID-19 pandemic can help inform future preparedness efforts and guidance. Using individual interviews conducted with school staff from across the U.S., the purpose of this study was to better understand what prevention strategies schools used to reduce COVID-19 transmission and identify barriers and facilitators to effective implementation of recommended prevention strategies.

Methods

National School COVID-19 Prevention Study

This qualitative study was a component of the National School COVID-19 Prevention Study (NSCPS), a mixed-method evaluation that explored the implementation of COVID-19 prevention strategies among U.S. K-12 public schools (CDC, 2021). The NSCPS included five, longitudinal web-based surveys administered to school-level staff from June 2021 to May 2022 measuring the implementation of school-level COVID-19 prevention strategies. Survey waves 2–5 focused on the 2021/2022 school year and included items relating to

learning modality, implementation of COVID-19 prevention strategies, school closures, and numerous other topics.

The invited stratified random sample for survey Waves 2–5 included 1602 public K-12 schools representing all 50 U.S. states and the District of Columbia. The sample was stratified based on school level (elementary, middle, high), National Center for Education Statistics school locale (city, suburb, town, rural), and region (Northeast, South, Midwest, West). Respondents who completed at least two survey waves of Waves 2–5 ($n = 376$) were asked if they would be interested in participating in a qualitative interview as part of the NSCPS. School staff who expressed interest in participating ($n = 45$) comprised the basis of our recruitment sample. Additional details about the NSCPS are published elsewhere (Pampati et al., 2022, 2023; Spencer et al., 2023).

A purposive sampling strategy (Creswell, 2013) was used for recruitment to ensure representation across school levels (i.e., elementary, middle, high), U.S. regions (i.e., Northeast, West, South, Central), and school size based on student enrollment. Characteristics (i.e., school level, school region, and school size) for the 45 schools were assessed and a smaller sample of 33 were invited to participate in interviews based on school level, school size, and geographic location. School staff who expressed interest were sent an email inviting them to participate in an in-depth interview. If an invited school declined participation, a replacement school with similar descriptive characteristics from the sample of 45 schools was invited to participate. In total, 33 schools were initially invited to participate in qualitative interviews. Of the 33, 12 declined to participate or did not respond to the invitation and were therefore later replaced. The inclusion criteria for this study included: (a) school staff currently working in an elementary, middle, or high school, (b) at least two NSCPS surveys completed for their school; and (c) having knowledge of their school's implementation of COVID-19 prevention strategies. The final qualitative sample included 21 school staff.

Instrumentation

A semistructured interview guide was developed by reviewing existing measures and extant literature focused on the implementation of COVID-19 prevention strategies in schools (Krishnaratne et al., 2020; Lessler et al., 2021; Viner et al., 2020). The interview guide was tailored further based on NSCPS survey data which measured the implementation of prevention strategies at school. Previous manuscripts describe the implementation of COVID-19 prevention strategies using NSCPS survey data (Pampati et al., 2022, 2023). The guide was then shared with a small group of school staff ($n = 2$) not part of the NSCPS sample to ensure clarity and comprehension of the interview questions. The final interview guide consisted of 16 questions, of which six questions focused on barriers and facilitators to prevention strategies. The interview guide assessed district/school COVID-19 policies and practices, as well as barriers and facilitators to implementing COVID-19 prevention strategies, challenges experienced during the COVID-19 pandemic, and future emergency preparedness and infection control plans. Table 1 presents select questions from the interview guide that focus on the implementation of COVID-19 prevention strategies.

Procedure

Virtual interviews were conducted via Microsoft Teams. Video was used during interviews, when possible, to establish rapport, but was not always used due to network connectivity problems or participant preferences. Interviews lasted 45 to 90 min and were audio-recorded. Participants received a \$75 electronic gift card for their time. This data collection activity was reviewed by CDC and conducted consistent with applicable federal law and CDC policy. Additionally, all study protocols were reviewed and approved by ICF's Institutional Review Board.

Data Analysis

Interview audio files were transcribed, cleaned, de-identified, and quality-checked by the study team. Qualitative data were managed and analyzed using MAXQDA 2022 (VERBI Software, 2021). An initial codebook was developed with deductive codes. These aligned with questions posed in the interview guide or relevant literature and included codes related to facilitators and barriers, prevention strategy decision-making, and strategy implementation. After reviewing transcripts, inductive codes, those which arose organically from interview data, were added. Examples of inductive codes include communication and parental involvement. To achieve intercoder reliability, 20% of the transcripts were coded independently by two coders to assess consistency, coder agreement, and application of developed codes. Discrepancies were addressed and intercoder reliability was achieved at Cohen's Kappa = 0.81. Two coders then used an inductive open and axial coding approach to identify relationships among coded segments and salient categories of information representing themes. Once coding was completed, data analysis and interpretations were reviewed for reliability, confirmability, and dependability, common practices in qualitative inquiry (McDonald et al., 2019).

Results

Characteristics of Participating Schools

Of the 21 school staff that participated in an interview, eight were from elementary, six were from middle, and seven were from high schools. The mean student enrollment at participant schools was 466 students with a range of 67 to 1722 students. Approximately 67% of the participants were school principals, 19% were district or school nurses, and 14% had other roles. Approximately 33% of schools were located in cities, 24% were located in rural settings, and 29% of schools were located in the South. Additional characteristics of interviewees and their schools are presented in Table 2.

Emergent Themes

Five major themes emerged as factors that influenced the implementation of COVID-19 prevention strategies. Table 3 presents the exhaustive list of facilitators and barriers noted by interview participants, further organized by specific COVID-19 prevention strategies.

Theme 1: Guidance at the federal, state, or district level influenced the implementation of COVID-19 prevention strategies in schools.

School staff indicated that CDC guidance and state and district policies were critical to preventing the spread of COVID-19. Schools followed federal and state guidance specifically related to cleaning, contact tracing, hand hygiene and respiratory etiquette, isolation and quarantine, masking, vaccinations, and ventilation. One elementary school staff member shared that they relied on CDC guidance to prioritize prevention strategy implementation commenting, “*(Ventilation improvements) were a strong recommendation both from the state and CDC as a strategy that would be promising and in fact, some of the primary (CDC prevention) strategies were ventilation, physical distancing, and face coverings. We took all of those very seriously (at our school).*”

Qualitative data showed that many states enacted statewide policies that followed CDC guidance. One elementary school staff member shared, “*State guidance followed CDC guidance, and they would say CDC is recommending this, that is why we are (implementing) this.*” One high school staff member shared that their school followed district, state, and federal guidance stating, “*It seemed like our district was working very closely with the county who was in alignment with the state and in alignment with CDC.*” A middle school staff member noted that when federal guidance changed, this prompted changes in prevention strategy implementation at the school level commenting, “*We would always pull up the CDC’s most updated information as it changed and compare it to our re-entry plan. And we tried to stay as much in alignment with what CDC recommended as possible.*”

School staff noted that when there were no clear district policies or state requirements in place, implementation of prevention strategies became more challenging. The lack of policies hindered schools’ ability to implement mask-use policies, require vaccinations, conduct COVID-19 testing, and implement isolation and quarantine procedures. For example, regarding COVID testing, school staff highlighted district policies or state requirements that prohibited testing at school sometimes limiting their ability to implement this recommended prevention strategy.

Theme 2: Schools needed adequate financial resources and supplies to implement COVID-19 prevention strategies effectively.

The majority of school staff discussed the importance of Elementary and Secondary School Emergency Relief (ESSER) funding to support their implementation of COVID-19 prevention strategies. School staff indicated that financial resources were needed to hire new staff, offer incentives to promote the uptake of strategies, purchase supplies, and make upgrades to schools’ ventilation systems. Some staff also noted challenges (e.g., supply chain issues, shipping delays) when purchasing supplies and materials needed for strategy implementation. School staff reported the need for adequate financial resources when implementing the following COVID-19 prevention strategies: contact tracing, COVID-19 testing, cleaning and disinfection (supplies), hand hygiene (supplies), mask use, vaccinations, and ventilation. School staff shared that their schools were able to implement less resource-intensive strategies more easily such as educating students and teachers about handwashing, the action of cleaning and disinfecting, and opening doors or windows,

but experienced resource-related challenges with implementing resource-intensive strategies such as COVID-19 screening testing and replacing or upgrading HVAC systems.

School staff indicated financial resources were integral in hiring individuals to assist their schools with prevention strategy implementation. All interviewed staff said their schools adopted CDC-recommended procedures for cleaning and disinfection. The majority of staff reported their schools enhanced their prepandemic routine cleaning measures by utilizing federal, state, or district funds to hire additional custodial staff. An elementary school staff member discussed how resources were used to hire additional custodial staff to support their school's cleaning and disinfection efforts stating, *"With some of our money, we hired someone to come in and periodically wipe down all the light switches, handles, anything that a student could touch."* In addition to cleaning and disinfecting, one elementary school staff member commented on how their school used the funding to support contact tracing, *"We increased the health assistant at each school to an eight-hour position so that they could engage in contact tracing and notifications."*

School staff shared that they also needed resources to offer cash incentives, nonmonetary rewards (e.g., t-shirts and workplace meals), and provide paid time off to increase COVID-19 vaccine uptake among students and staff. One participant commented on their district's vaccine incentive program, *"Our district gave incentives for students and staff that were vaccinated. So those that were vaccinated and turned in their information received a \$50 gift card, teachers got a little bigger (incentive)."* A high school staff member shared how teachers were given time off to get their COVID-19 vaccine stating, *"We let (teachers) go out during their prep period or during lunch. Usually, they have to sign out for that type of thing and that time can count against them. But we did not make them sign out or anything if they were going to get their vaccination or get their second shot or booster shot, that (time) did not count against them."*

Having resources also allowed schools to purchase supplies needed for strategy implementation, including at-home COVID-19 test kits, masks, hand sanitizer, and cleaning supplies. Several school staff reported that providing at-home COVID-19 tests made testing more readily available when tests were needed among students, teachers, and other school staff. School staff also shared that financial resources were essential for purchasing masks, hand sanitizer, and cleaning supplies. Having an increased supply of personal protective equipment (PPE) was noted as a facilitator for implementing schools' mask-use policies. Elementary, middle, and high school staff felt that their schools had an ample supply of hand sanitizer, disinfectant wipes, and other cleaning supplies needed to minimize transmission of COVID-19. One middle school staff member mentioned providing teachers at their school with cleaning supplies stating, *"We provided each of our teachers with individualized cleaning supplies that they could use specifically for targeted cleaning in their classrooms."* Another staff member noted the various supplies that their school had in place to prevent the spread of COVID-19 commenting, *"We had PPE stations that we created at every door. We created them with carts, they had big hand sanitizers, extra masks, paper towels, disinfection, gloves ... we also invested in electrostatic sprayers for all our facilities staff. We had them trained on proper usage."*

School staff reported having adequate funding also allowed their district to purchase proper air filters or install new HVAC systems. School staff reported that states approved the reallocation of existing ESSER funds to improve ventilation. One high school staff member noted, *“Our district was given ESSER funds. Since COVID has rocked along, those funds have shifted now that they can be used for ventilation and things like replacing roofs if there is mold and things that contribute to polluted air in the district. So, because of those shifts and the way the state has allowed us to use those funds, we are now able to use those funds for the HEPA filtration.”* One participant summarized the importance of having adequate resources and funding stating, *“Our administration was great in troubleshooting. And we also had tons of resources provided with masks. Even with our school, we had the ones given through federal money. Tons of the sanitized wipes, tons of spray that we could use to clean the surface in between classes. So, tons of resources provided to do what we need to do.”*

Schools also noted the challenges with COVID-19 prevention strategy implementation when financial resources and supplies were not available. School staff stated that lack of funding, shipping delays, and supply chain issues limited their schools’ ability to purchase materials needed for strategy implementation. School staff shared the impact that lack of funding and resources had on the following COVID-19 prevention strategies: cleaning and disinfection, hand hygiene and respiratory etiquette, mask use, and ventilation. At the height of the COVID-19 pandemic, another barrier noted by school staff was not having enough PPE. One middle school staff member commented on this barrier stating, *“I feel like lack of resources. At times it has been hard ... the last two school years, we do requisitions for supplies at the end of one school year, so we are ready and fully stocked for the next year. The last two school years I could only get five boxes of gloves at a time. Or a couple of boxes of any kind of PPE. So, I feel like some of those barriers were really hard in combating COVID when you cannot get the things you need to actually clean or protect yourself with.”* Additionally, schools that did not have sufficient resources were unable to improve their ventilation systems. One high school staff member shared, *“We did not have any money to do any major ventilation upgrades.”*

Lastly, schools shared that shipping delays and supply chain issues impacted their ability to implement some COVID-19 prevention strategies. School staff indicated that when resources were available, they still were not able to access needed supplies for strategy implementation due to extensive shipping delays. Some school staff reported waiting months for supplies to arrive and others shared that some supplies never arrived due to supply chain issues. One middle school staff member shared more about this challenge commenting, *“The only issue we have is supply chain, parts that are not available, HVAC units that are not available yet. It’s just acquiring the pieces that we need to implement everything.”*

Theme 3: Buy-in and support were critical when implementing COVID-19 prevention strategies in schools.

Qualitative data revealed there were supporting and conflicting feelings regarding COVID-19 prevention strategies. Buy-in and support from students, families, school districts, and communities were integral to schools’ implementation of COVID-19

prevention strategies. School staff indicated that support from these community members facilitated prevention strategy implementation while lack of support and buy-in hindered implementation. Family buy-in and support helped to increase the uptake of mask use among students and encouraged compliance with stay-home-when-sick policies. Families and caregivers were essential in assessing their child's condition each day and ensuring their child stayed home and quarantined when their child was identified as a close contact with someone with COVID-19.

In addition to families and caregivers, community, district, and school support were essential for implementing the following COVID-19 prevention strategies: contact tracing, hand hygiene and respiratory practices, and cleaning and disinfecting. Schools that had the support of their district reported fewer challenges in implementing prevention strategies. These schools also reported having support at the community level. Some school staff shared that teacher support was especially important for their schools' cleaning and disinfecting practices as the majority of teachers were responsible for wiping down high touchpoint areas in the classroom. Teachers were also asked to model proper hand hygiene and respiratory practices and behaviors for their students.

While most school staff reported that there was support from communities, districts, and families, some were faced with challenges and opposition. A common barrier to implementing prevention strategies in schools was community and parental opposition to mask requirements, vaccinations, staying home when sick, and isolation and quarantine. School staff reported receiving complaints from parents and pushback from the community regarding their school mask-use policy. Some parents and community members were opposed to students wearing masks and would share these concerns at local school board meetings. One middle school staff member shared, *“(School board meetings were) a little contentious, (when) we talked about masks. But all the parents, even before then, parents were coming to board meetings and expressing their opinion about masks, wanting masks removed much earlier.”*

Once COVID-19 vaccines were made available for children and teens, some school staff described the impact of vaccine reluctance and resistance among some school community members as a factor that impacted their vaccination efforts. An elementary school administrator commented, *“Certainly, there are people who are opposed to the vaccine and their voices have been heard. We did not have anything disruptive, but definitely even providing space is not without its challenges for families. I would not call it a deterrent; it was just uncomfortable.”*

Theme 4: Staffing was noted as both a facilitator and barrier to implementing COVID-19 prevention strategies in schools.

School staff described the importance of having designated staff to assist with or be responsible for the implementation of specific COVID-19 prevention strategies and the challenges they experienced when adequate staffing was not in place. Schools reported the critical role that health staff, specifically school nurses, played in supporting strategy implementation commenting, *“Here in our school we have a full-time nurse and she does*

a fantastic job. You almost have to have a school nurse at every school to assist with this (implementation of COVID-19 prevention strategies)." School nurses were identified as a key source of support, especially for COVID-19 testing, isolation and quarantine, and COVID-19 vaccination strategies. Schools shared that having health staff in place (e.g., school nurses) allowed them to conduct symptom screening and provide rapid tests to students. School staff reported that nurses provided critical COVID-19 guidance and other public health emergency information sharing, *"Our school nurse was responsible for talking to parents about that stuff (COVID-19 prevention strategies)"* and indicating that the school nurse *"Provided parents with information about COVID-19 vaccinations."* Additionally, participants noted consulting school nurses when developing their emergency operations plan stating, *"When I was developing an (emergency operations) plan, I took input from the nurse"* with another participant commenting, *"Most of the COVID decisions were bounced off the entire school administration to include the school nurses."*

Participants shared that teachers and other school staff were often tasked with conducting contact tracing, cleaning, and disinfecting, monitoring student cohorts, and ensuring students kept adequate physical distance from one another. School staff described that they did not have enough staff to effectively conduct contact tracing, especially during surges of COVID-19 transmission, and described how this increased responsibility led to burnout. Most staff indicated that their school's contact tracing team was composed of one or two school administrators (e.g., principals, assistant principals) and a school nurse if they had one. However, other staff shared that additional staff members (e.g., teachers, counselors, administrative staff) were needed to support contact tracing efforts.

School staff acknowledged custodians and janitorial staff took on additional responsibilities to maintain healthy facilities. However, without adequate staffing, a few school staff worried about the burdensome workload affecting their custodial staff. One elementary school staff mentioned, *"But (the impact of the COVID-19 pandemic) did put a burden on the custodians a lot. I think they had more than they could handle just trying to keep the building clean with all those other things that got attached to their job list. They couldn't do their job effectively because they were continually trying to do those other things we had in place."*

School staff also described the increased burden and responsibilities placed on teachers as they were expected to support cleaning and disinfecting practices in their classrooms and throughout the school building. A few staff shared that some teachers voiced their concerns regarding the addition of cleaning and disinfecting tasks to their role, expressing that they felt this was outside of their job duties and required additional time commitments. One middle school staff member commented, *"Those things are always big challenges and barriers in school systems because there is a lack of time. Teachers have large groups of kids to be in charge of. They do not feel like they have the time to do extra cleaning."* School staff shared that some teachers experienced burnout as a result of the increased demands placed on them during the pandemic. Additionally, there was high turnover among substitute teachers due to the increased responsibilities associated with strategy implementation. One middle school staff noted this challenge stating, *"This is too much work and we have had a lack of substitutes ever since the pandemic started. I guarantee you it is because of burnout."*

If I can quit and do something else, I am going to. You heard teachers say that more often, you did not hear that as much before the pandemic.”

Theme 5: Schools that had existing infrastructure, tracking systems, and processes in place reported being well-positioned to implement COVID-19 prevention strategies.

Infrastructure was commonly discussed by many school staff, most noting the impact of adequate infrastructure and resources to support prevention strategies. Many participants discussed the benefits of newer or physically larger schools as opposed to older or more physically constrained school buildings. Staff commonly described newer schools as having more space, though this was not applicable to all schools in the sample. Staff shared that physically larger schools were able to implement physical distancing strategies with greater ease. Staff with newer school buildings indicated that their HVAC systems were often brand new or newly upgraded, which facilitated the implementation of ventilation strategies. Some school staff explained challenges faced when installing new air filters due to their school being old or outdated commenting, *“Old facilities that would not really support any of that stuff. It would basically be a huge undertaking to start from scratch and put good new ventilation in our buildings.”* In addition to newer schools, physically larger schools had more room to encourage distancing between students. On the other hand, school staff members noted that distancing was more challenging in physically smaller schools. One elementary school staff member stated, *“We are overcrowded, and we are an older school building, and our (classrooms) are not really big. We sometimes have 30 kids in one little classroom; so it was very hard to distance them. Even at lunch, it was very hard to distance them because we’re overcrowded.”*

Many participants shared difficulties in tracking, documenting, and monitoring student and staff COVID-19 vaccinations, testing, and symptom screening which would have supported the effective implementation of these prevention strategies. Several school staff shared challenges and successes related to tracking vaccination status, testing results, and quarantine requirements. Some school staff reported having improved student record tracking and reporting systems as a facilitator. Other staff shared specifically that tracking vaccination status for students was not allowed, however in many states, it was required to track vaccination status for teachers, staff, and administration.

Most staff shared that information on vaccination status was typically provided by parents if a student was a close contact or was exhibiting COVID-19 symptoms. Several school staff shared that their school did not have a formal tracking system and utilized tools like Microsoft Excel to keep track of vaccination status and their required testing or quarantine dates for students. Of the few schools that used formal tracking systems, most shared that the school/district nurse had access to state immunization record systems which were used to assess the vaccination status of students. One high school staff member shared, *“Vaccinations are kept in (state immunization system) for the kids and so our school nurses have access to that. We have a spreadsheet that we share among the administrators that lists the kids that are vaccinated and the adults as well.”*

Discussion

Our study examined key factors influencing the implementation of COVID-19 prevention strategies in schools. Findings confirm that schools rely on federal, state, and district guidance during public health emergencies. Given the rapid spread of COVID-19, schools depended on guidance to assist them with identifying the appropriate prevention measures to protect the health and overall well-being of their students, teachers, and staff. Participants shared that CDC's *Operational Guidance for K-12 Schools and Early Care and Education Programs to Support Safe In-Person Learning* was often used to inform strategy implementation. School staff also indicated that state requirements and district policies served as facilitators for prevention strategy implementation. Consistent with previous research, schools depend on district policies and support during times of crisis (Kaul et al., 2022). These findings highlight the importance of federal guidance and clear policies from school districts in preventing the spread of infectious diseases.

Schools needed sufficient financial resources to implement recommended COVID-19 prevention strategies. Several federal funding sources were provided to schools during the COVID-19 pandemic to support implementation, including ESSER funding. A previous study showed that some schools felt unprepared and did not have the appropriate resources to safely operate during the COVID-19 pandemic (Varela & Fedynich, 2020). Additionally, prior research suggests that the use of school-based support throughout this pandemic has been uneven (Diliberti & Kaufman, 2020). Rice et al. (2020) found that extensive financial resources are needed to implement school-based COVID-19 prevention strategies due to costs associated with hiring staff and purchasing supplies (e.g., disposable masks, desk shields/Plexiglass). Pampati et al. (2022) highlighted the disparities in the implementation of resource-intensive strategies and the need to better support schools by raising awareness about funding opportunities and providing technical assistance on how to implement more resource-intensive COVID-19 prevention strategies. Within these more resource-intensive strategies, it is important to note that there is a continuum. Some strategies such as cleaning and disinfection require fewer resources and other strategies such as testing or replacing HVAC systems require costlier resources or even specific expertise. Our study findings support the need for public health and education professionals to work together to ensure resources get to all the schools that need them and that schools are provided with guidance and assistance in accessing those resources if needed.

Our study highlighted the need for schools to gain community, district, and family/parental buy-in and support. School staff reported fewer barriers to prevention strategy implementation when schools had the support of their school district, parents/caregivers, families, and their respective communities. Our study found that school staff faced some challenges with parents opposed to school mask requirements and COVID-19 vaccines. Previous research shows that not having a trusted information source about COVID-19 vaccines was a significant predictor of parents expressing both negative and uncertain intentions to vaccinate their children (Dayton et al., 2022). To further support this, schools may benefit from district or state-level policies that help bolster schools' support for protective action. Schools may also consider creating space for open discussion, delivering clear and consistent communication, and conveying information using multiple modalities

in an accessible manner as strategies for obtaining parent, caregiver, and community buy-in (Spencer et al., 2023).

Staffing is critical to schools' successful implementation of COVID-19 prevention strategies. Our study found that health staff, specifically nurses, served as an important resource for schools during the COVID-19 pandemic. School staff reported that school nurses assisted with symptom screening, COVID-19 testing, and vaccinations, as well as isolation and quarantine. The role of the school nurse has heightened as a result of the pandemic (Lowe et al., 2023). School nurses are health experts in schools and often serve as the primary connection to the public health community, making their role especially important in emergency preparedness and response planning (Lowe et al., 2023; McDonald, 2020). Furthermore, the National Association of School Nurses (2022) recommends that all schools have a full-time nurse.

The COVID-19 pandemic also placed increased demands on school staff which led to staff turnover and burnout. This study's findings are consistent with previous research that examined the impact of COVID-19 on burnout resulting in teachers' desire to leave the profession (Gillani et al., 2022; Li & Yu, 2022; Pressley, 2021; Robinson et al., 2023). Additionally, school staff work in resource-constrained environments and are frequently tasked with competing demands (Kaul et al., 2022; McKenzie & Varney, 2018). Future studies should examine what protective factors are in place to support school staff, especially in times of crisis. Furthermore, school districts and their community partners may consider ways that surge staffing could be added in times of public health emergencies. For example, schools may consider partnering with health departments to conduct contact tracing or COVID-19 testing or identifying staff that can support cleaning and disinfecting after school hours.

Our study provides evidence that having existing staff and practices in place served as a facilitator for some schools during the COVID-19 pandemic. Schools that reported having a school nurse were able to implement prevention strategies including COVID-19 screening testing, promoting vaccinations, and providing a space for students and staff to isolate and quarantine. These findings demonstrate that attention to health infrastructure and health staffing can bolster schools' ability to respond to future public health emergencies. Research shows that school-based health centers serve as a key mechanism through which emergency preparedness can occur (Arenson et al., 2019)

Study Limitations

This study's findings should be interpreted in the context of several limitations. First, the results of this study may not be applicable to different time periods given data collection occurred during a later phase of the COVID-19 pandemic (May–June 2022). Second, respondents were primarily school principals and their awareness of specific nuances related to strategy implementation may be limited. Third, this study was limited in its sample size, including only 21 K-12 schools across the U.S. Lastly, social desirability bias could be present given participants were informed the study was being supported by CDC.

Implications for School Nursing Practice

Despite these limitations, this study has important implications that may enhance future COVID-19 prevention efforts and school nursing practice. This study demonstrates the important role that school nurses play in emergency preparedness and response. Schools that had school nurses or school health infrastructure (i.e., a system for providing health services on-site or having referral systems in place to link students to community-based sources of care) reported being well-positioned to implement COVID-19 prevention strategies. Schools can continue to focus on building their health infrastructure, including hiring school nurses and other staff, which might better prepare schools for public health emergencies and also have long-lasting benefits in other school and health realms as well.

This study affirms that school nurses serve as a critical source of health information for students and their families. Schools should ensure that their school health staff have the necessary training and professional development that allows them to stay abreast of changes in the field. This will ensure school nurses and other health staff are prepared to meet the changing needs of students and staff in future pandemics. Further, this study exemplifies the need to develop policies, guidance, and strategies to support schools in implementing COVID-19 prevention strategies. Schools reported experiencing fewer challenges when clear policies were in place. Schools should consider involving school nurses in the design, implementation, and monitoring of school-based guidelines and other health promotion activities because of their extensive education and training, their role as first responders within the school environment, and their ability to identify and manage infectious diseases outbreaks and other emergency situations.

Conclusions

The findings from this study provide public health and school health professionals with an enhanced understanding of factors that supported or hindered the implementation of COVID-19 prevention strategies. Additionally, these results can inform the support needed to implement state and federal guidance, help schools better prepare for future public health emergencies, and prevent the spread of infectious disease more broadly.

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References

- Arenson M, Hudson PJ, Lee N, & Lai B (2019). The evidence on school-based health centers: A review. *Global Pediatric Health*, 6, 2333794X19828745. 10.1177/2333794X1982874
- CDC. (2020). School health profiles 2020: Characteristics of health programs among secondary schools. Centers for Disease Control and Prevention. <https://www.cdc.gov/healthyyouth/data/profiles/executive-summary.htm>
- CDC. (2021). National School COVID-19 Prevention Study (NSCPS). Updated September 8, 2021. <https://www.cdc.gov/healthyyouth/data/nscps/index.htm>
- Centers for Disease Control and Prevention [CDC] (2022). Operational Guidance for K-12 Schools and Early Care and Education Programs to Support Safe In-Person Learning. <https://public4.pagefreezer.com/browse/CDC%20Covid%20Pages/12-08-2022T12:32/https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-childcare-guidance.html>
- Creswell JW (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Sage Publications.
- Dayton L, Miller J, Strickland J, Davey-Rothwell M, & Latkin C (2022). A socio-ecological perspective on parents' intentions to vaccinate their children against COVID-19. *Vaccine*, 40(32), 4432–4439. 10.1016/j.vaccine.2022.05.089 [PubMed: 35697575]
- Diliberti MK, & Kaufman JH (2020). Will this school year be another casualty of the pandemic? Key findings from the American Educator Panels Fall 2020 COVID-19 Surveys. RAND Corporation. https://www.rand.org/pubs/research_reports/RRA168-4.html
- Gillani A, Dierst-Davies R, Lee S, Robin L, Li J, Glover-Kudon R, & Whitton A (2022). Teachers' dissatisfaction during the COVID-19 pandemic: Factors contributing to a desire to leave the profession. *Frontiers in Psychology*, 13, 10.3389/fpsyg.2022.940718
- Kaul M, Comstock M, & Simon NS (2022). Leading from the middle: How principals rely on district guidance and organizational conditions in times of crisis. *Aera Open*, 8, 23328584221077303. 10.1177/2332858422107730
- Krishnaratne S, Pfadenhauer LM, Coenen M, Geffert K, Jung-Sievers C, & Burns J (2020). Measures implemented in the school setting to contain the COVID-19 pandemic: A rapid scoping review. *Cochrane Database of Systematic Reviews*, 12(12). 10.1002/14651858.CD013812

- Lee RL, West S, Tang AC, Cheng HY, Chong CY, Chien WT, & Chan SW (2021). A qualitative exploration of the experiences of school nurses during COVID-19 pandemic as the frontline primary health care professionals. *Nursing Outlook*, 69(3), 399–408. 10.1016/j.outlook.2020.12.003 [PubMed: 33541726]
- Lessler J, Grabowski MK, Grantz KH, Badillo-Goicoechea E, Metcalf CJE, Lupton-Smith C, & Stuart EA (2021). Household COVID-19 risk and in-person schooling. *Science*, 372(6546), 1092–1097. 10.1126/science.abh2939 [PubMed: 33927057]
- Li M, & Yu Z (2022). Teachers' satisfaction, role, and digital literacy during the COVID-19 pandemic. *Sustainability*, 14(3), 1121. 10.3390/su14031121
- Lowe AA, Ravi P, Gerald LB, & Wilson AM (2023). The changing job of school nurses during the COVID-19 pandemic: A media content analysis of contributions to stress. *Annals of Work Exposures and Health*, 67(1), 101–117. 10.1093/annweh/wxac053 [PubMed: 36111528]
- McDonald CC (2020). Reopening schools in the time of pandemic: Look to the school nurses. *The Journal of School Nursing*, 36(4), 239–240. 10.1177/1059840520937853 [PubMed: 32552237]
- McDonald N, Schoenebeck S, & Forte A (2019). Reliability and inter-rater reliability in qualitative research: Norms and guidelines for CSCW and HCI practice. *Proceedings of the ACM Human-Computer Interaction*, 3, 1–23. 10.1145/3359174
- McIntosh CE, Brelage PK, Thomas CM, Wendel JM, & Phelps BE (2022). School nurse and COVID-19 response. *Psychology in the Schools*, 10, 10.1002/pits.22708
- McKenzie J, & Varney S (2018). Energizing middle managers' practice in organizational learning. *The Learning Organization*.
- National Association of School Nurses. (2022). Student access to school nursing services [Position Statement]. <https://www.nasn.org/nasn-resources/professional-practice-documents/position-statements/ps-access-to-services>
- Pampati S, Rasberry CN, McConnell L, Timpe Z, Lee S, Spencer P, & Barrios LC (2022). Ventilation improvement strategies among K–12 public schools—the national school COVID-19 prevention study, United States, February 14–March 27, 2022. *Morbidity and Mortality Weekly Report*, 71(23), 770. 10.15585/mmwr.mm7123e2 [PubMed: 35679198]
- Pampati S, Rasberry CN, Timpe Z, McConnel L, Moore S, Spencer P, & Barrios LC (2023). Disparities in implementing COVID-19 prevention strategies in public schools, United States, 2021–22 school year. *Emerging Infectious Disease*, 29(5). 10.3201/eid2905.221533
- Pressley T (2021). Factors contributing to teacher burnout during COVID-19. *Educational Researcher*, 50(5), 325–327. 10.3102/0013189X211004138
- Rice KL, Miller GF, Coronado F, & Meltzer MI (2020). Estimated resource costs for implementation of CDC's recommended COVID-19 mitigation strategies in pre-kindergarten through grade 12 public schools—United States, 2020–21 school year. *Morbidity and Mortality Weekly Report*, 69(50), 1917. 10.15585/mmwr.mm6950e1 [PubMed: 33332295]
- Robinson LE, Valido A, Drescher A, Woolweaver AB, Espelage DL, LoMurray S, & Dailey MM (2023). Teachers, stress, and the COVID-19 pandemic: A qualitative analysis. *School Mental Health*, 15, 78–89. 10.1007/s12310-022-09533-2 [PubMed: 35875185]
- Rothstein R, & Olympia RP (2020). School nurses on the front lines of healthcare: The approach to maintaining student health and well-ness during COVID-19 school closures. *NASN School Nurse*, 35(5), 269–275. 10.1177/1942602X20935612 [PubMed: 32546120]
- Spencer P, Timpe Z, Verlenden J, Rasberry CN, Moore S, Yeargin-Allsopp M, & Pampati S (2023). Challenges experienced by US K-12 public schools in serving students with special education needs or underlying health conditions during the COVID-19 pandemic and strategies for improved accessibility. *Disability and Health Journal*, 16(2), 101428. 10.1016/j.dhjo.2022.101428 [PubMed: 36610820]
- Um YJ, & Choi YJ (2022). A grounded theory on school nursing experiences with major pandemic diseases. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 59, 00469580221090405. 10.1177/00469580221090405
- Varela DG, & Fedynich L (2020). Leading schools from a social distance: Surveying South Texas school district leadership during the COVID-19 pandemic. *National Forum of Educational Administration and Supervision Journal*, 38(4), 1–10. <http://www.nationalforum.com/>

Electronic%20Journal%20Volumes/
Varela,%20daniella%20Surveying%20South%20Texas%20School%20District%20Leadership%20
NFEASJ%20V38%20N4%202020.pdf

VERBI Software (2021). MAXQDA 2022 [computer software]. VERBI Software. [maxqda.com](https://www.maxqda.com).

Verlenden JV, Pampati S, Rasberry CN, Liddon N, Hertz M, Kilmer G, Viox MH, Lee S, Cramer NK, Barrios LC, & Ethier KA (2021). Association of children's mode of school instruction with child and parent experiences and well-being during the COVID-19 pandemic—COVID experiences survey, United States, October 8–November 13. *Morbidity and Mortality Weekly Report*, 70(11), 369–376. 10.15585/mmwr.mm7011a1 [PubMed: 33735164]

Viner RM, Russell SJ, Croker H, Packer J, Ward J, Stansfield C, & Booy R (2020). School closure and management practices during coronavirus outbreaks including COVID-19: A rapid systematic review. *The Lancet Child & Adolescent Health*, 4(5), 397–404. 10.15585/mmwr.mm7011a1 [PubMed: 32272089]

Table 1.

Sample Interview Guide Questions.

Domain	Interview Question
COVID-19 prevention strategies	<i>What helped with successful implementation of your mask policy?</i>
	<i>What challenges, if any, has your school encountered in implementing or adhering to the mask requirement?</i>
	<i>What factors made your school's promotion of handwashing, cleaning, and disinfecting, and promoting physical distance challenging?</i>
	<i>What challenges, if any, has your school encountered when trying to improve or increase ventilation?</i>
	<i>What factors influenced your school's decision to not use COVID-19 testing as a prevention strategy?</i>
Challenges experienced during the COVID-19 pandemic	<i>What factors made your school's quarantine policy successful?</i>
	<i>What has supported the provision of vaccine events at the school or other district sponsored events?</i>
	<i>What have been the biggest challenges that your school, as a whole, has faced since the start of the pandemic? Probe: Limited resources and supplies, staff shortages and burnout, substitute teachers, reduction in student enrollment, direction, or guidance from district offices</i>
Future emergency preparedness and infection control	<i>How will lessons learned during the COVID-19 pandemic impact your school's ability to plan for future emergencies or disease outbreaks?</i>

Table 2.

Characteristics of Participants and the Schools They Represent.

Characteristic	<i>N</i>	Percent (%) ^a
Total participants	21	
Participant role		
Principal	14	67
District/school nurse	4	19
Other	3	14
School level ^b		
Elementary	8	38
Middle	6	29
High	7	33
U.S. region		
Midwest	5	24
Northeast	5	24
South	6	29
West	5	24
Locale		
City	7	33
Suburb	7	33
Town	2	10
Rural	5	24

^aDue to rounding, percents may not sum to 100.^bElementary school level defined as those comprising any grade from K through 4; middle school level defined as those comprising any grade 7 or 8; and high school level defined as those comprising any grade from 10 through 12.

Table 3.

Facilitators and Barriers to Implementation by COVID-19 Prevention Strategy.

COVID-19 Prevention Strategy	Facilitators	Barriers
<i>Cleaning and disinfection</i>	Adequate cleaning supplies Behavior modeling CDC guidance District support Funding to hire additional staff	Insufficient funding to hire additional staff Difficulty acquiring cleaning and disinfecting supplies Time constraints Soliciting teacher buy-in
<i>Cohorting/staggered scheduling</i>	Staggering schedules so students stay in the classroom while teachers move Eating lunch one grade level at a time Changing lunch times to reduce the number of students in the cafeteria	Lack of staff to monitor cohorts or pods Difficulty in sustaining this type of strategy long-term Limited social interactions between students Inability to use group learning strategies
<i>Contact tracing</i>	Well-articulated policies and procedures CDC guidance Existing racking system Staggered schedules and seating charts District resources and support	Limited time Lack of staff Difficulty keeping track of activities outside of school Inadequate or no tracking system Language barriers
<i>COVID-19 testing</i>	Distributing at-home COVID-19 tests Testing events Community partnerships	Policies prohibiting testing at school Time required for testing Loss of learning due to the consequences of a positive COVID-19 test Limited testing kits or testing sites in the community
<i>Hand hygiene and respiratory etiquette</i>	Adequate number of supplies Teacher and staff support and buy-in Training students on proper handwashing and respiratory etiquette Signage to promote and reinforce these behaviors	Limited sinks in school bathrooms Inadequate supplies Lack of student adherence Inability to monitor behaviors
<i>Isolation and quarantine</i>	Well-articulated policies and procedures Tracking system CDC guidance Dedicated school staff Collection of information on students' COVID-19 vaccination status	Parental opposition Unclear policies Changing landscape and guidance
<i>Mask use</i>	CDC guidance Parental and community support State/district mandate or requirement Adequate supply of personal protective equipment (PPE) Frequent reminders/visuals about masking	Parental opposition Community resistance Limited adherence to school's mask policy Limited PPE
<i>Physical distancing</i>	Posting signage Distance markers Staggered mealtimes Assigned seats in classrooms and cafeterias	Space constraints Difficulties maintaining adequate spacing due to the school's built environment Interference with students' social-emotional development
<i>Staying home when sick</i>	Parental buy-in and support Online platforms to support virtual learning	Parental opposition Learning loss Decreased emotional and social support
<i>Vaccinations (including offering COVID-19 vaccines and tracking</i>	Incentives Partnerships with vaccine providers Establishing vaccine confidence Robust tracking systems Designated point-of-contact	Parental opposition Parents' unwillingness to share their child's vaccination status Community resistance Vaccine misinformation and disinformation

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COVID-19 Prevention Strategy	Facilitators	Barriers
COVID-19 vaccine status of students or staff		Lack of state-sponsored vaccination requirements No tracking system in place Inefficiencies with data capture systems Limited understanding about the difference between being fully vaccinated and up-to-date with the COVID-19 vaccine
Ventilation	Adequate resources and supplies District buy-in and support School size and newer building facilities CDC guidance	Lack of resources Old facilities Supply chain issues Schools' shifting priorities