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Health Crisis Response Playbook for UC Davis

Prepared by the Strategic Readiness Committee
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Table of Contents

1. The UC Davis Response to COVID and the Creation of Healthy Davis Together <i>Overview of UC Davis's rapid response to the COVID-19 pandemic, including the creation of the "Healthy Davis Together" initiative to provide widespread testing, vaccines and education.</i>	4
2. Risk-based Approach to a Public Health Crisis <i>Examination of UC Davis's strategic approach to managing risks during the COVID-19 pandemic, focusing on decision-making, communication and the importance of flexibility.</i>	8
3. Operational Continuity <i>Insights into the strategies used to maintain operational continuity in supply chain management, communication, resource allocation and other functions.</i>	12
4. Financial Considerations <i>Analysis of financial strategies that UC Davis engaged to mitigate the economic impact of the pandemic, including federal relief funding, FEMA claims and budget management.</i>	16
5. Communication Considerations <i>Overview of the communication strategies used to coordinate messaging across the decentralized UC Davis campus during the pandemic, emphasizing the need for clear, consistent and accessible information.</i>	19
6. Community Engagement and Social Considerations <i>Examination of UC Davis's role in supporting local public health agencies and advocating for underserved populations during the COVID-19 crisis.</i>	22
7. Labor and Personnel Considerations <i>Discussion of the labor and personnel challenges during the pandemic, including the transition to remote work, management of employee safety, and how compliance with labor agreements was maintained.</i>	25
8. Mental Health Considerations <i>Exploration of the ways in which the crisis affected the mental health of the UC Davis community and the importance of embedded and Telemental Health (TMH) support.</i>	29
9. Clinical and Environmental Surveillance <i>Discussion of the development and implementation of large-scale COVID-19 testing and wastewater surveillance at UC Davis to monitor and control the spread of the virus.</i>	33
10. Research Considerations <i>Overview of the contributions that UC Davis's research community made to the global COVID-19 response and the adaptations that enabled continuation of research activities.</i>	42
11. Academic Senate Considerations <i>Details of the Academic Senate's role in adapting academic policies during the pandemic, including grading and instructional changes to accommodate remote learning.</i>	45
12. Faculty and Student Experience <i>Analysis of the faculty and student experiences during the transition to remote instruction, and the obstacles encountered in technology access, grading and retention of student engagement.</i>	49

Prologue

In March 2023, the Provost of the University of California, Davis, mandated the campus to convene a Strategic Readiness Committee (SRC) for pandemic preparedness to capture the lessons learned from the COVID-19 pandemic and develop recommendations to guide the Office of the Chancellor and Provost in managing future emerging health crises. The SRC was supported by UC Davis Grand Challenges and the Institute for Pandemic Intelligence through funding from the US Health Resources and Services Agency.

The Strategic Readiness Committee's goal was to develop a pandemic response playbook to inform robust and timely decision-making processes and establish a structure to respond to future epidemics and other health challenges that may affect our university community.

Approach

SRC membership was composed of diverse leaders of the campus community. Following the appointment of the committee chair and designation of the co-chair, the committee commenced activity through a series of virtual meetings and consultations to review the SRC goals, define the SRC scope and co-create a road map for developing the playbook.

Together with Grand Challenges, the SRC organized two workshops—one in October 2023 and another in January 2024—titled “Impacts of the COVID-19 Pandemic on UC Davis,” designed to bring together UC Davis stakeholders and Davis and Yolo County community leaders. Workshop goals were to understand critical lessons learned regarding UC Davis COVID-19 response activities, and workshop participants were identified as key and valuable contributors to the development and implementation of the UC Davis COVID-19 response. The workshops provided a comprehensive understanding of what went well, the key obstacles encountered and areas for improvement, all of which served as the foundation for developing this SRC playbook.

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Chapter 1: The UC Davis Response to COVID and the Creation of Healthy Davis Together

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Background

In the spring of 2020, UC Davis scientists on campus and at UC Davis Health in Sacramento were learning about COVID-19's method of spread, its persistence in the environment and best practices to avoid contagion by using personal protective equipment. COVID-19 testing was expensive and difficult to access, limited to individual polymerase chain reaction (PCR) tests for symptomatic patients and performed at select medical center laboratories that were hindered by a shortage of testing reagents. The COVID-19 virus had several properties that were making its spread difficult to control, including its high level of transmissibility during the period of time when infected individuals were presymptomatic. Uncertainty about the modes of transmission, the severity of illness, and the lack of diagnostic testing capability, vaccines, or treatment created extensive confusion and fear as news of the pandemic spread.

In response to this uncertainty, UC Davis leadership acted swiftly, closing the campus in March of 2020, with a commitment to prioritizing the health and safety of students, staff and the surrounding community. Campus academic departments and service units operated remotely through the remainder of spring and summer quarters. Leaders had announced their intention to reopen the campus in the fall of 2020, amid hesitancy to do so because of the unrelenting threat to the safety of university and surrounding community members.

They recognized that the influx of tens of thousands of students returning to the UC Davis campus raised considerable concerns

for both the safety of the city of Davis residents and the campus community. Campus leaders, scientists and public health personnel became determined to develop the means to maintain instructional and research programs safely. Widespread testing of asymptomatic individuals seemed to be a logical strategy to minimize the spread of the novel virus, but the technology to bring testing to scale did not yet exist.

Discussions between the UC Davis Genome Center, Student Health and Counseling Services and central campus representatives led to the development of a large-scale asymptomatic testing program on campus. UC Davis scientists, clinicians and policymakers subsequently joined forces with city of Davis officials to create a unique COVID-19 testing program called "Healthy Davis Together" (HDT). In partnership with the UC Davis campus testing program, HDT conducted free saliva testing to asymptomatic individuals throughout the Davis community, eventually expanding to include all of Yolo County (as described in Chapter 9). This project was made possible through the strong advocacy of UC Davis leaders and could not have achieved scale without the considerable philanthropic support secured by UC Davis Health.

Inception of Healthy Davis Together

Early in the summer of 2020, members of UC Davis Health were approached by philanthropists interested in supporting COVID-19 mitigation efforts in a small university community such as Davis, with relative geographic isolation and strong interdependence between the university and the community. They hoped that by employing a community-focused strategy, a model could be developed for other colleges and communities to adopt in order to reopen safely during COVID-19. This vision aligned perfectly

with UC Davis' mission to serve the public good, leading to a deepened commitment from the university's leaders to ensure the project's success. A UC Davis Health team articulated a strategy incorporating insights from the director of business development and the chair of the Department of Public Health Sciences. They presented to the UC Davis chancellor a resulting proposal for a program, to be operated as a partnership of UC Davis and the city of Davis, that would provide free COVID-19 testing, personal protective equipment and public health education to the community. The goal was to mitigate the health effects of COVID-19 on community members as well its financial impact on the city's businesses. With support from campus leaders, this team approached the Davis city manager, who was receptive to the proposed joint project and offered city-owned facilities and resources to use for testing sites.

As campus leaders considered COVID-19 mitigation strategies for safely returning students to campus, a parallel discussion was taking place about testing methodology that could be deployed on campus. The Genome Center director proposed investing in high-throughput PCR equipment capable of supporting weekly testing of students and employees. Campus leaders approved the request for funding, and the new PCR equipment was ordered. Critical steps remained before testing could begin, however, including evaluating test performance, determining the logistics of sample collection and preparation, regulatory certification of the lab, and implementing data management systems (as Chapter 9 describes). To enable Healthy Davis Together to expand testing throughout the community, the city and campus procured additional equipment and supplies.

Project Team

Central to the leadership of HDT were experienced personnel who had extensive knowledge of the university's priorities and processes and who were familiar with its day-

to-day operations. UC Davis faculty and staff members who had deep connections to key stakeholders in the university were instrumental in the university response to COVID-19 as well as in the formation of HDT.

Leaders of HDT relied upon its community advisory committee members for program guidance. The committee, which the UC Davis provost and the city of Davis city manager co-chaired, consisted of local business owners, members of the Davis Chamber of Commerce, community groups, faith groups and nonprofit organizations. A national advisory committee, composed of scientific, policy and technical advisors, lent perspective on national and global COVID-19 infection rates and mitigation strategies. Deloitte Healthcare Consulting contributed healthcare delivery expertise that was particularly valuable, given the short timeline to the project's launch. The consultants assisted with rapidly scaling the testing centers from a single site to dozens of sites across the city of Davis and Yolo County. They also facilitated evaluation of new project elements, and empowered timely decision-making in a novel and evolving pandemic environment.

Education

In addition to its COVID-19 testing program, Healthy Davis Together was committed to functioning as an authoritative source for clear, concise public health messaging to the community that aligned with emerging science and California state-level public health leadership. HDT worked with its communications team to create a brand and logo that were readily recognizable, making test sites easy to identify. The communications team partnered with the university and county to develop materials for community outreach utilizing paid media, social media and text campaigns. Educational materials promoted healthy behaviors, encouraged registration for recurrent testing and conveyed information about vaccine availability. To assess trends in attitudes, beliefs and practices

regarding COVID-19, the communications team conducted bimonthly surveys of Davis and Yolo County residents. The survey responses were valuable in directing content and targeting of the educational messaging.

A primary goal of HDT was to share the knowledge acquired from the project's activities. The goal was to create a playbook to be used by other U.S. communities and college towns to mitigate the effects of COVID-19. To rapidly disseminate this information, project findings were published in 21 playbooks, case studies and blog posts. Separate from these are the dozens of scholarly publications and presentations by HDT project leaders that continued beyond the project's conclusion in June 2022.

Nimbleness

In the context of a novel virus and global pandemic, HDT leaders in the summer of 2020 acknowledged the uncertainties in which the project would operate. High-throughput PCR testing at the community level would not be deployed until late September, and neither the capacity of the lab nor the level of interest in the community had yet been determined. HDT leaders adopted a growth mindset and committed to constant program evaluation and adjustment as needed, accepting that scientific data would continue to emerge throughout the project. This approach mirrored UC Davis' broader institutional response to the pandemic, which emphasized adaptability and a commitment to following the best available science. Project leaders conducted daily monitoring of testing utilization and positivity data for discussion at weekly meetings. Expressed needs from stakeholders, observations of advisory committees, and community survey data were reviewed at monthly executive committee meetings. In response to this frequent program evaluation, HDT consistently implemented corresponding changes. They included adjustments to test sites and hours, the addition of mobile testing, pop-

up testing and vaccine clinics, and promotion of incentives for testing. HDT also updated public health messaging frequently due to changes in COVID-19 positivity rates as well as evolving variants.

Collaboration and Results

Over the course of planning and implementing HDT's community testing program, a close partnership formed between HDT leaders and the Yolo County Health and Human Services Agency. The relationship quickly expanded from collaboration on testing, and evolved to include case investigation, personal protective equipment (PPE) distribution, public health messaging, data analysis and equitable vaccine distribution. The UC Davis Genome Center lab, with information technology support from HDT, supplied county public health leaders with critically important daily testing results, along with key data on emerging variants. HDT leaders engaged in frequent discussions with county public health officials regarding trends in positivity rates. In contrast to other California counties that lacked such collaborative programs, the Yolo County public health officer was able to follow local positivity rates and changes in prevalent variants in real time and, as a result, offer data-driven, timely guidance to the public.

Throughout the project's two-year duration, the university and county worked synergistically, leveraging their own strengths (Chapter 6). The county had insight into the needs of its diverse population of residents. Public health leaders closely followed census tract data on vaccine uptake and monitored congregate settings for COVID-19 activity. HDT relied on its nimble staff and testing resources to rapidly deploy mobile testing when county public health officials issued alerts about localized outbreaks. As a known and trusted entity, the Yolo County Health and Human Services Agency introduced HDT to community groups and school leaders countywide. HDT leveraged these relationships

to establish targeted vaccine and testing programs as well as to disseminate public health messaging regarding behavior, testing and vaccinations.

HDT is credited with increasing testing overall and sustaining the health and economy of the city of Davis. Countywide, HDT supported the precise deployment of testing and vaccine resources, as well as data-driven decision-making and public health messaging.

The collaboration between UC Davis, the city of Davis and Yolo County stands as a testament

to the power of community-focused, science-driven initiatives in the face of a global public health crisis. The success of Healthy Davis Together not only safeguarded the health of the local community but also set a precedent for how academic institutions can lead and innovate during unprecedented events that jeopardize public safety. As the world continues to grapple with emerging health threats, the lessons learned and the partnerships forged through this initiative ideally will remain invaluable for future public health agencies.

COVID-19 Tests administered:
HDT 900,000
UC Davis 1,300,000

Vaccines administered:
HDT 16,000
UC Davis 27,000

Chapter 2: Risk-based Approach to a Public Health Crisis

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Key Takeaways and Recommendations

- All aspects of university operation will be engaged with significant threats, changes and problems during a public health crisis. Attracting the attention of decision makers early in the process is critically important for managing change.
- Strive to understand what is important to decision makers. Recognize that the same set of facts can mean different things to different people because of different goals. Do not assume that the obvious is apparent to everyone.
- Keep the mission in mind. Worry at all times about mission creep. Consider each action within the context of supporting the mission and continuing the mission for the next 10–20 years.
- Build structure that forces communication and collaboration across every aspect of the enterprise. Recognize that others deep within separate divisions likely will try to solve the same problems but will come to different conclusions. Communicate often. Communicate broadly. Be repetitive through different channels of communication. Recognize that voids in communication likely will be filled by others, perhaps to ill effect.
- Have an exit strategy for every decision. Imagine the future circumstances that will make any new policy or practice unsustainable. Creation of any new policy or procedure should simultaneously incorporate a procedure for deactivating it.

- Anticipate conflicting scientific direction and bleeding-edge research that others will advocate. Use a single source of truth, such as a local public health authority, for every policy and operational decision.
- Community exhaustion and apathy to new information and change can be a big problem. Responses to future crises may meet significant resistance to change, depending on the extent to which people remember the COVID-19 pandemic responses.

Background, Introduction and Context

The university faced the usual set of institutional obstacles in 2019, as compared with many other years. In other words, all aspects of university administration, research and teaching enterprise were fully engaged with significant impediments, changes and problems. The context is helpful to remember because engaging the attention of decision makers early is an important part of managing change. The COVID-19 pandemic highlighted the need for proactive change management and resource management. As we dealt with unprecedented impacts, our response was only as effective as our communication, stakeholder engagement and flexible decision-making. This theme repeated itself over and over again.

Effective change management requires the cultivation of formal networks of stakeholders. The networks are the backbone of understanding the context and impacts of change agents coming from outside and inside the organization. During the height of the pandemic, policy-setting and planning groups commonly met twice weekly as needed to continually align guidance from executive leaders with on-the-ground realities of various

divisions. Leaders at the division level need to understand the thinking of the executive team and how to manage conflicting information, and then must share operational implications. Doing so creates a feedback loop that helps to keep messages consistent.

Maintenance of the campus' "town-gown" relations with the city of Davis, among all of the university's stakeholders, is especially important. This relationship should be founded on the understanding that the pandemic does not respect municipal or politically drawn boundaries and that public health policies of all involved entities ideally should be complementary. Establishment of a UC Davis plan as part of community problem-solving is important in maintaining those town-gown relationships and protecting both the campus and the adjoining city.

The dynamics of differing roles and perspectives of the various participating campus units and external offices complicated the exchange of information and the process of creating and adopting interagency policies. As a research institution, UC Davis is home to a community of learned scientists in positions that can directly and indirectly influence stakeholder relationships and public health and university policy. These scientists can be of tremendous benefit by virtue of their access to bleeding-edge information relevant to an emerging crisis and advocacy of novel response approaches, although in some cases, these evolving findings can also be a liability. This internal information, combined with external data streams that influence the development of ideas, can lead to conflicting approaches among key individuals and institutions within the UC Davis and stakeholder network when responding to the public health crisis. Clear communication and constant adjustments are needed in response to the rapidly changing information landscape, making change management for the university difficult.

Conflicts among stakeholders and campus leaders can be minimized or avoided by reliance

on a single source of authoritative information when setting policy. For UC Davis in a public health crisis, that source may be the Yolo County Health and Human Services Agency. This decision can be further empowered by establishing early on both a policy document and a reference point for which subsequent decisions will be made, thereby defining what source of authoritative information the campus should follow for policy guidance. The policy document gives the institution the legal authority to enact and enforce administrative decisions. Those decisions are broad and include evacuating campus housing, allocating infectious shelter areas, granting access to campus, establishing reporting requirements, and others. Without one consistent source of information, anyone who has access to the latest scientific paper or who simply speaks the loudest can hijack consistency of decision-making.

One of the first examples of change management during the COVID-19 pandemic was the fundamental decision to move to remote instruction. This decision came with perhaps one week of warning. Even so, no one had the mindset yet to truly visualize such a move. Indeed, UC Davis was not among the first few educational institutions to make the transition to remote instruction. The Los Angeles Unified School district and others initiated that movement when they announced their abandonment of in-person instruction. The UC Office of the President was close behind. It was only then that the full gravity of the situation became apparent.

The ability to quickly visualize, analyze, adapt and deploy operational changes to new context came into play on numerous occasions. However, the repetition of changes proved taxing for university personnel and the community. Eventually, exhaustion and apathy about new information and change became a real problem. Future responses to public health crises likely will experience the same

CHALLENGE	LESSONS LEARNED
Choosing a strategic path and decision-making with rapidly evolving information	● Have a trusted source for guidance and policy that support overall strategy ● Be prepared to advocate for less-than-perfect decisions in the face of time-sensitive needs ● Recognize the need for change and be resilient enough to implement changes when necessary; be aware that fear of change and delays in decision-making can be detrimental
Maintaining consistent, unified messaging regarding decision-making	● Have or create clear policies that integrate crisis response across organizational boundaries ● Use effective and repetitive communication to manage crises in the long term
Filling newly created positions and undertaking unprecedented roles in the emergency response	● Be sensitive and flexible to family concerns, child care problems, and working hours, and their effect on productivity and long-term operational readiness
Maintaining relationships with city of Davis and Yolo County and implementing complementary policies	● Do not assume that policymakers from multiple entities will be aligned ● Develop processes to anticipate and accommodate future cost recovery ● Develop documentation systems in culture and process that are compatible with federal disaster relief funds, especially if coordinating or leading disaster relief activities outside the campus jurisdiction

pattern leading to exhaustion, especially among members of the university community who still are able to recall the changes and impacts of the COVID-19 pandemic from 2020 to 2023.

Conclusion

The COVID-19 pandemic was unprecedented in many ways. In contrast to procedural readiness for other emergencies and circumstances, such as floods or protests, UC Davis had not previously established guidelines delineating how to best respond to a public health crisis. Instead, the campus community relied upon a collaborative culture that recognized the need

to come together to orchestrate an effective response.

Most problems were manageable when plugged into the newly improvised communication structures. Perhaps some of the worst outcomes resulted from the independent decisions made within divisional units that had not aligned with the collaborative communications network. “Bad” decisions do not mean wrong decisions. Instead, they occur when divergent sections of campus spontaneously enact different rules without any common understanding. Those situations lead to generalized confusion and frustration when people recognize non-uniform

Strategic Readiness Committee

application of policy or inconsistency with any one source of authoritative information, such as the Yolo County Health and Human Services Agency.

Each decision that governed operations or behavior has the potential for unanticipated impacts. Assume the possibility of unexpected consequences each and every time. To mitigate against that potential, communication functions and directives should contain some level of flexibility or interpretation whenever

and wherever possible. Communication plans should anticipate when any given action or activity likely will conclude, based upon some kind of future condition that would be measurable and, ideally, predictable. Knowing that every action has a limited shelf life helps to prepare the community for the arrival of better times. Maintaining a focus on that future in all messaging can help to sustain the campus, residential and business community through the crisis.

Chapter 3: Operational Continuity

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Key Takeaways and Recommendations

- Operational support for UC Davis relies upon the stewardship and cooperation of multiple service units, with main physical facilities predominantly in the cities of Davis and Sacramento.
- In 2020, the university had a daily population of approximately 50,000 people at its Davis campus and 15,000 people at its Sacramento campus.
- Immediate action establishing campus priorities and levels of operations in conjunction with available operational support resources was crucial to a successful and immediate response.
- During the COVID-19 pandemic, individual units were asked to prepare continuity plans with support from the Emergency Operations central office.
- Establishment of baseline and desired operating levels for each unit, along with redundancy plans, was critical to define and allocate resources to support the organization.
- Clear and ongoing communication, advanced planning around vendors and supply, and diligent organization and record-keeping are crucial for maintaining operational support in a public health crisis.

Background, Introduction and Context

The UC Davis enterprise is a large, complicated and disparate organization with a mission that spans the globe. Operational support for UC Davis relies upon the stewardship and cooperation of multiple service units. The main physical facilities are predominantly within the Sacramento Valley in Central California, specifically Davis (in Yolo County) and the Sacramento metropolitan area (encompassing Sacramento County and western Placer and El Dorado Counties). Robust operational programs maintain day-to-day support for the two main campuses—the college town campus in Davis and the urban campus in Sacramento.

In 2020 the Davis campus had a daily population of slightly less than 50,000, encompassing 36,000 students and 13,000 employees. Roughly one third of the students lived on campus in residence halls and apartments. The Sacramento campus had a daily population of somewhat less than 15,000, consisting of 2,000 students, 7,000 employees and 4,000 patients. These figures represent an approximation of people physically traveling to campus and do not reflect UC Davis affiliates across the entire enterprise in other facilities, such as those at Bodega Bay, Lake Tahoe or Tulare. These remote facilities were located within different counties with a variety of jurisdictional overlays. Each of these facilities had close ties to adjacent communities and a traditional model of mutual aid.

The COVID-19 pandemic challenged the operational model of the university and the ability of the campus to pursue its mission. Each unit was asked to prepare continuity plans as prompted and supported by the Emergency

Operations central office within UC Davis. While the UC Davis enterprise held unity in name, the jurisdictional context of each facility varied. More than ever, cooperation, as well as co-evolution of operational programs, among units was critical for the university to minimize impacts from the pandemic. Redundancy plans related to operations and resources were essential to maintain mission continuity across periods of disruptions and change.

In a global public health crisis, supply chains can be severely disrupted, hindering numerous aspects of campus operations and research activities. During the COVID-19 pandemic, the university established a centralized supply chain model to properly procure, receive and distribute supplies and informational materials during global shortages. The centralized system provided a single point of contact for outside vendors, thereby reducing lead time for procurement of supplies and focusing effort and funding on sourcing supplies in line with the scope of operations that university leaders established. The centralized system also provided the tracking and distribution records required to support reimbursement to UC Davis on multiple FEMA claims that were directly connected to the university's public health programs and responses activities related to the pandemic. In addition to a centralized structure, it was beneficial to maintain a stockpile of supplies for basic operations that could withstand minor disruptions in the global supply chain.

The transition of many campus activities to remote or online platforms significantly impeded funding of operational units that were structured as auxiliaries and financed through recharge work. For instance, Transportation Services and Student Housing and Dining, which derived revenue from recharge work, were largely dependent on the presence of an in-person, on-campus community. Other units, such as Facilities Management and Grounds, that were commonly perceived as general operations

and not structured as an auxiliary, depended on recharge funding for the overall budget. To maintain operational continuity of the campus, these groups depleted their budgets, because federal support did not cover the entirety of their expenses.

The pandemic dramatically disrupted and complicated the normal day-to-day support model of campus units. The operational priorities at the campus level and across units were constantly evolving in response to the pandemic, mission continuity, and the fundamental support of teaching, research and community service. Communication, strong leadership, and the establishment of baseline and desired operating levels were critical in defining and allocating resources to support the organization.

Healthy Davis Together (HDT) became an exemplar model for operational continuity, adaptation, and cooperation across units on campus and entities in the surrounding communities. The operational support for the development of the testing program that became HDT evolved organically, based upon robust communication and organizational awareness of the diverse and complex operational systems needed to support the program. HDT's impressive levels of cooperation and awareness were possible only with open communication across units, including discussion about problems, asking for help and voicing concerns or frustrations.

Not all COVID-19-related activities and campus experts were folded into HDT. Several organizational units with subject-matter expertise pertinent to a pandemic response were not as engaged in the development of, for example, the testing program. These specific entities still contributed to the pandemic response within their operational scope, highlighting that in an organization as large and diverse as UC Davis, strategic, effective responses that maintain operational continuity may not require an all-hands-on deck response.

CHALLENGE	LESSONS LEARNED
Receiving input from all organizational units with expertise relevant to the crisis response	● Implement a system with expectation of open communication across units ● Prioritize collaboration and problem solving that transcends organizational boundaries and traditional territorial spaces
Maintaining operational continuity despite safety concerns, absenteeism and uncertainty among support staff	● Use clear and ongoing communication from leaders to reduce level of frustration and anxiety among support staff
Overcoming supply chain disruptions	● Centralize the supply chain model to properly procure, receive and distribute supply resources during a global shortage ● Use a single point of contact for outside vendors to reduce lead time on supplies, and focus efforts and funding on sourcing supplies in line with the scope of operations as determined by university leaders ● Maintain adequate supplies to support baseline operation for at least two weeks
Scoping of operational support despite decentralized departmental operations and campus communications	● Be aware of the diversity and complexity of operational systems and communicate these differences across the organization
Delivering clear and consistent communication to the overall university community to determine allocation of operational support resources	● Immediately communicate priorities for operational support and update as needs change ● Identify key campus stakeholders who have departmental knowledge and decision-making authority
Integrating auxiliary operational units into the crisis response, despite their dependence on recharge funding	● Track all hours and expenses in anticipation of reimbursements from state and federal government agencies, but expect less than full compensation; consider allocation of one-time funds to cover payroll for auxiliary staff members

Communication and strong leadership should advise whether and how units work together for a coordinated response to public health crises.

Conclusion

Immediate action establishing campus priorities and levels of operations in conjunction with available operational support resources was pivotally important in achieving a successful and immediate response. Clear and ongoing communication from leaders regarding the operational support model and resources available to the campus community improve departmental ability to operate efficiently during a pandemic and reduce the level of frustration and anxiety.

Advance planning with regard to key stakeholders, vendor and community partners,

baseline supply inventories and technology solutions are essential in supporting university operations during the initial phases of a pandemic.

Over the course of the pandemic, consistent monitoring of local, state and federal recommendations must be evaluated for potential application within the university environment. Coordination with other organizations and surrounding communities is beneficial when resources become restricted.

Organization and record keeping are critical components of operational support, not only in allocating resources in line with campus priorities, but also in recouping financial expenditures if funding from government agencies is made available (Chapter 4).

Chapter 4: Financial Considerations

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Key Takeaways and Recommendations

- Leading a crisis response can present a large financial liability for the campus.
- University leaders should offer guidance to the broader campus community to prepare for future crises, in order to ensure clarity and readiness in their responses.
- The campus and its units must take advantage of relief funding, loans and philanthropic gifts to mitigate the financial impact of the crisis response.
- Consultants with subject-matter expertise should be hired, as appropriate, to navigate complex processes, eligibility criteria and documentation requirements associated with state or federal funding opportunities.
- The university should strengthen the supporting documentation within the campus procurement and timekeeping processes to ensure transparency, compliance, ability to claim all eligible costs and efficiency. Clear and comprehensive documentation is essential to achieve accountability and to maximize funding potential.
- Campus leaders must balance the moral, legal and financial trade-offs associated with leading or participating in crisis-response functions with respect to jurisdictional bounds and the ways in which

its actions affect its personnel and the communities outside of the university.

Background, Introduction and Context

Through strategic actions and access to much-needed federal relief funds, the campus mitigated the financial impact of its responses to the COVID-19 pandemic, thereby preserving the long-term financial stability of the campus. At the beginning of the pandemic, campus units were instructed to code all financial transactions with direct expenses related to the COVID-19 emergency. Additionally, the University of California Office of the President (UCOP) required campuses to report lost revenue. Tracking and reporting activities identified \$315 million in one-time increased costs and lost revenue on the Davis campus and its schools of health.

UC Davis mitigated that financial impact through several means: obtaining \$96 million in relief funding provided through three different federal acts; submitting over \$18 million in reimbursement claims to the Federal Emergency Management Agency (FEMA); taking advantage of working capital loans facilitated by UCOP to ensure liquidity through low-interest borrowing; and supplementing those revenues with philanthropic gifts to support public safety responses to the pandemic. The campus also relied on departments campuswide that individually attained one-time savings from reduction in travel and entertainment, maintaining position vacancies, and making use of carryforward funds. All of these actions together helped UC Davis constrain the financial burden that the pandemic response imposed.

Taking advantage of available relief funding can be a complex task. Early in the pandemic the university contracted with consultants from

Disaster Recovery Services (DRS), a planning and claims recovery company based in Houston, in order to develop a strategy and process for submitting reimbursement claims to FEMA. DRS helped UC Davis officials navigate the complex, and often changing, requirements to submit these claims. With strict eligibility requirements, the campus dedicated much time and effort into reviewing expenses to determine if they met the criteria for reimbursements. Developing a narrative, supported with documentation, can be instrumental in elucidating the effects of the pandemic on the campus and in articulating the necessity of relief funds, such as those offered through FEMA assistance. These narratives can help define the scope and depth of the university's relevant expertise, size and connection to the surrounding cities, counties and regional communities, and thus the role of UC Davis in the area's overall response to the public health crisis.

The eligibility of the campus for federal relief funds may present some tradeoffs to consider in the event of a future public health crisis, based on the limits of the university's legal responsibility. For instance, during the COVID-19 pandemic, the campus made an initial decision to take responsibility for conducting citywide, and

eventually countywide, COVID-19 testing and other services, because it was best positioned and had the resources to most effectively do so. However, to date the university has not received FEMA funds for performing those services, despite the eligibility of the services for relief funding due to FEMA's interpretation of who has the legal authority to perform this work for the city and county. This issue is currently under appeal with FEMA.

Conclusion

While the campus was largely successful in mitigating the financial impacts of the COVID-19 pandemic, this chapter identified opportunities to further enhance the campus response to a future pandemic. The success of the campus in persevering through the COVID-19 pandemic prompted several ongoing activities, including active engagement and training in the Finance and Administration Section of the UC Davis Emergency Operations Center. To refine and streamline its crisis readiness capabilities, the campus should consider ways to enhance procurement and time tracking processes to continually monitor take full advantage of additional funding opportunities.

CHALLENGE	LESSONS LEARNED
Navigating and fulfilling FEMA's intricate and frequently changing requirements for claim submissions	● Hire consultants, such as Disaster Recovery Services, early to develop a strategy and process for submitting reimbursement claims to FEMA ● Enhance supporting documentation on the campus procurement and timekeeping processes to better align with FEMA expectations ● Develop a narrative and associated documentation that elucidate the effects of the pandemic on the campus and articulate the necessity of FEMA assistance relief funds
Satisfying strict eligibility criteria for reimbursement of campus expenditures	● Implement a clear and transparent process for the approval and documentation of emergency response-related expenses ● Establish clear criteria for response expenses early and revise those criteria as needed ● Utilize the UC Davis Safety Services unit's Emergency Operations Center (EOC) Finance Section to manage this process ● Avoid moving expenses between units and chart of account segments in order to ensure accurate claim filing
Improve our ability to demonstrate legal authority for programs that the campus offers to the broader community beyond UC Davis students and employees	● Recognize legal responsibilities, limitations and potential liabilities associated with operation of university-city partnership programs, such as Healthy Davis Together ● Emphasize the need for thorough and early legal agreements outlining reimbursement and responsibilities for activities done in collaboration with other local governmental agencies in our region ● Consider FEMA public assistance policy elements related to legal authority and jurisdiction as a means to strengthen legal standing and clarity
Providing adequate supporting documentation for high volumes of claims with specific requirements	● Streamline procurement of personal protective equipment through centralized purchasing early in the crisis ● Establish a system to demonstrate budget costs versus actual costs at a departmental level, specifically for labor and supplies

Chapter 5: Communication Considerations

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Key Takeaways and Recommendations

- The university has a decentralized infrastructure for communication, so developing a messaging strategy and a centralized communication platform is critical during a public health crisis.
- Messaging from campus leaders must be clear, consistent and easily accessible for all stakeholders.
- Effective communication is the product of a strong, decisive leadership team.
- Centralized communication platforms can be used to direct inquiries and consolidate resources.
- Representatives need to be appointed to ensure accessibility of accurate and timely information for diverse audiences through a variety of communication channels.
- Focus communication on policies that are enforceable.
- Consult communication experts, use layered messaging—concise updates augmented by availability of more detailed information for those who want to learn more—and adapt to emerging social media and text messaging platforms to effectively reach the large, diverse and dispersed audiences that make up the university community.

Background, Introduction and Context

UC Davis, like most universities, has a decentralized infrastructure for communication, with no single authority for controlling all internal communication. Consequently, establishment of a team of communication professionals is essential in order to build a cohesive messaging

strategy and collective communication platform to deliver clear, consistent messages to internal audiences (e.g., students, academic personnel and staff members). A key point of success during the COVID-19 pandemic was early identification of communication leaders to build a collaborative team to deliver coordinated messages.

Managing a crisis on the scale of the COVID-19 pandemic requires proper staffing levels, with dozens of communication professionals collaborating across different aspects. Pivoting from regular duties to crisis communication was difficult, demanding a swift and comprehensive response. The discipline of crisis communication demands the full-time dedication of a multidisciplinary team to ensure coordinated messaging, manage new communication platforms, maintain consistent information flow, and respond to the community's evolving needs. Having a well-prepared, agile team is essential for a successful and effective communication strategy during a crisis.

The Aggie Public Health Ambassadors (APHA) program was created to empower students to amplify public health messaging during the pandemic. Through comprehensive training in COVID-19 protocols, teamwork and conflict resolution, students effectively communicated safety guidelines, reinforced protective behaviors and rectified misinformation. By acting as health ambassadors on campus and in the community, the team built trust, strengthened public health communication and contributed to the university's collaborative response. The participation of APHA volunteers was essential, and exemplified the valuable role that students can play in communicating health strategies.

The ability to identify and adapt to emergent communications platforms is an important component of communications strategy during a public health crisis. Although specific communication channels like social media, text messaging and newsletters proved essential for communicating with diverse audiences during the COVID-19 pandemic, communications channels could change drastically in the future. Thus, the ability to identify emerging platforms and adapt outreach strategies accordingly will remain critical. By prioritizing audience expertise and adaptability, communication professionals can ensure that their messages are conveyed clearly and meaningfully, regardless of future technological advancements.

Conclusion

The COVID-19 pandemic validated the importance of several vital communication strategies that are essential for any crisis response. Strong leadership and a coordinated communication team are crucial to swiftly disseminate policy changes and provide answers. A centralized information hub like the UC Davis Campus Ready website simplifies messaging, while layered communication ensures that both concise updates and comprehensive answers are available for all stakeholders.

Looking ahead, understanding your audience, adapting to emerging communication platforms, and having a multidisciplinary team are key to handling future crises effectively. Clear decision-making, consistent messaging, and proper staffing levels are vital to provide accurate information and build trust, ensuring a resilient and agile response in times of uncertainty.

CHALLENGE	LESSONS LEARNED
Tracking and correcting false or misleading information and rectifying rumors and inaccuracies swiftly to prevent confusion and maintain trust	● Use strong, decisive leadership to translate evolving information and public health recommendations ● Arrange regular meetings to discuss new information and local implications ● Keep communication professionals involved in all aspects of planning and operations
Quickly rolling out communications about new guidance, programs and services as part of adapting to rapidly changing situations	● Implement a clear and transparent process for the approval and documentation of emergency response-related expenses ● Outline clear consequences for non-compliance ● Set policy via strong and clear decision-making ● Have a well-prepared, agile communications team
Coordinating messages across various departments and organizations	● Collaborate and communicate with departments and organizations closely to identify paths for coordination without diluting relevance or clarity of messages ● Establish a central platform as the primary hub for up-to-date information and inquiries ● Regularly convene a core group of staff members and area experts to exchange knowledge, identify and rectify gaps in understanding, and convey information effectively through various communication channels
Helping the community navigate complex and dynamic policies and guidance	● Simplify explanations and clarify directives for a broad audience ● Use student ambassadors to amplify public health messaging
Effectively engaging a large, diverse and dispersed audience	● Use multiple channels to accommodate divergent communication preferences, and to surmount geographical and technological barriers ● Provide translated resources and culturally relevant messages for non-native English speakers ● Message in layers to keep initial messages short, simple and digestible with extended versions offered to provide additional context and details ● Consult experts who deeply understand targeted audiences and how to reach them effectively

Chapter 6: Community Engagement and Social Considerations

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Key Takeaways and Recommendations

- The university must follow and support the leadership and authority of local public health agencies, such as the Yolo County Office of Emergency Services and the Yolo County Health and Human Services Agency, during public health crises.
- The campus is well positioned to play a convening role in ensuring that all local government and civil society representatives have a space to share information, coordinate actions and troubleshoot problems.
- Faculty and staff members with specialized public health and pandemic-related expertise can help local agencies in communication, testing and other services.
- During a crisis, the university must advocate for underserved and disadvantaged populations, including the families and communities of the university's students, to ensure that they receive timely information and services.

Background, Introduction and Context

Convening

Emergency and public health responses are the purview of Yolo County entities, notably the Office of Emergency Services (OES), and the Yolo Health and Human Services Agency (HHS). The role of OES is clear in natural disasters, during

which population movements occur, and housing and commercial structures are destroyed. While they play a role in public health emergencies, their role is to support HHS representatives—notably the county health officer, who has broad powers to declare emergencies and is responsible for implementing state or federal requirements. Although UC Davis is the largest and best-staffed public agency in the county, the university cannot commandeer a pandemic response and must position itself to support other public agencies whose mandate includes leading the response. Proactively offering support may send the erroneous message that UC Davis has unlimited resources to dedicate to the response. From the outset, UC Davis should clarify what it is and IS NOT offering. One way that the university can assist public health authorities is to quickly communicate with them, expressing its support and offering to host general and specialized meetings to help organize the response. UC Davis also can release staff members to help these agencies in organizing their response.

In playing a convening role, UC Davis can help connect key local entities to each other and focus on defining the unique role that each can play. Those entities can include local government jurisdictions, civil society representatives and healthcare providers. Entities outside local government are most likely to have close relationships with underserved populations. These include businesses—especially those in the food and service industries—and direct service providers, such as organizations working with unhoused people, low-income seniors and non-native English speakers. UC Davis should focus on bringing all of these entities together to disseminate information, define roles and identify assets as part of a coordinated public health response.

Specialized Support

Information and misinformation evolve rapidly during a pandemic, and local agencies must monitor social media and other information channels to ensure that they convey accurate, up-to-date, and valuable information to the general population, particularly groups likely to be unreachable by regular channels.

UC Davis should make its specialized communication resources, including staff, available to Yolo County and its cities. UC Davis also offers specialized health and pandemic-related expertise from its One Health Institute, Department of Public Health Sciences, Genome Center, Medical Center and other units. Specialists can assist local agencies by lending additional expertise critical for communication, testing and service provision, as well as monitoring social media for misinformation and crafting appropriate messages for various subpopulations.

Community members place trust in the collective expertise, ability and willingness of UC Davis to solve problems. Accordingly, UC Davis should bring its pool of experts together, in consultation with local public health authorities, to issue recurrent technical updates for the campus and the broader community.

Advocating for Underserved Populations

UC Davis should use its position to advocate for the needs of underserved groups. Focusing on underserved populations ensures that the broader population receives timely information and services. Low-income, non-native English

speakers, unhoused and low-income senior populations are the most at risk of poor health outcomes during public health crises. A significant proportion of UC Davis students come from traditionally underrepresented and underserved population groups that are at risk during public health emergencies. Protection of the people who are most vulnerable to economic hardship and most susceptible to illness during a public health crisis can help reduce hospitalizations and emotional trauma, while maintaining workers in jobs that are critically important for the entire populace.

Conclusion

UC Davis must help lead a local pandemic response by quickly contacting county leaders to let them know that the campus is ready to contribute its human, communication and technical expertise resources. The shared governance structure of UC Davis enables a nimble response in supporting local public health agencies by quickly organizing and hosting assessment and planning meetings, helping with communication and making its infrastructure available. As a convener, UC Davis should focus on identifying, helping mobilize, and supporting ALL community agencies and organizations that can contribute to a rapid and effective response. The university also can articulate a moral position of advocacy for the underserved members of the community. Its commitment to equity and inclusion should guide all its contributions. All UC Davis staff members assigned to help with the response should be given clear instructions about their role in connecting with and assisting people in the most vulnerable groups.

CHALLENGE	LESSONS LEARNED
Maintaining close working relationships among city, county and university staff	● Invest in building trusting, working relationships with new partners in the community's response ● Repurpose staff to support community-based activities, possibly in lieu of offering financial resources
Navigating legal restrictions and moral imperatives while positioning the campus to support other public agencies during the crisis response	● Clarify at the outset what support UC Davis is and is not offering to public agencies ● Look beyond campus borders and make some assets available to the entire community, starting with the city of Davis
Convening public agencies to support rapid and effective crisis response	● Set realistic expectations and communicate thoroughly and clearly when bringing other agencies to the table ● Use convening power to bring relevant local entities, including community and faith-based organizations, to the table and solicit their participation ● Require key representatives, including UC Davis personnel, to review and update roles and responsibilities often

Chapter 7: Labor and Personnel Considerations

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Key Takeaways and Recommendations

- Collaboration and communication among university departments is critical to determine the impact of the crisis response on employees and labor considerations.
- The university must determine which on-site employees are essential and must document why their on-site presence is required. Documentation prior to an event will facilitate ease in communication by establishing expectations in advance of a crisis.
- Recurrent communication with employees by various means, including an up-to-date website specific to the crisis response, is critical. Communicating updates and policy changes as written and video messages will allow leaders and HR employees to distribute the information to those who need it.
- Public health crises result in staffing complications due to employee illnesses and family care responsibilities. During the COVID-19 pandemic, leave allocations were created outside of regular accruals for COVID-19-related illness to permit time off to care for an ill family member and to allow employees to remain at home as needed with children whose day care facilities had closed or whose schools had shifted to remote learning. Processes for such leaves should be centralized to ensure compliance and consistent practices.
- Extended absences of employees due to exposure or illness must be treated with discretion to maintain confidentiality.
- Labor considerations should always be at the forefront, with frequent reference to notice requirements and bargaining obligations for pandemic-related changes made to wages, hours or working conditions. Such changes may include mandatory testing, vaccine requirements, quarantine and isolation requirements, and daily symptom surveys.
- The university must act quickly and be prepared to accommodate and guide the transition of relevant employees to remote work in response to a shelter-in-place mandate.
- Safety equipment, such as personal protective equipment (PPE), should be made available to all staff members as needed.
- Recruitments for special staffing that are critical to the university's public health crisis response should be a priority.
- The university should establish a program to assist with alternate or temporary employment for employees who may be displaced during a public health crisis.
- Employee assistance programs should be communicated and made available to all staff members.
- After sufficient testing infrastructure is established and staff members are allowed back on campus, talent acquisition services may be required to recruit and train people to fill vacant positions.

Background, Introduction and Context

Enactment of the shelter-in-place mandate required the university's departments to quickly determine which employees could be sent home to work remotely and who needed to stay on site to ensure smooth operations. Communication between UC Davis Human Resources and departments throughout campus was pivotal in this decision-making process. Unfortunately, UC Davis positions are not classified in a way that inherently makes those distinctions evident. In addition, some staff members did not use laptop computers at work, which complicated the transition for those who needed technology at home.

One of the immediate concerns was how to accommodate employees in positions that were no longer needed due to the shutdown of activities. The university decided to maintain positions or find alternate work for employees rather than initiate layoffs for employees who could not perform their duties due to the pandemic. UC Davis Human Resources created the Temporary Opportunities to Work (TOW) program, administered by the Temporary Employment Services unit, to benefit employees whose positions had become idled. Departments informed the TOW program of employees whose assigned duties had been suspended, and university departments seeking to fill a vacancy or a temporary position contacted the TOW program to identify qualified candidates.

A pandemic is traumatic for all, and many employees were afraid to come to work, while others had contracted the virus or had family members who were exposed or sick. The fear and instability, exacerbated by frequent changes in information and obligations, fostered a tense environment for all. Maintaining the essential confidentiality of employees who contracted COVID-19 or were exposed conflicted in ways with Cal/OSHA regulations requiring notice to employees who may have been exposed.

Supervisors had to practice delicacy and discretion in ensuring that they were meeting business needs while their staff members were undergoing a very stressful situation. Support from the Academic and Staff Assistance Program (ASAP) and the UC Davis WorkLife department were critical in helping staff members endure this crisis. Individual support was available through ASAP counselors. WorkLife created resources, including webinars, web pages, emails and Zoom talks, to help supervisors and staff members sustain their emotional as well as physical well-being in this new work environment (Chapter 8).

Schools and child care centers were closed, thereby affecting employees who as a result had to supervise children at home. The university created leave allocations that allowed employees to remain at home with children, if necessary, and authorized paid leave for virus-related illnesses outside of their accruals. Many employees depleted this leave in the beginning of the pandemic in the belief that it would be of short duration, and therefore had no remaining leave time available as the pandemic extended. The university created required documentation for the use of the leave, which each department administered.

UC Davis experienced various staffing difficulties as a result of the pandemic due to leaves and evolving operational needs. Some roles shifted due to changes in operations or demand, including work location, duties and hours. Some employees were reassigned from the Davis campus to UC Davis Health in Sacramento due to increased demand there. To accommodate the personal obligations of employees affected by school closures and other circumstances during the pandemic, supervisors were encouraged to be flexible with work hours to the extent possible. Changes in terms and conditions of employment increased labor relations obligations as unions needed to be notified and given an opportunity to bargain concerning a wide array of ever-evolving workplace conditions. Examples of contract

changes include specification of vaccine requirements, testing obligations, daily symptom surveys, isolation or quarantine guidelines, and availability of paid leave options.

As the pandemic progressed and testing requirements were implemented, a significant need for talent acquisition services and rapid integration of new employees emerged because a large number of staff members needed to be placed quickly and trained in temporary roles. As the pandemic progressed, UC Davis created a new work environment in which a large number of the university staff primarily worked remotely. To enable subsequent reopening as the pandemic waned, the university created a new framework for its workforce within a flexible workplace, while ensuring that the business needs and mission of the university could be met. Reopening presented dilemmas for many departments as they improvised ways in which to operate in this new environment.

Conclusion

The COVID-19 pandemic presented a new set of operational obstacles and employee dilemmas. The UC Davis response to the pandemic was a “people first” approach regarding its staff and faculty members. The university expanded flexibility in paid leave options and encouraged adoption of flexible work schedules when possible. Administrators

decided to maintain staff through paid leave, temporary assignments or other methods. Leaders focused on the business needs of the university and determination of the best methods to accomplish tasks with the least risk to staff. A predominantly remote workforce was created, while dispensing safety equipment to those who had essential on-site responsibilities and establishing or modifying procedures to preserve a safe-as-possible work environment.

UC Davis created various channels to deliver continually changing information to staff members. Collaboration with Human Relations (HR) regarding any impact on employees and potential labor ramifications was critical. A large compliance factor emerged due to accrued leave entitlement requirements, vaccine requirements and safety requirements. Due to the distributed nature of the university, some of the HR compliance was handled within the departments. From this experience we recommend more centralized HR supervision of compliance with regulations.

The university is composed of numerous departments and divisions, each with different operational needs and varying cultures. By establishing definitive guidance regarding staff requirements, such as on-site designations, determination of how to maintain operations in a safe and effective way will be less ambiguous and more cohesive.

CHALLENGE	LESSONS LEARNED
Ensuring that departments and staff members are aware of new requirements or decisions that modify operations or conditions of employment	● Create communication channels that reach stakeholders who need the information ● Establish a crisis-specific website to convey relevant information to employees
Finding roles for employees who were not able to perform their assigned duties due to crisis restrictions	● Use the Temporary Opportunities to Work program to find units with vacancies and temporary needs for assistance to accommodate displaced employees
Responding to questions from employees who disputed whether their positions required them to be on site	● Determine accurately and fairly which roles needed to be performed on site
Giving employees the necessary equipment to work from home	● Promptly supply employees with the equipment needed for remote work
Alleviating safety concerns of employees, which led to the premature use of leave to avoid coming to work during the onset of public health crisis	● Widespread communication is necessary to alleviate fear to the extent possible, while acknowledging that fear is a natural reaction in these situations
Navigating staff stress, burnout and feelings about inequity related to the risks associated with on-site versus remote work	● Use resources from programs such as ASAP and WorkLife to offer emotional support during a crisis
Giving proper notices, as required under union contracts, while balancing the need to act quickly	● Notify and bargain with unions regarding evolving changes in procedures related to safety and working conditions
Ensuring safe work environments for on-site employees in a unit in which an exposure to the virus had occurred	● Have a plan in place to respond to and manage exposures on site
Navigating inconsistent practices across campus related to leave, remote work and other compliance requirements	● Establish and apply consistent practices for handling anything human resources-related for all departments and consider centralizing processes
Complying with all the safety policies, such as vaccine and testing requirements, across departments	● Centralize employee compliance obligations with central Human Resources

Chapter 8: Mental Health Considerations

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Key Takeaways and Recommendations

- Public health crises can significantly undermine mental health among students, staff and faculty members, and administrators.
- Embedded mental health support for students and university personnel is critical in times of high stress.
- Telemental health (TMH) is an essential mode of care and will continue as an available option for treatment at Student Health and Counseling Services (SHCS) and in the Academic and Staff Assistance Program (ASAP).
- ASAP and SHCS should maintain readiness to offer services via telehealth technology at all times, with requisite equipment, training, policies, procedures (routine and emergency) and documentation in place.
- Maintain awareness of rules regarding state-to-state reciprocity. If out-of-state reciprocity is unavailable, ready the campus' after-hours crisis line and vendor providers to see out-of-state students. Prepare text macros with guidelines for access.
- Maintain awareness of local, national and international crisis resources for mental health counseling.
- Communicate and coordinate with health insurance carriers to ensure that resources are available for campus constituents who are out of the geographic area.

Background, Introduction and Context

The COVID-19 pandemic inflicted a considerable toll on the mental health of everyone involved, and we observed increases in anxiety, depression, suicidality and substance abuse among students, staff and faculty members. Fear, economic stress and other factors were exacerbated by social isolation and reduced opportunities for connection and community-building. The university must have resources available and ready to deploy to help people manage these concerns in a future public health crisis.

A pandemic not only creates an immediate health emergency, but also exerts a delayed impact on mental health. The Business Group on Health, a Washington, D.C. nonprofit organization that guides business organizations in optimizing workforce strategies related to health policy, validated the mental health implications of a pandemic in a survey it conducted in June and July of 2023. That survey, encompassing 152 large employers representing approximately 19 million covered individuals, revealed that 77% of the employers sampled noted an increase in mental health struggles in their workforce in 2023, a big leap from 44% of employers in 2022. Another 16% of respondents expected to see more increases in the coming year. A Society for Human Resource Management survey of 1,099 employees found that work-related concerns left more than 40% of employees feeling hopeless, burned out or exhausted as they grappled with lives altered by the COVID-19 pandemic. This mental health toll creates an increased need and demand on services not only during but also following a pandemic. Consequently, an organization's mental health counseling unit must be staffed sufficiently to meet post-pandemic demands for services.

Rates of anxiety, depression and substance use disorder increased after the beginning of the pandemic, with nearly half of Americans reporting anxiety or depression, according to a 2021 survey by the National Institute of Mental Health (NIMH). The key takeaway is that the nation endured collective trauma as a pandemic result.

None of the campus clinicians at SHCS or ASAP had performed counseling services via tele-mental health (TMH) technology prior to the COVID-19 pandemic. The importance of establishing a curriculum to train counselors in how to conduct TMH effectively soon became apparent, and is now part of our standard process for hiring new counselors. Our counseling services units developed staff manual sections related to conducting services online and procedures for prescribing hospitalization of people remotely. In addition, we developed helpful note templates and text macros to enable transition of an in-person series of sessions to TMH. Our SHCS and ASAP staff are now ready and prepared to shift to 100% remote work immediately, if necessary. Important factors to consider are county restrictions, state-to-state reciprocity, emergency contacts, available internet services, and privacy for staff members and clients.

Per California state licensure guidelines, counselors must be licensed in the state where the client is located at the time of a session. During the pandemic, many students stayed home and attended university remotely outside of California, making them unable to participate in counseling center services. Similarly, many staff and faculty members relocated during the pandemic and were ineligible to use ASAP assistance for the same reason. Some states allow for reciprocity during national emergencies but it is not universal, so the applicable laws and regulations must be checked frequently. Preparation for a crisis should include exploration of staff capacity (how many TMH sessions can a counselor conduct per day before “Zoom fatigue” occurs) and relaxation of limits on the

number of session in order to accommodate the exigencies of a pandemic.

The ability to scale up quickly in operations remains important, as do access and knowledge of referrals and community resources. A campus vendor approval process should be readied to take effect quickly to vet outside companies if additional help is needed to supplement on-campus services. Already having an embedded, vetted, secure TMH platform to launch services quickly would be advantageous.

Conclusion

Pandemics can be manageable and can even invite a focus on “what really matters” for clients and clinicians. Central to this management is developing the flexible and responsive leadership, guidelines, and staff training that permit mental health services to be effective and adaptable over time and across jurisdictional boundaries.

Leaders, through decisions and communications, can demonstrate a sincere care for staff well-being and team cohesion, and can keep staff members well-equipped and informed with up-to-date guidelines pertaining to pertinent resources, policies and procedures. As part of this communication, leaders should have emergency contact information for all staff, including their county listings, as different counties can have different guidelines for crisis responses, such as in-person versus remote work capabilities. Work schedules should be done with consideration for clinician burnout, which can occur during periods of prolonged environmental stress. Leaders’ attention to this potential problem, along with steps to reduce or mitigate burnout symptoms among clinical staff, is important in maintaining the well-being of care providers from SHCS, ASAP and other units.

As the public health crisis evolves and the needs for mental health services change accordingly, department managers and campus leaders must continually monitor and fine-

CHALLENGE	LESSONS LEARNED
Maintaining staff cohesion and well-being	● Find opportunities for recurrent connection and collaboration among the team members ● Make leaders available for consultation and staff support ● Maintain a current and comprehensive set of online self-help resources for employees ● Send reminders to remotely located staff members regarding “remote hospitalization guidelines” and local resources ● Conduct weekly huddles to update all staff members on information about operations and schedule daily mini-huddles for teams, including crisis, Community Advising Network, centralized and satellite teams ● Develop staff wellness and family unit plans through which to protect the work time of staff members, ensure they have the resources they need to perform services, and prevent staff burnout
Keeping doors to the counseling center and emergency action plan (EAP) open despite remote staffing due to public health crisis	● Rely on emergency minimum staffing guidelines ● Share with management and leadership team a list of the county in which each staff member resides while working remotely ● Employ text macros to communicate the mode of visits available and update the pandemic operations website with availability information ● Allocate private space that students, staff and faculty members can use for therapy sessions ● Offer personal protective equipment that does not block facial expressions and that is protecting while still being therapy-conducive
Overcoming limited availability of community providers during crisis	● Hire additional clinicians in Sacramento ● Work with health insurance carriers to identify online mental health resources throughout California in order to expand the university’s network of referral options for employees ● Extend limits on the number of sessions to bridge the gap in service availability
Offering telemental health (TMH) services	● Train all staff members in TMH best practices ● Update the remote practice guidelines each year ● Offer remote services in addition to live services to expand access to mental health interventions ● Identify and publicize local and national crisis resources and campus and community after-hours care ● Publicize additional outside vendor mental health support services that are available to employees and students for TMH ● Persist in steps to reduce stigma and barriers to access of mental health support for campus community members ● Initiate programming to create a sense of community in remote settings, including groups that meet online or in remote locations

tune responses to student and employee needs. These adjustments can include cultural considerations, which are especially relevant given the sociopolitical climate during the COVID-19 pandemic. Literature, training and education should be developed on how to best support clients of diverse backgrounds amid the cumulative stress of a pandemic on top of potential racial injustice or violence. Furthermore, having staff that reflect the diversity of our campus population can help reduce stigma and improve access for care.

Communication is essential for effective mental health services, so that all campus constituents, including students, staff and faculty members, know what services and resources are available and how to access them. Campus leaders should procure and allocate numerous reservable, private spaces accessible by students and employees for mental or physical health appointments. Along with that, flexibility

and creativity should be encouraged in finding new ways to ease and improve access to mental health services for clients, such as drop-in consultation programs for employees on the health sciences campus and meet-and-greet initiatives for incoming physicians.

The students and staff of UC Davis constitute a dispersed community, especially during times of remote instruction and work. The university must strive to overcome barriers to mental health services and resources for individuals who live in other cities, states or countries. A point person needs to check in on state reciprocity guidelines for services. If no reciprocity exists, the campus must have vendors in place for out-of-state and out-of-country services. SHCS and ASAP offices need to maintain a comprehensive set of local, national, and global crisis and emergency resources that are readily available for clinical staff to support the university personnel, no matter where they are located.

Chapter 9: Clinical and Environmental Surveillance

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Key Takeaways and Recommendations

- Manage expectations: even a high-throughput workflow has a finite capacity.
- Evaluate contemporary technologies for community-scale testing.
- Utilize resources that are not vulnerable to supply chain constraints, such as custom plasticware and kits.
- Distinguish between the goals of large-scale community testing, including potentially asymptomatic individuals, and clinical diagnosis in hospitals.
- Decide on the balance needed between pooled testing, such as wastewater surveillance and individual testing. Consider integrating the approaches.
- Set up a broad, coordinated collaboration of experts who meet regularly regarding sample collection, analysis, data distribution and response (e.g., contact tracing).
- Identify key personnel for each area and give them resources and authority to achieve objectives.
- Secure adequate funding for infrastructure as well as ongoing testing.
- Ensure that all equipment is at least duplicated, to avoid single points of potential failure.
- Set up a secure data workflow capable of accommodating confidential testing and reporting to medical health records.
- Do not underestimate the amount of work required to collect samples at scale. Be prepared to set up a massive infrastructure to physically collect samples, especially if testing is expanded to the community.
- Surveillance of disease in wastewater from the UC Davis wastewater treatment plant is a cost-effective strategy to track diseases at the scale of the campus community. Doing so can enhance situational public health awareness during low-threat periods and serve as a potential early warning system if the system is maintained and advanced through time.
- High-resolution environmental surveillance can play a role in outbreak identification, if conducted rapidly and repeatedly in response to warning signals. Single environmental signals can otherwise be difficult to interpret. Protection of individual privacy is critical in environmental surveillance for smaller population sizes (e.g., within buildings).
- Campus utilities personnel are key in the identification of potential sampling sites that involve wastewater and other infrastructure.

Background, Introduction and Context

In August 2020, the provost and executive vice chancellor asked the medical director of Student Health and Counseling Services to implement

a program to test all incoming students at the beginning of fall quarter. This led to the mobilization of diverse resources across campus in two components: testing operation (including parallel testing during validation of the new high-throughput saliva test), and establishment (in collaboration with the Yolo County Health and Human Services Agency) of a contact tracing-case investigation program to coordinate follow-up of these medical test results.

Initially, every student who underwent saliva testing, with samples initially collected in the Pavilion parking garage, also had to do a U.S. Food and Drug Administration (FDA) approved nasal swab test. While the saliva test was still undergoing validation, only the nasal swab test could be reported as a valid actionable medical result. Nurses from Student Health and Counseling Services did thousands of nasal swab tests during this validation process. Because the nasal swabs and saliva tests were not comparable processes for regulatory purposes, the saliva samples had to be validated with samples from another lab, and only Arizona State University was able to supply comparable samples.

The various critical decisions that must be made when developing a testing program of this nature include determination of the type of sample to be collected and where those samples are to be collected. During the COVID-19 pandemic, most samples nationwide (including at-home tests that were deployed much later during the pandemic) were nasal swabs. UC Davis decided to pursue saliva testing, in order to reduce the burden and discomfort to the patient in obtaining the sample. The second decision was where to collect samples: at home, various collection sites or a central collection site. Early in the pandemic a lot of regulatory uncertainty arose regarding at-home collection. Combined with the formidable logistics of centralizing those samples for processing, that option was discarded. The use of several smaller collection sites was also eliminated because of the significant redundancy of personnel required at each site (e.g., IT support

for registration technology). After Healthy Davis Together (HDT) was established (Chapter 1) and testing spread throughout Yolo County, establishment of more sites became necessary, but some of demand was satisfied by van-based “mobile testing” teams.

The central collection site on campus was hosted at the Activities and Recreation Center (ARC) and contained 42 spit collection stations, which were able to sample 8 hours per day, 7 days a week for a capacity of about 32,000 samples per week. The “pass through” time for patients was less than 4 minutes. The staffing and organization model of this site was then copied for HDT at various community locations. Minimal staffing consisted of a supervisor, IT support and collection staff.

The UC Davis Genome Center, DNA Technologies Core, was repurposed to provide high-throughput testing. This was successful in part because of its service-oriented, salaried and expert staff (in contrast to an academic lab). This initially was a pop-up lab extension of the Clinical Laboratory Improvement Amendments (CLIA) certified high-complexity Student Health and Counseling Services Lab. The lab was staffed by two teams, each consisting of a clinical lab scientist (CLS) responsible for overseeing operations, experienced staff scientists within the Genome Center, and recent graduates who had trained in molecular biology; an emergency order allowed an exception permitting the participation of non-CLS staff members. Interactions between the teams were limited to minimize the impact of any one member contracting COVID-19. Once established, the Genome Center lab obtained independent CLIA certification.

By working long hours and seven days a week, the experienced, dedicated staff developed and validated a laboratory test and set up the testing lab within six weeks. Key aspects of the protocol that had to be determined were: effective methods for viral inactivation, sample transport and storage conditions, feasibility of

using saliva, optimization of the quantitative PCR (qPCR) reagents and protocols for sufficient sensitivity and specificity. Broad public and private collaboration that occurred among several universities and companies was vital because they were independently validating viral transport, viral inactivation, instrumentation, reagents and protocols for emergency use with COVID-19. Any stumbling block could have greatly slowed protocol development or capacity. However, the team met both the development deadline and throughput needs. Experience, dedication and good collaborations helped a lot, but did not guarantee success.

Testing was conducted from the end of September 2020 until December 2022. During that 27-month period the lab processed 2.2 million tests, averaging over 40,000 tests per week over the latter part of this period, with an unsustainable maximum of 65,000 tests during one week at the beginning of January 2022. Test results identified about 24,000 positive “asymptomatic” individuals, the majority of which were reported the same or next day. The lab publicly reported the positivity rate weekly on the UC Davis and Healthy Davis/Yolo Together websites. We submitted an application for FDA approval of an emergency use authorization (EUA) in June 2021; however, the FDA did not assign a reviewer until November 2022, by which time the testing program was being phased out. The final tests were run in mid-December 2022, and we withdrew the application for an EUA in January 2023.

Clinicians from Student Health and Counseling Services and Occupational Health initiated orders for the tests, and each had a system in place to process results. Negative results were released automatically, and positive results went to a case investigation team. The Yolo County public health director’s team helped train UC Davis staff members from units throughout campus to participate in contact tracing and case investigation functions under the direction of Student Health and Counseling Services providers. This team coordinated with Student

Housing and Dining to arrange isolation space, logistics of which included transportation to the isolation space (provided by the UC Davis Fire Department), meal delivery (provided by Student Dining Services) and delivery of other essentials (facilitated by Student Housing). Students in isolation received daily check-ins—initially by phone calls. After students objected to phone contact as too intrusive, the testing team switched to secure text messaging through which students could request a call from medical and/or counseling staff if needed or desired. Individuals who tested positive were instructed to refrain from testing again for 90 days because persistent viral RNA not correlated with infectiousness can remain detectable for many weeks.

Wastewater-based disease surveillance

In early 2020, public health officials in Europe reported detection of SARS-CoV-2 in the influent to wastewater treatment plants, indicating that the respiratory virus causing COVID-19 was excreted in human stool and that the virus’s genetic material could be detected in wastewater. Researchers in this quickly evolving domain realized that signals of SARS-CoV-2 RNA in wastewater could inform public health efforts both as an early warning signal for spread in a community and as a means to track community disease dynamics. These early findings remain true, and the field of wastewater-based epidemiology has grown significantly to include applications across the nation and globe for a suite of infectious diseases. Despite the strong potential for wastewater surveillance to inform public health decisions, the field was under-developed in practice at the time, leaving many uncertainties regarding sampling methods, sample processing techniques, analytical processes and decision-making guidance. Many applied research projects were simultaneously established across the nation, and broad communications among academics and practitioners facilitated information-sharing and communities of practice.

UC Davis' all-hands approach ensured allocation of facilities and academic collaboration to pursue wastewater surveillance as a response measure secondary to clinical surveillance. Unlike many university campuses, UC Davis has its own wastewater treatment plant—a valuable resource for community-level surveillance of infectious diseases. During the pandemic, daily samples were collected at the influent point of the wastewater treatment plant, and weekly samples were collected from approximately 22 maintenance holes for building or building clusters. Requests from campus leaders to focus on residential areas guided within-campus site selection, which utilities engineers put into action by means of their ready access to sewer system layouts and deep knowledge of safe access points. The team improved analytical processes through time as more efficient, automated sample processing pipelines were developed, and as communications and decision-making strategies were adapted.

The team that launched wastewater surveillance on campus was composed of faculty members, their research students and staff in Civil and Environmental Engineering (CEE), Veterinary Medicine and the Genome Center. The research team received immediate and strong in-kind support from the director of utilities, the wastewater supervisor-plant manager and utilities civil engineer to implement wastewater surveillance when possible. The readiness and willingness of campus wastewater utilities personnel to fully engage with the research team reflects the strong history of collaboration between faculty and staff on courses and applied research. Campus facilities, utilities, housing, and safety services staff members played critical roles throughout the pandemic in planning and implementing wastewater sampling strategies, acquiring, operating and maintaining equipment, developing creative solutions to sampling obstacles, and responding to wastewater results (e.g., with additional sampling). When the research team

initially was unable to obtain external funding to implement wastewater surveillance at UC Davis, the provost allocated \$48,000 to the group in June 2020 for pilot testing, based on an ad hoc internal proposal. In August 2020, as the UC Davis wastewater treatment plant staff collected the first influent samples, HDT leaders proposed inclusion of environmental surveillance within the HDT initiative. The participation of HDT enabled rapid acceleration of wastewater surveillance not only on the UC Davis campus but also throughout the city of Davis.

Over a two-year period, the wastewater surveillance team processed more than 6,500 wastewater samples, in addition to thousands more surface swab samples from air filters and high-touch surfaces in city of Davis schools and campus isolation units. The number of environmental samples processed was small in comparison to the clinical surveillance because wastewater sampling is a lengthier process, requiring additional analytical steps to obtain reliable results, and analysis was performed in an academic research lab rather than a service lab. Interpretation of data from wastewater surveillance is also different from clinical samples—wastewater influent is considered a pooled sample from an entire community. Concentrations of the virus in wastewater are correlated with community case incidence but are not directly translatable through straightforward calculations. Therefore, detection of trends in the wastewater data over time is important in order to assess the rise and fall of disease targets through time relative to past results. Results also can be highly variable from one sample to the next, due to changes in wastewater flows and the presence of inhibiting compounds (e.g., complex mixtures of chemicals and organic substances in sewage). These variables render results from individual wastewater samples difficult to interpret in isolation. This is why high-frequency sampling of wastewater (e.g., multiple times per week) is important to enable better interpretation of wastewater signals.

In addition to the collection of samples from centralized wastewater facilities, sampling wastewater at smaller geographic scales —i.e., neighborhoods via maintenance holes or buildings via clean-outs—can facilitate certain public health interventions or help identify outbreaks. Protection of individual privacy is critical in this type of environmental surveillance, where population subgroups or individuals are potentially identifiable. Samples that were obtained from wastewater at single residence buildings or building clusters and tested positive for COVID-19 were reviewed against known data for the number of COVID-19-positive individuals in the associated residence areas. In limited instances, wastewater data were also used to request additional testing by students in residence halls where signals were detected. Decisions for interventions were made by an ad hoc committee that included the research team and staff from facilities, safety services and housing. Because the samples from buildings or building clusters were collected only once per week, it was not possible to assess whether the COVID-19 signal strength from a given building or building cluster was increasing rapidly as may be expected in an outbreak. Follow-up wastewater sampling was conducted several times to validate positive signals observed. The associate vice chancellor of safety services contributed situational awareness of campus response measures for the committee to tailor recommendations and interventions.

A wastewater sampling campaign should be implemented in balance with clinical surveillance. Wastewater surveillance is cost-efficient compared to individual testing for tracking overall disease dynamics in a community through time and has been shown to be an early warning of entry of multiple types of diseases into communities. Clinical surveillance is critical for identification of individual cases, contact tracing and direct medical interventions. At the scale implemented at UC Davis, clinical surveillance also offered robust tracking of

community disease dynamics. Wastewater surveillance at UC Davis was thus established to complement the extensive clinical testing program. UC San Diego reported extensive use of wastewater surveillance to direct campus interventions, implementing even higher frequency of sampling (multiple days per week) and deploying many samplers across the campus. As individual clinical testing rates decline, or if testing is conducted only for symptomatic individuals, greater bias in clinical surveillance data can arise. Wastewater surveillance data can help fill this public health data gap.

Conclusion

During a public health crisis like that of COVID-19, community-scale disease surveillance is critically important for early detection of pathogens and understanding of community disease dynamics. However, surveillance programs must be reliable, efficient and fast to generate actionable results. In the next public health crisis, we can expect that resources, however limited, will be prioritized for clinical surveillance. As a result, community surveillance programs must be accomplished through alternative means, such as wastewater surveillance. A combined approach of clinical surveillance and community wastewater surveillance offers a powerful tool for early detection and disease tracking in communities like the UC Davis campus and surrounding areas. A successful joint program requires strong and active collaborations with other institutions, including other universities, government agencies and local health departments. Dedicated people also are key to the success of these programs because they lend valuable expertise in purchasing, human resources, software creation, database management, clinical knowledge and other disciplines, which are all necessary for surveillance programs.

Meeting these diverse needs during a public health crisis may be complicated, especially because the two surveillance programs

require distinct sets of skills and approaches for implementation and analysis to produce actionable data. For instance, the experienced certified laboratory scientists needed for clinical surveillance can be difficult to recruit during a public health crisis. These joint programs were essential to the successful response of UC Davis to COVID-19. Although the clinical testing programs were completed at the end of 2022,

community-scale wastewater surveillance remains a valuable and cost-effective tool for continued monitoring of pathogens in the UC Davis community. Based on our experiences with COVID-19, we strongly recommend inclusion of wastewater surveillance as a permanent part of the UC Davis health strategy to aid in early detection of ongoing and emerging health threats.

CHALLENGE	LESSONS LEARNED
Needing acquisition of equipment to occur much faster than possible under standard protocols involving multiple campus units	● Use a “make-it-happen” directive from the vice chancellor of finance, operations and administration to expedite processes and transfers across organization boundaries
Testing can be expensive and estimation of a “per test” cost is impossible without knowing the duration of the program	● Secure adequate funding for infrastructure as well as continual testing.
Avoiding disruptions in testing due to supply chain problems	● Choose reagents and supplies that are not being used by others, such as in clinical diagnostics ● Choose equipment and develop standard operating procedure (SOP) alternatives that are compatible with multiple reagents and supplies
Reassigning existing certified laboratory scientist (CLS) staff for long-term roles and recruiting experienced CLS personnel; Requiring CLS and other staff to work long and late hours to achieve quick turnaround times in lab tests	● Include the ability to pivot to public health projects within key position descriptions, including those for CLS staff, and especially for short-term coverage while awaiting hiring of longer-term staff members
Maintaining sufficient personnel to operate two independent teams with redundant capabilities in order to prevent a shutdown due to the illness of a member of one of the teams	● Schedule virtual meetings for supervisors and leads so that teams can remain physically separated but have touchpoints that help keep them from becoming siloed

CHALLENGE	LESSONS LEARNED
Balancing test speed and frequency with test sensitivity sufficiently to yield actionable results	● Anticipate that sample collection will consume a significant portion of resources and is personnel intensive ● Efficiently collect and deliver samples to the centralized testing laboratory to expedite reporting ● Simplify sample collection and do not collect more than necessary ● Create a custom laboratory information system for efficient sample reconciliation, workflow tracking, and data management
Developing a high-throughput workflow for rapid turnaround from sample collection reporting and for acting quickly in response to a positive result	● Identify key personnel for each area and give them resources and authority to achieve objectives ● Communicate and meet regularly to ensure coordination between different components ● Cluster samples into larger batches, such as 96-well rack format, before they reach the lab ● Build a sample tracking system that matches the workflow ● Use commercial software, such as FastFinder by UgenTec, to reliably and quickly analyze data and controls and present the results ● Maintain HIPAA (Health Insurance Portability and Accountability Act) and CLIA (Clinical Laboratory Improvement Amendments of 1988) compliance in the laboratory by using only two identifying pieces of information and keeping all other identifying information with patient records at the Student Health Center
Validating a lab-developed test (LDT) through correctly validated, independent samples from other institutions	● Contact other institutions, especially universities, encountering the same obstacles and performing similar novel approaches
Obtaining independent CLIA certification	● Anticipate that obtaining CLIA certification requires a highly skilled CLS and is a difficult, distracting and time-consuming process ● Operate the testing laboratory under an existing CLIA-certified high-complexity entity if at all possible

CHALLENGE	LESSONS LEARNED
Minimizing lab contamination and the false positive rate	● Develop a protocol that is robust to sample heterogeneity ● Minimize the number of handling steps and automate where possible, and anticipate the potential need for custom automation ● Use small, barcoded tubes arrayed into 96-well racks that can be scanned from the bottom without opening the rack ● Use tube de-capping equipment that can open and store 96 caps at a time ● Store and transport samples in racks that leave space for positive and negative controls to be added later ● Use a protease, such as papain, to reduce saliva viscosity and permit high-throughput processing via automation ● Create a custom laboratory information system for efficient sample reconciliation, workflow tracking, and data management
Maintaining equipment amid campus and community lockdowns	● Ensure that all components are at least duplicated, so that no single point of failure can interrupt work flow ● Purchase the highest level service contracts with rapid response times ● Be prepared to conduct some maintenance or repairs in-house, with guidance from vendors
Having a system in place to assess test results	● Work closely with Student Health and Counseling Services and Occupational Health to ensure that tests have an ordering provider and staffing in place to assess and report results ● Automate as much as possible, especially the release of negative test results, which requires significant IT support ● Ensure communication between the Student Health and Counseling Services public health unit and the Yolo County public health officer and their respective teams to coordinate contact tracing and case investigation ● Call on UC Davis Student Housing and Dining Services to support isolation housing and meal delivery to affected individuals

CHALLENGE	LESSONS LEARNED
Fulfilling reporting requirements to the state, because the lab did not have any HIPAA information for sample identification	● Dedicate time to negotiate with state agencies and with personnel on the HIPAA side of the laboratory to engineer solutions
Increasing scope of project (project creep)	● Manage expectations: we set up a high-throughput workflow, but because the capacity was finite, we resisted suggestions to expand capacity beyond about 50,000 tests per week
Establishing localized early warning systems for disease spread at the outset of the pandemic.	● Maintain wastewater surveillance in down times to act as a local early warning system and adapt disease targets in response to global threats identified through time; wastewater also can be highly informative when disease incidence is low by yielding insight into ongoing circulation of diseases and confirming low prevalence
Capturing and localizing outbreaks quickly to reduce disease spread when asymptomatic transmission is significant	● Consider using high-density and high-frequency wastewater monitoring to make wastewater data more actionable ● Require asymptomatic individual testing for contact tracing and case identification

Chapter 10: Research Considerations

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Grand Challenges

Key Takeaways and Recommendations

- UC Davis experts in public health and pandemic-related areas contributed to local, national, and global responses to constrain the COVID-19 pandemic.
- Research administration roles and services quickly made the transition to online deployment, which enabled the continued support of faculty research activities.
- UC Davis' establishment of a recurring COVID-19 Research Forum between the Davis and Sacramento campuses to enhance exchange of information regarding research findings, local infection rates, and updates on testing and vaccination efforts.
- A rapid-response seed grant program expedited collaborations and other research activities in response to the public health crisis.
- The campus supported the proof-of-concept work that later developed into the university's successful COVID-19 testing program for the campus, city of Davis, and wider Yolo and Solano County communities (Chapter 9).
- Recurrent consultation with on- and off-campus public health experts enabled a nimble scaling of research intensity during different phases of the pandemic.
- Epidemiological modeling research expertise made important contributions to help guide and inform campus operational policies.

Background, Introduction and Context

The COVID-19 pandemic influenced the research mission and activities on campus, resulting in an array of significant solutions that members of UC Davis research community originated.

With world-leading expertise in One Health and many other research fields highly relevant to pandemics, members of the UC Davis research community made critically important contributions in pandemic response approaches with local, national and global implications. UC Davis research leaders in zoonotic disease detection and prevention, indoor air quality and wastewater measurement, diagnostic test development for disease detection, and epidemiological modeling were all in great demand, lending key insights on many aspects of likely pandemic progression and helping develop innovative solutions to minimize viral infection and disease propagation. UC Davis human health researchers also made important contributions to global clinical trials relating to drug repurposing, vaccine development and rapidly developing disease treatment protocols.

The weekly COVID-19 Research Forum that UC Davis initiated on Zoom for collaboration and rapid information exchange attracted the participation of 200–300 individuals from the Davis and Sacramento campuses. A roster of prioritized discussion topics kept the research community actively engaged and apprised of progress on a range of important subjects ranging from statistical observations and reporting of infection levels in the Yolo County area, to local and global progress on test and vaccine development activities. This information exchange platform enabled rapid progress in our collective understanding of the disease, and contributed to maintaining a very engaged and active research community.

Campus leaders capitalized a rapid-response seed grant program (CRAFT – COVID-19 Research Accelerator Funding Track) to further cultivate collaborations, resulting in many important activities in which interdisciplinary teams worked on various aspects of the emerging health crisis.

Most notably, the campus invested in proof-of-concept work at the Genome Center, which developed a novel saliva-based rapid test for COVID-19 (Chapter 9). Following further refinement and with the financial support of a generous anonymous donor, this innovative research was rapidly scaled and deployed. This research activity spawned a phenomenally successful testing effort in the wider Yolo-Solano County community that became known as “Healthy Davis Together” (Chapter 1) which received national and international attention, and won numerous awards for community service.

From an overall campus research continuity perspective, UC Davis made significant strides to keep as much of the research enterprise as possible in operation throughout the pandemic.

Research administration functions quickly migrated online, with extensive use of Microsoft Teams, Zoom, Slack and other platforms. The Office of Research, with direct input and support from the School of Medicine and the associate deans for research, rapidly developed and deployed new online fora to allow a range of traditionally in-person services to move online in an attempt to minimize interruption to the research enterprise. Support services, including proposal development and faculty convenings, shifted from in-person to online environments within a few days of release of instructions.

Soon after the first “shelter in place” orders were issued, the vice chancellor for research assembled a COVID-19 Research Operations Advisory Committee with faculty representatives from all schools and colleges to assist with developing policies to safely manage research activities. This group met regularly to help develop operational protocols for safe operations of research laboratories and campus core facilities. The committee created a “stage-gate” approach to operations that defined operational practices to be deployed at different times during the pandemic, depending on local levels of infection and transmission. The committee developed practical guidelines for laboratory and core facility operations, including safe sample handling, appropriate room ventilation and occupancy levels, possible shift structures (e.g. non-overlapping shifts), and scheduling to minimize exposure risk. The committee and the vice chancellor reviewed these practical guidelines regularly and modified them as needed, depending on prevailing levels of community infection, as the pandemic progressed.

Conclusion

Continuing university research activity during a public health crisis is possible with careful planning, frequent communication and data-driven decision-making. A successful and rapid transition of research administration services to online platforms and effective support of research directly aimed at understanding the public health crisis are pivotal in protecting our local community and contributing to global solutions.

CHALLENGE	LESSONS LEARNED
Effectively communicating research enterprise-related guidance and actions across the community	● The vice chancellor for research, in consultation with a faculty research advisory committee, should deliver consistent and frequently scheduled communications and policy decision updates (every 1–2 weeks) to keep the research community apprised of current status and to facilitate modulation of research activity in a dynamic way depending on prevailing local infection levels
Navigating supply chain disruptions for equipment, reagents and other research materials	● Foster close collaboration among principal investigators, the Office of Research and Supply Chain Management to expedite acquisition of critical reagents and materials needed for research and development directly related to the COVID-19 response (e.g., supplies for early development efforts of the saliva-based test)
Monitoring and responding to large volume of rapidly developing research findings, misinformation and disinformation related to the crisis	● Host a weekly research convening on Zoom to allow rapid exchange of information and facilitate frequent discussions of latest findings and coordination of actions across campus and beyond
Addressing research related to key questions around the public health crisis	● Develop a campus mechanism for much-needed rapid, responsive seed funding for key members of the UC Davis research community to contribute directly to local, national, and global efforts

Chapter 11: Academic Senate Considerations

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Key Takeaways and Recommendations

- In public health crises, the Academic Senate can establish emergency policies to enable the flexibility necessary for students and instructors to adapt to rapidly changing circumstances that accompany a pandemic.
- During the COVID-19 pandemic, academic policies and regulations were amended or waived as needed on a quarter-by-quarter basis.
- Coordinating with various campus units, including the Offices of the Chancellor and Provost, Graduate Studies, Undergraduate Education, Academic Affairs, school and college dean's offices and the Office of the University Registrar, is necessary to implement and communicate emergency policies broadly.
- Developing a central website with academic policy information provides instructors and students with resources and helps avoid confusion (Chapter 5).
- Involving the Academic Senate in discussions regarding urgent or emergency circumstances as soon as possible allows the organization to act swiftly and decisively.

Background, Introduction and Context

In emergency situations, such as an emerging public health crisis, the Academic Senate may consider temporary exemptions from or waivers of various academic policies and regulations to give students and instructors added flexibility. These policies and regulations fall under the exclusive purview of the Academic Senate and govern campus instruction and degree requirements, making Academic Senate action critically important for adaptation to emergency circumstances.

The Academic Senate generally begins official proceedings to consider adjustments to instructional policies and regulations upon the chancellor's declaration of a change in campus operating status or state of emergency, or in advance of that declaration, with the declaration triggering enactment of the policy or regulation adjustments.

Using the emergency powers granted to them by Davis Division Bylaw 73, the Academic Senate chair and the Executive Council can temporarily suspend or modify Davis Division Regulations and Academic Senate committee policies during urgent or emergency circumstances. The Academic Senate chair represents the Academic Senate in discussions with the administration and remains apprised of any future or current emergency circumstances in order to coordinate Academic Senate action.

During the COVID-19 pandemic, the Academic Senate amended and/or temporarily waived numerous policies and regulations. These amendments and waivers were approved on a quarter-by-quarter basis, accounting for variations in the implementation dates of these actions:

- Committee on Courses of Instruction's Virtual and Hybrid Courses Policy: The Davis Division authorized instruction to shift from in-person to emergency remote instruction, overriding the normal limitation that courses with 10 or more hours of online instruction must be individually approved by the Committee on Courses of Instruction.
- Davis Division Regulations:
 - 521(C)(2), University of California Entry Level Writing Requirement (ELWR): Upon approval of the systemwide senate, the Davis Division allowed students to complete their ELWR courses with a C- or passed grade (normally limited to C or better). This allowed students to change their ELWR courses to passed/not passed grading.
 - 538, Examinations: The division temporarily discontinued the requirement for undergraduate courses to hold final exams, in some cases and for some quarters.
 - A545(A), Passed or Not Passed Grading: The regulation allowed students who were not in good academic standing to take courses on a passed/not passed basis with the approval of their dean's office.
 - A545(B), Passed or Not Passed Grading: The new regulation exempted some quarters from the calculation in A545(B), which limits the number of passed/not passed units that an undergraduate student may take. This allowed students to take more courses on a passed/not passed basis than would normally be allowed.
 - A546(A), Satisfactory or Unsatisfactory: The division exempted some quarters from A546(A), which limits graduate students from taking more than one course each term on a satisfactory or unsatisfactory basis. During these terms, graduate students were able to take no more than two or three courses on a satisfactory or unsatisfactory basis (the number of courses allowed varied by quarter).
- Grade Change Committee Policy:
 - The new policy allowed all retroactive grade mode changes for students in good standing, and
 - Allowed all retroactive grade mode changes for students not in good standing if they received approval from their dean's office.
- Deadline for Passed/Not Passed Grading:
 - The deadline to elect passed/not passed grading was extended to the last day of instruction.
 - At the time of the COVID-19 pandemic, the Davis Division of the Academic Senate, the Faculty Executive Committees and the undergraduate deans jointly agreed upon the deadline to elect passed/not passed grading. Since then, the deadline has been codified in Davis Division Regulation A545(F).
- Deadline for Satisfactory/Unsatisfactory Grading: The Office of Graduate Studies (in conjunction with temporary revision of deadlines for passed/not passed grading) extended the deadline allowing students to elect satisfactory/unsatisfactory grading as late as the last day of instruction.
- In addition to the above actions, the Executive Council endorsed statements directed to college and school deans or the Faculty Executive Committees:
 1. Encouraged Faculty Executive Committees to relax college and

major level requirements that mandated students to take courses for a letter grade.

1. Encouraged dean's offices and the Office of Graduate Studies to consider extenuating circumstances related to COVID-19 as allowable justification for requesting late drops.
2. Encouraged clear communications and advising to undergraduates so that they could make informed choices when deciding whether to take courses on a passed/not passed basis.

The Academic Senate made strong efforts to communicate temporary regulation and policy changes to the campus community. This was accomplished by:

- Developing a central website with academic policies and guidelines for instructors and students that was regularly updated each quarter.
- Sending joint senate-administration communications to the campus community that provided updates, guidance, and directives for instruction during the pandemic.

- Issuing regular updates to Academic Senate and Academic Federation members through existing list servers.

Conclusion

The Academic Senate has exclusive authority over academic policies. The Academic Senate chair and the Executive Council are empowered to act on behalf of the Davis Division to develop and enact emergency policies that address instructional needs during a pandemic. The academic policy flexibilities implemented over the course of the pandemic prioritized equity for both students and instructors and were extended on an as-needed basis in response to changing circumstances.

During future public health crises, university leaders should involve the Academic Senate at the earliest opportunity, including through direct consultation and coordination with the Academic Senate chair, as granted by Davis Division Bylaw 73. Coordination between the Academic Senate and the administration allows the Academic Senate chair and the Executive Council to take appropriate action proactively and preemptively, and ensures that the faculty perspective is incorporated into any action that may be taken in response to a pandemic.

CHALLENGE	LESSONS LEARNED
Coordinating with administrators and campus units to ensure synchrony about action and communication	Communicate instruction flexibilities broadly and through a central website to avoid confusion for instructors and students
Anticipating future circumstances during a time of uncertainty	The Academic Senate can enact emergency policy and regulation amendments and waivers on a quarter-by-quarter basis to respond and adapt to potentially changing circumstances
Balancing the need for quick, decisive action with the need to allow for as much input and consultation with the Academic Senate as possible	The Academic Senate, per its bylaws and regulations, is already poised to take quick action and consult broadly when necessary
Balancing flexibilities desired by students with the Academic Senate's responsibility for delivering high-quality UC instruction	Existing processes, including the request for consultation (RFC) process, allow committees, committee members and stakeholders to convey their views on and propose potential policy changes
Overriding campus norms that are not included as official policies or regulations and require consultation with uncertain chain of command	Codifying new campus norms as a result of our experience is an important strategy to move forward and reduce confusion with future events

Chapter 12: Faculty and Student Experience

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Key Takeaways and Recommendations

- When considering significant shifts in teaching modality, such as moving instruction online, it is important to consider all three potential components of a class: lecture, lab and discussion.
- Students face many potential technological, social and economic barriers associated with remote instruction. These needs must be surveyed and communicated to faculty.
- Compliance with teaching policies, such as grading schemes, requires establishment of “norms” at different levels, including sections within a class, classes within a department and departments across campus.
- Clear and early communication must take place between departments and the Academic Senate regarding which decisions can be made by whom pertaining to grading and exams.

Background, Introduction and Context

The pivot from in-person to remote instruction in spring 2020 was a massive shift for faculty, staff and students. Faculty and staff members scrambled to produce online content (synchronous or asynchronous), and obtain the resources that faculty members and students needed to develop and make available the content. Many students went home to other countries or domestic environments that were not conducive to online learning, and some were unable to access university resources and online platforms. These barriers were attributable to residing in a different time zone, virtual private network (VPN) restrictions outside the country, restricted ability to access online resources, and limited access to either a computer or sufficient internet connection.

While the Academic Senate controls academic policies (Chapter 11), their mandates contain significant flexibility in interpretation and implementation. During the COVID-19 pandemic, different colleges, departments and even faculty members teaching the same course took unique approaches to managing the shift to online learning. Variation, or rather inconsistency, in remote instruction, in combination with variations in student needs and circumstances, created inequities. For instance, changes in grading schemes to pass/no-pass could put graduating students at a disadvantage if they were applying to competitive graduate programs, whereas first- or second-year undergraduate students would otherwise not be drastically affected. Beyond grades, changes to remote instruction can have nuanced effects on the student experience. For example, the UC Davis “Belonging Project” found that a number of student metrics increased from 2019 to 2020, including students’ sense of belonging and

the perception that faculty and staff members cared that they succeeded academically. The disconnection between students and their instructors also presented barriers to students seeking extracurricular opportunities and interfered with the ability of instructors to notice whether students were struggling academically in the course.

Conclusion

Uniform training and guidance from campus leaders can ensure the implementation of best practices during remote instruction, maximizing the success and well-being of all students,

regardless of the instructors, departments or colleges. Additional lessons can be gleaned from the UC Davis Belonging Project, including the importance of early and frequent outreach to students, the normalization of mental health challenges and wellness (Chapter 8), building community among students, classroom engagement and equitable academic policies (Chapter 11). A broad understanding of the potential impacts of remote instruction, in combination with the stressors of a public health crisis, should be strongly considered and incorporated in the university's response to future emergency situations.

CHALLENGE	LESSONS LEARNED
Transitioning lab classes to remote instruction	Consider alternatives, including “at home” labs mailed to students and teaching assistants leading recorded or livecast “demonstration labs”
Training faculty in online teaching	- Offer teaching resources for faculty through the UC Davis “Keep Teaching” website - Create “green room” spaces and offer programs and workshops to teach faculty how to create recorded lectures - Discuss the level of professionalism needed or not needed for prerecorded lectures
Understanding which interventions worked for which student populations	Conduct longitudinal surveys throughout and beyond a crisis to measure the impacts of different interventions and changes
Identifying and tracking struggling students during remote instruction	Use early and frequent direct contact between faculty, teaching staff and students
Offering students opportunities for personal connections with instructional staff to work toward accolades, such as letters of recommendation	Encourage early and frequent direct contact among faculty, staff, teaching assistants and students

CHALLENGE	LESSONS LEARNED
Navigating technological, social and economic barriers to remote access and learning for students	● Use Center for Educational Effectiveness (CEE) and Academic Technology Services (ATS) to understand and communicate barriers to faculty on a per-classroom basis ● Recognize that the utility of synchronous versus asynchronous learning depends on circumstances ● Provide funding for faculty to identify students with technological gaps and fill those gaps ● Do not assume that all students will have access to technology or be proficient in its use ● Survey students early to determine needs pertaining to technology and reliable Internet access ● Create programs and services that connect students to appropriate technology, such as the laptop loan program
Quickly addressing inequities introduced by technology in the classroom	● Be aware that some technologies can disadvantage students, such as online exam proctoring that may introduce inequities, and take steps to mitigate these impacts, including consideration of alternative assessments ● Create channels of communication to allow for collaboration among campus units, such as Centers for Teaching and Technology Services, to rapidly respond to emerging academic technology needs and impediments
Navigating the disparate effects that grading schemes, such as pass/no-pass and incompletes, can have on different students, such as a senior going into medical school versus a freshman	● Require the Academic Senate and departments to set clear standards, taking into account long-term implications of changes to grading schemes ● Educate academic advisors on both the changes and the implications of grading schemes, so that they can effectively advise students ● Consider that UC Davis students may be judged (i.e., for admission to professional schools) against students from places that did not make the same decisions
Equipping graduate teaching assistants (TAs) for the transition to remote learning	● Recognize that TAs require much of the same support given to faculty during a time of crisis ● Recognize that preparing course materials in an online context may require significantly more time than that required for traditional instruction

CHALLENGE	LESSONS LEARNED
Effectively engaging students in remote classes	● Support faculty and TAs in creating a sense of community in the asynchronous or synchronous classroom ● Support faculty and TAs with information about engagement strategies in online/remote learning ● Support faculty and TAs with the resources and skills to create inclusive classrooms and build online presence ● Provide faculty, TAs and students with campus diversity resources and services ● Direct students to campus resources to support student well-being and mental health ● Give faculty and TAs resources for creating a positive remote course environment
Creating accessible and equitable assessments for student learning during remote instruction	● Offer options for remote assessment, including technology-supported testing and assessment ● Support faculty in creating and implementing low-stakes, equitable assessments, such as frequent quizzes or reflections ● Establish faculty methods for learning-focused grading, including binary grading of assignments as “done” or “not done”